# xyzspaces

HERE Europe B.V.

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# GETTING STARTED


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Manage your XYZ Hub or HERE Data Hub spaces and Interactive Map Layer from Python.

CHAPTER

ONE

# DATA HUB

XYZ is an Open Source, real-time, cloud database system providing access to large geospatial data at scale. An XYZ "Hub" manages "spaces" that contain "features" (geodata "records") with tags and properties, with spaces and features having unique IDs. A RESTful API exists to provide low-level access to interact with a XYZ Hub.

This Python package allows to interact with your XYZ spaces and features on a given Hub using a higher level programmatic interface that wraps the RESTful API. Using this package you can:

- Create, read, list, update, share, delete spaces (also: get space info and stats).
- Add, read, update, iterate, search, cluster (hex/quad bins), delete features.
- Search features by ID, tag, property, bbox, tile, radius, geometry.

Based on the XYZ Hub the HERE Data Hub is a commercial service (with a free plan), that offers some additional features (in a pro plan), like clustering, virtual spaces, activity logs, schema validation, rule based tagging and likely more to come.

CHAPTER

TWO

# INTERACTIVE MAP LAYERS

The `xyzspaces` package supports Interactive Map Layers which is Data Hub on HERE Platform. Using `xyzspaces` you can interact with your Interactive Map Layers using higher level pythonic interface that wraps the RESTful API. With Interactive Map Layers, data is stored in GeoJSON and can be retrieved dynamically at any zoom level. Interactive map layer is optimized for the visualization, analysis, and modification of data on a map (i.e., GIS functions).

Key features of Interactive Map Layers include:

- Creating and modifying maps manually or programmatically; edits are published real-time and require no additional interaction.
- Modifying data a granular feature and feature property level.
- Adding and removing points, lines, and polygons directly on a map.
- Ability to retrieve data in different tiling schemes.
- Exploring and retrieving data by feature ID, bounding box, spatial search, property search, and features contained within a tile.
- Searching for data by values of feature properties (e.g., speed limits, type of place, address, name, etc.).
- Data sampling, making it possible to efficiently render an excerpt of a very large data set for visual reference and analysis.
- Clustering using hexbins or quadbins to produce rich, visual data representations.

## 2.1 Prerequisites

Before you install the `xyzspaces` package make sure you meet the following prerequisites:

- A Python installation, 3.7+ recommended, with the `pip` or `conda` command available to install dependencies.

### 2.1.1 Data Hub

- A HERE developer account, free and available under HERE Developer Portal.
- An XYZ API access token from your XYZ Hub server or the XYZ portal (see also its Getting Started section) in an environment variable named XYZ_TOKEN which you can set like this (with a valid value, of course):

```
export XYZ_TOKEN=MY-XYZ-TOKEN
```

### 2.1.2 Interactive Map Layer

- To interact with Interactive Map Layers you will need an account on the HERE Platform. To get more details on the HERE Platform account please check our documentation Get a HERE account.

Once you have the account follow the below steps to get credentials:

- Go to HERE Platform Applications and Keys and register a new app.
- Create a key for the app and download the generated `credentials.properties` file.

The HERE platform generated app credentials should look similar to the example below:

```
here.user.id = <example_here>
here.client.id = <example_here>
here.access.key.id = <example_here>
here.access.key.secret = <example_here>
here.token.endpoint.url = <example_here>
```

You can provide your credentials using any of the following methods:

- Default credentials
- Environment variables
- Credentials file

#### Default credentials

- Place the credentials file into:

  For Linux/MacOS:

  ```
  $HOME/.here/credentials.properties
  ```

  For Windows:

  ```
  %USERPROFILE%\.here\credentials.properties
  ```

#### Environment Variables

You can override default credentials by assigning values to the following environment variables:

```
HERE_USER_ID
HERE_CLIENT_ID
HERE_ACCESS_KEY_ID
HERE_ACCESS_KEY_SECRET
HERE_TOKEN_ENDPOINT_URL
```

#### Credentials File

You can specify any credentials file as an alternative to that found in `~/.here/credentials.properties`. An error is generated if there is no file present at the path, or if the file is not properly formatted.

## 2.2 Installation

xyzspaces has optional dependencies for its spatial functionality on a large geospatial, open source stack of libraries (Geopandas, turfpy, geobuf). See the *Dependencies* section below for more details. The C depedencies of Geopandas such as (GEOS, GDAL, PROJ) can sometimes be a challenge to install. Therefore, we advise you to closely follow the recommendations below to avoid installation problems.

### 2.2.1 Installing with Anaconda / conda

To install xyzspaces and all its dependencies, we recommend to use the conda package manager. This can be obtained by installing the Anaconda Distribution (a free Python distribution for data science), or through miniconda (minimal distribution only containing Python and the conda package manager). See also the installation docs for more information on how to install Anaconda or miniconda locally.

The advantage of using the conda package manager is that it provides pre-built binaries for all the required dependencies of xyzspaces for all platforms (Windows, Mac, Linux).

To install the latest version of xyzspaces from conda-forge, you can then do:

```
conda install -c conda-forge xyzspaces
```

#### Creating a new environment

Creating a new environment is not strictly necessary, but given that installing other geospatial packages from different channels may cause dependency conflicts (as mentioned in the note above), it can be good practice to install the geospatial stack in a clean environment starting fresh.

The following commands create a new environment with the name `xyz_env`, configures it to install packages always from conda-forge, and installs xyzspaces in it:

```
conda create -n xyz_env
conda activate xyz_env
conda config --env --add channels conda-forge
conda config --env --set channel_priority strict
conda install python=3 xyzspaces
```

### 2.2.2 Installing with pip

Install `xyzspaces` without optional dependencies:

```
pip install xyzspaces
```

Install `xyzspaces` with optional dependencies:

```
pip install "xyzspaces[geo]"
```

**Warning:** When using pip to install xyzspaces, you need to make sure that all dependencies of Geopandas are installed correctly.

- fiona provides binary wheels with the dependencies included for Mac and Linux, but not for Windows.
- pyproj and shapely provide binary wheels with dependencies included for Mac, Linux, and Windows.
- rtree does not provide wheels.
- Windows wheels for *shapely*, *fiona*, *pyproj* and *rtree* can be found at Christopher Gohlke's website.

So depending on your platform, you might need to compile and install their C dependencies manually. We refer to the individual packages for more details on installing those. Using conda (see above) avoids the need to compile the dependencies yourself.

### 2.2.3 Installing from source

You may install the latest development version by cloning the *GitHub* repository and using pip to install from the local directory:

```
git clone https://github.com/heremaps/xyz-spaces-python.git
cd xyz-spaces-python
pip install .
```

It is also possible to install the latest development version directly from the GitHub repository with:

```
pip install -e git+https://github.com/heremaps/xyz-spaces-python#egg=xyzspaces
```

For installing xyzspaces from source, the same *note* on the need to have all dependencies correctly installed applies.

See the *section on conda* above for more details on getting running with Anaconda.

### 2.2.4 Dependencies

Required dependencies:

- requirements

Optional depedencies:

- Geopandas
- turfpy
- geobuf

Dev dependencies:

- dev requirements

## 2.3 Examples

The Jupyter notebooks show various functionalities of xyzspaces. You can directly play with examples by clicking on the binder button:

To run the example notebooks locally See docs/notebooks/README.md.

The GIF below shows an interaction with an example notebook, demonstrating how to use a spatial search on a big public dataset, loaded from the HERE Data Hub.

### 2.3.1 Interactive examples

These are some preliminary code snippets that can be executed online. Click on the "Start" button first before you execute the following cells!

The following is a cell. Click the "run" button or press Shift-Enter inside the cell to execute it. Launching the computation backend may take a few seconds, and you may need to re-start it.

```
import xyzspaces
xyzspaces.__version__
```

This is another cell. Replace the "MY_XYZ_TOKEN" with your real XYZ token and click "run" again to search for the GeoJSON feature of the White House in Washington, DC, USA!

```
import os
import geojson
from xyzspaces.datasets import get_microsoft_buildings_space

os.environ["XYZ_TOKEN"] = "MY_XYZ_TOKEN"
space = get_microsoft_buildings_space()
feat = next(space.search(tags=["postalcode@20500"]))
print(geojson.dumps(feat, indent=4))
```

More to come… please stay tuned!

## 2.4 xyzspaces package

The XYZ Spaces for Python - manage your XYZ Hub server or HERE Data Hub.

XYZ Spaces for Python allows you to manage XYZ spaces, projects and tokens with the Hub API, Project API, and Token API, respectively. The Hub API provides the most features to let you read and write GeoJSON data (features) from and to an XYZ space, and perform some higher-level operations like return features inside or clipped by some bounding box or map tile. The Project API and Token API let you manage your XYZ projects and tokens.

See also: - XYZ Hub server: https://github.com/heremaps/xyz-hub - HERE Data Hub: https://developer.here.com/products/data-hub

**class** xyzspaces.**XYZ**(*config=None*)

Bases: object

A single interface to interact with your XYZ Hub server or HERE Data Hub.

**Parameters** **config** (*Optional[xyzspaces.config.default.XYZConfig]*) –

**__init__**(*config=None*)

**Instantiate an XYZ object, optionally with custom configuration for** your credentials and base URL.

**Parameters** **config** (*Optional[xyzspaces.config.default.XYZConfig]*) – An object of *class:XYZConfig*, If not provied `XYZ_TOKEN` will be used from environment variable and other configurations will be used as defined in module `default_config`

### 2.4.1 Subpackages

#### xyzspaces.config package

#### Submodules

#### xyzspaces.config.default module

This module defines classes for default configuration for the project.

**class** xyzspaces.config.default.**XYZConfig**(***kwargs*)

Bases: `object`

This class defines methods to manage configurations for project.

**__init__**(***kwargs*)

**classmethod from_default**()

Return the default config for the project.

**Return type** *xyzspaces.config.default.XYZConfig*

**classmethod from_file**(*path*)

Return the config from file path provided.

**Parameters** **path** (*Union[str, pathlib.Path]*) –

**Return type** *xyzspaces.config.default.XYZConfig*

#### xyzspaces.datasets package

This package provides access to some public datasets used.

xyzspaces.datasets.**get_countries_data**()

Pull countries example GeoJSON from the net or a locally cached file.

If this is not locally cached, yet, it will be after the first call, unless the file cannot be saved, in which case it will be re-downloaded again with every call.

Source (under http://unlicense.org): https://raw.githubusercontent.com/johan/world.geo.json/master/countries.geo.json

The data contains 180 countries, and does not cover all existing countries, ca. 200. For example the Vatican is missing.

**Returns** A JSON object.

xyzspaces.datasets.**get_chicago_parks_data**()

Create GeoJSON from file `chicago_parks.geo.json` stored locally.

xyzspaces.datasets.**get_microsoft_buildings_space**()
Create a space object for the MS "US Buildings Footprints" dataset.

The original source for this dataset can be found on https://github.com/Microsoft/USBuildingFootprints.

**Returns** A space object.

### xyzspaces.iml package

This module defines IML class to interact with Interactive Map Layer.

**class** xyzspaces.iml.**IML**
Bases: object

A single interface to interact with Interactive Map Layer.

**__init__**()

**classmethod from_catalog_hrn_and_layer_id**(*catalog_hrn*, *layer_id*, *credentials=None*)
Instantiate a IML object for an existing catalog and interactive map layer.

**Parameters**

- **catalog_hrn** (*str*) – HRN of the catalog.
- **layer_id** (*str*) – a string with the layer ID of this layer.
- **credentials** (*Optional[xyzspaces.iml.credentials.Credentials]*) – object of Credentials.

**Returns** Object of IML

**Return type** *xyzspaces.iml.IML*

**classmethod new**(*catalog_id*, *catalog_name*, *catalog_summary*, *catalog_description*, *layer_details*, *credentials=None*, *billing_tag=None*, *proxies=None*)
Create a new catalog and interactive map layer.

**Parameters**

- **catalog_id** (*str*) – ID of the catalog.
- **catalog_name** (*str*) – name of the catalog.
- **catalog_summary** (*str*) – catalog summary.
- **catalog_description** (*str*) – catalog description.
- **layer_details** (*Dict*) – A dict to represent interactive map layer details.
- **credentials** (*Optional[xyzspaces.iml.credentials.Credentials]*) – A Credentials instance.
- **billing_tag** (*Optional[str]*) – A string to represent billing tag.
- **proxies** (*Optional[Dict]*) – A dict to represnt proxies.

**Returns** Object of IML.

**Return type** *xyzspaces.iml.IML*

**add_interactive_map_layer**(*catalog_hrn*, *layer_details*, *credentials=None*, *billing_tag=None*, *proxies=None*)
Add a new interactive map layer to existing catalog.

**Parameters**

- **catalog_hrn** (*str*) – HRN of the catalog.
- **layer_details** (*Dict*) – A dict to represent interactive map layer details.
- **credentials** (*Optional[xyzspaces.iml.credentials.Credentials]*) – A Credentials instance.
- **billing_tag** (*Optional[str]*) – A string to represent billing tag.
- **proxies** (*Optional[Dict]*) – A dict to represnt proxies.

**Return type** None

**delete_catalog**(*catalog_hrn*, *credentials=None*, *billing_tag=None*, *proxies=None*)
Delete a catalog along with the layers it contains.

**Parameters**

- **catalog_hrn** (*str*) – The *HERE Resource Name* of the catalog
- **credentials** (*Optional[xyzspaces.iml.credentials.Credentials]*) – The credentials object.
- **billing_tag** (*Optional[str]*) – A string to represent billing tag.
- **proxies** (*Optional[Dict]*) – A dict to represnt proxies.

**Return type** None

## Submodules

### xyzspaces.iml.auth module

This module provides an `Auth` class to authenticate an app on the platform.

The authentication is based on some credentials object and will create an access token. It can be checked if the token is still valid, and it can be refreshed, too.

**class** xyzspaces.iml.auth.**Auth**(*credentials*, *aaa_oauth2_api*)
Bases: `object`

This class is responsible for authenticating with the HERE platform.

It requires PlatformCredentials, AAAOauth2BaseApi object.

**Parameters**

- **credentials** (xyzspaces.iml.credentials.Credentials) –
- **aaa_oauth2_api** (xyzspaces.iml.apis.aaa_oauth2_api.AAAOauth2Api) –

**__init__**(*credentials*, *aaa_oauth2_api*)
Instantiate authentication token.

**Parameters**

- **credentials** (xyzspaces.iml.credentials.Credentials) – an instance of PlatformCredentials
- **aaa_oauth2_api** (xyzspaces.iml.apis.aaa_oauth2_api.AAAOauth2Api) – an instance of AAAOauth2Api required in case of Credentials type.

**property token: Optional[str]**
Return the current token or requests a new one if needed.

**Returns** a valid token

`token_still_valid()`
Check whether the auth token is still valid or expired.

**Returns** a boolean indicating if a token is still valid.

**Return type** bool

`generate_token()`
Authenticate with the HERE account service and retrieve a new token.

### xyzspaces.iml.catalog module

This module defines Catalog class.

`class xyzspaces.iml.catalog.Catalog(hrn, credentials=None, proxies=None)`
Bases: `object`

A class to define catalog.

**Parameters**

- **hrn** (*str*) –
- **credentials** (*Optional[xyzspaces.iml.credentials.Credentials]*) –
- **proxies** (*Optional[dict]*) –

`__init__(hrn, credentials=None, proxies=None)`

**Parameters**

- **hrn** (*str*) –
- **credentials** (*Optional[xyzspaces.iml.credentials.Credentials]*) –
- **proxies** (*Optional[dict]*) –

`get_details()`
Get catalog details. :return: Dict

**Return type** Dict

### xyzspaces.iml.credentials module

This module provides a `Credentials` class to be used for authentication.

A credentials object can be created from a `credentials.properties` file obtained from the HERE platform portal or from environment variables.

`class xyzspaces.iml.credentials.Credentials(cred_properties)`
Bases: `object`

Credentials provides functions for dealing with the HERE platform Credentials.

Credentials can be read from the following locations:

- The default location: "~/.here/credentials.properties"
- A custom path to a credentials properties file
- Environment variables

**Parameters** **cred_properties** (*pyhocon.config_tree.ConfigTree*) –

**__init__**(*cred_properties*)
Instantiate the credentials object.

**Parameters** **cred_properties** (*pyhocon.config_tree.ConfigTree*) – the properties of Credentials.

**classmethod from_default**()
Return the credentials object from the default default credential path at '~/.here/credentials.properties'.

If environmental variables are set, these values will override the ones found in the default file.

If no default file is found, this method will try to read the credentials from the environmental variables.

**Returns** credentials

**Return type** *xyzspaces.iml.credentials.Credentials*

**classmethod from_credentials_file**(*path*)
Return the credentials object from a specified credentials path.

**Parameters** **path** (*str*) – path to a HERE platform credentials.properties file.

**Returns** credentials

**Raises** ***ConfigException*** – Erroneous credentials.properties file in path

**Return type** *xyzspaces.iml.credentials.Credentials*

**classmethod from_env**()
Return the credentials object from the following environment variables:

- HERE_USER_ID
- HERE_CLIENT_ID
- HERE_ACCESS_KEY_ID
- HERE_ACCESS_KEY_SECRET
- HERE_TOKEN_ENDPOINT_URL (optional)

**Returns** credentials parsed from the environment variables

**Raises** ***ConfigException*** – missing environmental variables that are mandatory

**Return type** *xyzspaces.iml.credentials.Credentials*

**patch_using_env**()
Patch the credentials by reading the following environment variables and applying them accordingly.

- HERE_USER_ID
- HERE_CLIENT_ID
- HERE_ACCESS_KEY_ID
- HERE_ACCESS_KEY_SECRET
- HERE_TOKEN_ENDPOINT_URL

Whenever such an environment variable is set, it overrides the one loaded from file.

### xyzspaces.iml.exceptions module

This module defines all the exceptions for iml package.

**exception** xyzspaces.iml.exceptions.**AuthenticationException**(*resp*)
Bases: Exception

This AuthenticationException is raised either authentication or authorization on the platform fails.

**__init__**(*resp*)
Instantiate AuthenticationException . :param resp: response detail will be stored in this param

**__str__**()
Return the message to be raised for this exception.

**Returns** error message

**Return type** str

**exception** xyzspaces.iml.exceptions.**TooManyRequestsException**(*resp*)
Bases: Exception

Exception raised for API HTTP response status code 429.

This is a dedicated exception to be used with the *backoff* package, because it requires a specific exception class. The exception value will be the response object returned by requests which provides access to all its attributes, eg. status_code, reason and text, etc.

**__init__**(*resp*)
Instantiate AuthenticationException . :param resp: response detail will be stored in this param

**__str__**()
Return a string from the HTTP response causing the exception.

The string simply lists the response status code, reason and text content, separated with commas.

**exception** xyzspaces.iml.exceptions.**ConfigException**
Bases: Exception

This ConfigException is raised whenever there is any error related to platform configuration.

**exception** xyzspaces.iml.exceptions.**PayloadTooLargeException**(*resp*)
Bases: Exception

Exception raised for API HTTP response status code 513.

This is a dedicated exception to be used for interactive map layer. This exception will be raised when response payload is larger than the specified limits of the interactive map layer. The exception value will be the response object returned by requests which provides access to all its attributes, eg. status_code, reason and text, etc.

**__init__**(*resp*)
Instantiate AuthenticationException . :param resp: response detail will be stored in this param

**__str__**()
Return a string from the HTTP response causing the exception.

The string simply lists the response status code, reason and text content, separated with commas.

**exception** xyzspaces.iml.exceptions.**RequestEntityTooLargeException**(*resp*)
Bases: Exception

Exception raised for API HTTP response status code 413.

This is a dedicated exception to be used for interactive map layer. This exception will be raised when request body is larger than the specified limits of the interactive map layer. The exception value will be the response object returned by `requests` which provides access to all its attributes, eg. `status_code`, `reason` and `text`, etc.

**__init__**(*resp*)
Instantiate AuthenticationException . :param resp: response detail will be stored in this param

**__str__**()
Return a string from the HTTP response causing the exception.

The string simply lists the response status code, reason and text content, separated with commas.

### xyzspaces.iml.layer module

This module defines interactive map layer.

**class** xyzspaces.iml.layer.**HexbinClustering**(*clustering_type='hexbin'*, *absolute_resolution=None*, *resolution=None*, *relative_resolution=None*, *property=None*, *pointmode=None*)

Bases: `object`

This class defines attributes for `hexbin` clustering algorithm.

**Parameters**

- **clustering_type** (*str*) –
- **absolute_resolution** (*Optional[int]*) –
- **resolution** (*Optional[int]*) –
- **relative_resolution** (*Optional[int]*) –
- **property** (*Optional[str]*) –
- **pointmode** (*Optional[bool]*) –

**Return type** None

**clustering_type: str = 'hexbin'**

**absolute_resolution: Optional[int] = None**

**resolution: Optional[int] = None**

**relative_resolution: Optional[int] = None**

**property: Optional[str] = None**

**pointmode: Optional[bool] = None**

**__annotations__ = {'absolute_resolution': typing.Union[int, NoneType], 'clustering_type': <class 'str'>, 'pointmode': typing.Union[bool, NoneType], 'property': typing.Union[str, NoneType], 'relative_resolution': typing.Union[int, NoneType], 'resolution': typing.Union[int, NoneType]}**

__dataclass_fields__ = {'absolute_resolution': Field(name='absolute_resolution',type=typing.Union[int, NoneType],default=None,default_factory=<dataclasses._MISSING_TYPE object>,init=True, repr=True,hash=None,compare=True,metadata=mappingproxy({}),_field_type=_FIELD), 'clustering_type': Field(name='clustering_type',type=<class 'str'>,default='hexbin',default_factory=<dataclasses._MISSING_TYPE object>,init=True,repr=True,hash=None,compare=True,metadata=mappingproxy({}), _field_type=_FIELD), 'pointmode': Field(name='pointmode',type=typing.Union[bool, NoneType],default=None,default_factory=<dataclasses._MISSING_TYPE object>,init=True, repr=True,hash=None,compare=True,metadata=mappingproxy({}),_field_type=_FIELD), 'property': Field(name='property',type=typing.Union[str, NoneType],default=None,default_factory=<dataclasses._MISSING_TYPE object>,init=True, repr=True,hash=None,compare=True,metadata=mappingproxy({}),_field_type=_FIELD), 'relative_resolution': Field(name='relative_resolution',type=typing.Union[int, NoneType],default=None,default_factory=<dataclasses._MISSING_TYPE object>,init=True, repr=True,hash=None,compare=True,metadata=mappingproxy({}),_field_type=_FIELD), 'resolution': Field(name='resolution',type=typing.Union[int, NoneType],default=None,default_factory=<dataclasses._MISSING_TYPE object>,init=True, repr=True,hash=None,compare=True,metadata=mappingproxy({}),_field_type=_FIELD)}

__dataclass_params__ = _DataclassParams(init=True,repr=True,eq=True,order=False, unsafe_hash=False,frozen=False)

__eq__(*other*)
Return self==value.

__hash__ = None

__init__(*clustering_type='hexbin'*, *absolute_resolution=None*, *resolution=None*, *relative_resolution=None*, *property=None*, *pointmode=None*)

**Parameters**

- **clustering_type** (*str*) –
- **absolute_resolution** (*Optional[int]*) –
- **resolution** (*Optional[int]*) –
- **relative_resolution** (*Optional[int]*) –
- **property** (*Optional[str]*) –
- **pointmode** (*Optional[bool]*) –

**Return type** None

__repr__()
Return repr(self).

class xyzspaces.iml.layer.**QuadbinClustering**(*clustering_type='quadbin'*, *no_buffer=False*, *relative_resolution=None*, *resolution=None*, *countmode=None*)

Bases: object

This class defines attributes for quadbin clustering algorithm.

**Parameters**

- **clustering_type** (*str*) –
- **no_buffer** (*bool*) –

- **relative_resolution** (*Optional[int]*) –
- **resolution** (*Optional[int]*) –
- **countmode** (*Optional[str]*) –

**Return type** None

clustering_type: str = 'quadbin'

no_buffer: bool = False

relative_resolution: Optional[int] = None

resolution: Optional[int] = None

countmode: Optional[str] = None

__annotations__ = {'clustering_type': <class 'str'>, 'countmode': typing.Union[str, NoneType], 'no_buffer': <class 'bool'>, 'relative_resolution': typing.Union[int, NoneType], 'resolution': typing.Union[int, NoneType]}

__dataclass_fields__ = {'clustering_type': Field(name='clustering_type',type=<class 'str'>,default='quadbin',default_factory=<dataclasses._MISSING_TYPE object>,init=True,repr=True,hash=None,compare=True,metadata=mappingproxy({}),_field_type=_FIELD), 'countmode': Field(name='countmode',type=typing.Union[str, NoneType],default=None,default_factory=<dataclasses._MISSING_TYPE object>,init=True,repr=True,hash=None,compare=True,metadata=mappingproxy({}),_field_type=_FIELD), 'no_buffer': Field(name='no_buffer',type=<class 'bool'>,default=False,default_factory=<dataclasses._MISSING_TYPE object>,init=True,repr=True,hash=None,compare=True,metadata=mappingproxy({}),_field_type=_FIELD), 'relative_resolution': Field(name='relative_resolution',type=typing.Union[int, NoneType],default=None,default_factory=<dataclasses._MISSING_TYPE object>,init=True,repr=True,hash=None,compare=True,metadata=mappingproxy({}),_field_type=_FIELD), 'resolution': Field(name='resolution',type=typing.Union[int, NoneType],default=None,default_factory=<dataclasses._MISSING_TYPE object>,init=True,repr=True,hash=None,compare=True,metadata=mappingproxy({}),_field_type=_FIELD)}

__dataclass_params__ = _DataclassParams(init=True,repr=True,eq=True,order=False,unsafe_hash=False,frozen=False)

__eq__(*other*)
Return self==value.

__hash__ = None

__init__(*clustering_type='quadbin'*, *no_buffer=False*, *relative_resolution=None*, *resolution=None*, *countmode=None*)

**Parameters**

- **clustering_type** (*str*) –
- **no_buffer** (*bool*) –
- **relative_resolution** (*Optional[int]*) –
- **resolution** (*Optional[int]*) –
- **countmode** (*Optional[str]*) –

**Return type** None

__repr__()
Return repr(self).

class xyzspaces.iml.layer.InteractiveMapApiResponse(*resp*)
Bases: object

This class defines response returned from Interactive Map APIs.

__init__(*resp*)

to_geojson()
Return response from API as geojson.Feature or geojson.FeatureCollection

**Returns** Either GeoJSON Feature or FeatureCollection.

**Raises** NotImplementedError – Response is incorrect.

**Return type** Union[geojson.feature.Feature, geojson.feature.FeatureCollection]

to_geopandas()
Return response from API as geopandas dataframe.

**Return type** gpd.GeoDataFrame

class xyzspaces.iml.layer.InteractiveMapLayer(*layer_id*, *catalog*)
Bases: object

This class provides access to data stored in Interactive Map layers.

**Parameters**

- **layer_id** (*str*) –
- **catalog** (Catalog) –

__init__(*layer_id*, *catalog*)
Initialize layer instance.

**Parameters**

- **layer_id** (*str*) – a string with the layer ID of this layer
- **catalog** (xyzspaces.iml.catalog.Catalog) – the instance of the Catalog this layer belongs to

__repr__()
Return string representation of this instance.

property statistics: dict
The statistical information of the layer.

get_feature(*feature_id*, *selection=None*, *force_2d=False*)
Return GeoJSON feature for the provided feature_id.

**Parameters**

- **feature_id** (*str*) – Feature id which is to fetched.
- **selection** (*Optional[List[str]]*) – A list, only these properties will be present in returned feature.
- **force_2d** (*bool*) – If set to True then features in the response will have only X and Y components, else all x,y,z coordinates will be returned.

**Returns** Feature object.

**Return type** *xyzspaces.iml.layer.InteractiveMapApiResponse*

**get_features**(*feature_ids*, *selection=None*, *force_2d=False*)
Return GeoJSON FeatureCollection for the provided feature_ids.

**Parameters**

- **feature_ids** (*List[str]*) – A list of feature identifiers to fetch.
- **selection** (*Optional[List[str]]*) – A list, only these properties will be present in returned features.
- **force_2d** (*bool*) – If set to `True` then features in the response will have only X and Y components, else all x,y,z coordinates will be returned.

**Returns** `FeatureCollection` object.

**Raises** **ValueError** – If `feature_ids` is empty list.

**Return type** *xyzspaces.iml.layer.InteractiveMapApiResponse*

**search_features**(*limit=30000*, *params=None*, *selection=None*, *skip_cache=False*, *force_2d=False*)
Search for features in the layer based on the properties.

**Parameters**

- **limit** (*int*) – A maximum number of features to return in the result. Default is 30000. Hard limit is 100000.
- **params** (*Optional[Dict[str, Union[str, list, tuple]]]*) – A dict to represent additional filters on features to be searched.

  Examples:

  - `params={"name": "foo"}` returns all features with a value of property `name` equal to `foo`.
  - `params={"name!": "foo"}` returns all features with a value of property `name` not equal to `foo`.
  - `params={"count=gte": "10"}` returns all features with a value of property `count` greater than or equal to `10`.
  - `params={"count=lte": "10"}` returns all features with a value of property `count` less than or equal to `10`.
  - `params={"count=gt": "10"}` returns all features with a value of property `count` greater than `10`.
  - `params={"count=lt": "10"}` returns all features with a value of property `count` less than `10`.
  - `params={"name=cs": "bar"}` returns all features with a value of property `name` which contains``bar``.
- **selection** (*Optional[List[str]]*) – A list, only these properties will be present in returned features.
- **skip_cache** (*bool*) – If set to `True` the response is not returned from cache. Default is `False`.
- **force_2d** (*bool*) – If set to `True` then features in the response will have only X and Y components, else all x,y,z coordinates will be returned.

**Returns** `FeatureCollection` object.

**Return type** *xyzspaces.iml.layer.InteractiveMapApiResponse*

**iter_features**(*chunk_size=30000*, *selection=None*, *skip_cache=False*, *force_2d=False*)
Return all the features in a Layer as Generator.

**Parameters**

- **chunk_size** (*int*) – A number of features to return in single iteration.
- **selection** (*Optional[List[str]]*) – A list, only these properties will be present in returned features.
- **skip_cache** (*bool*) – If set to `True` the response is not returned from cache. Default is `False`.
- **force_2d** (*bool*) – If set to `True` then features in the response will have only X and Y components, else all x,y,z coordinates will be returned.

**Yields** A `Feature` object.

**Return type** Iterator[geojson.feature.Feature]

**get_features_in_bounding_box**(*bounds*, *clip=False*, *limit=30000*, *params=None*, *selection=None*, *skip_cache=False*, *clustering=None*, *force_2d=False*)
Return the features which are inside a bounding box stipulated by `bounds` parameter.

**Parameters**

- **bounds** (*Tuple[float, float, float, float]*) – A tuple of four numbers representing the West, South, East and North margins, respectively, of the bounding box.
- **clip** (*bool*) – A Boolean indicating if the result should be clipped (default: False)
- **limit** (*int*) – A maximum number of features to return in the result. Default is 30000. Hard limit is 100000.
- **params** (*Optional[Dict[str, Union[str, list, tuple]]]*) – A dict to represent additional filters on features to be searched.

  Examples:

  – `params={"name": "foo"}` returns all features with a value of property `name` equal to `foo`.

  – `params={"name!": "foo"}` returns all features with a value of property `name` not equal to `foo`.

  – `params={"count=gte": "10"}` returns all features with a value of property `count` greater than or equal to `10`.

  – `params={"count=lte": "10"}` returns all features with a value of property `count` less than or equal to `10`.

  – `params={"count=gt": "10"}` returns all features with a value of property `count` greater than `10`.

  – `params={"count=lt": "10"}` returns all features with a value of property `count` less than `10`.

  – `params={"name=cs": "bar"}` returns all features with a value of property `name` which contains``bar``.
- **selection** (*Optional[List[str]]*) – A list, only these properties will be present in returned features.
- **skip_cache** (*bool*) – If set to `True` the response is not returned from cache. Default is `False`.

- **clustering** (*Optional[Union[xyzspaces.iml.layer.HexbinClustering, xyzspaces.iml.layer.QuadbinClustering]]*) – An object of either *HexbinClustering* or *QuadbinClustering*.
- **force_2d** (*bool*) – If set to `True` then features in the response will have only X and Y components, else all x,y,z coordinates will be returned.

**Returns** `FeatureCollection` object.

**Return type** *xyzspaces.iml.layer.InteractiveMapApiResponse*

**spatial_search**(*lng*, *lat*, *radius*, *limit=30000*, *params=None*, *selection=None*, *skip_cache=False*, *force_2d=False*)

Return the features which are inside the specified radius.

**Parameters**

- **lng** (*float*) – The longitude in WGS'84 decimal degree (-180 to +180) of the center Point.
- **lat** (*float*) – The latitude in WGS'84 decimal degree (-90 to +90) of the center Point.
- **radius** (*int*) – Radius in meter which defines the diameter of the search request.
- **limit** (*int*) – The maximum number of features in the response. Default is 30000. Hard limit is 100000.
- **params** (*Optional[Dict[str, Union[str, list, tuple]]]*) – A dict to represent additional filters on features to be searched.

  Examples:

  - `params={"name": "foo"}` returns all features with a value of property `name` equal to `foo`.
  - `params={"name!": "foo"}` returns all features with a value of property `name` not equal to `foo`.
  - `params={"count=gte": "10"}` returns all features with a value of property `count` greater than or equal to `10`.
  - `params={"count=lte": "10"}` returns all features with a value of property `count` less than or equal to `10`.
  - `params={"count=gt": "10"}` returns all features with a value of property `count` greater than `10`.
  - `params={"count=lt": "10"}` returns all features with a value of property `count` less than `10`.
  - `params={"name=cs": "bar"}` returns all features with a value of property `name` which contains``bar``.
- **selection** (*Optional[List[str]]*) – A list, only these properties will be present in returned features.
- **skip_cache** (*bool*) – If set to `True` the response is not returned from cache. Default is `False`.
- **force_2d** (*bool*) – If set to `True` then features in the response will have only X and Y components, else all x,y,z coordinates will be returned.

**Returns** `FeatureCollection` object.

**Return type** *xyzspaces.iml.layer.InteractiveMapApiResponse*

**spatial_search_geometry**(*geometry*, *radius=None*, *limit=30000*, *params=None*, *selection=None*, *skip_cache=False*, *force_2d=False*)

Return the features which are inside the specified radius and geometry.

The origin point is calculated based on the provided geometry.

**Parameters**

- **geometry** (*Union[geojson.feature.Feature, geojson.geometry.Geometry, dict, Any]*) – Geometry which will be used in intersection.
- **radius** (*Optional[int]*) – Radius in meter which defines the diameter of the search request.
- **limit** (*int*) – The maximum number of features in the response. Default is 30000. Hard limit is 100000.
- **params** (*Optional[Dict[str, Union[str, list, tuple]]]*) – A dict to represent additional filters on features to be searched.

  Examples:

  - `params={"name": "foo"}` returns all features with a value of property `name` equal to `foo`.
  - `params={"name!": "foo"}` returns all features with a value of property `name` not equal to `foo`.
  - `params={"count=gte": "10"}` returns all features with a value of property `count` greater than or equal to `10`.
  - `params={"count=lte": "10"}` returns all features with a value of property `count` less than or equal to `10`.
  - `params={"count=gt": "10"}` returns all features with a value of property `count` greater than `10`.
  - `params={"count=lt": "10"}` returns all features with a value of property `count` less than `10`.
  - `params={"name=cs": "bar"}` returns all features with a value of property `name` which contains``bar``.
- **selection** (*Optional[List[str]]*) – A list, only these properties will be present in returned features.
- **skip_cache** (*bool*) – If set to `True` the response is not returned from cache. Default is `False`.
- **force_2d** (*bool*) – If set to `True` then features in the response will have only X and Y components, else all x,y,z coordinates will be returned.

**Type** a GeoJSON Feature of Geometry or any object that supports the `__geo_interface__`.

**Returns** `FeatureCollection` object.

**Return type** *xyzspaces.iml.layer.InteractiveMapApiResponse*

**write_feature**(*feature_id*, *data*)

Write GeoJSON feature to Layer.

**Parameters**

- **feature_id** (*str*) – Identifier for the feature.

- **data** (*Union[geojson.feature.Feature, dict]*) – GeoJSON feature which is written to layer.

**Return type** None

**update_feature**(*feature_id*, *data*)
Update the GeoJSON feature in the Layer.

**Parameters**

- **feature_id** (*str*) – A feature_id to be updated.
- **data** (*Union[geojson.feature.Feature, dict]*) – A GeoJSON Feature object to update.

**Return type** None

**delete_feature**(*feature_id*)
Delete feature from the layer.

**Parameters** **feature_id** (*str*) – A feature_id to be deleted.

**Return type** None

**write_features**(*features=None*, *from_file=None*, *feature_count=2000*)
Write GeoJSON FeatureCollection to layer.

As API has a limitation on the size of features, features are divided into groups, and each group has number of features based on `feature_count`.

**Parameters**

- **features** (*Optional[Union[geojson.feature.FeatureCollection, dict, Iterator[geojson.feature.Feature], List[geojson.feature.Feature]]]*) – Features represented by `FeatureCollection`, Dict, `Iterator` or list of features.
- **from_file** (*Optional[Union[str, pathlib.Path]]*) – Path of GeoJSON file.
- **feature_count** (*int*) – An int representing a number of features to upload at a time.

**Return type** None

**_upload_features**(*feature_groups*)

**Parameters** **feature_groups** (*Iterator[Union[geojson.feature.Feature, Dict]]*) –

**Return type** None

**update_features**(*data*)
Update multiple features provided as `FeatureCollection` object.

**Parameters** **data** (*Union[geojson.feature.FeatureCollection, dict]*) – A `FeatureCollection` to be updated.

**Return type** None

**delete_features**(*feature_ids*)
Delete features from layer.

**Parameters** **feature_ids** (*List[str]*) – A list of feature_ids to be deleted.

**Return type** None

### xyzspaces.iml.apis package

#### Submodules

#### xyzspaces.iml.apis.aaa_oauth2_api module

This module contains an `AAAOauth2ApiClient` class to perform oauth API operations.

The HERE API reference documentation used in this module can be found here:

**class** xyzspaces.iml.apis.aaa_oauth2_api.**AAAOauth2Api**(*base_url*, *proxies=None*)

Bases: *xyzspaces.iml.apis.api.Api*

This class provides access to HERE platform AAA Oauth2 APIs.

**Parameters**

- **base_url** (*str*) –
- **proxies** (*Optional[dict]*) –

**__init__**(*base_url*, *proxies=None*)

**Parameters**

- **base_url** (*str*) –
- **proxies** (*Optional[dict]*) –

**request_scoped_access_token**(*oauth*, *data*)

Request scoped access oauth2 token from platform.

**Parameters**

- **oauth** (*requests_oauthlib.oauth1_auth.OAuth1*) – oauth1 configuration.
- **data** (*str*) – a string which represents request body.

**Returns** a json with scoped access token.

**Raises**

- ***TooManyRequestsException*** – If the status code of the HTTP response is 429
- ***AuthenticationException*** – If platform responds with HTTP 401 or 403.
- **RuntimeError** – If platform does not respond with HTTP 200.

**Return type** Dict

#### xyzspaces.iml.apis.api module

This module implements base class for low level api client.

**class** xyzspaces.iml.apis.api.**Api**(*access_token*, *proxies=None*)

Bases: `object`

Base class for low level api calls.

**Parameters** **proxies** (*Optional[dict]*) –

**__init__**(*access_token*, *proxies=None*)

**Parameters** **proxies** (*Optional[dict]*) –

**property headers: dict**
Return HTTP request headers with Bearer token in `Authorization` field.

**Returns** authorization tokens

**get**(*url*, *params=None*, *headers=None*, ***kwargs*)
Perform a get request of an API at a specified URL with backoff.

**Parameters**

- **url** (*str*) – URL of the API.
- **params** (*Optional[dict]*) – Parameters to pass to the API.
- **headers** (*Optional[dict]*) – Request headers. Defaults to the Api headers property.
- **kwargs** – Optional arguments that request takes.

**Returns** response from the API.

**Return type** requests.models.Response

**head**(*url*, *params=None*, *headers=None*, ***kwargs*)
Perform a head request of an API at specified URL.

**Parameters**

- **url** (*str*) – URL of the API.
- **params** (*Optional[dict]*) – Parameters to pass to the API.
- **headers** (*Optional[dict]*) – Request headers. Defaults to the api headers property.
- **kwargs** – Optional arguments that request takes.

**Returns** response from the API.

**Return type** requests.models.Response

**post**(*url*, *data=None*, *params=None*, *headers=None*, ***kwargs*)
Perform a post request of an API at a specified URL with backoff.

**Parameters**

- **url** (*str*) – URL of the API.
- **data** (*Optional[Union[dict, list, bytes, str]]*) – Post data for http request.
- **params** (*Optional[dict]*) – Parameters to pass to the API.
- **headers** (*Optional[dict]*) – Request headers. Defaults to the api headers property.
- **kwargs** – Optional arguments that request takes.

**Returns** response from the API.

**Return type** requests.models.Response

**put**(*url*, *data=None*, *params=None*, *headers=None*, ***kwargs*)
Perform a put request of an API at a specified URL with backoff.

**Parameters**

- **url** (*str*) – URL of the API
- **data** (*Optional[Union[dict, bytes]]*) – Put data for http request.
- **params** (*Optional[dict]*) – Parameters to pass to the API.

- **headers** (*Optional[dict]*) – Request headers. Defaults to the api headers property.
- **kwargs** – Optional arguments that request takes.

**Returns** response from the API.

**Return type** requests.models.Response

**patch**(*url*, *data=None*, *params=None*, *headers=None*, ***kwargs*)
Perform a patch request of an API at a specified URL with backoff.

**Parameters**

- **url** (*str*) – URL of the API
- **data** (*Optional[Union[dict, bytes, str]]*) – Patch data for http request.
- **params** (*Optional[dict]*) – Parameters to pass to the API.
- **headers** (*Optional[dict]*) – Request headers. Defaults to the api headers property.
- **kwargs** – Optional arguments that request takes.

**Returns** response from the API.

**Return type** requests.models.Response

**delete**(*url*, *params=None*, *headers=None*, ***kwargs*)
Perform a delete request of an API at a specified URL with backoff.

**Parameters**

- **url** (*str*) – URL of the API
- **params** (*Optional[Dict]*) – parameters to pass to the API.
- **headers** (*Optional[dict]*) – Request headers. Defaults to the api headers property.
- **kwargs** – Optional arguments that request takes.

**Returns** response from the API.

**Return type** requests.models.Response

**static raise_response_exception**(*resp*)
Parse HTTP errors status code and raise necessary exceptions.

**Parameters** **resp** (*requests.models.Response*) – An HTTP response to parse.

**Raises**

- *TooManyRequestsException* – If platform responds with HTTP 429.
- *AuthenticationException* – If platform responds with HTTP 401 or 403.
- *RequestEntityTooLargeException* – If platform responds with HTTP 413.
- *PayloadTooLargeException* – If platform responds with HTTP 513.
- **Exception** – If client responds with any other exception.

**Return type** None

### xyzspaces.iml.apis.data_config_api module

This module contains a *DataConfigApi* class to perform API operations.

The HERE API reference documentation used in this module can be found here:

**class** xyzspaces.iml.apis.data_config_api.**DataConfigApi**(*auth*, *proxies=None*)

Bases: *xyzspaces.iml.apis.api.Api*

This class defines data config APIs

**Parameters**

- **auth** (xyzspaces.iml.auth.Auth) –
- **proxies** (*Optional[dict]*) –

**__init__**(*auth*, *proxies=None*)

**Parameters**

- **auth** (xyzspaces.iml.auth.Auth) –
- **proxies** (*Optional[dict]*) –

**create_catalog**(*data*, *billing_tag=None*)

Create a catalog.

**Parameters**

- **data** (*Dict[str, Any]*) – a dict with a catalog metadata.
- **billing_tag** (*Optional[str]*) – A string which is used for grouping billing records.

**Returns** response from the API.

**Return type** Dict

**get_catalog_status**(*catalog_status_href*, *billing_tag=None*)

Get the status of the catalog operations for the given token.

**Parameters**

- **catalog_status_href** (*str*) – a catalog status href url.
- **billing_tag** (*Optional[str]*) – A string which is used for grouping billing records.

**Returns** response from the API.

**Return type** tuple

**get_catalog_details**(*catalog_hrn*, *billing_tag=None*)

Get the full catalog configuration for the requested catalog.

**Parameters**

- **catalog_hrn** (*str*) – a HERE Resource Name
- **billing_tag** (*Optional[str]*) – A string which is used for grouping billing records.

**Returns** response from the API.

**Return type** Dict

**update_catalog**(*catalog_hrn*, *data*, *billing_tag=None*)

Update a catalog.

**Parameters**

- **catalog_hrn** (*str*) – a HERE Resource Name.
- **data** (*Dict[str, Any]*) – body of the update catalog request.
- **billing_tag** (*Optional[str]*) – A string which is used for grouping billing records.

**Returns** a dict with catalog update status.

**Return type** dict

**delete_catalog**(*catalog_hrn*, *billing_tag=None*)
Delete a catalog.

**Parameters**

- **catalog_hrn** (*str*) – a HERE Resource Name.
- **billing_tag** (*Optional[str]*) – a string which is used for grouping billing records.

**Returns** a dict with catalog deletion status.

**Return type** dict

### xyzspaces.iml.apis.data_interactive_api module

This module contains a `DataInteractiveApiClient` class to perform API operations.

The HERE API reference documentation used in this module can be found here:

**class** xyzspaces.iml.apis.data_interactive_api.**DataInteractiveApi**(*base_url*, *auth*, *proxies=None*)
Bases: *xyzspaces.iml.apis.api.Api*

This class provides access to HERE platform Data Interactive APIs.

Interactive APIs offer a set of unique capabilities, enabling you to store, retrieve, search for, analyze and modify data at a feature (e.g., a place) and feature property (e.g., the name of the place) level. With interactive APIs, data is stored in GeoJSON and can be retrieved dynamically at any zoom level.

**Parameters**

- **base_url** (*str*) –
- **auth** (xyzspaces.iml.auth.Auth) –
- **proxies** (*Optional[dict]*) –

**__init__**(*base_url*, *auth*, *proxies=None*)

**Parameters**

- **base_url** (*str*) –
- **auth** (xyzspaces.iml.auth.Auth) –
- **proxies** (*Optional[dict]*) –

**static query_params_to_string**(*params*)
Convert query params in a dictionary to string.

This method is required as character encoding needs to be skipped for , to support OR condition, and if property value has any special character then character encoding is required. As python `requests` by default does encoding of all the characters hence, this needs to be handled separately. For more details please check: https://saeljira.it.here.com/browse/DH-1369.

**Parameters** **params** (*Dict[str, Union[str, list, tuple]]*) – A dict to represent query params.

**Returns** A string.

**Return type** str

**get_feature**(*layer_id*, *feature_id*, *selection=None*, *force2d=False*)
Return the feature with the provided `feature_id`.

**Parameters**

- **layer_id** (*str*) – Identifier of the Interactive Map Layer.
- **feature_id** (*str*) – Feature id which is to fetched.
- **selection** (*Optional[List[str]]*) – A list, only these properties will be present in returned feature.
- **force2d** (*bool*) – If set to `True` then features in the response will have only X and Y components, else all x,y,z coordinates will be returned.

**Returns** Response from the API.

**Return type** Dict

**get_features**(*layer_id*, *feature_ids*, *selection=None*, *force2d=False*)
Return all of the features found for the provided list of feature ids.

The response is always a FeatureCollection, even if there are no features with the provided ids.

**Parameters**

- **layer_id** (*str*) – Identifier of the Interactive Map Layer.
- **feature_ids** (*List*) – A list of feature_ids to fetch.
- **selection** (*Optional[List[str]]*) – A list, only these properties will be present in returned features.
- **force2d** (*bool*) – If set to `True` then features in the response will have only X and Y components, else all x,y,z coordinates will be returned.

**Returns** Response from the API.

**Return type** Dict

**get_statistics**(*layer_id*, *skip_cache=False*)
Return statistical information about this layer.

**Parameters**

- **layer_id** (*str*) – Identifier of the Interactive Map Layer.
- **skip_cache** (*bool*) – If set to `True` the response is not returned from cache. Default is `False`.

**Returns** Response from the API.

**Return type** Dict

**get_features_by_bbox**(*layer_id*, *bbox*, *clip=False*, *limit=30000*, *params=None*, *selection=None*, *skip_cache=False*, *clustering=None*, *clustering_params=None*, *force2d=False*)
Return the features which are inside a bounding box stipulated by `bbox` parameter.

**Parameters**

- **layer_id** (*str*) – Identifier of the Interactive Map Layer.

- **bbox** (*tuple*) – A list of four numbers representing the West, South, East and North margins, respectively, of the bounding box.
- **clip** (*bool*) – A Boolean indicating if the result should be clipped (default: False).
- **limit** (*int*) – A maximum number of features to return in the result. Default is 30000. Hard limit is 100000.
- **params** (*Optional[dict]*) – A dict to represent additional filters on features to be searched.

  Examples:

  - `params={"name": "foo"}` returns all features with a value of property `name` equal to `foo`.
  - `params={"name!": "foo"}` returns all features with a value of property `name` not equal to `foo`.
  - `params={"count=gte": "10"}` returns all features with a value of property `count` greater than or equal to `10`.
  - `params={"count=lte": "10"}` returns all features with a value of property `count` less than or equal to `10`.
  - `params={"count=gt": "10"}` returns all features with a value of property `count` greater than `10`.
  - `params={"count=lt": "10"}` returns all features with a value of property `count` less than `10`.
  - `params={"name=cs": "bar"}` returns all features with a value of property `name` which contains``bar``.
- **selection** (*Optional[List[str]]*) – A list, only these properties will be present in returned features.
- **skip_cache** (*bool*) – If set to `True` the response is not returned from cache. Default is `False`.
- **clustering** (*Optional[str]*) – The clustering algorithm to apply to the data within the result. Clustering algorithms supported: `hexbin`, `quadbin`.
- **clustering_params** (*Optional[Dict]*) – Parameters for the chosen clustering algorithm.
- **force2d** (*bool*) – If set to `True` then features in the response will have only X and Y components, else all x,y,z coordinates will be returned.

**Returns** Response from the API.

**Return type** Dict

**get_features_in_tile**(*layer_id*, *tile_type*, *tile_id*, *clip=False*, *params=None*, *selection=None*, *skip_cache=False*, *clustering=None*, *clustering_params=None*, *margin=0*, *limit=30000*, *force2d=False*)

Retrieve features in tile.

**Parameters**

- **layer_id** (*str*) – Identifier of the Interactive Map Layer.
- **tile_type** (*str*) – A string with the name of a tile type, one of “quadkeys”, “web”, “tms” or “here”. The type of tile identifier. “quadkey” - Virtual Earth, “web” - Web Mercator, “tms” - OSGEO Tile Map Service, “here” - Here Tile Schema.

- **tile_id** (*str*) – The tile identifier can be provided as quadkey (1), Web Mercator level,x,y coordinates (1_1_0) or OSGEO Tile Map Service level,x,y (1_1_0).
- **clip** (*bool*) – A Boolean indicating if the result should be clipped (default: False).
- **params** (*Optional[dict]*) – A dict to represent additional filters on features to be searched.

  Examples:

  - `params={"name": "foo"}` returns all features with a value of property `name` equal to `foo`.
  - `params={"name!": "foo"}` returns all features with a value of property `name` not equal to `foo`.
  - `params={"count=gte": "10"}` returns all features with a value of property `count` greater than or equal to `10`.
  - `params={"count=lte": "10"}` returns all features with a value of property `count` less than or equal to `10`.
  - `params={"count=gt": "10"}` returns all features with a value of property `count` greater than `10`.
  - `params={"count=lt": "10"}` returns all features with a value of property `count` less than `10`.
  - `params={"name=cs": "bar"}` returns all features with a value of property `name` which contains``bar``.
- **selection** (*Optional[List[str]]*) – A list, only these properties will be present in returned features.
- **skip_cache** (*bool*) – If set to `True` the response is not returned from cache. Default is `False`.
- **clustering** (*Optional[str]*) – The clustering algorithm to apply to the data within the result. Clustering algorithms supported: `hexbin`, `quadbin`.
- **clustering_params** (*Optional[Dict]*) – Parameters for the chosen clustering algorithm.
- **margin** (*Optional[int]*) – Margin in pixels on the respective projected level around the tile. Default is 0.
- **limit** (*int*) – The maximum number of features in the response. Default is 30000. Hard limit is 100000.
- **force2d** (*bool*) – If set to `True` then features in the response will have only X and Y components, else all x,y,z coordinates will be returned.

**Returns** Response from the API.

**Return type** Dict

**get_features_with_radius_search**(*layer_id*, *lat=None*, *lng=None*, *ref_catalog=None*, *ref_layer_id=None*, *ref_feature_id=None*, *radius=None*, *limit=30000*, *params=None*, *selection=None*, *skip_cache=False*, *force2d=False*)

Retrieve the features which are inside the specified radius.

The origin radius point is calculated based either on latitude & longitude or by specifying a feature's geometry.

**Parameters**

- **layer_id** (*str*) – Identifier of the Interactive Map Layer.
- **lat** (*Optional[float]*) – The latitude in WGS'84 decimal degree (-90 to +90) of the center Point.
- **lng** (*Optional[float]*) – The longitude in WGS'84 decimal degree (-180 to +180) of the center Point.
- **ref_catalog** (*Optional[str]*) – The catalog HRN where the layer containing the referenced feature is stored. Always to use in combination with `ref_feature_id`.
- **ref_layer_id** (*Optional[str]*) – As alternative for defining center coordinates, it is possible to reference a geometry in a layer. Therefore it is needed to provide the layer id where the referenced feature is stored. Always to use in combination with `ref_feature_id`.
- **ref_feature_id** (*Optional[str]*) – The unique identifier of a feature in the referenced layer. The geometry of that feature gets used for the spatial query. Always to use in combination with `ref_catalog` and `ref_layer_id`.
- **radius** (*Optional[int]*) – Radius in meter which defines the diameter of the search request.
- **limit** (*int*) – The maximum number of features in the response. Default is 30000. Hard limit is 100000.
- **params** (*Optional[dict]*) – A dict to represent additional filters on features to be searched.

  Examples:

  - `params={"name": "foo"}` returns all features with a value of property `name` equal to `foo`.
  - `params={"name!": "foo"}` returns all features with a value of property `name` not equal to `foo`.
  - `params={"count=gte": "10"}` returns all features with a value of property `count` greater than or equal to `10`.
  - `params={"count=lte": "10"}` returns all features with a value of property `count` less than or equal to `10`.
  - `params={"count=gt": "10"}` returns all features with a value of property `count` greater than `10`.
  - `params={"count=lt": "10"}` returns all features with a value of property `count` less than `10`.
  - `params={"name=cs": "bar"}` returns all features with a value of property `name` which contains``bar``.
- **selection** (*Optional[List[str]]*) – A list, only these properties will be present in returned features.
- **skip_cache** (*bool*) – If set to `True` the response is not returned from cache. Default is `False`.
- **force2d** (*bool*) – If set to `True` then features in the response will have only X and Y components, else all x,y,z coordinates will be returned.

**Returns** Response from the API.

**Return type** Dict

`get_features_with_geometry_intersection`(*layer_id*, *data*, *radius=None*, *limit=30000*, *params=None*, *selection=None*, *skip_cache=False*, *force2d=False*)

Retrieve the features which are inside the specified radius and geometry.

The origin point is calculated based on the geometry provided as payload.

**Parameters**

- **layer_id** (*str*) – Identifier of the Interactive Map Layer.
- **data** (*dict*) – Geometry which will be used in intersection.
- **radius** (*Optional[int]*) – Radius in meter which defines the diameter of the search request.
- **limit** (*int*) – The maximum number of features in the response. Default is 30000. Hard limit is 100000.
- **params** (*Optional[dict]*) – A dict to represent additional filters on features to be searched.

  Examples:

  - `params={"name": "foo"}` returns all features with a value of property `name` equal to `foo`.
  - `params={"name!": "foo"}` returns all features with a value of property `name` not equal to `foo`.
  - `params={"count=gte": "10"}` returns all features with a value of property `count` greater than or equal to `10`.
  - `params={"count=lte": "10"}` returns all features with a value of property `count` less than or equal to `10`.
  - `params={"count=gt": "10"}` returns all features with a value of property `count` greater than `10`.
  - `params={"count=lt": "10"}` returns all features with a value of property `count` less than `10`.
  - `params={"name=cs": "bar"}` returns all features with a value of property `name` which contains``bar``.
- **selection** (*Optional[List[str]]*) – A list, only these properties will be present in returned features.
- **skip_cache** (*bool*) – If set to `True` the response is not returned from cache. Default is `False`.
- **force2d** (*bool*) – If set to `True` then features in the response will have only X and Y components, else all x,y,z coordinates will be returned.

**Returns** Response from the API.

**Return type** Dict

`search_features`(*layer_id*, *limit=30000*, *params=None*, *selection=None*, *skip_cache=False*, *force2d=False*)

Search for features in the layer.

The results are unordered and the request does not allow to continue the search,

**Parameters**

- **layer_id** (*str*) – Identifier of the Interactive Map Layer.
- **limit** (*int*) – The maximum number of features in the response. Default is 30000. Hard limit is 100000.
- **params** (*Optional[dict]*) – A dict to represent additional filters on features to be searched.

  Examples:

  - `params={"name": "foo"}` returns all features with a value of property `name` equal to `foo`.
  - `params={"name!": "foo"}` returns all features with a value of property `name` not equal to `foo`.
  - `params={"count=gte": "10"}` returns all features with a value of property `count` greater than or equal to `10`.
  - `params={"count=lte": "10"}` returns all features with a value of property `count` less than or equal to `10`.
  - `params={"count=gt": "10"}` returns all features with a value of property `count` greater than `10`.
  - `params={"count=lt": "10"}` returns all features with a value of property `count` less than `10`.
  - `params={"name=cs": "bar"}` returns all features with a value of property `name` which contains``bar``.
- **selection** (*Optional[List[str]]*) – A list, only these properties will be present in returned features.
- **skip_cache** (*bool*) – If set to `True` the response is not returned from cache. Default is `False`.
- **force2d** (*bool*) – If set to `True` then features in the response will have only X and Y components, else all x,y,z coordinates will be returned.

**Returns** Response from the API.

**Return type** Dict

**iter_features**(*layer_id*, *limit=30000*, *page_token=None*, *selection=None*, *skip_cache=False*, *force2d=False*)

Iterate over all of the features in the layer.

The features in the response are ordered so that no feature is returned twice.

**Parameters**

- **layer_id** (*str*) – Identifier of the Interactive Map Layer.
- **limit** (*int*) – The maximum number of features in the response in single iteration. Default is 30000. Hard limit is 100000.
- **page_token** (*Optional[str]*) – The page token where the iteration will continue.
- **selection** (*Optional[List[str]]*) – A list, only these properties will be present in returned features.
- **skip_cache** (*bool*) – If set to `True` the response is not returned from cache. Default is `False`.

- **force2d** (*bool*) – If set to True then features in the response will have only X and Y components, else all x,y,z coordinates will be returned.

**Returns** Response from the API.

**Return type** Dict

**put_features**(*layer_id*, *data*)
Create or replace the provided features.

**Parameters**

- **layer_id** (*str*) – Identifier of the Interactive Map Layer.
- **data** (*dict*) – Request body representing FeatureCollection to create or replace.

**Returns** Response from the API.

**post_features**(*layer_id*, *data*)
Create or patch features.

**Parameters**

- **layer_id** (*str*) – Identifier of the Interactive Map Layer.
- **data** (*dict*) – Request body representing FeatureCollection to create or update.

**Returns** Response from the API.

**delete_features**(*layer_id*, *feature_ids*)
Delete multiple features from the layer.

**Parameters**

- **layer_id** (*str*) – Identifier of the Interactive Map Layer.
- **feature_ids** (*List[str]*) – A list of feature_ids to be deleted.

**Returns** Response from the API.

**put_feature**(*layer_id*, *feature_id*, *data*)
Creates or replace a feature in the layer.

**Parameters**

- **layer_id** (*str*) – Identifier of the Interactive Map Layer.
- **feature_id** (*str*) – Feature id which is to fetched.
- **data** (*dict*) – Request body representing feature to create or replace.

**Returns** Response from the API.

**patch_feature**(*layer_id*, *feature_id*, *data*)
Patch an existing feature.

**Parameters**

- **layer_id** (*str*) – Identifier of the Interactive Map Layer.
- **feature_id** (*str*) – Feature id which is to fetched.
- **data** (*dict*) – Request body representing feature to change.

**Returns** Response from the API.

**delete_feature**(*layer_id*, *feature_id*)
Delete an existing feature.

**Parameters**

- **layer_id** (*str*) – Identifier of the Interactive Map Layer.
- **feature_id** (*str*) – Feature id which is to fetched.

**Returns** Response from the API.

### xyzspaces.iml.apis.lookup_api module

This module contains an *LookupApi* class to perform API operations.

The HERE API reference documentation used in this module can be found here:

**class** xyzspaces.iml.apis.lookup_api.**LookupApi**(*auth*, *proxies=None*)

Bases: *xyzspaces.iml.apis.api.Api*

This class provides access to HERE platform Lookup APIs.

Instances can call only to those API endpoints relevant for accessing catalog and layer metadata, as well as those needed to access the data contained in different types of layers.

**Parameters**

- **auth** (xyzspaces.iml.auth.Auth) –
- **proxies** (*Optional[dict]*) –

**api_version_impl = {'interactive': 'v1', 'lookup': 'v1'}**

**platform_api_version_impl = {'artifact': 'v1', 'config': 'v1', 'lookup': 'v1'}**

**__init__**(*auth*, *proxies=None*)

**Parameters**

- **auth** (xyzspaces.iml.auth.Auth) –
- **proxies** (*Optional[dict]*) –

**get_resource_api_list**(*hrn*, *region=None*)

Lookup all available APIs for given HRN.

**Parameters**

- **hrn** (*str*) – a HERE Resource Name identifying the resource
- **region** (*Optional[str]*) – an Optional param to look up a specific region for a given resource

**Returns** The list of APIs that can be used with the resource

**Return type** dict

**get_resource_api**(*hrn*, *api*, *version*, *region=None*)

Return details of a single API for a given resource identified by hrn, api and version.

**Parameters**

- **hrn** (*str*) – a HERE Resource Name identifying the resource
- **api** (*str*) – The identifier of the API
- **version** (*str*) – The version of the API

- **region** (*Optional[str]*) – an Optional param to look up a specific region for a given resource

**Returns** Details of the requested API for the resource

**Return type** dict

### 2.4.2 Submodules

#### xyzspaces.__version__ module

Project version information.

#### xyzspaces.apis module

This module does access the APIs of an XYZ Hub server or HERE Data Hub.

It provides classes like *HubApi*, *ProjectApi*, and *TokenApi* to interact with the respective XYZ APIs in a programmatic way.

**class** xyzspaces.apis.**Api**(*config=None*)

Bases: object

A low-level HTTP RESTful API client.

This uses requests to make HTTP requests with typical parameters and will return the entire response when calling instances directly, or when using the aliased HTTP methods like *Api.get()*, *Api.put()* etc. provided for convenience.

All these methods like *Api.get()*, *Api.put()* etc. will raise ApiError if the status code of the HTTP response is not in the interval [200, 300).

This class is a base class for concrete HERE XYZ APIs, but can also be used outside of that particular context for any RESTful API, maybe with slight changes regarding authentication.

**Parameters** **config** (*Optional[xyzspaces.config.default.XYZConfig]*) –

**__init__**(*config=None*)

Instantiate an *Api* object.

**Parameters** **config** (*Optional[xyzspaces.config.default.XYZConfig]*) –

**__call__**(*method*, *path=''*, *params=None*, *headers=None*, *cookies=None*, *json=None*, *data=None*, *proxies=None*)

Make an API call with parameters passed to requests.

**Parameters**

- **method** (*str*) – The HTTP method name, e.g. "GET", "PUT", etc.
- **path** (*Optional[str]*) – The HTTP path to be appended to the server attribute.
- **params** (*Optional[Dict]*) – A dict holding the HTTP query parameters.
- **headers** (*Optional[Dict]*) – A dict holding the HTTP request headers.
- **cookies** (*Optional[Dict]*) – A dict holding the HTTP request cookies.
- **json** (*Optional[Dict]*) – A JSON object (usually a dict) to be passed as request body with content-type application/json.

- **data** (*Optional[Dict]*) – A str to be passed as request body with content-type `application/x-www-form-urlencoded`.
- **proxies** (*Optional[Dict]*) – A dict holding the HTTP proxies to be used.

**Returns** The HTTP response returned by the `requests` package.

**Raises** *ApiError* – If the status code of the HTTP response is not in the interval [200, 300).

**Return type** requests.models.Response

**get**(***kwargs*)
Send a HTTP GET request.

**Parameters** **kwargs** – Keyword arguments passed when sending the HTTP request.

**Returns** The HTTP response.

**Return type** requests.models.Response

**put**(***kwargs*)
Send a HTTP PUT request.

**Parameters** **kwargs** – Keyword arguments passed when sending the HTTP request.

**Returns** The HTTP response.

**Return type** requests.models.Response

**patch**(***kwargs*)
Send a HTTP PATCH request.

**Parameters** **kwargs** – Keyword arguments passed when sending the HTTP request.

**Returns** The HTTP response.

**Return type** requests.models.Response

**post**(***kwargs*)
Send a HTTP POST request.

**Parameters** **kwargs** – Keyword arguments passed when sending the HTTP request.

**Returns** The HTTP response.

**Return type** requests.models.Response

**delete**(***kwargs*)
Send a HTTP DELETE request.

**Parameters** **kwargs** – Keyword arguments passed when sending the HTTP request.

**Returns** The HTTP response.

**Return type** requests.models.Response

**class** xyzspaces.apis.**ProjectApi**(*config=None*)
Bases: *xyzspaces.apis.Api*

XYZ RESTful Project API abstraction.

Instances of this class allow to manage XYZ Hub projects.

API calls must be authenticated via a bearer token which needs to be provided in env variable called as `XYZ_TOKEN` or in config object when initialising an instance.

**Parameters** **config** (*Optional[xyzspaces.config.default.XYZConfig]*) –

__init__(*config=None*)
Instantiate a *ProjectApi* object.

**Parameters** **config** (*Optional[xyzspaces.config.default.XYZConfig]*) –

get_projects(*paginate=None*, *handle=None*, *limit=None*)
List the projects either for the token owner or list the published projects.

**Parameters**

- **paginate** (*Optional[bool]*) – A Boolean telling if the results should be paginated (default: ?).
- **handle** (*Optional[int]*) – A string to be used when running the next request in a sequence of pagninated responses. Works only when `paginate` is `True`.
- **limit** (*Optional[int]*) – The max. number of projects to return. Works only when `paginate` is `True`.

**Returns** A JSON object containing information about the projects.

**Return type** dict

get_project(*project_id*)
Get the project by ID.

**Parameters** **project_id** (*str*) – A string representing the project ID.

**Returns** A JSON object with information about the requested project.

**Return type** dict

post_project(*data*)
Create a project.

**Parameters** **data** – A JSON object describing the project to be created.

**Returns** A JSON object with all information about the created project.

**Return type** dict

put_project(*project_id*, *data*)
Update a project by ID.

Update the project with the provided project ID and create it if it does not exist. This will replace the whole project definition.

**Parameters**

- **project_id** (*str*) – A string representing the desired project ID.
- **data** – A JSON object describing the project details to be updated.

**Returns** A JSON object with information about the updated project.

**Return type** dict

patch_project(*project_id*, *data*)
Update parts of a project by ID.

**Parameters**

- **project_id** (*str*) – A string representing the desired project ID.
- **data** – A JSON object describing the project parts to be updated.

**Returns** A JSON object with information about the updated project.

**Return type** dict

**delete_project**(*project_id*)
Delete a project by ID.

**Parameters** **project_id** (*str*) – A string representing the desired project ID.

**Returns** An empty string if the operation was successful.

**Return type** str

**class** xyzspaces.apis.**TokenApi**(*config=None*)
Bases: *xyzspaces.apis.Api*

XYZ RESTful Token API abstraction.

Instances of this API class allow to manage HERE XYZ tokens.

API calls must be authenticated via authenticated access cookies derived from the username and password of an existing HERE developer account with access to HERE XYZ. These need to be provided as a `credentials` parameter when initialising an instance.

Example:

```
>>> from xyzspaces.apis import TokenApi
>>> from xyzspaces.config.default import XYZConfig
>>> config = XYZConfig.from_default()
>>> api = TokenApi(config=config)
>>> api.get_tokens()
[...]
```

**Parameters** **config** (*Optional[xyzspaces.config.default.XYZConfig]*) –

**__init__**(*config=None*)
Instantiate a *TokenApi* object.

**Parameters** **config** (*Optional[xyzspaces.config.default.XYZConfig]*) –

**get_token**(*token_id*, ***kwargs*)
Get info for given token ID.

**Parameters**

- **token_id** (*str*) – A string representing the requested token.
- **kwargs** – A dict with additional parameters passed to the HTTP request made when provided.

**Returns** A JSON object with the information about the requested token.

**Return type** dict

**get_tokens**(***kwargs*)
Get list of tokens for the authenticated user.

**Parameters** **kwargs** – A dict with additional parameters passed to the HTTP request made when provided.

**Returns** A list with information about all available tokens.

**Return type** list

**post_token**(*json={}*, ***kwargs*)
Create a new permanent or temporary token.

**Parameters**

- **json** (*Dict*) – A dict with information about the token to be created.
- **kwargs** – A dict with additional parameters passed to the HTTP request made when provided.

**Returns** A JSON object with all information about the created token.

**Return type** dict

**delete_token**(*token_id*, ***kwargs*)
Delete the token with the provided ID.

**Parameters**

- **token_id** (*str*) – A string representing a valid token.
- **kwargs** – A dict with additional parameters passed to the HTTP request made when provided.

**Returns** An empty string if the operation was successful.

**Return type** str

**class** xyzspaces.apis.**HubApi**(*config=None*)
Bases: *xyzspaces.apis.Api*

XYZ RESTful Hub API abstraction.

Instances of this API class allow to manage HERE XYZ spaces.

API calls must be authenticated via a bearer token which needs to be provided as a `credentials` parameter when initialising an instance.

A few convenience methods for calling HTTP methods directly are inherited from the *Api* base class, and can also be used, although this class provides dedicated methods for the Hub API, like *HubApi.get_spaces()* starting with HTTP method names and an underscore, followed by a name resembling the respective API endpoint, in this case `GET /hub/spaces`.

Example:

```
>>> from xyzspaces.apis import HubApi
>>> from xyzspaces.config.default import XYZConfig
>>> config = XYZConfig.from_default()
>>> api = HubApi(config=config)
>>> api.get_spaces()
[...]
```

This is based on the HERE XYZ Hub API specification defined here: https://xyz.api.here.com/hub/static/swagger/#/

**Parameters** **config** (*Optional[xyzspaces.config.default.XYZConfig]*) –

**__init__**(*config=None*)
Instantiate an *HubApi* object.

**Parameters** **config** (*Optional[xyzspaces.config.default.XYZConfig]*) – An object of *class:XYZConfig*, If not provied `XYZ_TOKEN` will be used from environment variable and other configurations will be used as defined in `default_config`

**get_hub**(*params=None*)
Get basic information about the XYZ Hub.

**Parameters** **params** (*Optional[dict]*) – A dict holding the HTTP query parameters.

**Returns** A JSON object with hub information.

**Return type** dict

`get_spaces`(*params=None*)
Get Spaces information.

**Parameters** **params** (*Optional[dict]*) – A dict holding the HTTP query parameters.

**Returns** A JSON object with list of spaces.

**Return type** dict

`get_space`(*space_id*, *params=None*)
Get a space by ID.

**Parameters**

- **space_id** (*str*) – The desired space ID.
- **params** (*Optional[dict]*) – A dict for query params.

**Returns** A JSON object with information about the space_id.

**Return type** dict

`post_space`(*data*)
Create a space.

**Parameters** **data** (*dict*) – A dict describing the space to be created.

**Returns** A JSON object with all information about the created space.

**Return type** dict

`patch_space`(*space_id*, *data*)
Update a space.

**Parameters**

- **space_id** (*str*) – A string representing the desired space ID.
- **data** (*dict*) – A JSON object describing the space attributes to be updated.

**Returns** A JSON object with information about the updated space.

**Return type** dict

`delete_space`(*space_id*)
Delete a space.

**Parameters** **space_id** (*str*) – A string representing desired space ID.

**Returns** An empty string if the operation was successful.

**Return type** str

`get_space_features`(*space_id*, *feature_ids*, *force_2d=None*)
Get features by ID.

**Parameters**

- **space_id** (*str*) – The desired space ID.
- **feature_ids** (*List[str]*) – A list of feature_ids.
- **force_2d** (*Optional[bool]*) – If set to True the features in the response will have only X and Y components, by default all x,y,z coordinates will be returned.

**Returns** A feature collection with all features inside the specified space.

**Return type** dict

Example: Get single feature from space

```
>>> feats = api.get_space_features(
...         space_id=space_id, feature_ids=["GER", "BRA"])
>>> print(feats)
```

**get_space_feature**(*space_id*, *feature_id*, *force_2d=None*)

Get a feature by ID.

**Parameters**

- **space_id** (*str*) – The desired space ID.
- **feature_id** (*str*) – The desired feature ID.
- **force_2d** (*Optional[bool]*) – If set to True the features in the response will have only X and Y components, by default all x,y,z coordinates will be returned.

**Returns** A feature with the specified feature ID inside the space with the specified ID.

**Return type** dict

Example: Read the feature from the space.

```
>>>     feature = api.get_space_feature(
...     space_id=space_id, feature_id=feature_id)
>>>     print(json.dumps(feature, indent=4, sort_keys=True))
```

**get_space_statistics**(*space_id*)

Get statistics.

**Parameters** **space_id** (*str*) – The desired space ID.

**Returns** A JSON object with some statistics about the specified space.

**Return type** dict

Example:

```
>>>     stats = api.get_space_statistics(space_id=space_id)
>>>     print(json.dumps(stats, indent=4, sort_keys=True))
```

**get_space_bbox**(*space_id*, *bbox*, *tags=None*, *clip=None*, *limit=None*, *params=None*, *selection=None*, *skip_cache=None*, *clustering=None*, *clusteringParams=None*, *force_2d=None*)

Get features inside some given bounding box.

**Parameters**

- **space_id** (*str*) – A string with the ID of the desired XYZ space.
- **bbox** (*List[Union[float, int]]*) – A list of four numbers representing the West, South, East and North margins, respectively, of the bounding box.
- **tags** (*Optional[List[str]]*) – A list of strings holding tag values.
- **clip** (*Optional[bool]*) – A Boolean indicating if the result should be clipped (default: False).
- **limit** (*Optional[int]*) – A max. number of features to return in the result.
- **params** (*Optional[dict]*) – ...

- **selection** (*Optional[List[str]]*) – ...
- **skip_cache** (*Optional[bool]*) – ...
- **clustering** (*Optional[str]*) – ...
- **clusteringParams** (*Optional[dict]*) – ...
- **force_2d** (*Optional[bool]*) – If set to True the features in the response will have only X and Y components, by default all x,y,z coordinates will be returned.

**Returns** A dict representing a feature collection.

**Return type** dict

Example:

```
>>>     bb = [0, 0, 20, 20]
>>>     bbox = api.get_space_bbox(space_id=space_id, bbox=bb)
>>>     print(len(bbox["features"]))
>>>     print(bbox["type"])
```

**get_space_tile**(*space_id*, *tile_type*, *tile_id*, *tags=None*, *clip=None*, *params=None*, *selection=None*, *skip_cache=None*, *clustering=None*, *clusteringParams=None*, *margin=None*, *limit=None*, *force_2d=None*, *mode=None*, *viz_sampling=None*)

Get features in tile.

**Parameters**

- **space_id** (*str*) – A string with the ID of the desired XYZ space.
- **tile_type** (*str*) – A string with the name of a tile type, one of "quadkeys", "web", "tms" or "here". See below.
- **tile_id** (*str*) – A string holding a valid tile ID according to the specified `tile_type`.
- **tags** (*Optional[List[str]]*) – A list of strings holding tag values.
- **clip** (*Optional[bool]*) – A Boolean indicating if the result should be clipped (default: False).
- **margin** (*Optional[int]*) – ...
- **limit** (*Optional[int]*) – A max. number of features to return in the result.
- **params** (*Optional[dict]*) – ...
- **selection** (*Optional[List[str]]*) – ...
- **skip_cache** (*Optional[bool]*) – ...
- **clustering** (*Optional[str]*) – ...
- **clusteringParams** (*Optional[dict]*) – ...
- **force_2d** (*Optional[bool]*) – If set to True the features in the response will have only X and Y components, by default all x,y,z coordinates will be returned.
- **mode** (*Optional[str]*) – A string to indicate how to optimize the resultset and geometries for display. Allowed values are `raw` and `viz`.
- **viz_sampling** (*Optional[str]*) – A string to indicate the sampling strength in case of `mode=viz`. Allowed values are: `low`, `med`, `high`, and `off`, default: `med`.

**Returns** A dict representing a feature collection.

**Return type** dict

Available tile types are:

- quadkeys, Virtual Earth Tile System,
- web, Tiled Web Map.
- tms, OSGEO Tile Map Service,
- here, ?

**get_space_search**(*space_id*, *tags=None*, *limit=None*, *params=None*, *selection=None*, *skip_cache=None*, *force_2d=None*)

Search for features.

**Parameters**

- **space_id** (*str*) – A string with the ID of the desired XYZ space.
- **tags** (*Optional[List[str]]*) – A list of strings holding tag values.
- **limit** (*Optional[int]*) – A max. number of features to return in the result.
- **params** (*Optional[dict]*) – ...
- **selection** (*Optional[List[str]]*) – ...
- **skip_cache** (*Optional[bool]*) – ...
- **force_2d** (*Optional[bool]*) – If set to True the features in the response will have only X and Y components, by default all x,y,z coordinates will be returned.

**Returns** A dict representing a feature collection.

**Return type** dict

Example:

```
>>>     feats = api.get_space_search(space_id=space_id)
>>>     print(feats["type"] )
>>>     print(len(feats["features"]) )
```

**get_space_iterate**(*space_id*, *limit*, *force_2d=None*)

Iterate features in the space (yielding them one by one).

**Parameters**

- **space_id** (*str*) – A string representing desired space ID.
- **limit** (*int*) – A max. number of features to return in the result.
- **force_2d** (*Optional[bool]*) – If set to True the features in the response will have only X and Y components, by default all x,y,z coordinates will be returned.

**Yields** A feature in space.

**Return type** Generator

**get_space_all**(*space_id*, *limit*, *max_len=1000*)

Get all features as one single GeoJSON feature collection.

This is a convenience method, not directly available in the XYZ API. It hides the API paging mechanism and returns all data in one chunk. So be careful if you don't know how much data you will get.

**Parameters**

- **space_id** (*str*) – A string representing desired space ID.
- **limit** (*int*) – A max. number of features to return in the result.

- **max_len** – A max. number of features to return in the result.

**Returns** A dict representing a feature collection.

**Return type** dict

Example:

```
>>>     fc = api.get_space_all(space_id=space_id, limit=100)
>>>     print(len(fc["features"]) )
>>>     print(fc["type"])
```

**get_space_count**(*space_id*)
Get feature count.

**Parameters** **space_id** (*str*) – A string with the ID of the desired XYZ space.

**Returns** A dict containing the number of features inside the specified space.

**Return type** dict

**put_space_features**(*space_id*, *data*, *add_tags=None*, *remove_tags=None*)
Create or replace multiple features.

**Parameters**

- **space_id** (*str*) – A string with the ID of the desired XYZ space.
- **data** (*dict*) – A JSON object describing one or more features to add.
- **add_tags** (*Optional[List[str]]*) – A list of strings describing tags to be added to the features.
- **remove_tags** (*Optional[List[str]]*) – A list of strings describing tags to be removed from the features.

**Returns** A dict representing a feature collection.

**Return type** dict

Example:

```
>>> from xyzspaces.datasets import get_countries_data
>>>     gj_countries = get_countries_data()
>>>     features = api.put_space_features(
...     space_id=space_id,
...     data=gj_countries,
...     add_tags=["foo", "bar"],
...     remove_tags=["bar"],
... )
>>> print(features)
```

**post_space_features**(*space_id*, *data*, *add_tags=None*, *remove_tags=None*)
Modify multiple features in the space.

**Parameters**

- **space_id** (*str*) – A string with the ID of the desired XYZ space.
- **data** (*dict*) – A JSON object describing one or more features to modify.
- **add_tags** (*Optional[List[str]]*) – A list of strings describing tags to be added to the features.

- **remove_tags** (*Optional[List[str]]*) – A list of strings describing tags to be removed from the features.

**Returns** A dict representing a feature collection.

**Return type** dict

Example:

```
>>> data = dict(type="FeatureCollection", features=[deu, ita])
>>> space_features = api.post_space_features(
...     space_id=space_id, data=data)
>>> print(space_features)
```

**delete_space_features**(*space_id*, *id=None*, *tags=None*)

Delete multiple features from the space.

**Parameters**

- **space_id** (*str*) – A string with the ID of the desired XYZ space.
- **id** (*Optional[List[str]]*) – A list of feature IDs to delete.
- **tags** (*Optional[List[str]]*) – A list of strings describing tags the features to be deleted must have.

**Returns** A response from API call.

**Return type** str

Example:

```
>>>     deu = api.get_space_feature(space_id=space_id, feature_id="DEU")
>>>     ita = api.get_space_feature(space_id=space_id, feature_id="ITA")
>>>     deleted_features = api.delete_space_features(
...     space_id=space_id, id=["DEU", "ITA"])  # noqa: E501
```

**put_space_feature**(*space_id*, *data*, *feature_id=None*, *add_tags=None*, *remove_tags=None*)

Create or replace a single feature.

**Parameters**

- **space_id** (*str*) – A string with the ID of the desired XYZ space.
- **data** (*dict*) – A JSON object describing the feature to be added.
- **feature_id** (*Optional[str]*) – A string with the ID of the feature to be created.
- **add_tags** (*Optional[List[str]]*) – A list of strings describing tags to be added to the feature.
- **remove_tags** (*Optional[List[str]]*) – A list of strings describing tags to be removed from the feature.

**Returns** A dict representing a feature.

**Return type** dict

Example:

```
>>>     api.put_space_feature(
...     space_id=space_id, feature_id=feature_id, data=fra)
```

patch_space_feature(*space_id*, *feature_id*, *data*, *add_tags=None*, *remove_tags=None*)
Patch a single feature in the space.

**Parameters**

- **space_id** (*str*) – A string with the ID of the desired XYZ space.
- **feature_id** (*str*) – A string with the ID of the feature to be modified.
- **data** (*dict*) – A JSON object describing the feature to be changed.
- **add_tags** (*Optional[List[str]]*) – A list of strings describing tags to be added to the feature.
- **remove_tags** (*Optional[List[str]]*) – A list of strings describing tags to be removed from the feature.

**Returns** A dict representing a feature.

**Return type** dict

delete_space_feature(*space_id*, *feature_id*)
Delete a single feature from the space.

**Parameters**

- **space_id** (*str*) – A string with the ID of the desired XYZ space.
- **feature_id** (*str*) – A string with the ID of the feature to be deleted.

**Returns** An empty string if the operation was successful.

**Return type** str

get_space_spatial(*space_id*, *lat=None*, *lon=None*, *ref_space_id=None*, *ref_feature_id=None*, *radius=None*, *tags=None*, *limit=None*, *params=None*, *selection=None*, *skip_cache=None*, *force_2d=None*)
Get features with radius search.

**Parameters**

- **space_id** (*str*) – A string with the ID of the desired XYZ space.
- **lat** (*Optional[float]*) – A float in WGS'84 decimal degree (-90 to +90) of the center Point.
- **lon** (*Optional[float]*) – A float in WGS'84 decimal degree (-180 to +180) of the center Point.
- **ref_space_id** (*Optional[str]*) – A string as alternative for defining center coordinates, it is possible to reference a geometry in a space, hence it is needed to provide the `ref_space_id` where the referenced feature is stored. Always to use in combination with `ref_feature_id`.
- **ref_feature_id** (*Optional[str]*) – A string as unique identifier of a feature in the referenced space. The geometry of that feature gets used for the spatial query. Always to use in combination with `ref_space_id`.
- **radius** (*Optional[int]*) – An int in meter which defines the diameter of the search request.
- **tags** (*Optional[List[str]]*) – A list of strings holding tag values.
- **limit** (*Optional[int]*) – A max. number of features to return in the result.
- **params** (*Optional[dict]*) – A dict holding the HTTP query parameters.

- **selection** (*Optional[List[str]]*) – A list of strings holding properties values.
- **skip_cache** (*Optional[bool]*) – A Boolean if set to `True` the response is not returned from cache.
- **force_2d** (*Optional[bool]*) – If set to True the features in the response will have only X and Y components, by default all x,y,z coordinates will be returned.

**Returns** A dict representing a feature collection.

**Raises** **ValueError** – If incorrect params are passed, either `lat` and `lon` or `ref_space_id` and `ref_feature_id` must have a value.

**Return type** dict

**post_space_spatial**(*space_id*, *data*, *radius=None*, *tags=None*, *limit=None*, *params=None*, *selection=None*, *skip_cache=None*, *force_2d=None*)

Post features which intersect the provided geometry.

**Parameters**

- **space_id** (*str*) – A string with the ID of the desired XYZ space.
- **data** (*dict*) – A JSON object which is getting used for the spatial search.
- **radius** (*Optional[int]*) – An int which defines the diameter(meters) of the search request.
- **tags** (*Optional[List[str]]*) – A list of strings holding tag values.
- **limit** (*Optional[int]*) – A max. number of features to return in the result.
- **params** (*Optional[dict]*) – A dict holding the HTTP query parameters.
- **selection** (*Optional[List[str]]*) – A list of strings holding properties values.
- **skip_cache** (*Optional[bool]*) – A Boolean if set to `True` the response is not returned from cache.
- **force_2d** (*Optional[bool]*) – If set to True the features in the response will have only X and Y components, by default all x,y,z coordinates will be returned.

**Returns** A dict representing a feature collection.

**Return type** dict

### xyzspaces.auth module

This module provides HERE authentication via cookies for the Token API.

This *get_auth_cookies()* function simulates the login process on http://developer.here.com to obtain an access cookie for authenticating with certain RESTful APIs like the XYZ Token API.

This implementation is inspired by the Open Source HERE XYZ CLI: https://github.com/heremaps/here-cli/blob/master/src/sso.ts.

xyzspaces.auth.**filter_cookies**(*cookies*, *prefix*)

Filter `requests` cookies with some given name prefix into a new dict.

**Parameters**

- **cookies** (*requests.cookies.RequestsCookieJar*) – A `requests` cookies object.
- **prefix** (*str*) – A prefix string to search in cookies.

**Returns** A dict.

**Return type** dict

Example:

Input:

```
<RequestsCookieJar[
    <Cookie locale=en-US for .here.com/>,
    <Cookie here_account=foobar for account.here.com/>,
    <Cookie here_account.sig=barfoo for account.here.com/>]
>
```

Output:

```
{'here_account': 'foobar', 'here_account.sig': 'barfoo'}
```

xyzspaces.auth.**get_auth_cookies**(*username*, *password*)

Get authentication cookies from name and password of a HERE account.

**Parameters**

- **username** (*str*) – Username for HERE account.
- **password** (*str*) – Password for HERE account.

**Returns** A dict.

**Raises** ***AuthenticationError*** – If status_code for HTTP response returned by `requests` is not equal to 200.

**Return type** dict

### xyzspaces._compact module

This module is used to check optional depedencies and based on that flags will be set.

### xyzspaces.curl module

This module contains functionality related to `curl` commands.

It provides methods for creating/executing `curl` commands which mimic the `requests` signatures.

This module has been mainly designed to be used in the `Api` module for logging purposes.

The `curl` module could be also used as stand alone:

Example:

```
>>> import xyzspaces.curl as curl
>>> command = curl.get(url='https://xkcd.com/552/info.0.json')
['curl', '--request', 'GET', 'https://xkcd.com/552/info.0.json']
>>> curl.execute(command)
b'{"month": "3", "num": 552, "link": "", "year": "2009", "news": "", "safe_title":
↪"Correlation", "transcript": "[[A man is talking to a woman]]\\nMan: I used to think␣
↪correlation implied causation.\\nMan: Then I took a statistics class.  Now I don\'t.\\
↪nWoman: Sounds like the class helped.\\nMan: Well, maybe.\\n{{Title text: Correlation␣
↪doesn\'t imply causation, but it does waggle its eyebrows suggestively and gesture␣
↪furtively while mouthing \'look over there\'.}}", "alt": "Correlation doesn\'t imply␣
↪causation, but it does waggle its eyebrows suggestively and gesture furtively while␣
↪mouthing \'look over there\'.", "img": "https://imgs.xkcd.com/comics/correlation.png",
↪"title": "Correlation", "day": "6"}'  # noqa: E501
```

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```
[...]
```

xyzspaces.curl.**get**(*url*, *params=None*, ***kwargs*)

Run `curl GET` mimicking the `requests.get()` signature.

This completes a `curl GET` command.

**Parameters**

- **url** – The URL of the server including the path.
- **params** – The query string params.
- **kwargs** – Further keyword arguments that should match those expected by `requests`.

**Returns** The `List[str]` representation of the `curl GET` command.

**Return type** List[str]

Example:

```
>>> import xyzspaces.curl as curl
>>> curl.get(url="https://xkcd.com/552/info.0.json")
['curl', '--request', 'GET', 'ttps://xkcd.com/552/info.0.json']
```

xyzspaces.curl.**put**(*url*, *data=None*, ***kwargs*)

Run `curl PUT` command mimicking the `requests.put()` signature.

This completes a `curl PUT` command.

**Parameters**

- **url** – The URL of the server including the path for the new object.
- **data** – (optional) Dictionary, list of tuples, bytes, or file-like object.
- **kwargs** – Further keyword arguments that should match those expected by `requests`.

**Returns** The `List[str]` representation of the `curl PUT` command.

**Return type** List[str]

xyzspaces.curl.**patch**(*url*, *data=None*, ***kwargs*)

Run `curl PATCH` command mimicking the `requests.patch()` signature.

This completes a `curl PATCH` command.

**Parameters**

- **url** – The URL of the server including the path for the new object.
- **data** – (optional) Dictionary, list of tuples, bytes, or file-like object.
- **kwargs** – Further keyword arguments that should match those expected by `requests`.

**Returns** The `List[str]` representation of the `curl PATCH` command.

**Return type** List[str]

xyzspaces.curl.**post**(*url*, *data=None*, *json=None*, ***kwargs*)

Run `curl POST` command mimicking the `requests.post()` signature.

This completes a `curl POST` command.

**Parameters**

- **url** – The URL of the server including the path for the new object.
- **data** – (optional) Dictionary, list of tuples, bytes, or file-like object.
- **json** – (optional) json data.
- **kwargs** – Further keyword arguments that should match those expected by `requests`.

**Returns** The `List[str]` representation of the `curl POST` command.

**Return type** List[str]

`xyzspaces.curl.delete(`*url*, ***kwargs*`)`

Run `curl DELETE` command mimicking the `requests.delete()` signature.

This completes a `curl DELETE` command.

**Parameters**

- **url** – The URL of the server including the path.
- **kwargs** – Further keyword arguments that should match those expected by `requests`.

**Returns** The `List[str]` representation of the `curl DELETE` command.

**Return type** List[str]

`xyzspaces.curl.command(`*url*, *method*, *params=None*, ***kwargs*`)`

Return a `curl` command equivalent from the params for `requests`.

This builds and returns a list of strings representing a `curl` command that can be directly passed to functions like `subprocess.check_output()`. When joined with blanks into a single string it can also be used for logging or pasting to a terminal.

To be used like `requests.get()`, passing the same params for headers, cookies, etc. So the function signature is similar to `requests.get()`, with additional `method` parameter.

**Parameters**

- **url** (*str*) – The URL of the server including the path.
- **method** (*str*) – The HTTP method name, e.g. "GET", "PUT", etc.
- **params** (*Optional[dict]*) – The query string params.
- **kwargs** (*Optional[Mapping]*) – Further keyword arguments that should match those expected by `requests`.

**Returns** The generated `curl` command (a list of strings).

**Return type** List[str]

Example:

```
>>> import xyzspaces.curl as curl
>>> curl.command(method="get", url="https://xkcd.com/552/info.0.json")
['curl', '--request', 'GET', 'https://xkcd.com/552/info.0.json']
```

`xyzspaces.curl.execute(`*command*`)`

Execute a `command` and create the `requests.models.Response` object.

The Python's `subprocess` module will be used for the executing a `command`.

In the `requests.models.Response` object will be initialized following attributes: _content: The response data from the `stdout` status_code: Simplified conversion from the `subprocess.CompletedProcess.returncode` to `HTTP` ones 200 ~ 0, 500 ~ >0.

**Parameters** **command** (*List[str]*) – The `curl` to be executed in the `List[str]` type.

**Returns** The generated `requests.models.Response` object.

**Return type** requests.models.Response

Example:

```
>>> import xyzspaces.curl as curl
>>> command = curl.get(url='https://xkcd.com/552/info.0.json')
['curl', '--request', 'GET', 'ttps://xkcd.com/552/info.0.json']
>>> curl.execute(command)
b'{"month": "3", "num": 552, "link": "", "year": "2009", "news": "", "safe_title":
↪"Correlation", "transcript": "[[A man is talking to a woman]]\\nMan: I used to␣
↪think correlation implied causation.\\nMan: Then I took a statistics class.  Now␣
↪I don\'t.\\nWoman: Sounds like the class helped.\\nMan: Well, maybe.\\n{{Title␣
↪text: Correlation doesn\'t imply causation, but it does waggle its eyebrows␣
↪suggestively and gesture furtively while mouthing \'look over there\'.}}", "alt":
↪"Correlation doesn\'t imply causation, but it does waggle its eyebrows␣
↪suggestively and gesture furtively while mouthing \'look over there\'.", "img":
↪"https://imgs.xkcd.com/comics/correlation.png", "title": "Correlation", "day": "6
↪"}'  # noqa: E501
[...]
```

### xyzspaces.exceptions module

This module defines API exceptions.

**exception** xyzspaces.exceptions.**AuthenticationError**

Bases: `Exception`

Exception raised when authentication fails.

**exception** xyzspaces.exceptions.**ApiError**

Bases: `Exception`

Exception raised for API HTTP response status codes not in [200...300).

The exception value will be the response object returned by `requests` which provides access to all its attributes, eg. `status_code`, `reason` and `text`, etc.

Example:

```
>>> try:
>>>     import os
>>>     os.environ["XYZ_TOKEN"] = "MY-XYZ-TOKEN"
>>>     api = HubApi()
>>>     api.get("/hub/nope").json()
>>> except ApiError as e:
>>>     resp = e.value.args[0]
>>>     if resp.status_code == 404 and resp.reason == "Not Found":
>>>         ...
```

**__str__**()

Return a string from the HTTP response causing the exception.

The string simply lists the repsonse's status code, reason and text content, separated with commas.

**exception** xyzspaces.exceptions.**TooManyRequestsException**
Bases: Exception

Exception raised for API HTTP response status code 429.

This is a dedicated exception to be used with the *backoff* package, because it requires a specific exception class.

The exception value will be the response object returned by `requests` which provides access to all its attributes, eg. `status_code`, `reason` and `text`, etc.

**__str__**()
Return a string from the HTTP response causing the exception.

The string simply lists the repsonse's status code, reason and text content, separated with commas.

### xyzspaces.logconf module

This module configures logging.

xyzspaces.logconf.**setup_logging**(*default_path='config/logconfig.json'*, *default_level=40*, *env_key='XYZ_LOG_CONFIG'*)
Set up logging configuration.

**Parameters**

- **default_path** (*str*) – A string representing the path of the config file in JSON format.
- **default_level** (*int*) – An int representing logging level.
- **env_key** (*str*) – A string representing environment variable to enable logging to file.

**class** xyzspaces.logconf.**NullHandler**(*level=0*)
Bases: logging.Handler

NullHandler class is a 'no-op' handler for use by library developers.

**emit**(*record*)
Skip the emit record. This is used to give preference to user.

### xyzspaces.spaces module

An more Pythonic abstraction for XYZ Spaces.

This contains only one class for an XYZ "space" which in turn provides access to "features". There is no separate class abstraction for single features, but they are taken to be valid `geojson.GeoJSON` objects. Various other bits of the XYZ Hub API are simply returned as-is, usually wrapped in dictionaries, like the "statistics" of some given XYZ space.

**class** xyzspaces.spaces.**Space**(*api=None*, *config=None*)
Bases: object

An abstraction for XYZ Spaces.

A space object is created with an existing, authenticated XYZ Hub API instance.

Example:

```
>>> space = Space.new(...)
>>> space.delete()
>>> for feat in space.iter_feature():
....    print(feat["id"])
```

**Parameters**

- **api** (*Optional[xyzspaces.apis.HubApi]*) –
- **config** (*Optional[xyzspaces.config.default.XYZConfig]*) –

**classmethod from_id**(*space_id*, *config=None*)

Instantiate a space object for an existing space ID.

**Parameters**

- **space_id** (*str*) – A string to represent the id of the space.
- **config** (*Optional[xyzspaces.config.default.XYZConfig]*) – An object of class:*XYZConfig*, If not provied `XYZ_TOKEN` will be used from environment variable and other configurations will be used as defined in `default_config`.

**Returns** An object of *Space*.

**Return type** *xyzspaces.spaces.Space*

**classmethod new**(*title*, *description*, *space_id=None*, *schema=None*, *enable_uuid=None*, *listeners=None*, *shared=None*, *config=None*)

Create new space object with given title and description.

Optionally, the desired space ID can be provided as well, and will be used if still available.

**Parameters**

- **title** (*str*) – A string representing the title of the space.
- **description** (*str*) – A string representing a description of the space.
- **space_id** (*Optional[str]*) – A string representing space_id.
- **schema** (*Optional[str]*) – JSON object or URL to be added as a schema for space.
- **enable_uuid** (*Optional[bool]*) – A boolean if set `True` it will create additional activity log space to log the activities in current space.
- **listeners** (*Optional[Dict[str, Union[str, int]]]*) – A dict for activity log listener params.
- **shared** (*Optional[bool]*) – A boolean, if set to `True`, space will be shared with other users having XYZ account, they will be able to read from the space using their own token. By default space will not be a shared space.
- **config** (*Optional[xyzspaces.config.default.XYZConfig]*) – An object of class:*XYZConfig*, If not provied `XYZ_TOKEN` will be used from environment variable and other configurations will be used as defined in `default_config`.

**Returns** A object of *Space*.

**Return type** *xyzspaces.spaces.Space*

**classmethod virtual**(*title*, *description=None*, *config=None*, ***kwargs*)

Create a new virtual-space.

Virtual-space references one or multiple spaces. A virtual-space is described by definition which references other existing spaces (the upstream spaces). Queries being done to a virtual-space will return the features of its upstream spaces combined. There are different predefined operations of how to combine the features of the upstream spaces. In order to use virtual spaces feature user needs to have HERE Data Hub paid plan. Plans can be found here: HERE Data Hub.

**Parameters**

- **title** (*str*) – A string representing the title of the virtual-space.
- **description** (*Optional[str]*) – A string representing a description of the virtual-space.
- **config** (*Optional[xyzspaces.config.default.XYZConfig]*) – An object of class:*XYZConfig*, If not provied `XYZ_TOKEN` will be used from environment variable and other configurations will be used as defined in `default_config`.
- **kwargs** (*Dict[str, Dict]*) – A dict for the operation to perform on upstream spaces.

**Returns** An object of *Space*.

**Return type** *xyzspaces.spaces.Space*

**__init__**(*api=None*, *config=None*)
Instantiate a space object, optionally with authenticated api instance and custom base URL as `server`, `server` is required only for self-hosted Data Hub instances.

**Parameters**

- **api** (*Optional[xyzspaces.apis.HubApi]*) –
- **config** (*Optional[xyzspaces.config.default.XYZConfig]*) –

**__repr__**()
Return string representation of this instance.

**property info**
Space config information.

**list**(*owner='me'*, *include_rights=False*)
Return list of spaces for given owner with access rights if desired.

This does not modify the space object itself.

**Parameters**

- **owner** (*str*) – A string representing the owner.
- **include_rights** (*bool*) – A boolean. If set to True, the access rights for each space are included in the response.

**Returns** A JSON object with list of spaces.

**Return type** Dict

**read**(*id*)
Read existing space object for given space ID.

**Parameters** **id** (*str*) –

**Return type** *xyzspaces.spaces.Space*

**update**(*title=None*, *description=None*, *tagging_rules=None*, *schema=None*, *shared=None*)
Update space attributes.

This method updates title, description, schema, shared status or tagging rules of space, at least one of these params should have a non-default value to update the space.

Does update the space in the XYZ storage and this object mirroring it. Also apply the tags based on rules mentioned in *tagging_rules* dict.

**Parameters**

- **title** (*Optional[str]*) – A string representing the title of the space.

- **description** (*Optional[str]*) – A string representing a description of the space.
- **tagging_rules** (*Optional[Dict[str, str]]*) – A dict where the key is the tag to be applied to all features matching the JSON-path expression being the value.
- **schema** (*Optional[str]*) – JSON object or URL to be added as schema for space.
- **shared** (*Optional[bool]*) – A boolean, if set to `True`, space will be shared with other users having XYZ account, they will be able to read from the space using their own token. If set to `False` space will be unshared.

**Returns** A response from API.

**Return type** Dict

Example:

```
>>> import os
>>> from xyzspaces import XYZ
>>> os.environ["XYZ_TOKEN"] = "XYZ_TOKEN"
>>> xyz = XYZ()
>>> space = xyz.spaces.new(title="new space", description="new space")
>>> tagging_rules = {"large": "$.features[?(@.properties.area>=500)]"}
>>> space.update(title="updated title",
...              description="updated description",
...              tagging_rules=tagging_rules)
```

**delete**()
Delete this space object.

**get_statistics**()
Get statistics for this space object.

**Returns** A JSON object with some statistics about the specified space.

**Return type** dict

**search**(*tags=None*, *limit=None*, *params=None*, *selection=None*, *skip_cache=None*, *geo_dataframe=None*, *force_2d=None*)
Search features for this space object.

**Parameters**

- **tags** (*Optional[List[str]]*) – A list of strings holding tag values.
- **limit** (*Optional[int]*) – A max. number of features to return in the result.
- **params** (*Optional[dict]*) – A dict to represent additional filter on features to be searched. Examples:
  - `params={"p.name": "foo"}` returns all features with a value of property `name` equal to `foo`.
  - `params={"p.name!": "foo"}` returns all features with a value of property `name` not qual to `foo`.
  - `params={"p.count=gte": "10"}` returns all features with a value of property `count` greater than or equal to `10`.
  - `params={"p.count=lte": "10"}` returns all features with a value of property `count` less than or equal to `10`.
  - `params={"p.count=gt": "10"}` returns all features with a value of property `count` greater than `10`.

- params={"p.count=lt": "10"} returns all features with a value of property count less than 10.
- params={"p.name=cs": "bar"} returns all features with a value of property name which contains bar.

- **selection** (*Optional[List[str]]*) – A list, only these properties will be returned in features result list.
- **skip_cache** (*Optional[bool]*) – If set to True the response is not returned from cache. Default is False.
- **geo_dataframe** (*Optional[bool]*) – A boolean if set to True searched features will be yield as single Geopandas Dataframe.
- **force_2d** (*Optional[bool]*) – If set to True the features in the response will have only X and Y components, by default all x,y,z coordinates will be returned.

**Yields** A Feature object by default. If param geo_dataframe is True then yields single Geopandas Dataframe.

**Return type** Generator[geojson.feature.Feature, None, None]

**iter_feature**(*limit=100*, *force_2d=None*)
Iterate over features in this space object.

**Parameters**

- **limit** (*int*) – A max. number of features to return in the result.
- **force_2d** (*Optional[bool]*) – If set to True the features in the response will have only X and Y components, by default all x,y,z coordinates will be returned.

**Yields** A Feature object.

**Return type** Generator[geojson.feature.Feature, None, None]

**get_feature**(*feature_id*, *force_2d=None*)
Retrieve one GeoJSON feature with given ID from this space.

**Parameters**

- **feature_id** (*str*) – Feature id which is to fetched.
- **force_2d** (*Optional[bool]*) – If set to True the features in the response will have only X and Y components, by default all x,y,z coordinates will be returned.

**Returns** A GeoJSON representing a feature with the specified feature ID inside the space.

**Return type** geojson.base.GeoJSON

**add_feature**(*data*, *feature_id=None*, *add_tags=None*, *remove_tags=None*)
Add one GeoJSON feature with given ID in this space.

**Parameters**

- **data** (*Union[geojson.base.GeoJSON, Dict]*) – A JSON object describing the feature to be added.
- **feature_id** (*Optional[str]*) – A string with the ID of the feature to be created.
- **add_tags** (*Optional[List[str]]*) – A list of strings describing tags to be added to the feature.
- **remove_tags** (*Optional[List[str]]*) – A list of strings describing tags to be removed from the feature.

**Returns** A GeoJSON representing a feature.

**Return type** geojson.base.GeoJSON

`update_feature`(*feature_id*, *data*, *add_tags=None*, *remove_tags=None*)
Update one GeoJSON feature with given ID in this space.

**Parameters**

- **feature_id** (*str*) – A string with the ID of the feature to be modified.
- **data** (*dict*) – A JSON object describing the feature to be changed.
- **add_tags** (*Optional[List[str]]*) – A list of strings describing tags to be added to the feature.
- **remove_tags** (*Optional[List[str]]*) – A list of strings describing tags to be removed from the feature.

**Returns** A GeoJSON representing a feature.

**Return type** geojson.base.GeoJSON

`delete_feature`(*feature_id*)
Delete one GeoJSON feature with given ID in this space.

**Parameters** **feature_id** (*str*) – A string with the ID of the feature to be deleted.

**Returns** An empty string if the operation was successful.

`get_features`(*feature_ids*, *geo_dataframe=None*, *force_2d=None*)
Retrieve one GeoJSON feature with given ID from this space.

**Parameters**

- **feature_ids** (*List[str]*) – A list of feature_ids.
- **geo_dataframe** (*Optional[bool]*) – A boolean if set to `True` features will be returned as single Geopandas Dataframe.
- **force_2d** (*Optional[bool]*) – If set to True the features in the response will have only X and Y components, by default all x,y,z coordinates will be returned.

**Returns** A feature collection with all features inside the specified space. If param `geo_dataframe` is set to `True` then return features in single Geopandas Dataframe.

**Return type** Union[geojson.base.GeoJSON, gpd.GeoDataFrame]

`add_features`(*features*, *add_tags=None*, *remove_tags=None*, *features_size=2000*, *chunk_size=1*, *id_properties=None*, *mutate=True*)
Add GeoJSON features to this space.

As API has a limitation on the size of features, features are divided into chunks, and multiple processes will process those chunks. Each chunk has a number of features based on the value of `features_size`. Each process handles chunks based on the value of `chunk_size`.

**Parameters**

- **features** (*Union[geojson.base.GeoJSON, Dict]*) – A JSON object describing one or more features to add.
- **add_tags** (*Optional[List[str]]*) – A list of strings describing tags to be added to the features.
- **remove_tags** (*Optional[List[str]]*) – A list of strings describing tags to be removed from the features.

- **features_size** (*int*) – An int representing a number of features to upload at a time.
- **chunk_size** (*int*) – Number of chunks each process to handle. The default value is 1, for a large number of features please use *chunk_size* greater than 1 to get better results in terms of performance.
- **id_properties** (*Optional[List[str]]*) – List of properties name from which id to be generated if id does not exists for a feature.
- **mutate** (*Optional[bool]*) – If True will update the existing features object passed, this will prevent making copy of the features object which may help to improving performance.

**Returns** A GeoJSON representing a feature collection.

**Return type** geojson.base.GeoJSON

**_upload_features**(*features*, *ids_map*, *add_tags=None*, *remove_tags=None*, *id_properties=None*)

**Parameters**

- **add_tags** (*Optional[List[str]]*) –
- **remove_tags** (*Optional[List[str]]*) –
- **id_properties** (*Optional[List[str]]*) –

**_process_features**(*features*, *id_properties*, *ids_map*)

**_gen_id_from_properties**(*feature*, *id_properties*)

**update_features**(*features*, *add_tags=None*, *remove_tags=None*)
Update GeoJSON features in this space.

**Parameters**

- **features** (*geojson.base.GeoJSON*) – A JSON object describing one or more features to modify.
- **add_tags** (*Optional[List[str]]*) – A list of strings describing tags to be added to the features.
- **remove_tags** (*Optional[List[str]]*) – A list of strings describing tags to be removed from the features.

**Returns** A GeoJSON representing a feature collection.

**Return type** geojson.base.GeoJSON

**delete_features**(*feature_ids*, *tags=None*)
Delete GeoJSON features in this space.

**Parameters**

- **feature_ids** (*List[str]*) – A list of feature IDs to delete.
- **tags** (*Optional[List[str]]*) – A list of strings describing tags the features to be deleted must have.

**Returns** A response from API.

**features_in_bbox**(*bbox*, *tags=None*, *clip=None*, *limit=None*, *params=None*, *selection=None*, *skip_cache=None*, *clustering=None*, *clustering_params=None*, *geo_dataframe=None*, *force_2d=None*)
Get features inside some given bounding box.

**Parameters**

- **bbox** (*List[Union[float, int]]*) – A list of four numbers representing the West, South, East and North margins, respectively, of the bounding box.
- **tags** (*Optional[List[str]]*) – A list of strings holding tag values.
- **clip** (*Optional[bool]*) – A Boolean indicating if the result should be clipped (default: False).
- **limit** (*Optional[int]*) – A max. number of features to return in the result.
- **params** (*Optional[dict]*) – A dict to represent additional filter on features to be searched. Examples:
  - `params={"p.name": "foo"}` returns all features with a value of property `name` equal to `foo`.
  - `params={"p.name!": "foo"}` returns all features with a value of property `name` not qual to `foo`.
  - `params={"p.count=gte": "10"}` returns all features with a value of property `count` greater than or equal to `10`.
  - `params={"p.count=lte": "10"}` returns all features with a value of property `count` less than or equal to `10`.
  - `params={"p.count=gt": "10"}` returns all features with a value of property `count` greater than `10`.
  - `params={"p.count=lt": "10"}` returns all features with a value of property `count` less than `10`.
  - `params={"p.name=cs": "bar"}` returns all features with a value of property `name` which contains `bar`.
- **selection** (*Optional[List[str]]*) – A list, only these properties will be returned in features result list.
- **skip_cache** (*Optional[bool]*) – If set to `True` the response is not returned from cache. Default is `False`.
- **clustering** (*Optional[str]*) – ...
- **clustering_params** (*Optional[dict]*) – ...
- **geo_dataframe** (*Optional[bool]*) – A boolean if set to `True` searched features will be yield as single Geopandas Dataframe.
- **force_2d** (*Optional[bool]*) – If set to True the features in the response will have only X and Y components, by default all x,y,z coordinates will be returned.

**Yields** A Feature object by default. If param `geo_dataframe` is True then yields single Geopandas Dataframe.

**Return type** Generator[geojson.feature.Feature, None, None]

**features_in_tile**(*tile_type*, *tile_id*, *tags=None*, *clip=None*, *params=None*, *selection=None*, *skip_cache=None*, *clustering=None*, *clustering_params=None*, *margin=None*, *limit=None*, *geo_dataframe=None*, *force_2d=None*, *mode=None*, *viz_sampling=None*)

Get features in tile.

**Parameters**

- **tile_type** (*str*) – A string with the name of a tile type, one of "quadkeys", "web", "tms" or "here". See below.

- **tile_id** (*str*) – A string holding a valid tile ID according to the specified `tile_type`.
- **tags** (*Optional[List[str]]*) – A list of strings holding tag values.
- **clip** (*Optional[bool]*) – A Boolean indicating if the result should be clipped (default: False).
- **params** (*Optional[dict]*) – A dict to represent additional filter on features to be searched. Examples:
  - `params={"p.name": "foo"}` returns all features with a value of property `name` equal to `foo`.
  - `params={"p.name!": "foo"}` returns all features with a value of property `name` not qual to `foo`.
  - `params={"p.count=gte": "10"}` returns all features with a value of property `count` greater than or equal to `10`.
  - `params={"p.count=lte": "10"}` returns all features with a value of property `count` less than or equal to `10`.
  - `params={"p.count=gt": "10"}` returns all features with a value of property `count` greater than `10`.
  - `params={"p.count=lt": "10"}` returns all features with a value of property `count` less than `10`.
  - `params={"p.name=cs": "bar"}` returns all features with a value of property `name` which contains `bar`.
- **selection** (*Optional[List[str]]*) – A list, only these properties will be returned in features result list.
- **skip_cache** (*Optional[bool]*) – If set to `True` the response is not returned from cache. Default is `False`.
- **clustering** (*Optional[str]*) – ...
- **clustering_params** (*Optional[dict]*) – ...
- **margin** (*Optional[int]*) – ...
- **limit** (*Optional[int]*) – A max. number of features to return in the result.
- **geo_dataframe** (*Optional[bool]*) – A boolean if set to `True` searched features will be yield as single Geopandas Dataframe.
- **force_2d** (*Optional[bool]*) – If set to True the features in the response will have only X and Y components, by default all x,y,z coordinates will be returned.
- **mode** (*Optional[str]*) – A string to indicate how to optimize the resultset and geometries for display. Allowed values are `raw` and `viz`.
- **viz_sampling** (*Optional[str]*) – A string to indicate the sampling strength in case of `mode=viz`. Allowed values are: `low`, `med`, `high`, and `off`, default: `med`.

**Yields** A Feature object by default. If param `geo_dataframe` is True then yields single Geopandas Dataframe.

**Raises** **ValueError** – If *tile_type* is invalid, valid tile_types are *quadkeys*, *web*, *tms* and *here*.

**Return type** Generator[geojson.feature.Feature, None, None]

**spatial_search**(*lat=None*, *lon=None*, *ref_space_id=None*, *ref_feature_id=None*, *radius=None*, *tags=None*, *limit=None*, *params=None*, *selection=None*, *skip_cache=None*, *geo_dataframe=None*, *force_2d=None*)

Get features with radius search.

**Parameters**

- **lat** (*Optional[float]*) – A float in WGS'84 decimal degree (-90 to +90) of the center Point.
- **lon** (*Optional[float]*) – A float in WGS'84 decimal degree (-180 to +180) of the center Point.
- **ref_space_id** (*Optional[str]*) – A string as alternative for defining center coordinates, it is possible to reference a geometry in a space, hence it is needed to provide the `ref_space_id` where the referenced feature is stored. Always to use in combination with `ref_feature_id`.
- **ref_feature_id** (*Optional[str]*) – A string as unique identifier of a feature in the referenced space. The geometry of that feature gets used for the spatial query. Always to use in combination with `ref_space_id`.
- **radius** (*Optional[int]*) – An int in meter which defines the diameter of the search request.
- **tags** (*Optional[List[str]]*) – A list of strings holding tag values.
- **limit** (*Optional[int]*) – A max. number of features to return in the result.
- **params** (*Optional[dict]*) – A dict to represent additional filter on features to be searched. Examples:
  - `params={"p.name": "foo"}` returns all features with a value of property `name` equal to `foo`.
  - `params={"p.name!": "foo"}` returns all features with a value of property `name` not qual to `foo`.
  - `params={"p.count=gte": "10"}` returns all features with a value of property `count` greater than or equal to `10`.
  - `params={"p.count=lte": "10"}` returns all features with a value of property `count` less than or equal to `10`.
  - `params={"p.count=gt": "10"}` returns all features with a value of property `count` greater than `10`.
  - `params={"p.count=lt": "10"}` returns all features with a value of property `count` less than `10`.
  - `params={"p.name=cs": "bar"}` returns all features with a value of property `name` which contains `bar`.
- **selection** (*Optional[List[str]]*) – A list of strings holding properties values.
- **skip_cache** (*Optional[bool]*) – A Boolean if set to `True` the response is not returned from cache.
- **geo_dataframe** (*Optional[bool]*) – A boolean if set to `True` searched features will be yield as single Geopandas Dataframe.
- **force_2d** (*Optional[bool]*) – If set to True the features in the response will have only X and Y components, by default all x,y,z coordinates will be returned.

**Yields** A Feature object by default. If param `geo_dataframe` is True then yields single Geopandas Dataframe.

**Return type** Generator[geojson.feature.Feature, None, None]

**spatial_search_geometry**(*data*, *radius=None*, *tags=None*, *limit=None*, *params=None*, *selection=None*, *skip_cache=None*, *divide=False*, *cell_width=None*, *units='m'*, *chunk_size=1*, *geo_dataframe=None*, *force_2d=None*)

Search features which intersect the provided geometry.

**Parameters**

- **data** (*dict*) – A JSON object which is getting used for the spatial search.
- **radius** (*Optional[int]*) – An int which defines the diameter(meters) of the search request.
- **tags** (*Optional[List[str]]*) – A list of strings holding tag values.
- **limit** (*Optional[int]*) – A max. number of features to return in the result.
- **params** (*Optional[dict]*) – A dict to represent additional filter on features to be searched. Examples:
  - `params={"p.name": "foo"}` returns all features with a value of property `name` equal to `foo`.
  - `params={"p.name!": "foo"}` returns all features with a value of property `name` not qual to `foo`.
  - `params={"p.count=gte": "10"}` returns all features with a value of property `count` greater than or equal to `10`.
  - `params={"p.count=lte": "10"}` returns all features with a value of property `count` less than or equal to `10`.
  - `params={"p.count=gt": "10"}` returns all features with a value of property `count` greater than `10`.
  - `params={"p.count=lt": "10"}` returns all features with a value of property `count` less than `10`.
  - `params={"p.name=cs": "bar"}` returns all features with a value of property `name` which contains `bar`.
- **selection** (*Optional[List[str]]*) – A list of strings holding properties values.
- **skip_cache** (*Optional[bool]*) – A Boolean if set to `True` the response is not returned from cache.
- **divide** (*Optional[bool]*) – To divide geometry if the resultant features count is large.
- **cell_width** (*Optional[float]*) – Width of each cell in which geometry is to be divided in units specified, default values is meters.
- **units** (*Optional[str]*) – Unit for cell_width please refer, https://github.com/omanges/turfpy/blob/master/measurements.md#units-type
- **chunk_size** (*int*) – Number of chunks each process to handle. The default value is 1, for a large number of features please use *chunk_size* greater than 1 to get better results in terms of performance.
- **geo_dataframe** (*Optional[bool]*) – A boolean if set to `True` searched features will be yield as single Geopandas Dataframe.

- **force_2d** (*Optional[bool]*) – If set to True the features in the response will have only X and Y components, by default all x,y,z coordinates will be returned.

**Yields** A Feature object by default. If param `geo_dataframe` is True then yields as single Geopandas Dataframe.

**Return type** Generator[geojson.feature.Feature, None, None]

**_spatial_search_geometry**(*data*, *feature_list*, *radius=None*, *tags=None*, *limit=None*, *params=None*, *selection=None*, *skip_cache=None*, *force_2d=None*)

**Parameters**

- **data** (*dict*) –
- **feature_list** (*List[dict]*) –
- **radius** (*Optional[int]*) –
- **tags** (*Optional[List[str]]*) –
- **limit** (*Optional[int]*) –
- **params** (*Optional[dict]*) –
- **selection** (*Optional[List[str]]*) –
- **skip_cache** (*Optional[bool]*) –
- **force_2d** (*Optional[bool]*) –

**add_features_geojson**(*path*, *encoding='utf-8'*, *features_size=2000*, *chunk_size=1*)

Add features in space from a GeoJSON file.

As API has a limitation on the size of features, features are divided into chunks, and multiple processes will process those chunks. Each chunk has a number of features based on the value of `features_size`. Each process handles chunks based on the value of `chunk_size`.

**Parameters**

- **path** (*str*) – Path to the GeoJSON file.
- **encoding** (*str*) – A string to represent the type of encoding.
- **features_size** (*int*) – An int representing a number of features to upload at a time.
- **chunk_size** (*int*) – Number of chunks for each process to handle. The default value is 1, for a large number of features please use *chunk_size* greater than 1.

**add_features_csv**(*path*, *lon_col*, *lat_col*, *id_col=''*, *alt_col=''*, *delimiter=','*, *add_tags=None*, *remove_tags=None*, *features_size=2000*, *chunk_size=1*, *id_properties=None*)

Add features in space from a csv file.

As API has a limitation on the size of features, features are divided into chunks, and multiple processes will process those chunks. Each chunk has a number of features based on the value of `features_size`. Each process handles chunks based on the value of `chunk_size`.

**Parameters**

- **path** (*str*) – Path to csv file.
- **lon_col** (*str*) – Name of the column for longitude coordinates.
- **lat_col** (*str*) – Name of the column for latitude coordinates.
- **id_col** (*str*) – Name of the column for feature id's.

- **alt_col** (*str*) – Name of the column for altitude, if not provided altitudes with default value 0.0 will be added.
- **delimiter** (*str*) – delimiter which should be used to process the csv file.
- **add_tags** (*Optional[List[str]]*) – A list of strings describing tags to be added to the features.
- **remove_tags** (*Optional[List[str]]*) – A list of strings describing tags to be removed from the features.
- **features_size** (*int*) – An int representing a number of features to upload at a time.
- **chunk_size** (*int*) – Number of chunks each process to handle. The default value is 1, for a large number of features please use *chunk_size* greater than 1 to get better results in terms of performance.
- **id_properties** (*Optional[List[str]]*) – List of properties name from which id to be generated if id does not exists for a feature.

**Raises** **Exception** – If values of params *lat_col*, *lon_col*, *id_col* do not match with column names in csv file.

**cluster**(*clustering*, *clustering_params=None*)

Apply clustering algorithm for the space data.

**Parameters**

- **clustering** (*str*) – Name of the clustering algorithm. Available values : hexbin, quadbin
- **clustering_params** (*Optional[dict]*) – Parameters for the clustering algorithm. Please refer : https://www.here.xyz/api/devguide/usingclustering/

**Returns** GeoJSON.

**Raises** **Exception** – If bounding box is not present in space statistics.

**Return type** dict

Example:

```
>>> import os
>>> from xyzspaces import XYZ
>>> os.environ["XYZ_TOKEN"] = "MY-XYZ-TOKEN"
>>> xyz = XYZ()
>>> space = xyz.spaces.from_id(space_id="existing-space-id")
>>> space.cluster(clustering="hexbin")
```

**isshared**()

Return the shared status of the space.

**Returns** A boolean to indicate shared status of the space.

**Return type** bool

**add_features_shapefile**(*path*, *features_size=2000*, *chunk_size=1*, *encoding='utf-8'*)

Upload shapefile to the space.

**Parameters**

- **path** (*str*) – A string representing full path of the shapefile. For zipped shapefile prepend `zip://` before path of shapefile.
- **features_size** (*int*) – An int representing a number of features to upload at a time.

- **chunk_size** (*int*) – Number of chunks for each process to handle. The default value is 1, for a large number of features please use *chunk_size* greater than 1.
- **encoding** (*str*) – A string to represent the type of encoding.

Example:

```
>>> import os
>>> from xyzspaces import XYZ
>>> os.environ["XYZ_TOKEN"] = "MY-XYZ-TOKEN"
>>> xyz = XYZ()
>>> space = xyz.spaces.from_id(space_id="existing-space-id")
>>> space.add_features_shapefile(path="shapefile.shp")
```

**add_features_wkt**(*path*)
To upload data from wkt file to a space

**Parameters** **path** (*str*) – Path to wkt file

**add_features_gpx**(*path*, *features_size=2000*, *chunk_size=1*)
Upload data from gpx file to the space.

**Parameters**

- **path** (*str*) – A string representing full path of the gpx file.
- **features_size** (*int*) – An int representing a number of features to upload at a time.
- **chunk_size** (*int*) – Number of chunks for each process to handle. The default value is 1, for a large number of features please use *chunk_size* greater than 1.

**add_features_kml**(*path*, *features_size=2000*, *chunk_size=1*)
To upload data from kml file to a space

**Parameters**

- **path** (*str*) – Path to kml file
- **features_size** (*int*) – An int representing a number of features to upload at a time.
- **chunk_size** (*int*) – Number of chunks for each process to handle. The default value is 1, for a large number of features please use *chunk_size* greater than 1.

**add_features_geobuf**(*path*, *features_size=2000*, *chunk_size=1*)
To upload data from geobuff file to a space.

**Parameters**

- **path** (*str*) – Path to geobuff file.
- **features_size** (*int*) – An int representing a number of features to upload at a time.
- **chunk_size** (*int*) – Number of chunks for each process to handle. The default value is 1, for a large number of features please use *chunk_size* greater than 1.

**add_features_geopandas**(*data*, *features_size=2000*, *chunk_size=1*)
Add features from GeoPandas dataframe to a space.

**Parameters**

- **data** (*gpd.GeoDataFrame*) – GeoPandas dataframe to be uploaded
- **features_size** (*int*) – The number of features to upload at a time.
- **chunk_size** (*int*) – Number of chunks for each process to handle. The default value is 1, for a large number of features please use *chunk_size* greater than 1.

**clone**(*space_id=None*, *chunks=1000*)
Copy current space data into a newly created or into an existing space.

**Parameters**

- **space_id** (*Optional[str]*) – space id into which to copy data, if not provided will create a new space and copy the data.
- **chunks** (*int*) – A max. number of features to read in a single iteration while iterating over the source space.

**Returns** The cloned Space Object

**browse**()
Inspect and analyze space using Data Hub Space Invader. More information about Data Hub Space Invader can be found here.

### xyzspaces.tools module

This is a preliminary collection of little tools that use XYZ.

xyzspaces.tools.**subset_geojson**(*gj*, *config=None*, *bbox=None*, *tile_type=None*, *tile_id=None*, *clip=False*, *lat=None*, *lon=None*, *radius=None*)
Return a subset of the GeoJSON object inside some bbox or map tile or radius.

This will create a temporary space, add the provided GeoJSON object, perform the bbox or tile subsetting and return the resulting GeoJSON object after deleting the temporary space again.

**Parameters**

- **config** (*Optional[xyzspaces.config.default.XYZConfig]*) – An object of *class:XYZConfig*, If not provied `XYZ_TOKEN` will be used from environment variable and other configurations will be used as defined in `default_config`.
- **gj** (*dict*) – The GeoJSON data object.
- **bbox** (*Optional[List[float]]*) – The bounding box described as a list of four numbers (its West, South, East, and North margins).
- **tile_type** (*Optional[str]*) – The tile type, for now one of: ...
- **tile_id** (*Optional[str]*) – The tile ID, a string composed of digits to identify the tile according to the specified tile type.
- **clip** (*Optional[bool]*) – A Boolean to indicate if the features should be clipped at the tile or bbox.
- **lat** (*Optional[float]*) – A float to represent latitude.
- **lon** (*Optional[float]*) – A float to represent longitude.
- **radius** (*Optional[int]*) – An int in meter which defines the diameter of the search request. Should be provided with `lat` and `lon` for spatial search.

**Returns** A GeoJSON object covering the desired tile or bbox subset of the original GeoJSON object.

**Raises** **ValueError** – If the wrong combination of `bbox`, `tile_type` and `tile_id`, `lat` and `lon` was provided.

**Return type** dict

### xyzspaces.utils module

This is a collection of utilities for using XYZ Hub.

Actually, they are almost unspecific to any XYZ Hub functionality, apart from *feature_to_bbox()*, but convenient to use.

xyzspaces.utils.**join_string_lists**(***kwargs*)
Convert named lists of strings to one dict with comma-separated strings.

**Parameters** **kwargs** – Lists of strings

**Returns** Converted dict.

**Return type** dict

Example:

```
>>> join_string_lists(foo=["a", "b", "c"], bar=["a", "b"], foobar=None)
{"foo": "a,b,c", "bar": "a,b"}
```

xyzspaces.utils.**feature_to_bbox**(*feature*)
Extract bounding box from GeoJSON feature rectangle.

**Parameters** **feature** (*dict*) – A dict representing a GeoJSON feature.

**Returns** A list of four floats representing West, South, East and North margins of the resulting bounding box.

**Return type** List[float]

xyzspaces.utils.**get_xyz_token**()
Read and return the value of the environment variable XYZ_TOKEN.

**Returns** The string value of the environment variable or an empty string if no such variable could be found.

**Return type** str

xyzspaces.utils.**grouper**(*size*, *iterable*, *fillvalue=None*)
Create groups of *size* each from given iterable.

**Parameters**

- **size** – An int representing size of each group.
- **iterable** – An iterable.
- **fillvalue** – Value to put for the last group.

**Returns** A generator.

xyzspaces.utils.**wkt_to_geojson**(*wkt_data*)
Converts wkt to geojson

**Parameters** **wkt_data** (*str*) – wkt data to be converted

**Returns** Geojson

**Return type** dict

xyzspaces.utils.**grid**(*bbox*, *cell_width*, *cell_height*, *units*)
This function generates the grids for the given bounding box

**Parameters**

- **bbox** – bounding box coordinates

- **cell_width** – Cell width in specified in units
- **cell_height** – Cell height in specified in units
- **units** – Units for given sizes

**Returns** FeatureCollection of grid boxes genarated for the giving bounding box

xyzspaces.utils.**divide_bbox**(*feature*, *cell_width=None*, *units='m'*)
Divides the given feature into grid boxes as per given cell width

**Parameters**

- **feature** (*dict*) – Feature to be divide in grid
- **cell_width** (*Optional[float]*) – Width of each grid boxs
- **units** (*Optional[str]*) – Units for the width of grid boxs

**Returns** List of features in which the input feature is divided

xyzspaces.utils.**flatten_geometry**(*data*)
Flatten the geometries in the given GeoPandas dataframe. Flatten geometry is formed by extracting individual geometries from GeometryCollection, MultiPoint, MultiLineString, MultiPolygon.

**Parameters** **data** (*gpd.GeoDataFrame*) – GeoPandas dataframe to be flatten

**Returns** Flat GeoPandas dataframe

**Return type** gpd.GeoDataFrame

## 2.5 Logging Configuration

By default logging is disabled. To enable logging, use below code snippets in your python code to setup logging at DEBUG level:

```
import logging
from xyzspaces import setup_logging

setup_logging(default_level=logging.DEBUG)
```

Default logging configuration is defined in a file. This ensures that log messages will be written to the file `xyz.log` in your current working directory. Here is an example log file (xyz.log):

```
2020-02-21 17:55:46,132 - apis.py:130 - ERROR - Curl command: curl --request GET https://
↪xyz.api.here.com/hub/spaces/dummy-111 --header "Authorization: Bearer <XYZ_TOKEN>"
2020-02-21 17:55:46,133 - apis.py:131 - ERROR - Response status code: 404
2020-02-21 17:55:46,133 - apis.py:132 - ERROR - Response headers: {'Content-Type':
↪'application/json', 'Content-Length': '150', 'Connection': 'keep-alive', 'Date': 'Fri,␣
↪21 Feb 2020 12:25:46 GMT', 'x-amzn-RequestId': '397c8039-79f1-4956-bbe4-46ca78c7ec2d',
↪'content-encoding': 'gzip', 'Stream-Id': '397c8039-79f1-4956-bbe4-46ca78c7ec2d', 'x-
↪amzn-Remapped-Content-Length': '150', 'x-amzn-Remapped-Connection': 'keep-alive', 'x-
↪amz-apigw-id': 'IPzblGVFjoEF5pg=', 'x-amzn-Remapped-Date': 'Fri, 21 Feb 2020 12:25:46␣
↪GMT', 'X-Cache': 'Error from cloudfront', 'Via': '1.1 e25383e25378de918d3b187b3239eb5b.
↪cloudfront.net (CloudFront)', 'X-Amz-Cf-Pop': 'BOM51-C2', 'X-Amz-Cf-Id': 'nZAJUB_
↪FBiHdojziSoG3SBcMdf8rNyHuOMSlJljyxDNlx1I0O3t9YQ=='}
2020-02-21 17:55:46,134 - apis.py:133 - ERROR - Response text: {"type":"ErrorResponse",
↪"error":"Exception","errorMessage":"The requested resource does not exist.","streamId":
↪"397c8039-79f1-4956-bbe4-46ca78c7ec2d"}
```

To customize the logging configuration, set the variable XYZ_LOG_CONFIG to hold the full path of the logging configuration options file logging_config.json:

```
export XYZ_LOG_CONFIG=~/logging_config.json
```

## 2.6 Tests

xyzspaces uses pytest for testing.

You can run the test suite locally:

```
pip install -r requirements_dev.txt
pytest -v --cov=xyzspaces tests
```

The test suite provides test coverage of around 98% (but less if the tests cannot find your credentials).

## 2.7 CHANGELOG

### 2.7.1 xyzspaces 0.7.2 (2021-08-18)

- Made geopandas, turfpy, geobuf as optional dependencies of the xyzspaces

### 2.7.2 xyzspaces 0.7.1 (2021-08-10)

- Fixed minor issues

### 2.7.3 xyzspaces 0.7.0 (2021-08-10)

- **Features**
  - Added support for Interactive Map Layers. (#117)

### 2.7.4 xyzspaces 0.6.0 (2021-06-17)

- **Features**
  - Added support custom base URL of Data Hub APIs for self-hosted Data Hub. (#113)
  - Added support for launch datahub space invader. (commit)
  - Fixed feature_id gettting skipped from GeoPandas data.(commit)

### 2.7.5 xyzspaces 0.5.0 (2021-02-01)

- **Features**
  - Added functionality to `clone` Space. (#93)
  - Handle HTTP 429 responses with `backoff` package. (#95)
  - support the new `force2D` parameter for all the APIs used to read features. (#96)
  - Add support for new mode and vizSampling params in HubApi.get_space_tile. (#101)
- **Documentation**
  - Start collecting/documenting architecture decision records (ADRs). (#90)
  - Add support for executable code in Sphinx documentation. (#99)
- **Misc**
  - Migrated CI from Travis to GitHub Actions. (#111)

### 2.7.6 xyzspaces 0.4.0 (2020-09-18)

- **Features**
  - Added feature to upload data from `kml` file to the space.(#49)
  - Added `limit` param to method `iter_feature` to control numer of features to iterate in single call.(#52)
  - Fixed encoding and projections issue for `shapefile` upload.(#54)
  - Enabled property search while searching features in bounding box.(#56)
  - Added feature to upload data from `geobuff` file to the space.(#57)
  - Remove duplicate features for `spatial_search_geometry` with division(#58)
  - Enabled property search while searching features in tile.(#61)
  - Remove duplicate features while add to space using `add_features` and also added a `mutation` parameter to mutate input features or not.(#64)
  - `description` is optional when creating the space.(#68)
  - Added feature to upload data from `Geopandas Dataframe` file to the space.(#71)
  - Enabled reading space data as Geopandas Dataframe.(#72)
  - Improved performance of CSV upload.(#77)
  - Improvement in the performance of `add_features_geojson`.(#79)
  - Changes to convert shape file with projection of different type to EPSG:4326.(#83)
- **Documentation**
  - New notebook illustrating spatial search on MS US building footprints dataset.(#62)

### 2.7.7 xyzspaces 0.3.2 (2020-08-19)

- **Features**
  - Added feature to upload data from `shapefile` to the space.(#40)
  - Added feature to upload data from `WKT` file to the space.(#41)
  - Added feature to upload data from `gpx` file to the space.(#42)
  - Optimized the `spatial search` to search features from large geometries.(#44)
- **Misc**
  - Added Binder support to the repository.(#28)
  - Added **clientId** in query params of the Hub API requests.(#36)
  - Updated `__version__` attribute now it can be used as `from xyzspaces import __version__`.(#38)

### 2.7.8 xyzspaces 0.3.1 (2020-07-24)

- **Misc**
  - Minor changes to README.(0.3.1)

### 2.7.9 xyzspaces 0.3.0 (2020-07-24)

- **Misc**
  - First public release.(0.3.0)

## 2.8 Blogs and Talks

Various blog posts and conference presentations about `xyzspaces`:

### 2.8.1 Blogs

- A simple way to build your own 3D map with Coloured LIDAR point clouds using xyzspaces.

### 2.8.2 Talks

- Online Python Machine Learning Conference & GeoPython 2020

## 2.9 Contributing to xyzspaces

### 2.9.1 Overview

Contributions to xyzspaces are very welcome. They are likely to be accepted more quickly if they follow these guidelines.

Below are guidelines, when submitting a pull request:

- All existing tests should pass. Please make sure that the test suite passes, both locally and on Travis CI. Status on Travis will be visible on a pull request.
- New functionality should include tests. Please write reasonable tests for your code and make sure that they pass on your pull request.
- Classes, methods, functions, etc. should have docstrings. The first line of a docstring should be a standalone summary. Parameters and return values should be documented explicitly.
- Follow PEP 8 when possible. We use Black, Flake8, isort, typing and darglint to ensure a consistent code format throughout the project. For more details see *below*.
- Imports should be grouped with standard library imports first, 3rd-party libraries next, and xyzspaces imports third. Within each grouping, imports should be alphabetized. Always use absolute imports when possible, and explicit relative imports for local imports when necessary in tests.
- xyzspaces supports Python 3.6+.

#### Seven Steps for Contributing

There are seven basic steps to contributing to *xyzspaces*:

1) Fork the *xyzspaces* git repository
2) Create a development environment
3) Install *xyzspaces* dependencies
4) Make changes to code and add tests
5) Run linting
6) Update the documentation
7) Submit a Pull Request

Each of these 7 steps is detailed below.

### 2.9.2 1) Forking the *xyz-spaces-python* repository using Git

To the new user, working with Git is one of the more daunting aspects of contributing to *xyzspaces**. It can very quickly become overwhelming, but sticking to the guidelines below will help keep the process straightforward and mostly trouble free. As always, if you are having difficulties please feel free to ask for help.

The code is hosted on GitHub. To contribute you will need to sign up for a free GitHub account.

Some great resources for learning Git:

- Software Carpentry's Git Tutorial
- Atlassian

- the GitHub help pages.
- Matthew Brett's Pydagogue.

### Getting started with Git

GitHub has instructions for installing git, setting up your SSH key, and configuring git. All these steps need to be completed before you can work seamlessly between your local repository and GitHub.

### Forking

You will need your own fork to work on the code. Go to the xyz-spaces-python project page and hit the `Fork` button. You will want to clone your fork to your machine:

```
git clone git@github.com:your-user-name/xyz-spaces-python.git xyz-spaces-python-yourname
cd xyz-spaces-python-yourname
git remote add upstream git://github.com/heremaps/xyz-spaces-python.git
```

This creates the directory *xyz-spaces-python-yourname* and connects your repository to the upstream (main project) *xyzspaces* repository.

The testing suite will run automatically on Travis-CI once your pull request is submitted. However, if you wish to run the test suite on a branch prior to submitting the pull request, then Travis-CI needs to be hooked up to your GitHub repository. Instructions for doing so are here.

### Creating a branch

You want your master branch to reflect only production-ready code, so create a feature branch for making your changes. For example:

```
git branch shiny-new-feature
git checkout shiny-new-feature
```

The above can be simplified to:

```
git checkout -b shiny-new-feature
```

This changes your working directory to the shiny-new-feature branch. Keep any changes in this branch specific to one bug or feature so it is clear what the branch brings to *xyzspaces*. You can have many shiny-new-features and switch in between them using the git checkout command.

To update this branch, you need to retrieve the changes from the master branch:

```
git fetch upstream
git rebase upstream/master
```

This will replay your commits on top of the latest xyzspaces git master. If this leads to merge conflicts, you must resolve these before submitting your pull request. If you have uncommitted changes, you will need to `stash` them prior to updating. This will effectively store your changes and they can be reapplied after updating.

### 2.9.3 2) Creating a development environment

A development environment is a virtual space where you can keep an independent installation of *xyzspaces*. This makes it easy to keep both a stable version of python in one place you use for work, and a development version (which you may break while playing with code) in another.

An easy way to create a *xyzspaces* development environment is as follows:

- Install either Anaconda or miniconda
- Make sure that you have *cloned the repository*
- `cd` to the *xyzspaces** source directory

Tell conda to create a new environment, named `xyz_dev`, or any other name you would like for this environment, by running:

```
conda create -n xyz_dev python
```

This will create the new environment, and not touch any of your existing environments, nor any existing python installation.

To work in this environment, you need to `activate` it. The instructions below should work for both Windows, Mac and Linux:

```
conda activate xyz_dev
```

Once your environment is activated, you will see a confirmation message to indicate you are in the new development environment.

To view your environments:

```
conda info -e
```

To return to you home root environment:

```
conda deactivate
```

See the full conda docs here.

At this point you can easily do a *development* install, as detailed in the next sections.

### 2.9.4 3) Installing Dependencies

To run *xyzspaces* in an development environment, you must first install *xyzspaces*'s dependencies. We suggest doing so using the following commands (executed after your development environment has been activated):

```
pip install -r requirements.txt
pip install -r requirements_dev.txt
```

This should install all necessary dependencies.

### 2.9.5 4) Making changes and writing tests

*xyzspaces* is serious about testing and strongly encourages contributors to embrace test-driven development (TDD). This development process "relies on the repetition of a very short development cycle: first the developer writes an (initially failing) automated test case that defines a desired improvement or new function, then produces the minimum amount of code to pass that test." So, before actually writing any code, you should write your tests. Often the test can be taken from the original GitHub issue. However, it is always worth considering additional use cases and writing corresponding tests.

Adding tests is one of the most common requests after code is pushed to *xyzspaces*. Therefore, it is worth getting in the habit of writing tests ahead of time so this is never an issue.

*xyzspaces* uses the pytest framework.

#### Writing tests

All tests should go into the `tests` directory. This folder contains many current examples of tests, and we suggest looking to these for inspiration.

#### Running the test suite

The tests can then be run directly inside your Git clone (without having to install *xyzspaces*) by typing:

```
pytest -v --cov=xyzspaces tests
```

### 2.9.6 5) Run linting

For linting please refer *contributing style*

### 2.9.7 6) Updating the Documentation

*xyzspaces* documentation resides in the *docs* folder. Changes to the docs are make by modifying the appropriate file in the *source* folder within *docs*. *xyzspaces* docs use reStructuredText syntax, which is explained here and the docstrings follow the Sphinx Docstring standard.

Once you have made your changes, you may try if they render correctly by building the docs using sphinx. To do so, you can type from project's root folder:

```
sh scripts/build_docs.sh
```

The resulting html pages will be located in *docs/source/_build/html*.

### 2.9.8 7) Submitting a Pull Request

Once you've made changes and pushed them to your forked repository, you then submit a pull request to have them integrated into the *xyzspaces* code base.

You can find a pull request (or PR) tutorial in the GitHub's Help Docs.

### 2.9.9 Style Guide & Linting

xyzspaces follows the PEP8 standard and uses Black, Flake8, isort, typing and darglint to ensure a consistent code format throughout the project.

Continuous Integration (Travis CI) will run those tools and report any stylistic errors in your code. Therefore, it is helpful before submitting code to run the check yourself. To autoformat the code run:

```
make black
```

To check linting errors run:

```
make lint
```

To check typing errors run:

```
make typing
```

### 2.9.10 Signing each Commit

As part of filing a pull request we ask you to sign off the Developer Certificate of Origin (DCO) in each commit. Any Pull Request with commits that are not signed off will be reject by the DCO check. A DCO is lightweight way for a contributor to confirm that you wrote or otherwise have the right to submit code or documentation to a project. Simply add Signed-off-by as shown in the example below to indicate that you agree with the DCO. An example signed commit message:

```
README.md: Fix minor spelling mistake
Signed-off-by: John Doe <john.doe@example.com>
```

Git has the -s flag that can sign a commit for you, see example below:

```
$ git commit -s -m 'README.md: Fix minor spelling mistake'
```

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