

Application Programming Interface (API)

Barbara Ericson

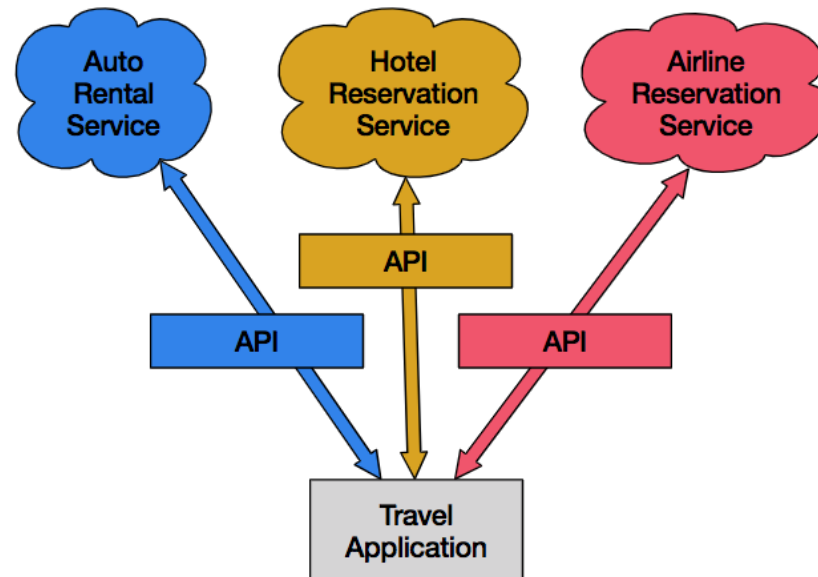
What is an API?

- ▶ Software that provides programs access to data on a remote server
 - ▶ Clients request data
 - ▶ Servers give a reply with the data
 - ▶ Typically in JSON
 - ▶ Like a waiter at a restaurant



Service Oriented Architecture (SOA)

- ▶ Application that uses the services of other applications
- ▶ If web-based then this is a web service



Security and API usage

- ▶ Servers may require a key
 - ▶ Want to know who is using the service and how much
 - ▶ May require billing information
 - ▶ Google Maps used to be open - Now requires an account
- ▶ Servers may require OAuth 2.0
 - ▶ Authorization framework to allow 3rd party applications to access a web service
 - ▶ <https://oauth.net/>

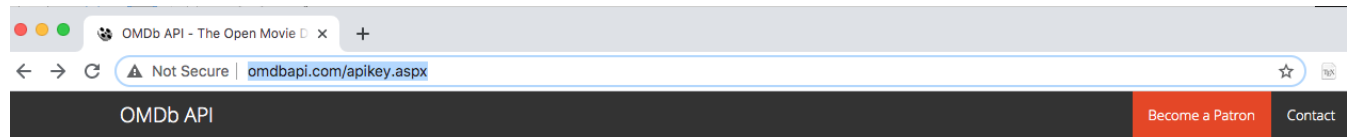
OMDB API

► Requires a key

► Apply for one at

<http://www.omdbapi.com/apikey.aspx>

Add to your API
requests as
`apikey="your key"`



API Key

3/10/19 Disposable/Temporary Emails Purged! All keys associated with these emails have been removed. Friendly reminder, we do not sell or share your information with anyone else. ✕

Generate API Key

Account Type ☐ Patreon
☒ FREE! (1,000 daily limit)

Email

Enter the email address that you used with Patreon.

[Legal](#) [Donate](#)

API for OMDb

► <http://www.omdbapi.com/>

By ID or Title

Parameter	Required	Valid Options	Default Value	Description
i	Optional*		<empty>	A valid IMDb ID (e.g. tt1285016)
t	Optional*		<empty>	Movie title to search for.
type	No	movie, series, episode	<empty>	Type of result to return.
y	No		<empty>	Year of release.
plot	No	short, full	short	Return short or full plot.
r	No	json, xml	json	The data type to return.
callback	No		<empty>	JSONP callback name.
v	No		1	API version (reserved for future use).

By Search

Parameter	Required	Valid options	Default Value	Description
s	Yes		<empty>	Movie title to search for.
type	No	movie, series, episode	<empty>	Type of result to return.
y	No		<empty>	Year of release.
r	No	json, xml	json	The data type to return.
page <small>New!</small>	No	1-100	1	Page number to return.
callback	No		<empty>	JSONP callback name.
v	No		1	API version (reserved for future use).

Example with OMDb -

<http://www.omdbapi.com/>

Examples

By Title

Title: Year: Plot: Response:

Request:

<http://www.omdbapi.com/?t=Inception>

Response:

```
{
  "Title": "Inception",
  "Year": "2010",
  "Rated": "PG-13",
  "Released": "16 Jul 2010",
  "Runtime": "148 min",
  "Genre": "Action, Adventure, Sci-Fi, Thriller",
  "Director": "Christopher Nolan",
  "Writer": "Christopher Nolan",
  "Actors": "Leonardo DiCaprio, Joseph Gordon-Levitt, Elliot Page, Tom Hardy",
  "Plot": "A thief who steals corporate secrets through the use of dream-sharing technology is given the inverse task of planting an idea into the mind of a C.E.O.",
  "Language": "English, Japanese, French",
  "Country": "USA, UK",
  "Awards": "Won 4 Oscars. Another 151 wins & 219 nominations.",
  "Poster": "https://m.media-amazon.com/images/M/MV5BMjAxMzY3Njc5NF5hbnBnXkFtZTcwNTI5OTM0Mw@@_V1_SX300.jpg",
  "Ratings": [
    {
      "Source": "Internet Movie Database",
      "Value": "8.8/10"
    },
    {
      "Source": "Rotten Tomatoes",
      "Value": "87%"
    },
    {
      "Source": "Metacritic",
      "Value": "74/100"
    }
  ],
  "Metascore": "74",
  "imdbRating": "8.8",
  "imdbVotes": "2,086,135",
  "imdbID": "tt1375666",
  "Type": "movie",
  "DVD": "20 Jun 2013",
  "BoxOffice": "$292,576,195",
  "Production": "Warner Bros., Syncopy",
  "Website": "N/A",
  "Response": "True"
}
```

Viewing the JSON - <https://jsonformatter.org/>

The screenshot displays the JSON Formatter website interface. The browser address bar shows the URL <https://jsonformatter.org/>. The website has a dark blue header with navigation links: JSON PARSER, JSON PRETTY PRINT, JSBEAUTIFIER, SAVE, RECENT LINKS, and LOGIN. The main content area is split into two panels. The left panel shows the raw JSON data for the movie Inception, starting with `{ "Title": "Inception", "Year": "2010", "Rated": "PG-13", "Released": "16 Jul 2010", "Runtime": "148 min", "Genre": "Action, Adventure, Sci-Fi, Thriller", "Director": "Christopher Nolan", "Writer": "Christopher Nolan", "Actors": "Leonardo DiCaprio, Joseph Gordon-Levitt, Elliot Page, Tom Hardy", "Plot": "A thief who steals corporate secrets through the use of dream-sharing technology is given the inverse task of planting an idea into the mind of a C.E.O."` . The right panel shows the same JSON data formatted and beautified, with proper indentation and line wrapping. A central sidebar contains buttons for 'Upload Data', 'Validate', 'Format / Beautify', 'Minify / Compact', 'Convert JSON to-', and 'Download'. There is also an advertisement for Ashley Furniture. The status bar at the bottom indicates 'Ln: 2 Col: 1' for the left panel and 'Ln: 1 Col: 1' for the right panel.

```
{ "Title": "Inception", "Year": "2010", "Rated": "PG-13", "Released": "16 Jul 2010", "Runtime": "148 min", "Genre": "Action, Adventure, Sci-Fi, Thriller", "Director": "Christopher Nolan", "Writer": "Christopher Nolan", "Actors": "Leonardo DiCaprio, Joseph Gordon-Levitt, Elliot Page, Tom Hardy", "Plot": "A thief who steals corporate secrets through the use of dream-sharing technology is given the inverse task of planting an idea into the mind of a C.E.O.", "Language": "English, Japanese, French", "Country": "USA, UK", "Awards": "Won 4 Oscars. Another 151 wins & 219 nominations.", "Poster": "https://m.media-amazon.com/images/M/MV5BMjAxMzY3Njc5NF5hbnBnXkFtZTcwNTI5OTM0Mw@@._V1_SX300.jpg", "Ratings": [{"Source": "Internet Movie Database", "Value": "8.8/10"}, {"Source": "Rotten Tomatoes", "Value": "87%"}, {"Source": "Metacritic", "Value": "74/100"}], "Metascore": "74", "imdbRating": "8.8", "imdbVotes": "2,086,135", "imdbID": "tt1375666", "Type": "movie", "DVD": "20 Jun 2013", "BoxOffice": "$292,576,195", "Production": "Warner Bros., Syncopy", "Website": "N/A", "Response": "True" }
```

imdbID

Using a separate file with key/Oauth

- ▶ It is best to not turn in your api keys with your final project
- ▶ Create a separate python file that defines the keys/Oauth information and name it *my_info.py*
 - ▶ `omdb_key = "xxxxx"`
- ▶ import the file
 - ▶ `import my_info`
- ▶ Use `filename.value` to access each value
 - ▶ `my_info.omdb_key`

How to Use an API key

- ▶ You can just add “?apikey=key” to the end of the url as a string. Separate other parameters with ‘&’

```
response = requests.get("http://www.omdbapi.com/?apikey=" +  
my_key.omdb_key + "&t=" + title)
```

- ▶ You can create a dictionary and with a key of apikey and the key as the value and pass that to requests.get

```
r_dict = {}  
r_dict["apikey"] = my_key.omdb_key  
r_dict["t"] = title  
response = requests.get("http://www.omdbapi.com/", params = r_dict)
```

Sample Code - api-test.py

```
import requests
import my_info

# get the title for the movie
title = input("Enter a title for a movie: ")

# put the parameters for the request in a dictionary
r_dict = {}
r_dict["apikey"] = my_info.omdb_key
r_dict["t"] = title

# get the response from the endpoint
#response = requests.get("http://www.omdbapi.com/?apikey=" + my_key.omdb_key + "&t=" + title)
response = requests.get("http://www.omdbapi.com/", params = r_dict)
print(response.status_code)
print(response.content)
```

Caching Response Data

- ▶ Often you will need lots of data from a server
- ▶ Servers may limit the number of requests
 - ▶ Before a new request, check if you already have that data (look it up in a dictionary)
 - ▶ If so, return it
 - ▶ If not - do the request and save (cache) the results in a dictionary
 - ▶ Can also save to a file using JSON

Pros and Cons to Caching

▶ Pros

- ▶ Reduces the load on the server
- ▶ Makes your program run faster
- ▶ Makes it easier to debug when you know the data format

▶ Cons

- ▶ The data may change online

Free APIs

► <https://github.com/public-apis/public-apis>

Public APIs

A collective list of free APIs for use in software and web development

Status

Number of Categories **51** Number of APIs **invalid**

Tests of push & pull **passing** Validate links **failing** Tests of validate package **passing**

The Project

[Contributing Guide](#) • [API for this project](#) • [Issues](#) • [Pull Requests](#) • [License](#)

Currently Active Maintainers

[matheusfelipecog](#) • [pawelborkar](#) • [marekdano](#) • [yannbertrand](#)

Alternative sites for the project (unofficials)

[Free APIs](#) • [Dev Resources](#) • [Public APIs Site](#) • [Apihouse](#) • [Collective APIs](#)

Index

- [Animals](#)
- [Anime](#)
- [Anti-Malware](#)
- [Art & Design](#)
- [Authentication & Authorization](#)
- [Blockchain](#)
- [Books](#)
- [Business](#)
- [Calendar](#)
- [Cloud Storage & File Sharing](#)
- [Continuous Integration](#)
- [Cryptocurrency](#)
- [Currency Exchange](#)
- [Data Validation](#)
- [Development](#)
- [Dictionaries](#)
- [Documents & Productivity](#)
- [Email](#)

Cat Facts

- ▶ Free API
 - ▶ Endpoints URLs for the resources
 - ▶ APIs often have more than one
- ▶ Models describe the data

<https://alexwohlbruck.github.io/cat-facts/docs/>

API Documentation

Base URL for all endpoints <https://cat-fact.herokuapp.com>

The response time will likely be a few seconds long on the first request, because this app is running on a free Heroku dyno. Subsequent requests will behave as normal.

Endpoints

[/facts](#) Retrieve and query facts

[/users](#) * Get user data

* Requires authentication. As of now, this can only be achieved by logging in manually on the website.

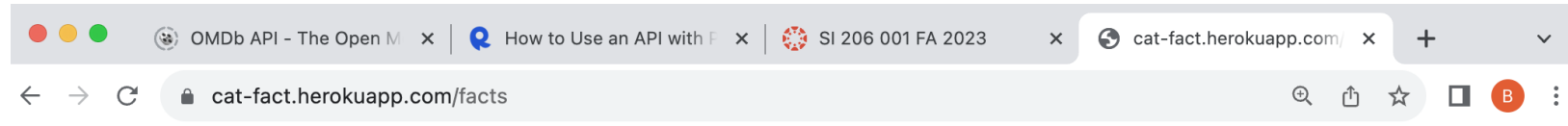
Models

[Fact](#) An animal fact

[User](#) A user of the Cat Facts site

Try it in a Browser

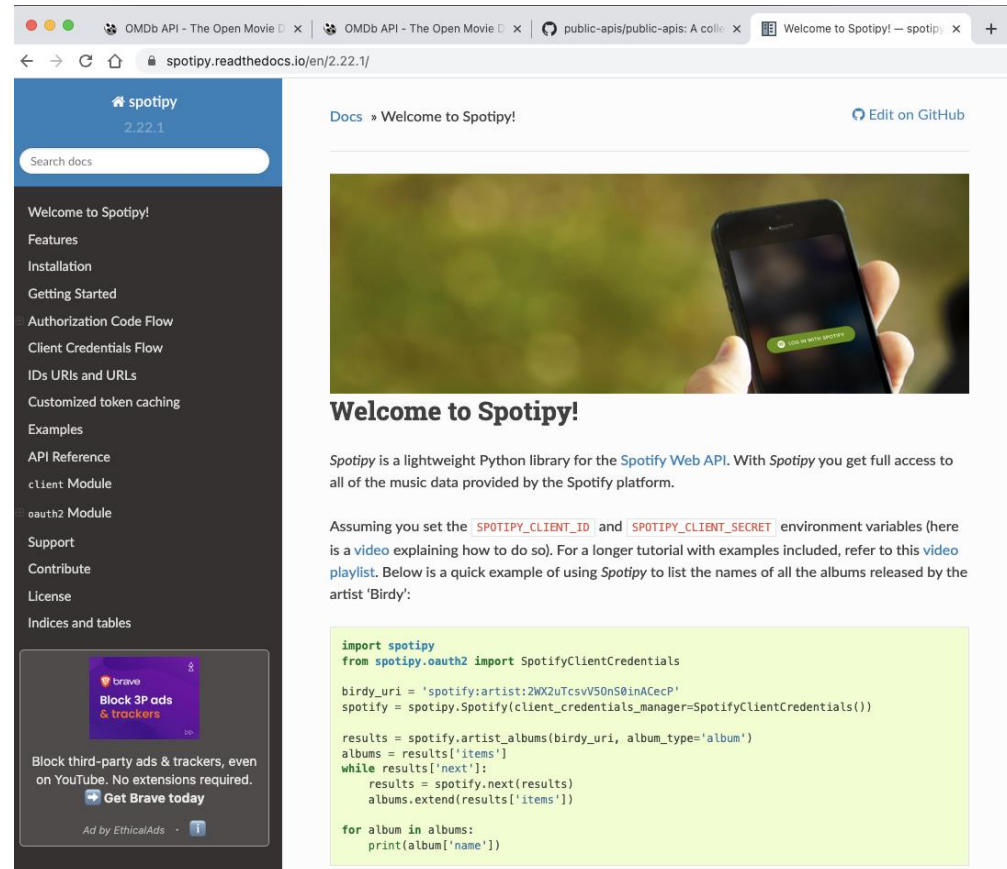
► <https://cat-fact.herokuapp.com/facts>



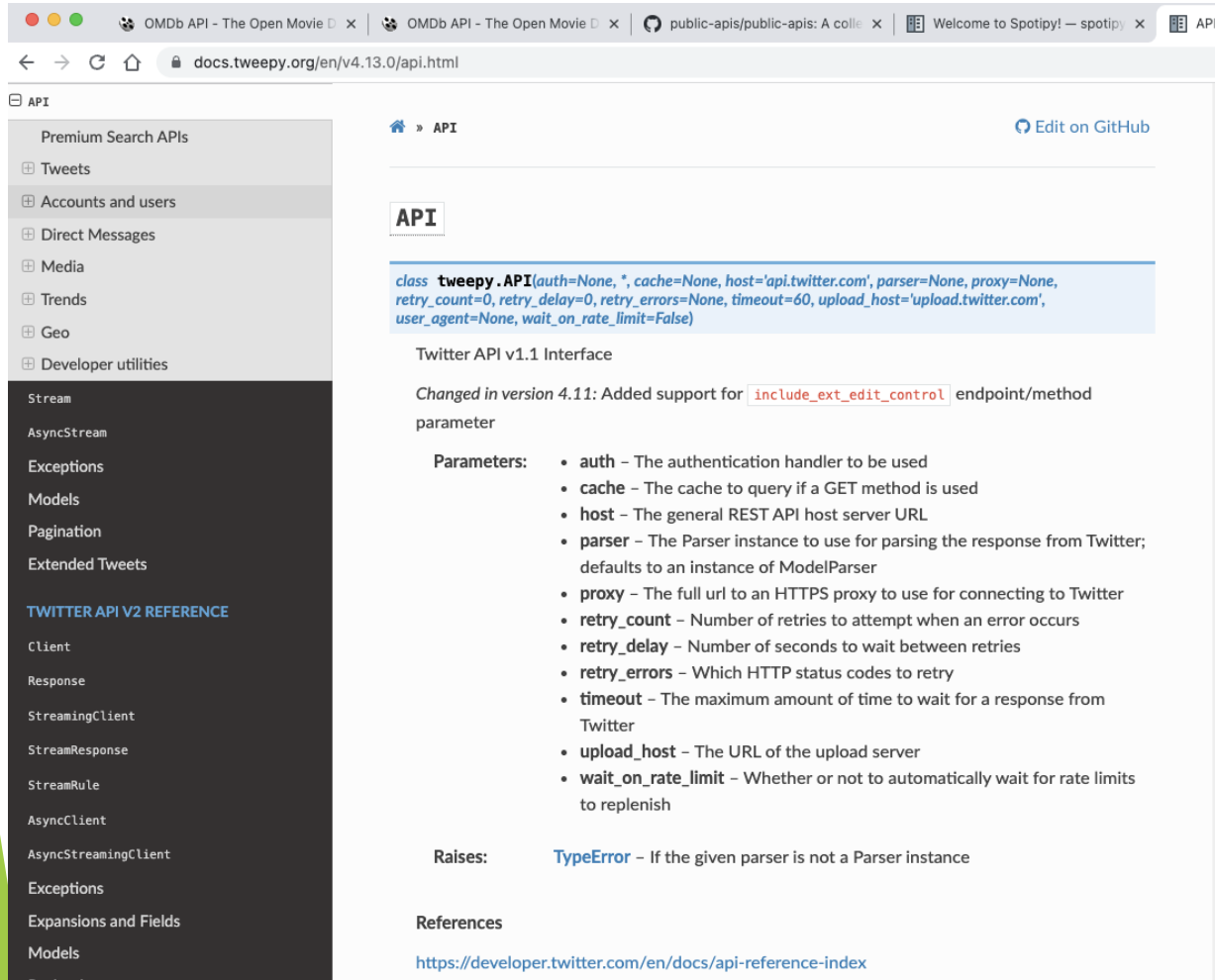
```
[{"status":  
{"verified":true,"sentCount":1},"_id":"58e00b5f0  
aac31001185ed24","user":"58e007480aac31001185ece  
f","text":"When asked if her husband had any  
hobbies, Mary Todd Lincoln is said to have  
replied  
\"cats.\"","__v":0,"source":"user","updatedAt":"  
2020-08-  
23T20:20:01.611Z","type":"cat","createdAt":"2018
```


There are Python Libraries that Make it Easier to get Data From APIs

- ▶ Don't use the Spotify API - use Spotipy
 - ▶ <https://spotipy.readthedocs.io/en/2.22.1/>
- ▶ Have to install the library



Other Libraries - Tweepy and Goodreads



The screenshot shows the Tweepy API documentation page. The browser's address bar displays `docs.tweepy.org/en/v4.13.0/api.html`. On the left, a sidebar lists various API features and a detailed list of classes under the 'TWITTER API V2 REFERENCE' section. The main content area is titled 'API' and includes a code snippet for the `tweepy.API` class, a description of the 'Twitter API v1.1 Interface', a note about changes in version 4.11, a list of parameters for the API class, a 'Raises' section for `TypeError`, and a 'References' section with a link to the Twitter developer documentation.

Premium Search APIs

- Tweets
- Accounts and users
- Direct Messages
- Media
- Trends
- Geo
- Developer utilities

Stream

AsyncStream

Exceptions

Models

Pagination

Extended Tweets

TWITTER API V2 REFERENCE

Client

Response

StreamingClient

StreamResponse

StreamRule

AsyncClient

AsyncStreamingClient

Exceptions

Expansions and Fields

Models

Definition

API

```
class tweepy.API(auth=None, *, cache=None, host='api.twitter.com', parser=None, proxy=None, retry_count=0, retry_delay=0, retry_errors=None, timeout=60, upload_host='upload.twitter.com', user_agent=None, wait_on_rate_limit=False)
```

Twitter API v1.1 Interface

Changed in version 4.11: Added support for `include_ext_edit_control` endpoint/method parameter

Parameters:

- `auth` – The authentication handler to be used
- `cache` – The cache to query if a GET method is used
- `host` – The general REST API host server URL
- `parser` – The Parser instance to use for parsing the response from Twitter; defaults to an instance of `ModelParser`
- `proxy` – The full url to an HTTPS proxy to use for connecting to Twitter
- `retry_count` – Number of retries to attempt when an error occurs
- `retry_delay` – Number of seconds to wait between retries
- `retry_errors` – Which HTTP status codes to retry
- `timeout` – The maximum amount of time to wait for a response from Twitter
- `upload_host` – The URL of the upload server
- `wait_on_rate_limit` – Whether or not to automatically wait for rate limits to replenish

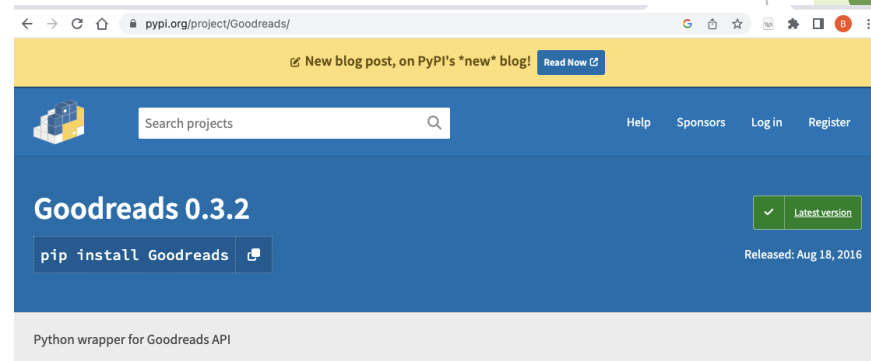
Raises:

- `TypeError` – If the given parser is not a Parser instance

References

<https://developer.twitter.com/en/docs/api-reference-index>

Goodreads



The screenshot shows the Goodreads project page on PyPI. The browser's address bar displays `pypi.org/project/Goodreads/`. The page features a search bar, navigation links for Help, Sponsors, Log in, and Register. The main heading is 'Goodreads 0.3.2', with a 'Latest version' button. Below the heading, there is a 'pip install Goodreads' button and a 'Released: Aug 18, 2016' date. The footer indicates it is a 'Python wrapper for Goodreads API'.

New blog post, on PyPI's "new" blog! [Read Now](#)

Search projects

Help Sponsors Log in Register

Goodreads 0.3.2

[pip install Goodreads](#)

Released: Aug 18, 2016

Python wrapper for Goodreads API

How to Use an API

<https://blog.hubspot.com/website/api-documentation>

- ▶ Read the documentation
 - ▶ Every API is unique
- ▶ Check the Authorization
 - ▶ APIs will often require some type of authorization
 - ▶ apiKey - identifies you - request one
 - ▶ OAuth - more secure and complex
- ▶ Rate limits
 - ▶ How many requests can you send in a time period?
- ▶ Terms of Service - What is allowed?
- ▶ Look for Examples
- ▶ Look at the status codes and error messages

May have to Pay for Some Types of Access

aviationstack Pricing Documentation FAQ Blog Status Log In SIGN UP

Pricing Plans That Fit Your Business

☒ Monthly Billing ☐ Yearly Billing 20% Discount

Free	Basic	Professional (BESTSELLER)	Business	Enterprise
Personal use, no credit card required.	Basic level - commercial use with premium features and up to 10,000 monthly requests.	Best value - extended access limits and up to 50,000 monthly flight data requests.	Business level - everything we can offer and up to 250,000 monthly requests.	Looking for more? Contact us for a quote.
\$0 per month	\$49.99 per month or \$39.99 if billed yearly	\$149.99 per month or \$119.99 if billed yearly	\$499.99 per month or \$399.99 if billed yearly	Custom Pricing Tailored to your needs
SIGN UP	SIGN UP	SIGN UP	SIGN UP	CONTACT US
</> 100 Requests	</> 10,000 Requests	</> 50,000 Requests	</> 250,000 Requests	</> Volume Requests
👤 No Support	👤 Standard Support	👤 Standard Support	👤 Standard Support	👤 Standard Support
📄 Personal License	📄 Commercial License	📄 Commercial License	📄 Commercial License	📄 Commercial License
📊 Full Aviation Data	📊 Full Aviation Data	📊 Full Aviation Data	📊 Full Aviation Data	📊 Full Aviation Data
🕒 Real-Time Flights	🕒 Real-Time Flights	🕒 Real-Time Flights	🕒 Real-Time Flights	🕒 Real-Time Flights
	📅 Historical Flights	📅 Historical Flights	📅 Historical Flights	📅 Historical Flights