REST API Documentation

US Airlines Delays

Group 20

Emiel Pasman
Andrés Salinas Lima
Stefan Valeanu

March 2019

Table of Contents

Overview

Schema

All API access is over HTTP, and accessed from <u>localhost:8080</u>.

When fetching a list of resources, the data portion of the response will contain a list of objects that contain a link to the individual resource as well as a name and code (if applicable) of that resource. Individual resources' attributes are returned in full.

Content Type

All data is sent and received as JSON by default.

However, each API endpoint supports both JSON and CSV representations of the resources. To specify this you can use the HTTP header:

```
Content-Type = application/json
```

```
Content-Type = text/csv
```

Pagination

Requests that return multiple items will be paginated to 30 items by default.

You can specify further pages with the `?page` parameter.

You can also set a custom page size with the `?per_page` parameter.

Note that omitting the `?page` parameter will return the first page.

Error Handling

Three error codes are used:

- 400 - Bad Request
    - 400 is the generic client-side error status. The response body may contain a document describing the client's error.
- 404 - Not Found
    - The 404 error status code indicates that the REST API can't map the client's URI to a resource.
- 500 - Internal Server Error

- 500 is used to indicate API malfunction. A 500 error is never the client's fault and therefore it is reasonable for the client to retry the exact same request that triggered this response, and hope to get a different response.

Examples

- Not sending the data in a valid format will result in a 400 Bad Request response.

```
HTTP/1.1 400 Bad Request
Content-Length: 40

{"message": "Only json input is supported"}
```

- Not sending the required parameters will result in a 400 Bad Request response.

```
HTTP/1.1 400 Bad Request
Content-Length: 40

{"message":"Parameters required"}
```

- Wrong URL could result in a 404 Not Found response.

```
HTTP/1.1 404 Not Found
Content-Length: 40

{"message": "Not Found"}
```

HTTP status codes

Other HTTP status codes are used apart from the error codes stated above:

- 200 - OK
  - Standard response for successful requests.
- 201 - Created
  - The request has been fulfilled, resulting in the creation of a new resource.
- 204 - No Content
  - The server successfully processed the request and is not returning any content.

HTTP verbs

Where possible, API strives to use appropriate HTTP verbs for each action.

Verb	Description
GET	Used for retrieving resources.
POST	Used for creating resources.
PUT	Used for replacing resources or collections.
DELETE	Used for deleting resources.
PATCH	Used for updating resources with partial JSON data.

Parameters

Parameters are always optional unless stated otherwise.

Parameters in GET requests should be in the HTTP query. Optional parameters will default to 'all', meaning no filter will be applied to the resulting data. Parameters named 'select' allow for filtering by a list of desired categories separated by commas.

For POST, PATCH, PUT, and DELETE requests, parameters not included in the URL should be encoded as JSON or CSV (specified in Content-Type)

Endpoints

Airports

Airports - Get all US airports (#1)

Returns all airports available in the USA.

```
GET /airports
```

Example 1

```
GET localhost:8080/airports?page=2&per_page=3
```

Content-Type	application/json

```
Status: 200 OK

{
    "page_number": 2,
    "per_page": 3,
    "total_count": 29,
    "total_pages": 10,
    "last_page": "localhost:8080/airports?page=10&per_page=3",
    "previous_page": "localhost:8080/airports?page=1&per_page=3",
    "next_page": "localhost:8080/airports?page=3&per_page=3",
    "data": [
        {
            "code": "DCA",
            "name": "Washington, DC: Ronald Reagan Washington National",
            "url": "localhost:8080/airports/DCA"
        },
        {
            "code": "DTW",
            "name": "Detroit, MI: Detroit Metro Wayne County",
            "url": "localhost:8080/airports/DTW"
        },
        {
            "code": "IAD",
            "name": "Washington, DC: Washington Dulles International",
            "url": "localhost:8080/airports/IAD"
        }
```

```
    ]
}
```

Example 2

```
GET localhost:8080/airports?page=2&per_page=3
```

Content-Type	text/csv

```
Status: 200 OK

page_number,per_page,total_count,total_pages,last_page,previous_page,nex
t_page,data.0.code,data.0.name,data.0.url,data.1.code,data.1.name,data.1
.url,data.2.code,data.2.name,data.2.url
2,3,29,10,localhost:8080/airports?page=10&per_page=3,localhost:8080/airp
orts?page=1&per_page=3,localhost:8080/airports?page=3&per_page=3,DCA,"Wa
shington, DC: Ronald Reagan Washington
National",localhost:8080/airports/DCA,DTW,"Detroit, MI: Detroit Metro
Wayne County",localhost:8080/airports/DTW,IAD,"Washington, DC:
Washington Dulles International",localhost:8080/airports/IAD
```

Airports - Get specific US airport

Returns all data available about the specified airport.

```
GET /airports/:airportCode/
```

Example

```
GET localhost:8080/airports/JFK
```

Content-Type	application/json

```
Status: 200 OK

{
    "data": {
        "code": "JFK",
        "name": "New York, NY: John F. Kennedy International"
    }
}
```

Carriers

Carriers - Get all carriers operating in US airports (#2)

Provides all carriers operating in US airports.

```
GET /carriers
```

Example

```
GET localhost:8080/carriers?page=2&per_page=3
```

Content-Type	application/json

```
Status: 200 OK

{
    "page_number": 2,
    "per_page": 3,
    "total_count": 30,
    "total_pages": 10,
    "last_page": "localhost:8080/carriers?page=10&per_page=3",
    "previous_page": "localhost:8080/carriers?page=1&per_page=3",
    "next_page": "localhost:8080/carriers?page=3&per_page=3",
    "data": [
        {
            "code": "CO",
            "name": "Continental Air Lines Inc.",
            "url": "localhost:8080/carriers/CO"
        },
        {
            "code": "DH",
            "name": "Atlantic Coast Airlines",
            "url": "localhost:8080/carriers/DH"
        },
        {
            "code": "DL",
            "name": "Delta Air Lines Inc.",
            "url": "localhost:8080/carriers/DL"
        }
    ]
}
```

Carriers - Get specific carrier

Returns all data available about the specified carrier.

```
GET /carriers/:carrierCode/
```

Example

```
GET localhost:8080/carriers/DL
```

Content-Type	application/json

```
Status: 200 OK

{
    "data": {
        "code": "DL",
        "name": "Delta Air Lines Inc."
    },
    "statistics": "localhost:8080/carriers/DL/statistics/"
}
```

Carriers - Get all carriers operating at a specific US airport (#3)

It is possible to filter carriers in order to get the carriers operating at a specific US airport

```
GET /carriers?airport=:airportCode
```

Example

```
GET localhost:8080/carriers?airport=ATL&page=2&per_page=3
```

Content-Type	application/json

```
Status: 200 OK

{
    "page_number": 2,
    "per_page": 3,
    "total_count": 26,
    "total_pages": 9,
    "last_page": "localhost:8080/carriers?page=9&per_page=3
```

```
&airport=ATL",
    "previous_page": "localhost:8080/carriers?page=1&per_page=3
&airport=ATL",
    "next_page": "localhost:8080/carriers?page=3&per_page=3
&airport=ATL",
    "data": [
        {
            "code": "DL",
            "name": "Delta Air Lines Inc.",
            "url": "localhost:8080/carriers/DL"
        },
        {
            "code": "EV",
            "name": "Atlantic Southeast Airlines",
            "url": "localhost:8080/carriers/EV"
        },
        {
            "code": "FL",
            "name": "AirTran Airways Corporation",
            "url": "localhost:8080/carriers/FL"
        }
    ]
}
```

Parameters

Name	Type	Description
Required. airport	string	Code of the airport.

Carrier Statistics

Carrier Statistics - Get statistics about all flights of a carrier (#4)

Provides statistics about flights of a carrier. It's possible to filter it to get statistics about flights of a carrier from/to a US airport for a given month/all months available.

```
GET
/carriers/:carrierCode/statistics?airport=:airportCode&month=:yearMonth
```

Example

```
GET localhost:8080/carriers/AA/statistics?airport=JFK&month=2003-9
```

Content-Type	application/json

```
Status: 200 OK

{
    "page_number": 1,
    "per_page": 30,
    "total_count": 1,
    "total_pages": 1,
    "last_page": "localhost:8080/carriers/AA/statistics?page=1
&per_page=30&airport=JFK&month=2003-9",
    "data": [
        {
            "airport": {
                "code": "JFK",
                "name": "New York, NY: John F. Kennedy International"
            },
            "statistics": {
                "flights": "localhost:8080/carriers/AA/statistics/
flights?airport=JFK&month=2003-9",
                "# of delays": "localhost:8080/carriers/AA/statistics/
delays?airport=JFK&month=2003-9",
                "minutes delayed": "localhost:8080/carriers/AA/
statistics/minutes-delayed?airport=JFK&month=2003-9"
            },
            "time": {
                "label": "2003/9",
                "year": 2003,
                "month": 9
            },
            "carrier": {
                "code": "AA",
                "name": "American Airlines Inc."
            }
        }
    ]
}
```

Parameters

Name	Type	Description
airport	string	Code of the airport.

month	string	Month in the format yyyy-(m)m.

Carrier Statistics - Update specific statistics about all flights of a carrier (#4)

Updates specific statistics about flights of a carrier from/to a US airport for a given month.

```
PATCH
/carriers/:carrierCode/statistics/:typeOfStatistics?airport=:airportCode
&month=:yearMonth

{ … }
```

Example

```
PATCH
localhost:8080/carriers/AA/statistics/minutes-delayed?airport=ATL&month=
2003-6

{
  "late aircraft": 11111111,
  "weather": 22222222,
  "carrier": 33333333
}
```

Content-Type	application/json

```
Status: 200 OK

{
    "statistics": {
        "minutes delayed": {
            "late aircraft": 11111111,
            "weather": 22222222,
            "carrier": 33333333,
            "security": 139,
            "total": 8314,
            "national aviation system": 3817
        }
    }
}
```

Parameters

Name	Type	Description
Required. airportCode	string	Code of the airport.
Required. month	string	Month in the format yyyy-(m)m
late aircraft	integer	The number of minutes delayed caused by a previous flight with the same aircraft arriving late, causing the present flight to depart late in this month.
weather	integer	Number of of minutes delayed caused by significant meteorological conditions (actual or forecasted) that, in the judgment of the carrier, delays or prevents the operation of a flight such as tornado, blizzard or hurricane in this month.
carrier	integer	The number of minutes delayed due to circumstances within the airline's control (e.g. maintenance or crew problems, aircraft cleaning, baggage loading, fueling, etc.) in this month.
security	integer	Number of minutes delayed caused by evacuation of a terminal or concourse, re-boarding of aircraft because of security breach, inoperative screening equipment and/or long lines in excess of 29 minutes at screening areas in this month.
national aviation system	integer	The number of minutes delayed attributable to the national aviation system that

		refer to a broad set of conditions, such as non-extreme weather conditions, airport operations, heavy traffic volume, and air traffic control in this month.

For the definition of the parameters of the rest of types of statistics visit this site.

Carrier Statistics - Delete specific statistics about all flights of a carrier (#4)

Deletes specific statistics about flights of a carrier from/to a US airport for a given month.

```
DELETE
/carriers/:carrierCode/statistics/:typeOfStatistics?airport=:airportCode
&month=:yearMonth
```

Example

```
DELETE
localhost:8080/carriers/AA/statistics/delays?airport=ATL&month=2003-7
```

```
Status: 204 No Content
```

Parameters

Name	Type	Description
Required. airportCode	string	Code of the airport.
Required. month	string	Month in the format yyyy-(m)m

Carrier Statistics - Add specific statistics about all flights of a carrier (#4)

Add specific statistics about flights of a carrier from/to a US airport for a given month.

POST

```
/carriers/:carrierCode/statistics/:typeOfStatistics?airport=:airportCode
&month=:yearMonth

{ … }
```

Example

POST
```
localhost:8080/carriers/AA/statistics/flights?airport=ATL&month=:2003-06

{
  "cancelled": 5,
  "on time": 561,
  "total": 752,
  "delayed": 186,
  "diverted": 2
}
```

Content-Type	application/json

```
Status: 201 Created

{
  "cancelled": 5,
  "on time": 561,
  "total": 752,
  "delayed": 186,
  "diverted": 2
}
```

Parameters

Name	Type	Description
Required. airportCode	string	Code of the airport.
Required. month	string	Month in the format yyyy-(m)m
cancelled	int	The number of flights that were cancelled in this month.
on time	int	The number of flights that

			were on time in this month.
total	int		The total number of flights in this month.
delayed	int		The number of flights that were delayed in this month.
diverted	int		The number of flights that were diverted in this month.

For the definition of the parameters of the rest of types of statistics visit this site.

Carrier Statistics - Specific flights statistics of a carrier (#5)

Provides the flights statistics of a carrier from/to a US airport for a given month/all months available. It allows to select which specific data will be returned.

```
GET
/carriers/:carrierCode/statistics/flights?airport=:airportCode&month=:mo
nth&select=on-time,delayed,cancelled
```

Example 1

```
GET
localhost:8080/carriers/AA/statistics/flights?airport=ATL&month=2003-6&s
elect=on-time,delayed,cancelled
```

Content-Type	application/json

```
Status: 200 OK

{
    "page_number": 1,
    "per_page": 30,
    "total_count": 1,
    "total_pages": 1,
    "last_page": "localhost:8080/carriers/AA/statistics/flights
?page=1&per_page=30&airport=ATL&month=2003-6",
    "data": [
        {
            "airport": {
                "code": "ATL",
                "name": "Atlanta, GA: Hartsfield-Jackson Atlanta
International"
```

```
        },
        "statistics": {
            "flights": {
                "cancelled": 5,
                "on time": 561,
                "delayed": 186
            }
        },
        "time": {
            "label": "2003/6",
            "year": 2003,
            "month": 6
        }
    }
  ]
}
```

Example 2

GET
localhost:8080/carriers/AA/statistics/flights?airport=ATL&month=2003-6

Content-Type	application/json

```
Status: 200 OK

{
    "page_number": 1,
    "per_page": 30,
    "total_count": 1,
    "total_pages": 1,
    "last_page": "localhost:8080/carriers/AA/statistics/flights
?page=1&per_page=30&airport=ATL&month=2003-6",
    "data": [
        {
            "airport": {
                "code": "ATL",
                "name": "Atlanta, GA: Hartsfield-Jackson Atlanta
International"
            },
            "statistics": {
                "flights": {
                    "cancelled": 5,
                    "on time": 561,
                    "total": 752,
```

```
                    "delayed": 186,
                    "diverted": 0
                }
            },
            "time": {
                "label": "2003/6",
                "year": 2003,
                "month": 6
            }
        }
    ]
}
```

Parameters

Name	Type	Description
airportCode	string	Code of the airport.
month	string	Month in the format yyyy-(m)m
select	string (enumeration)	Can be 'cancelled', 'on-time', 'total', 'delayed' or 'diverted'

Carrier Statistics - Specific minutes of delay statistics of a carrier (#6)

Provides number of minutes of delay per carrier attributed to carrier-specific reasons (i.e. attributes carrier and late aircraft in the dataset)/all reasons, for a given month/all months available and for a specific airport/across all US airports.

```
GET
/carriers/:carrierCode/statistics/minutes-delayed?airport=:airportCode&m
onth=:month&select=:reason1,reason2...
```

Example

```
GET
localhost:8080/carriers/AA/statistics/minutes-delayed?airport=ATL&month=
2003-6&select=late-aircraft,weather
```

Content-Type	application/json

```
Status: 200 OK

{
    "page_number": 1,
    "per_page": 30,
    "total_count": 1,
    "total_pages": 1,
    "last_page": "localhost:8080/carriers/AA/statistics/minutes-delayed
?page=1&per_page=30&airport=ATL&month=2003-6",
    "data": [
        {
            "airport": {
                "code": "ATL",
                "name": "Atlanta, GA: Hartsfield-Jackson Atlanta
International"
            },
            "statistics": {
                "minutes delayed": {
                    "late aircraft": 1269,
                    "weather": 1722
                }
            },
            "time": {
                "label": "2003/6",
                "year": 2003,
                "month": 6
            }
        }
    ]
}
```

Parameters

Name	Type	Description
airportCode	string	Code of the airport.
month	string	Month in the format yyyy-(m)m
select	string (enumeration)	Can be 'late-aircraft', 'weather', 'carrier', 'security', 'total' or 'national-aviation-system'.

Carrier Statistics - Specific number of delays statistics of a carrier

Provides the total number of delays per carrier attributed to carrier-specific reasons (i.e. attributes carrier and late aircraft in the dataset)/all reasons, for a given month/all months available and for a specific airport/across all US airports.

```
GET
/carriers/:carrierCode/statistics/delays?airport=:airportCode&month=:mon
th&select=:reason1,reason2...
```

Example

```
GET
localhost:8080/carriers/AA/statistics/delays?airport=ATL&month=2003-6&se
lect=late-aircraft,weather
```

Content-Type	application/json

```
Status: 200 OK

{
    "page_number": 1,
    "per_page": 30,
    "total_count": 1,
    "total_pages": 1,
    "last_page":
"localhost:8080/carriers/AA/statistics/delays?page=1&per_page=30&airport
=ATL&month=2003-6",
    "data": [
        {
            "airport": {
                "code": "ATL",
                "name": "Atlanta, GA: Hartsfield-Jackson Atlanta
International"
            },
            "statistics": {
                "# of delays": {
                    "late aircraft": 18,
                    "weather": 28
                }
            },
            "time": {
                "label": "2003/6",
```

```
            "year": 2003,
            "month": 6
        }
    }
  ]
}
```

Parameters

Name	Type	Description
airportCode	string	Code of the airport.
month	string	Month in the format yyyy-(m)m
select	string (enumeration)	Can be 'late-aircraft', 'weather', 'carrier', 'security', or 'national-aviation-system'.

Airport Statistics

Airport Statistics - Descriptive statistics for carrier-specific delays (#7)

Provides descriptive statistics (mean, median, standard deviation) for carrier-specific delays (as above) for a flight between any two airports in the USA for a specific carrier/all carriers serving this route.

```
GET
/airports/:airportCode/delaystats?airport=:airportCode&carrier=:carrierC
ode&select=:reason1,:reason2
```

Example

GET localhost:8080/airports/JFK/delaystats?airport=BOS&carrier=AA	
Content-Type	application/json

```
Status: 200 OK

{
    "data": {
        "late aircraft": {
            "mean": 4.1294832461483795,
            "median": 3.888205631900657,
            "std": 1.8709088973644397
        },
        "weather": {
            "mean": 0.6352587158579611,
            "median": 0.5378189834288534,
            "std": 0.49704445861961843
        },
        "carrier": {
            "mean": 4.6294067416378235,
            "median": 4.31413776987687,
            "std": 1.7546687685306093
        },
        "security": {
            "mean": 0.020100196933452694,
            "median": 0,
            "std": 0.049565339997854715
```

```
        },
        "total": {
            "mean": 14.445238124904208,
            "median": 13.748139479441791,
            "std": 5.700968273678718
        },
        "national aviation system": {
            "mean": 5.0309892243265875,
            "median": 4.362893936776121,
            "std": 3.0287401247692114
        }
    }
}
```

Parameters

Name	Type	Description
Required. airportCode	string	Code of the destination airport.
Required. carrier	string	Code of the carrier.
select	string (enumeration)	Can be 'late-aircraft', 'weather', 'carrier', 'security', 'total' or 'national-aviation-system'.