Documentation

ORFAP Organisation for all purposes

Contents

Chapter 1

User Documentation

Getting Started

The **Flight-Analyzer**^{TM} is a normal Web-Application, like `google.com` or `nytimes.com`. So to access it you need any one of these modern Webbrowsers:

Google Chrome https://www.google.de/chrome/browser/desktop/

Firefox https://www.mozilla.org/de/firefox/new/

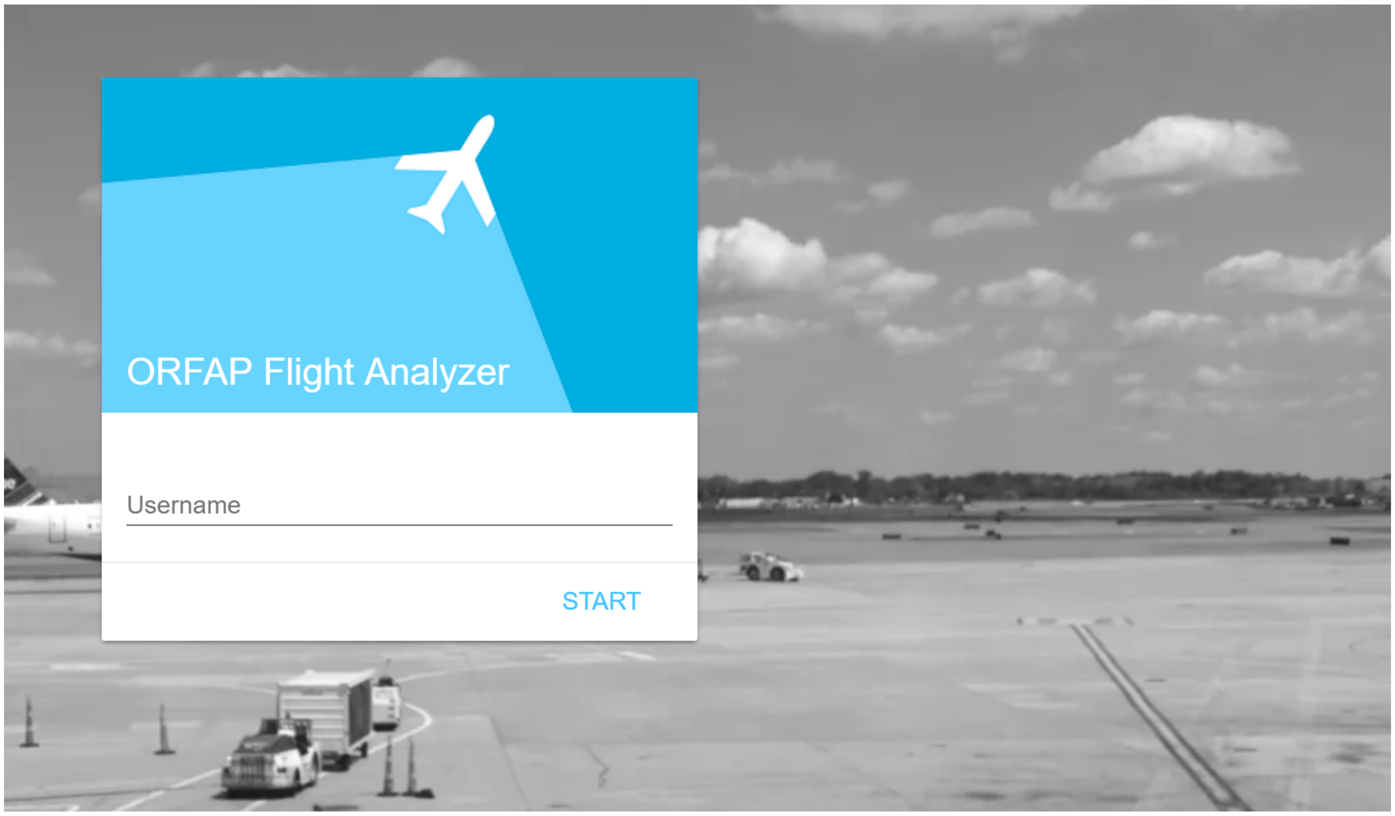
Microsoft Edge https://www.microsoft.com/de-de/windows/microsoft-edge

If you already have one of them installed you're good to go. If not you can follow these links to learn more about them and install one.

Once you have your browser up and running and are connected to the company network [1], you can visit the **Flight-Analyzer**^{TM} Application at http://10.28.2.166/.

[1]Currently, this means you are connected via VPN to the `lrz.de` network of the University of Applied Sciences Munich.

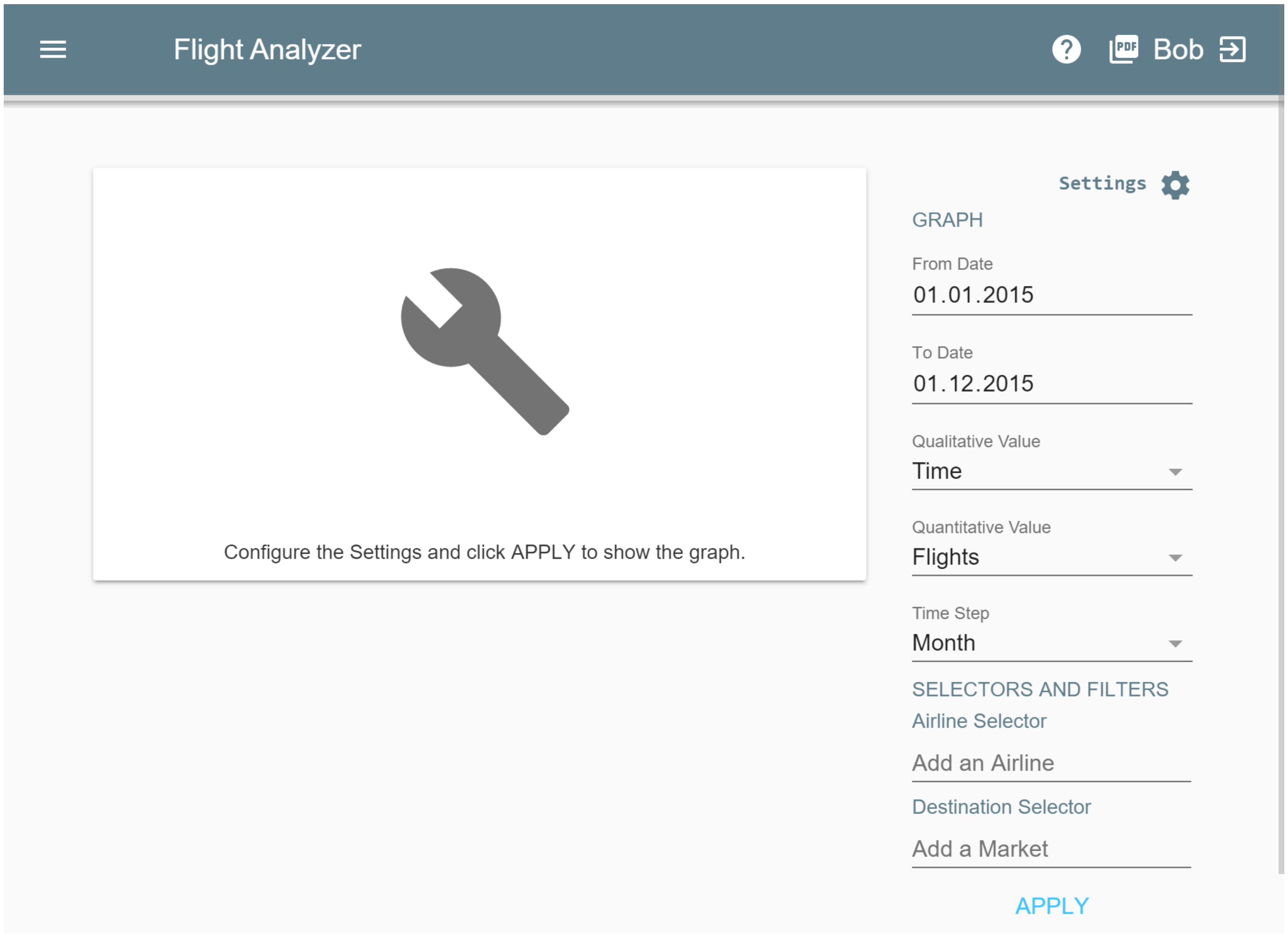
Logging in



You are now presented with a splash screen. Here you are asked to insert your Username and click **`START`**. The username will be used to recognize you and store your personal settings.

The Pages and Navigation

Graph Page



Configure the Settings and click APPLY to show the graph.

From Date: 01.01.2015

To Date: 01.12.2015

Qualitative Value: Time

Quantitative Value: Flights

Time Step: Month

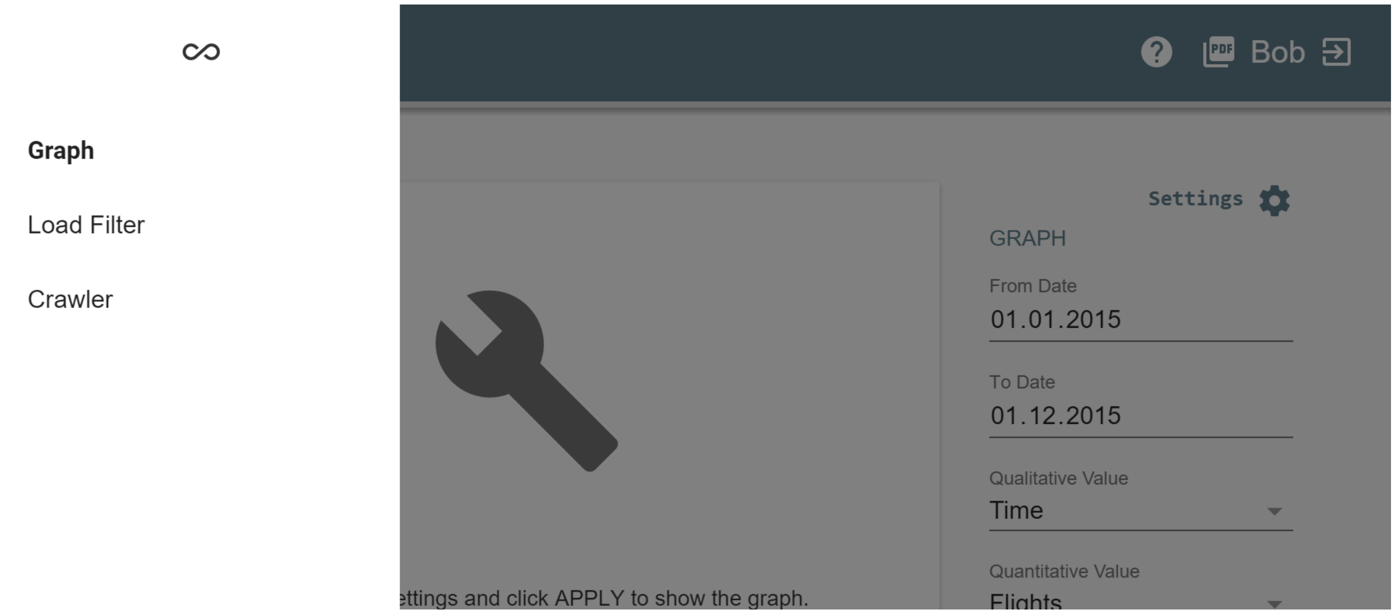
Add an Airline

Add a Market

Upon first login, you will see the **Graph Page**. This is the main page of the application and allows you to configure the settings for the graph and will show it once you click `APPLY`.

The configuration of the graph will be explained in an additional chapter.

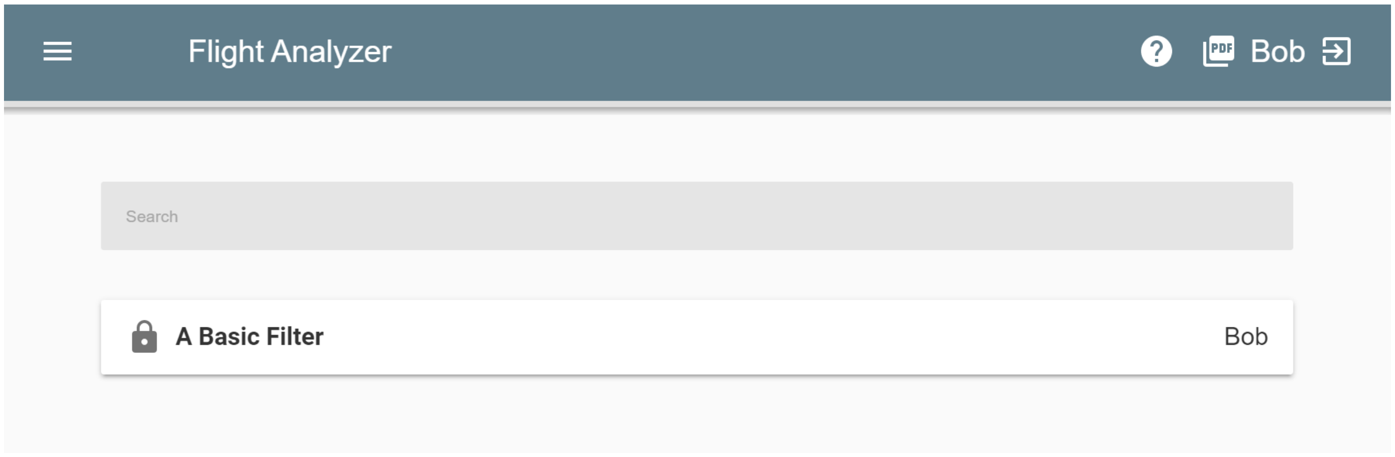
Navigation



A click on the top left menu *(hamburger)* button will reveal the menu for changing pages. If you decide to not change the page you can still click on the large grey area and discard this action.

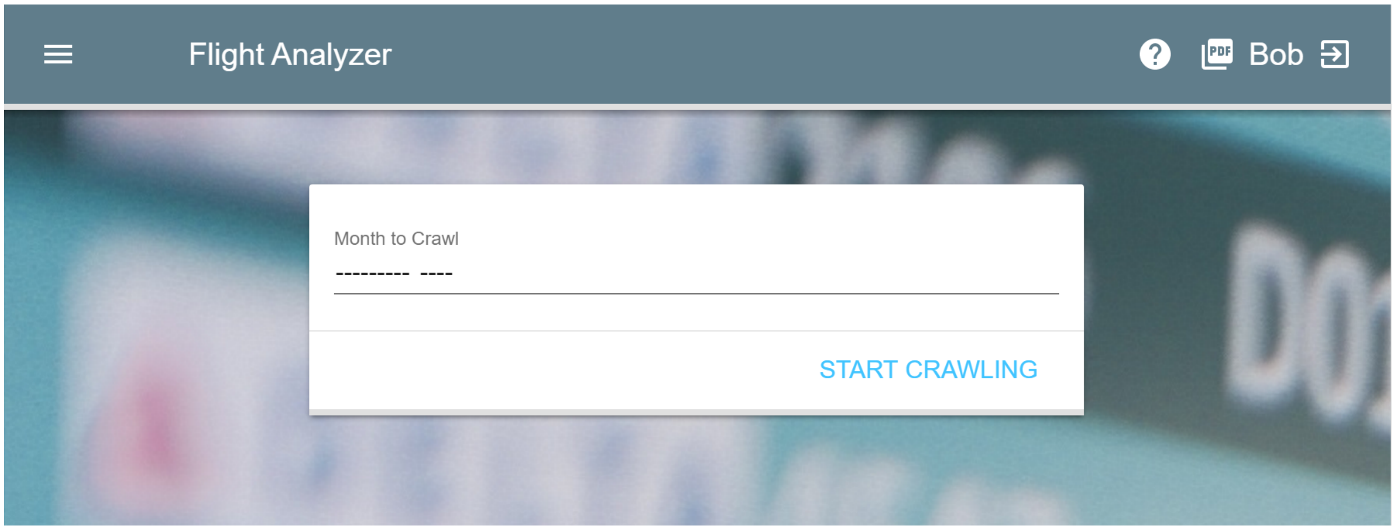
Settings Page

By selecting `Load Filter` in the Menu, you will see this page. Here you can load any stored filters/settings by selecting them and confirming the action with the button that appears in the bottom right corner.



You can also limit the filters by typing into the light grey search field.

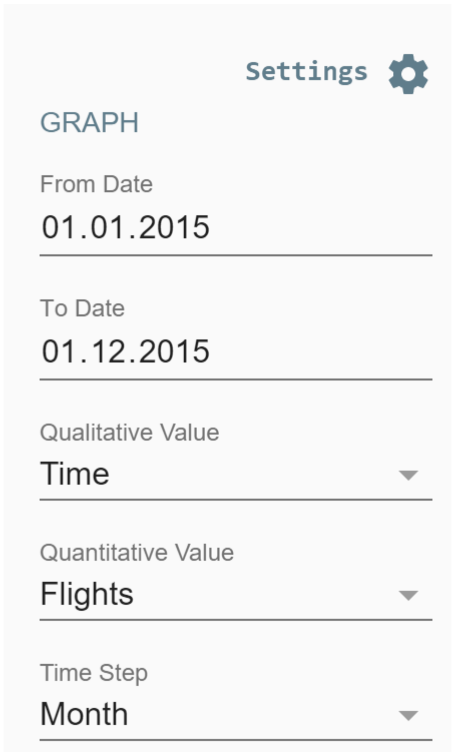
Crawler Page



Here you can start the Crawler to update the data from the `transtats.com` website. In the input field you have to specify the month to update. To start the crawling process click on `START CRAWLING`.

Graph Configuration

Basic Configuration



From Date
01.01.2015

To Date
01.12.2015

Qualitative Value
Time

Quantitative Value
Flights

Time Step
Month

In here you can change the most fundamental way how and which data is displayed in the graph.

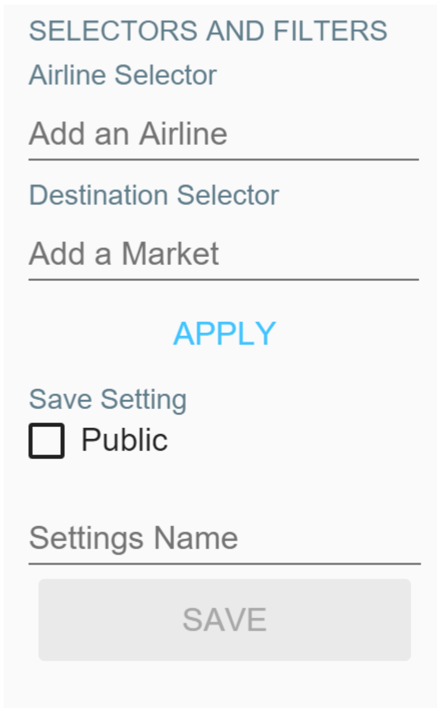
In the first to fields you select the time range to limit the data.

With the `Qualitative Value` you can select how the data is grouped. For example by selecting Destination, for each date (or date range) on the X-Axis multiple Bars (for all the different Destinations) will appear.

The `Quantitative Value` simply states what value should be used for the Y-Axis.

The `Time Step` picker sets the length of the period you are interested in. Adjust this Setting if you are interested in accumulated data for a whole year or the specific days of week.

Selectors and Saving a Setting



With this Selectors you can additionally limit data by Airline or Destination.

By adding an Airline to the Airline Selector, you tell the application that you are only interested for data of this Airline. You can also set a group (combination) of multiple Airlines. Choosing no Airline results in a collection of data for all Airlines.

The Destination Selector behaves exactly like the Airline Selector. By selecting multiple (or one) Markets the data will be limited to the flights that have these Destinations.

The **`APPLY`** button will calculate the data for the current filter settings and display them in the graph.

With the **Save Setting** Dialog you can store the current setting (filter) for only your personal use or shared for the whole company (public).

To store the Setting publically you need to check the `Public` box.

In the `Settings Name` field you can choose a fitting name for your Filter.

Export as PDF

To export the Graph as a PDF simply click the PDF button on the top right in the toolbar. Then you can choose the target folder and name of the PDF an click Save to finish this process.

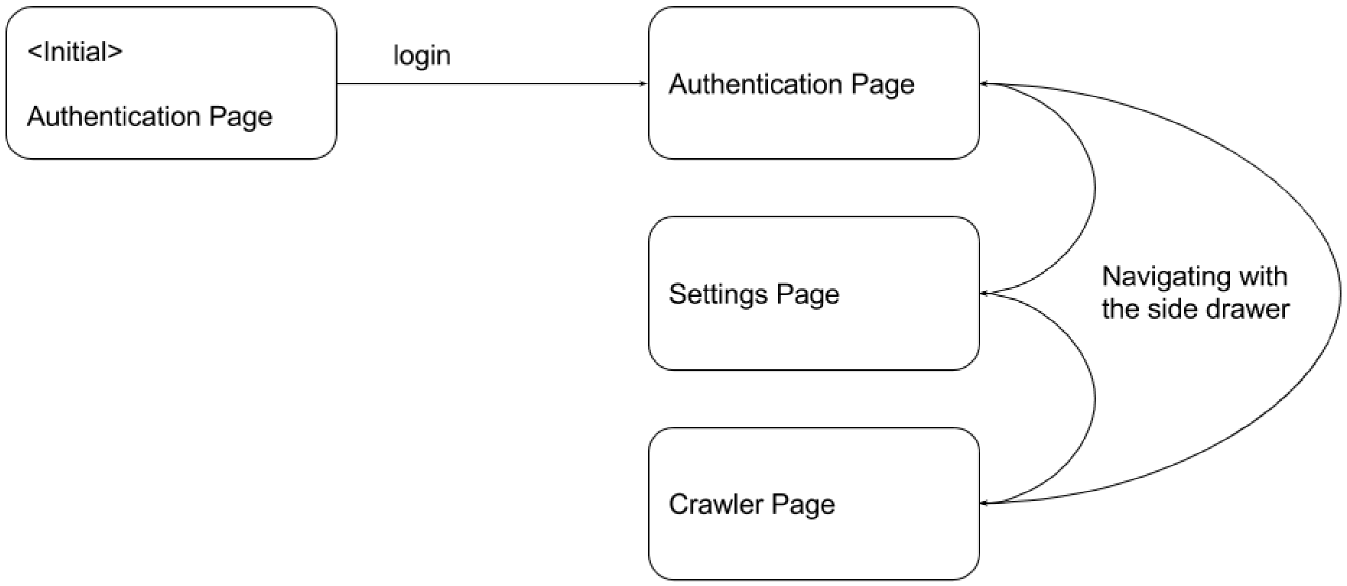
Chapter 2

Technical Documentation

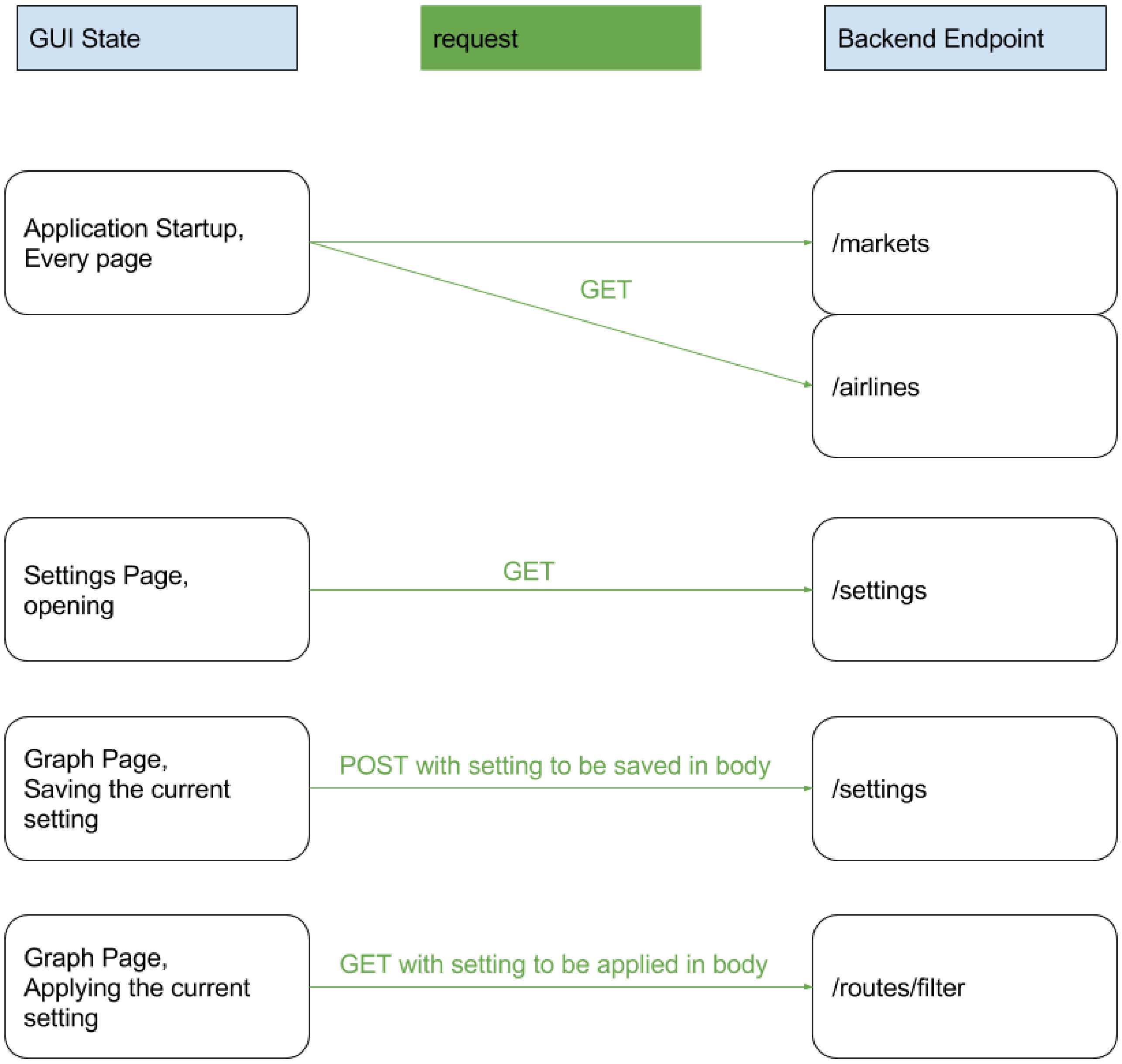
GUI

The GUI offers a visual representation for the backends API which is described further down in this document. The only data which is stored locally is the last entered username of the user. This username is stored inside a cookie called `username` but is not needed for the correct functionality of the application.

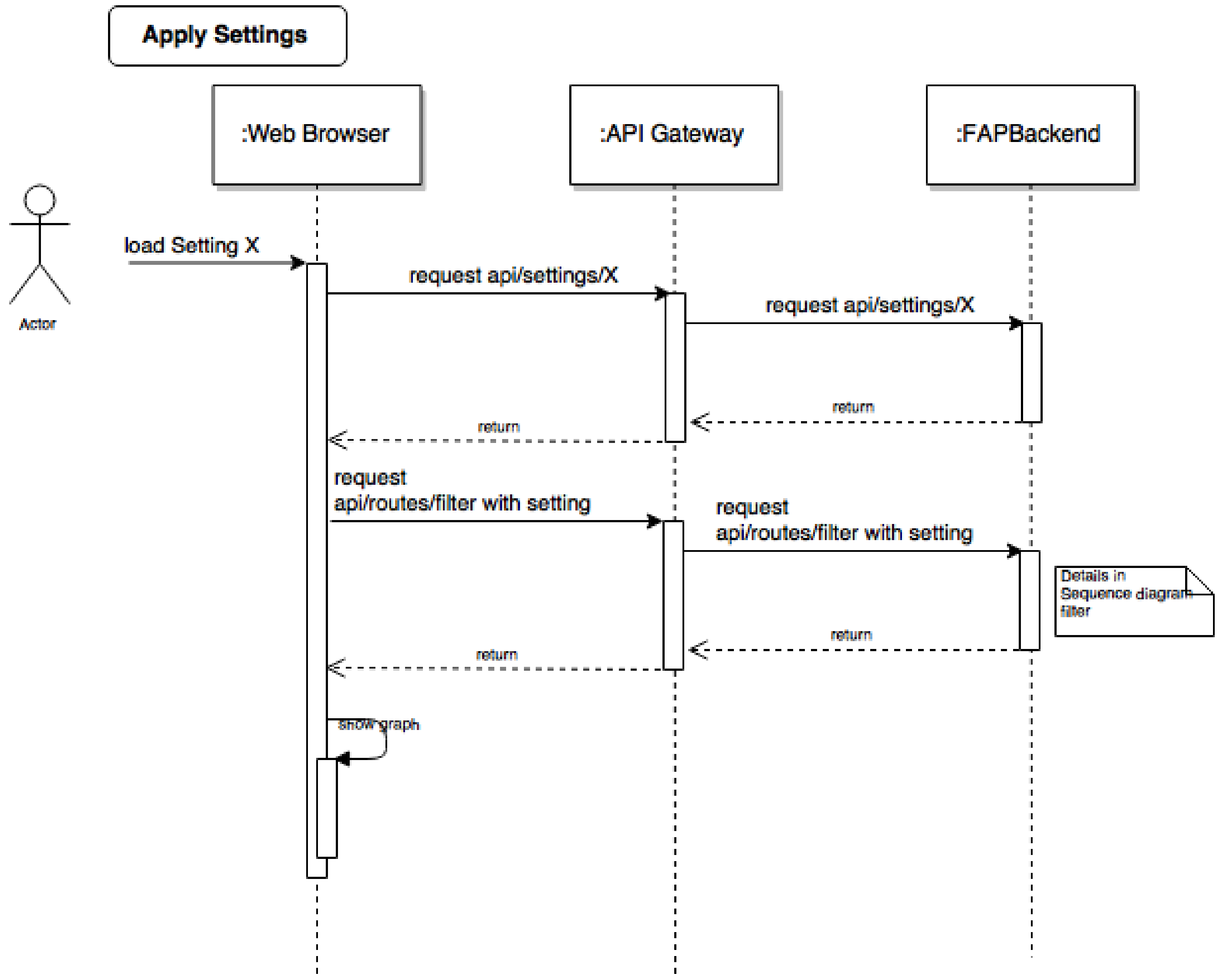
The application can be in one of four different states during use:



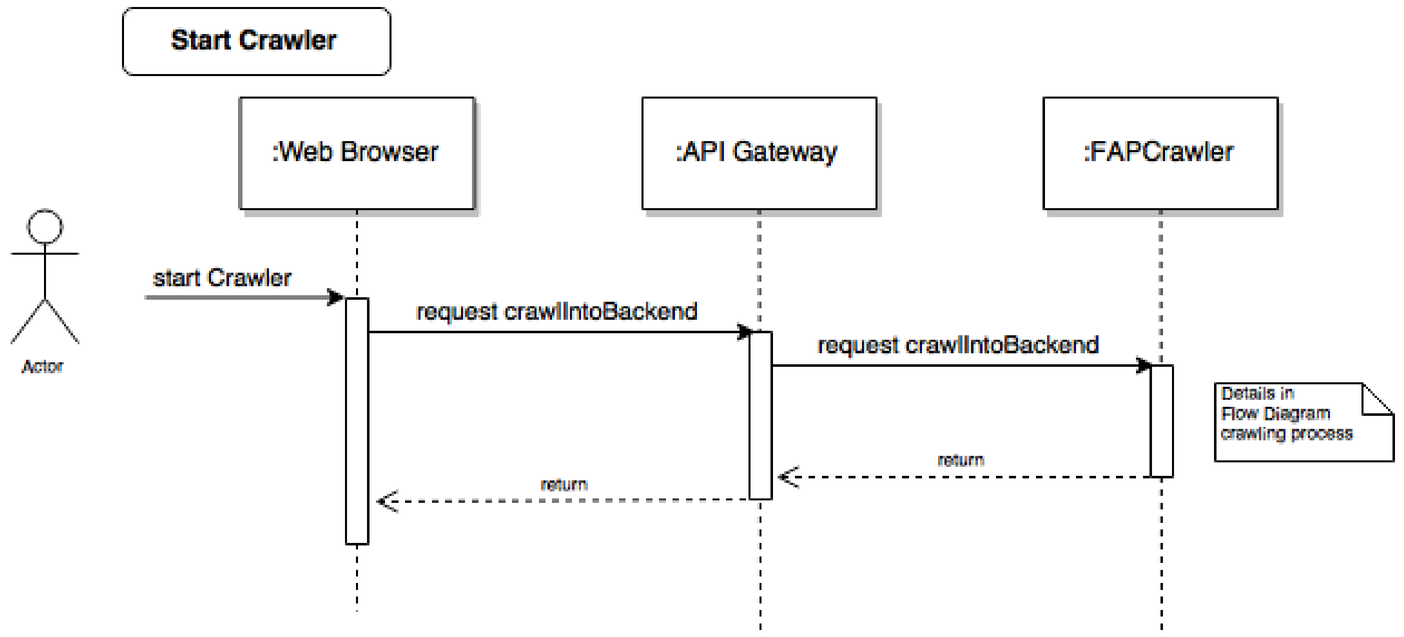
The following flowchart displays the requests from the frontend in the different states. A refresh in the browser restarts these requests.


GUI State
request
Backend Endpoint
Application Startup, Every page
GET
/markets
/airlines
Settings Page, opening
GET
/settings
Graph Page, Saving the current setting
POST with setting to be saved in body
/settings
Graph Page, Applying the current setting
GET with setting to be applied in body
/routes/filter

The next sequence diagram shows the background workflow of loading and automatically applying a setting.



With the GUI the user can start the crawler to fetch the latest data from transtats. This is shown in the next sequence diagram.



Backend

The Backend holds the whole data and offers an API for it. The following section will describe this API. For every Entity on the database the necessary endpoints (Path) will be shown with the depending HTTP Methods to call.

Base URL: `http://10.28.2.166/api`

API Overview

Entity	Path	HTTP Methods
Airline	/airlines	GET, POST
Airline	/airlines/{id}	GET, PUT, DELETE
Market	/markets	GET, POST
Market	/markets/{id}	GET, PUT, DELETE
Route	/routes	GET, POST
Route	/routes/{id}	GET, PUT, DELETE
Route	/routes/saveAll	POST
Route	/routes/search/isRouteInMonth	GET
Route	/routes/filter	GET

Airline

Entity Schema

Property	Type	Required
id	String	yes
name	String	yes

Path `/airlines`

Http Methods

Get

Description: Get all saved airlines.

Response Example:

`Code 200`

```
[
  {
    "id": "213123",
    "name": "Lufthansa"
  },
  {
    "id": "12312",
    "name": "AirBerlin"
  }
]
```

Post

Description: Save an airline.

Request Example:

Header: Content-Type application/json

```
{
  "id": "213123",
  "name": "Lufthansa"
}
```

Response Example:

`Code 201`

```
{
  "id": "213123",
  "name": "Lufthansa"
}
```

Path `/airlines/{id}`

Http Methods

`Get`

Description: Get an specific airline with the given `id`.

Response Example:

`Code 200`

```
{
    "id": "213123",
    "name": "Lufthansa"
}
```

`Put`

Description: Update an specific airline with the given `id`.

Request Example:

Header: Content-Type application/json

```
{
  "id": "213123",
  "name": "Lufthansa"
}
```

Response Example:

`Code 200`

```
{
  "id": "213123",
  "name": "Lufthansa"
}
```

`Delete`

Description: Deletes an specific airline with the given `id`.

Response Example:

`Code 204`

Market

Entity Schema

Property	Type	Required
id	String	yes
name	String	yes

Path `/markets`

Http Methods

`Get`

Description: Get all saved markets.

Response Example:

```
Code 200
```

```
[
  {
    "id": "213123",
    "name": "New York"
  },
  {
    "id": "12312",
    "name": "Colorado"
  }
]
```

`Post`

Description: Save a market.

Request Example:

Header: Content-Type application/json

```
{
  "id": "213123",
  "name": "New York"
}
```

Response Example:

```
Code 201
```

```
{
  "id": "213123",
  "name": "New York"
}
```

Path `/markets/{id}`

Http Methods

`Get`

Description: Get a specific market with the given `id`.

Response Example:

```
Code 200
```

```
{
    "id": "213123",
    "name": "New York"
}
```

Put

Description: Update a specific market with the given `id`.

Request Example:

Header: Content-Type application/json

```
{
  "id": "213123",
  "name": "New York"
}
```

Response Example:

`Code 200`

```
{
  "id": "213123",
  "name": "New York"
}
```

Delete

Description: Deletes a specific market with the given `id`.

Response Example:

`Code 204`

Route

Entity Schema

Property	Type	Required
id	String	no
date	Date/String	yes
delays	double	no
cancelled	double	no
passengerCount	double	no
flightCount	double	no
airline	Link	yes
source	Link	yes
destination	Link	yes

Path `/routes`

Http Methods

Get

Description: Get all saved routes.

Response Example:

`Code 200`

```
[
  {
    "date": "2015-12-01",
    "delays": 10,
    "cancelled": 0,
    "passengerCount": 130,
    "flightCount": 1,
    "airline": "http://10.28.2.166/api/airlines/123123",
    "source": "http://10.28.2.166/api/markets/23423424",
    "destination": "http://10.28.2.166/api/markets/1231231"
  },
  {
    "date": "2015-10-20",
    "delays": 15,
    "cancelled": 0,
    "passengerCount": 120,
    "flightCount": 1,
    "airline": "http://10.28.2.166/api/airlines/123123",
    "source": "http://10.28.2.166/api/markets/23423424",
    "destination": "http://10.28.2.166/api/markets/1231231"
  }
]
```

Post

Description: Save a route.

Request Example:

Header: Content-Type application/json

```
{
  "date": "2015-12-01",
  "delays": 10,
  "cancelled": 0,
  "passengerCount": 130,
  "flightCount": 1,
  "airline": "http://10.28.2.166/api/airlines/123123",
  "source": "http://10.28.2.166/api/markets/23423424",
  "destination": "http://10.28.2.166/api/markets/1231231"
}
```

Response Example:

`Code 201`

```
{
  "date": "2015-12-01",
  "delays": 10,
  "cancelled": 0,
  "passengerCount": 130,
  "flightCount": 1,
  "airline": "http://10.28.2.166/api/airlines/123123",
  "source": "http://10.28.2.166/api/markets/23423424",
  "destination": "http://10.28.2.166/api/markets/1231231"
}
```

Path `/routes/saveAll`

Http Methods

Post

Description: Saves a list of routes.

Request Example:

Header: Content-Type application/json

```
[
  {
    "date": "2015-12-01",
    "delays": 10,
    "cancelled": 0,
    "passengerCount": 130,
    "flightCount": 1,
    "airline": "123123",
    "source": "23423424",
    "destination": "1231231"
  },
  {
    "date": "2015-10-20",
    "delays": 15,
    "cancelled": 0,
    "passengerCount": 120,
    "flightCount": 1,
    "airline": "123123",
    "source": "23423424",
    "destination": "1231231"
  }
]
```

Response Example:

```
Code 200
```

Path `/routes/search/isRouteInMonthOfYear`

Http Methods

Get

Description: Determine if there are already routes saved for the given month of year.

Query

- **date** Date to check with format: yyyy-MM

Response Example:

```
Code 200
```

```
true
```

Path `/routes/{id}`

Http Methods

Get

Description: Get a specific route with the given `id`.

Response Example:

```
Code 200
```

```
{
  "date": "2015-12-01",
  "delays": 10,
  "cancelled": 0,
  "passengerCount": 130,
  "flightCount": 1,
  "airline": "http://10.28.2.166/api/airlines/123123",
  "source": "http://10.28.2.166/api/markets/23423424",
  "destination": "http://10.28.2.166/api/markets/1231231"
}
```

Put

Description: Update a specific route with the given `id`.

Request Example:

Header: Content-Type application/json

```
{
  "date": "2015-12-01",
  "delays": 10,
  "cancelled": 0,
  "passengerCount": 130,
  "flightCount": 1,
  "airline": "http://10.28.2.166/api/airlines/123123",
  "source": "http://10.28.2.166/api/markets/23423424",
  "destination": "http://10.28.2.166/api/markets/1231231"
}
```

Response Example:

```
Code 200
```

```
{
  "date": "2015-12-01",
  "delays": 10,
  "cancelled": 0,
  "passengerCount": 130,
  "flightCount": 1,
  "airline": "http://10.28.2.166/api/airlines/123123",
  "source": "http://10.28.2.166/api/markets/23423424",
  "destination": "http://10.28.2.166/api/markets/1231231"
}
```

Delete

Description: Deletes a specific route with the given `id`.

Response Example:

```
Code 204
```

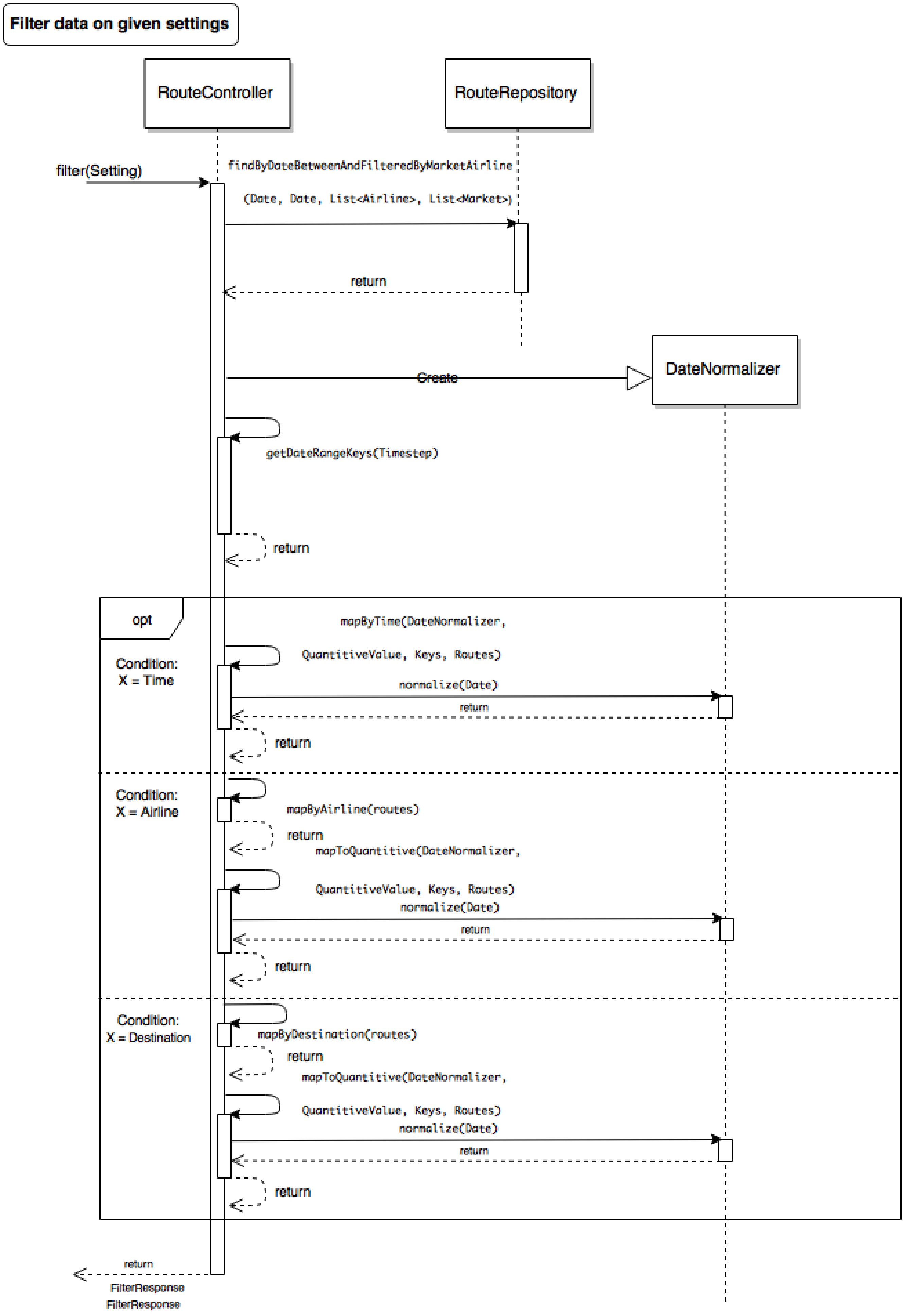
Path `/routes/filter`

Http Methods

Get

Description: Apply a given filter setting to the database and provide preformatted data.

This action is not a simple database request and includes business logic. The following sequence diagram describes this logic:


Filter data on given settings
RouteController
RouteRepository
filter(Setting)
findByDateBetweenAndFilteredByMarketAirline
(Date, Date, List<Airline>, List<Market>)
return
Create
DateNormalizer
getDateRangeKeys(Timestep)
return
opt
Condition:
X = Time
mapByTime(DateNormalizer,
QuantitiveValue, Keys, Routes)
normalize(Date)
return
return
Condition:
X = Airline
mapByAirline(routes)
return
mapToQuantitive(DateNormalizer,
QuantitiveValue, Keys, Routes)
normalize(Date)
return
return
Condition:
X = Destination
mapByDestination(routes)
return
mapToQuantitive(DateNormalizer,
QuantitiveValue, Keys, Routes)
normalize(Date)
return
return
return
FilterResponse
FilterResponse

Request Example:

Header: Content-Type application/json

```
{
  "name": "Test-View",
  "creator": "Hans",
  "shareable": true,
  "rangeFrom": "2015-01-01",
  "rangeTo": "2015-03-31",
  "filter": {
    "destinations": [
      "23123123","2313123123"
    ],
    "airlines": [
      "678678","6786786867"
    ],
    "timestep": "MONTH"
    },
  "axis": {
    "x": "TIME",
    "y": "FLIGHTS"
  }
}
```

Response Example:

```
Code 200
```

```
{
  "y": "FLIGHTS",
  "z": "TIME",
  "x": "January, February, March",
  "data":{
    "January": 20,
    "February": 15,
    "March": 21
  }
}
```

Settings

Entity Schema

Property	Type	Required
id	String	no
name	String	yes
creator	String	yes
shareable	boolean	no
rangeFrom	Date/String	no
rangeTo	Date/String	no
filter	Filter	yes
axis	Axis	yes

Path `/settings`

Http Methods

Get

Description: Get all saved settings.

Response Example:

`Code 200`

```
[
  {
    "name": "Standard-View",
    "creator": "Hans",
    "shareable": true,
    "rangeFrom": "2015-01-01",
    "rangeTo": "2015-12-31",
    "filter": {
      "destinations": [
        "23123123","2313123123"
      ],
      "airlines": [
        "678678","6786786867"
      ],
      "timestep": "MONTH"
      },
    "axis": {
      "x": "TIME",
      "y": "FLIGHTS"
    }
  },
  {
    "name": "Extended-View",
    "creator": "Hans",
    "shareable": true,
    "rangeFrom": "2015-01-01",
    "rangeTo": "2015-01-31",
    "filter": {
      "destinations": [
        "23123123","2313123123"
      ],
      "airlines": [
        "678678","6786786867"
      ],
      "timestep": "DAY_OF_WEEK"
      },
    "axis": {
      "x": "DESTINATION",
      "y": "PASSENGERS"
    }
  }
]
```

Post

Description: Save a setting.

Request Example:

Header: Content-Type application/json

```
{
  "name": "Standard-View",
  "creator": "Hans",
  "shareable": true,
  "rangeFrom": "2015-01-01",
  "rangeTo": "2015-12-31",
  "filter": {
    "destinations": [
      "23123123","2313123123"
    ],
    "airlines": [
      "678678","6786786867"
    ],
    "timestep": "MONTH"
    },
  "axis": {
    "x": "TIME",
    "y": "FLIGHTS"
  }
}
```

Response Example:

`Code 201`

```
{
  "name": "Standard-View",
  "creator": "Hans",
  "shareable": true,
  "rangeFrom": "2015-01-01",
  "rangeTo": "2015-12-31",
  "filter": {
    "destinations": [
      "23123123","2313123123"
    ],
    "airlines": [
      "678678","6786786867"
    ],
    "timestep": "MONTH"
    },
  "axis": {
    "x": "TIME",
    "y": "FLIGHTS"
  }
}
```

Path `/settings/{id}`

Http Methods

Get

Description: Get a specific setting with the given `id`.

Response Example:

`Code 200`

```
{
  "name": "Standard-View",
  "creator": "Hans",
  "shareable": true,
  "rangeFrom": "2015-01-01",
  "rangeTo": "2015-12-31",
  "filter": {
    "destinations": [
      "23123123","2313123123"
    ],
    "airlines": [
      "678678","6786786867"
    ],
    "timestep": "MONTH"
    },
  "axis": {
    "x": "TIME",
    "y": "FLIGHTS"
  }
}
```

Put

Description: Update a specific setting with the given `id`.

Request Example:

Header: Content-Type application/json

```
{
  "name": "Standard-View",
  "creator": "Hans",
  "shareable": true,
  "rangeFrom": "2015-01-01",
  "rangeTo": "2015-12-31",
  "filter": {
    "destinations": [
      "23123123","2313123123"
    ],
    "airlines": [
      "678678","6786786867"
    ],
    "timestep": "MONTH"
    },
  "axis": {
    "x": "TIME",
    "y": "FLIGHTS"
  }
}
```

Response Example:

`Code 200`

```
{
  "name": "Standard-View",
  "creator": "Hans",
  "shareable": true,
  "rangeFrom": "2015-01-01",
  "rangeTo": "2015-12-31",
  "filter": {
    "destinations": [
      "23123123","2313123123"
    ],
    "airlines": [
      "678678","6786786867"
    ],
    "timestep": "MONTH"
    },
  "axis": {
    "x": "TIME",
    "y": "FLIGHTS"
  }
}
```

Delete

Description: Deletes a specific setting with the given `id`.

Response Example:

```
Code 204
```

Path `/settings/search/ findByNameContainingIgnoreCaseOrCreatorContainingIgnoreCase`

Http Methods

Get

Description: Find settings by name or by creator name.

Query

- **name** Name of setting
- **creator** Name of creator

Response Example:

```
Code 200
```

```
[
  {
    "name": "Standard-View",
    "creator": "Hans",
    "shareable": true,
    "rangeFrom": "2015-01-01",
    "rangeTo": "2015-12-31",
    "filter": {
      "destinations": [
        "23123123","2313123123"
      ],
      "airlines": [
        "678678","6786786867"
      ],
      "timestep": "MONTH"
      },
    "axis": {
      "x": "TIME",
      "y": "FLIGHTS"
    }
  }
]
```

Path `/settings/search/ findByCreatorContainingIgnoreCaseOrShareableTrue`

Http Methods

Get

Description: Find settings by creator name including all public settings.

Query

- **creator** Name of creator

Response Example:

```
Code 200
```

```
[
  {
    "name": "Standard-View",
    "creator": "Hans",
    "shareable": true,
    "rangeFrom": "2015-01-01",
    "rangeTo": "2015-12-31",
    "filter": {
      "destinations": [
        "23123123","2313123123"
      ],
      "airlines": [
        "678678","6786786867"
      ],
      "timestep": "MONTH"
      },
    "axis": {
      "x": "TIME",
      "y": "FLIGHTS"
    }
  }
]
```

Crawler

Format of the downloaded Tables from transtats

Airline Lookup table

- AirlineID http://transtats.bts.gov/Download_Lookup.asp?Lookup=L_AIRLINE_ID

Example

```
http.Get("http://transtats.bts.gov/Download_Lookup.asp?Lookup=L_AIRLINE_ID")
```

```
Code,Description
"19031","Mackey International Inc.: MAC"
"19032","Munz Northern Airlines Inc.: XY"
"19033","Cochise Airlines Inc.: COC"
"19034","Golden Gate Airlines Inc.: GSA"
"19035","Aeromech Inc.: RZZ"
"19036","Golden West Airlines Co.: GLW"
"19037","Puerto Rico Intl Airlines: PRN"
"19038","Air America Inc.: STZ"
"19039","Swift Aire Lines Inc.: SWT"
```

```
{
    "name": "string[[Description]]",
    "id": "int[[Code]]"
}
```

Market Lookup table

- Dest/OriginCityMarketID http://transtats.bts.gov/Download_Lookup.asp?Lookup=L_CITY_MARKET_ID

Example

```
http.Get("http://transtats.bts.gov/Download_Lookup.asp?Lookup=L_CITY_MARKET_ID")
```

```
Code,Description
"30001","Afognak Lake, AK"
"30003","Granite Mountain, AK"
"30004","Lik, AK"
"30005","Little Squaw, AK"
"30006","Kizhuyak, AK"
"30007","Klawock, AK"
"30008","Elizabeth Island, AK"
"30009","Homer, AK"
"30010","Hudson, NY"
```

```
{
    "name": "string[[Description]]",
    "id": "int[[Code]]"
}
```

Route table

- T-100 Domestic Segment (All Carriers) http://transtats.bts.gov/DL_SelectFields.asp?Table_ID=311

```
"YEAR","MONTH","DEPARTURES_SCHEDULED","DEPARTURES_PERFORMED","PASSENGERS","AIRLINE_ID","ORIGIN_CITY_MARKET_
```

Example

```
form := url.Values{"sqlstr": {"SELECT YEAR,MONTH,DEPARTURES_SCHEDULED,DEPARTURES_PERFORMED,PASSENGERS,AIRL
                                    ORIGIN_CITY_MARKET_ID,DEST_CITY_MARKET_ID,MONTH
                               FROM  T_T100D_SEGMENT_ALL_CARRIER
                               AND YEAR=[[year]]
                 AND MONTH=[[month]]
                               AND ORIGIN_CITY_MARKET_ID=31703"}}
http.PostForm("http://transtats.bts.gov/DownLoad_Table.asp", form)
```

```
"DEPARTURES_SCHEDULED","DEPARTURES_PERFORMED","PASSENGERS","AIRLINE_ID","ORIGIN_CITY_MARKET_ID","DEST_CITY
0.00,1.00,0.00,21107,31703,31703,2,
0.00,1.00,0.00,21492,31703,31995,2,
0.00,1.00,0.00,21492,31703,31703,2
```

```
{
    "date": "string[[YEAR]]-[[MONTH]]-01",
    "delays": "0",
    "cancelled": "0",
    "passengerCount": "double[[PASSENGERS]]",
    "flightCount": "0",
    "airline": "hal+id[[AIRLINE_ID]]",
    "source": "hal+id[[ORIGIN_CITY_MARKET_ID]]",
    "destination": "hal+id[[DEST_CITY_MARKET_ID]]"
}
```

Flights table

- On-Time Performance http://transtats.bts.gov/DL_SelectFields.asp?Table_ID=236

```
"DAY_OF_WEEK","FL_DATE","AIRLINE_ID","ORIGIN_CITY_MARKET_ID","DEST_CITY_MARKET_ID","ARR_DELAY_NEW","CANCEL
```

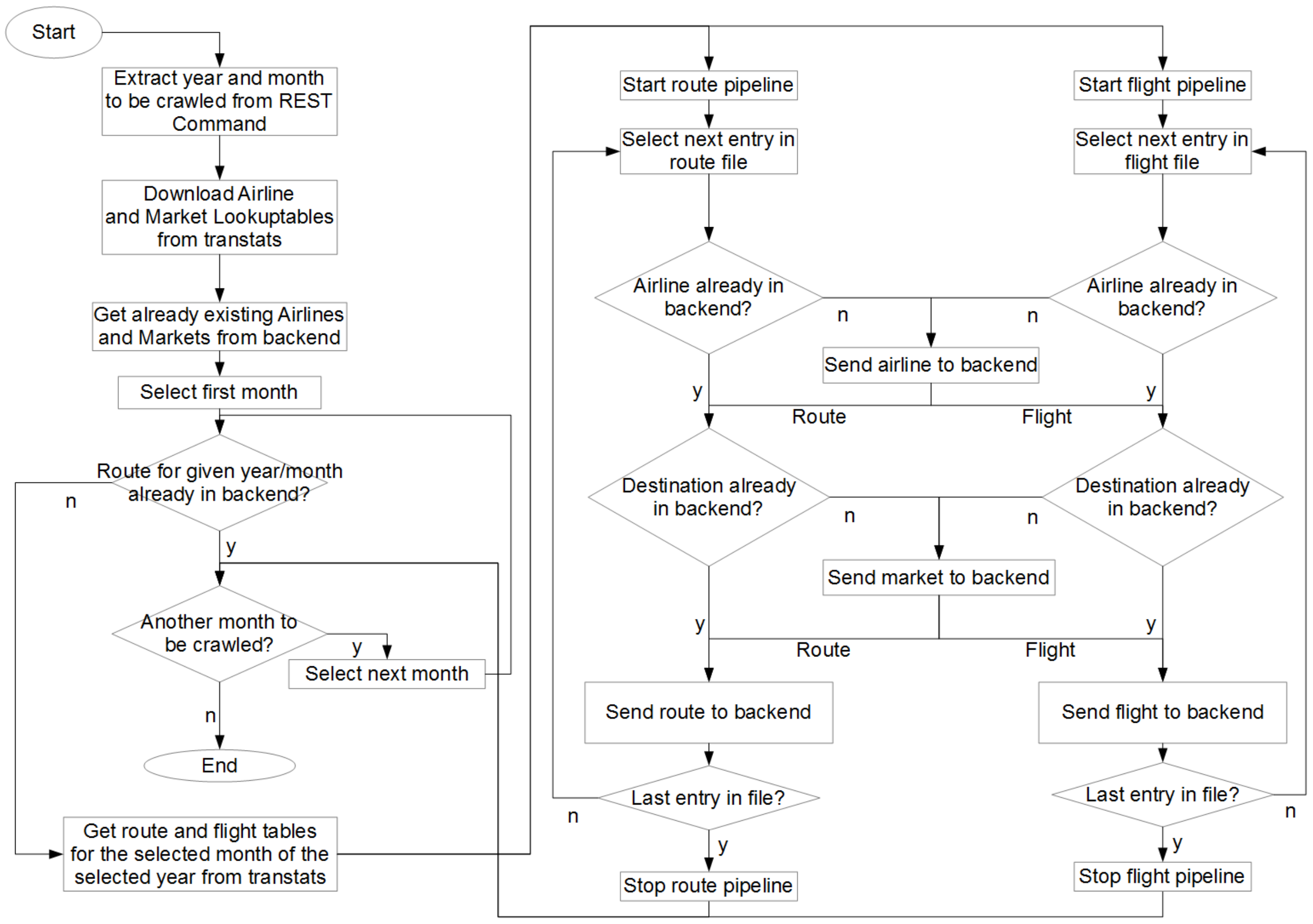
Example

```
form := url.Values{"sqlstr": {"SELECT DAY_OF_WEEK,FL_DATE,AIRLINE_ID,ORIGIN_CITY_MARKET_ID,DEST_CITY_MARKE
                                    ARR_DELAY_NEW,CANCELLED
                               FROM T_ONTIME
                               WHERE Month=[[month]]
                               AND YEAR=[[year]]
                               AND ORIGIN_CITY_MARKET_ID=31703"}}
http.PostForm("http://transtats.bts.gov/DownLoad_Table.asp", form)
```

```
"DAY_OF_WEEK","FL_DATE","AIRLINE_ID","ORIGIN_CITY_MARKET_ID","DEST_CITY_MARKET_ID","ARR_DELAY_NEW","CANCEL
1,2015-02-02,19805,31703,32575,,1.00,
1,2015-02-09,19805,31703,32575,22.00,0.00,
1,2015-02-16,19805,31703,32575,0.00,0.00,
1,2015-02-23,19805,31703,32575,9.00,0.00
```

```
{
    "date": "string[[FL_DATE]]",
    "delays": "double[[ARR_DELAY_NEW]]",
    "cancelled": "double[[CANCELLED]]",
    "passengerCount": "0",
    "flightCount": "1",
    "airline": "hal+id[[AIRLINE_ID]]",
    "source": "hal+id[[ORIGIN_CITY_MARKET_ID]]",
    "destination": "hal+id[[DEST_CITY_MARKET_ID]]"
}
```

Flowchart for the crawling process


Start
Extract year and month to be crawled from REST Command
Download Airline and Market Lookuptables from transtats
Get already existing Airlines and Markets from backend
Select first month
Route for given year/month already in backend?
n
y
Another month to be crawled?
y
Select next month
n
End
Get route and flight tables for the selected month of the selected year from transtats
Start route pipeline
Select next entry in route file
Airline already in backend?
n
n
Send airline to backend
y
y
Route
Flight
Destination already in backend?
n
n
Send market to backend
y
y
Route
Flight
Send route to backend
Last entry in file?
n
y
Stop route pipeline
Start flight pipeline
Select next entry in flight file
Airline already in backend?
Destination already in backend?
Send flight to backend
Last entry in file?
n
y
Stop flight pipeline

Detailed listing of the proceedings of the crawling process

1. Start the crawler via a REST command, either by using the "Crawler"-Button in the GUI or by just sending the command to http://10.28.2.166/crawler.
   The command has the following syntax: http://<serverIPAddress/crawler>/crawlIntoBackend?year=<year>(&month=<mo
   The year must be a number, so must the month. If just the year is provided, the full year will be crawled.
   Months can be given as discrete months or in ranges, e.g. 1-7.
   The part in () brackets is optional.

2. The crawler now starts the crawling process. This process is divided in several steps.
3. The list of all airlines available is downloaded from the transtats server and they are saved in a hashmap. Also all airlines already in the database are requested and saved into a set.
4. The list of all markets available is downloaded from the transtats server and they are saved in a hashmap. Also all markets already in the database are requested and saved into a set.
5. The given year and month or months, are extracted and a loop is created, starting with the first given month, ending with the last given month.
6. The T100D database is queried for all routes originating in the NYC market, going to other markets in the US, in the first given month.
7. The route pipeline is created.
8. The zip-file containing the routes is extracted entry by entry and pushed into the route pipeline.
9. Routes are created from the given entry.
10. Invalid routes are filtered.
11. Airlines and markets used in the created route and not already in the database are written into the database.
12. The route is written into the database
13. Step 6 to 12 are done for the on-time-database, now creating (logical) flights instead of routes.
14. If there is more than one month to be crawled, steps 6 to 13 are repeated for every given month.

Definitions

- **Route:** Information available on a monthly base. They contain the number of passengers going from one market to the other in the given month. The information for number of passengers is always given as a route with the date of the first day of the corresponding month.

- **Flight:** Information available on a daily base. This contains, for each flight, information about delays and cancellations, as well as the exact date of the flight. Flights also make up the number of flights from one market to another.
- **Market:** A market includes all airports of a domestic region. E.g. the domestic region New York includes 13 airports.

Crawler API

Base URL: `http://10.28.2.166/crawler`

Path `/crawlIntoBackend`

Http Methods

`Get`

Description: Crawl new data into the backend.

Query

- **year** Year to crawl with format: `yyyy`
- **month** Range of months to crawl (optional) with the format: `mm-mm` or `mm`

Response Example:

```
Code 200
```

Chapter 3

Installation Guide

Server Side Installation

To deploy the application on your companies server you need to install docker on the server you want to deploy the application on. A docker installation guide can be found `https://docs.docker.com/linux/`.

Further you need to make sure you have a MYSQL-Database setup with the following data: * Username: ExtDev2 * Password: ***

To setup a MYSQL-Database on the server please refer to `http://dev.mysql.com/doc/refman/5.7/en/linux-installation.ht`

Now you are ready to go to get the application up and running! From here it is as simple as executing some commands.

- Starting the Backend: `docker run -d -e TZ=GMT+2 -e "SPRING_PROFILES_ACTIVE=production" -p 8081:8080 darenegade/fapbackend`
- Starting the Crawler: `sudo docker run -d -p 8082:8081 arne2/fapcrawler`
- Starting the GUI: `sudo docker run -d -p 8080:80 petermueller/flight-analyzer`
- Starting the API-Gateway: `sudo docker run -d -p 80:8080 darenegade/fapapigateway`

If you want you can also start the so called Watchtower. This docker container will keep all parts of the applications updated automatically when a new version is released.

- Starting the watchtower: `sudo docker run -d -v /var/run/docker.sock:/var/run/docker.sock centurylink/watch`

Some more neat commands to get you started with using docker:

- `sudo docker ps` lists all running containers. The `-a` flag lists all stopped containers, too.
- `sudo docker logs <id>` shows the log output of this container. `-f` tails the log so you can continue watching the output.
- `sudo docker stop <id(s)>` stops all given containers.
- `sudo docker stats <id(s)>` show the current system usage of all given containers.

Now just wait for all containers to start and you can continue by crawling your first data. How to do this? Just follow the user documentation!

Client Side Installation

To get the application running on your machine you only need two things.

1. You need a connection to your companies network. You can connect to your companies network with the companies VPN. You can find an instruction how to connect to it `https://www.lrz.de/services/netz/mobil/vpn_en/`
2. A modern web browser. It doesn't matter if it's Firefox, Chrome or Microsoft Edge. Only Internet Explorer is not supported.

Now you are ready to go! Just go to 10.28.2.166 and login with your name. For further instruction on how to use the application please refer to the user guide.