Rest API Design

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1 Introduction

1.1 Framework choice

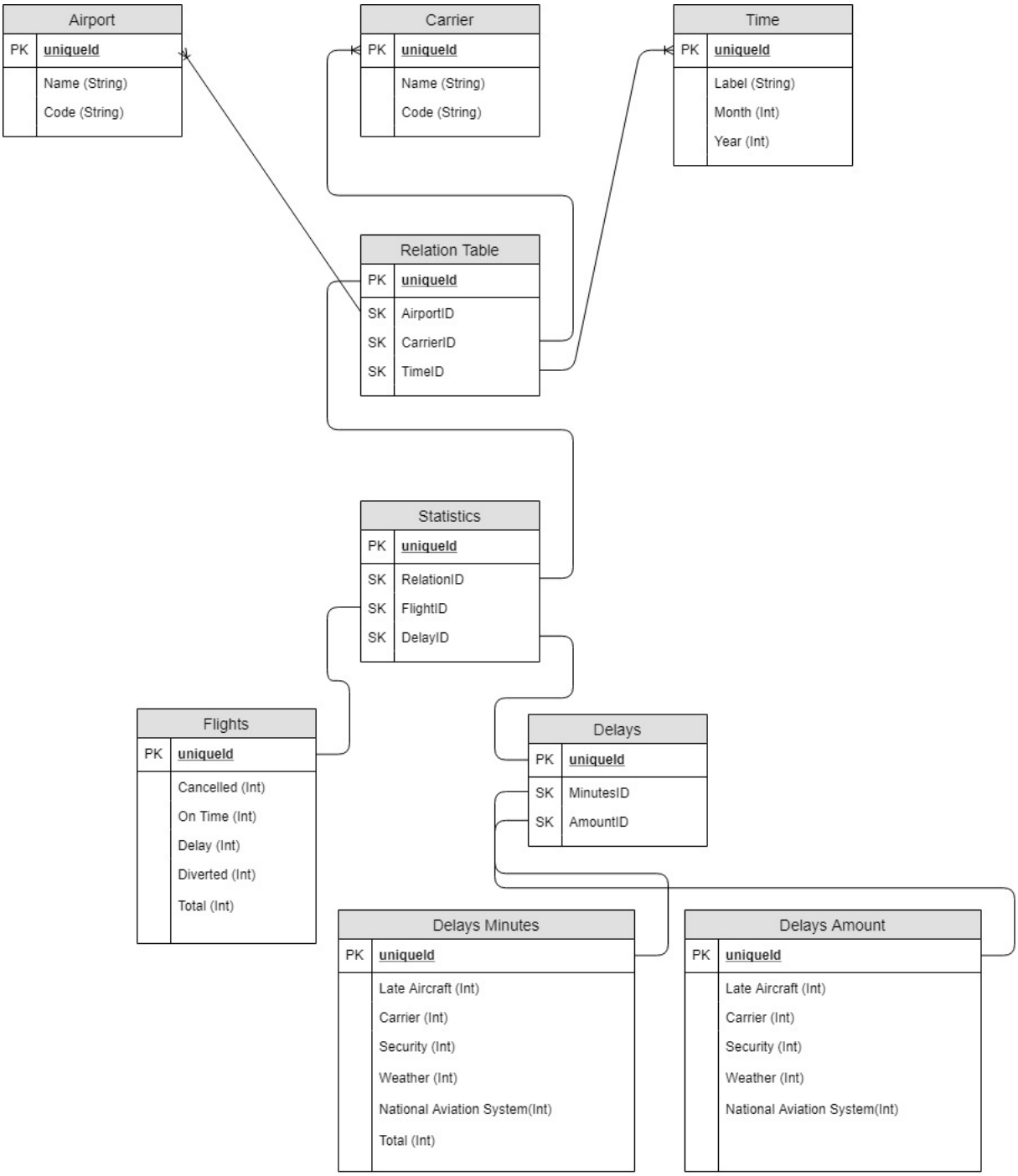
Python will as the main language of the API. The framework flask implements restful design.

1.2 Data storage options

In this project, the initial data we receive is in JSON and CSV format. Either of these formats can be directly parsed and loaded into memory as lists in python. This way of processing data works well for read only data, however, there will be POST requests in the API, meaning the data will be subject to change. This causes problems for data loaded in memory, saving the data as text for every POST request is very inefficient. Therefore SQL will be used as the main storage method. Because the API will be made in python, the SQL handling will be performed by SQLAlchamy.

2 Data model

2.1 Database structure/relations



2.2 URI/resource hierarchy

The resource and their relations must be defined before an API can be designed. The database design will be different from the URI Hierarchies used (For example, time is a query parameter whereas carriers is a hierarchical parameter. Visible Objects (with URI):

–Airport
–Carrier
–Statistics
–Delays
–Amount
–Minutes
–Flights

2.3 URIs

Entity	**URI**
airports	website/airports/< *code* >
carriers	website/carriers/< *code* >
statistics	website/carriers/< *code* >/statistics
delays(minutes)	website/carriers/< *code* >/statistics/delays/minutes
delays(amount)	website/carriers/< *code* >/statistics/delays/amount
flights	website/carriers/< *code* >/statistics/flights

3 End Points

3.1 Airports

Endpoint	/airports [1]
Type	GET
Return	List of airport URIs
Query options	content-type

Endpoint	/airports/< *airportcode* > [3]
Type	GET
return	Airport name + List of carrier URIs related to that airport
Query options	content-type

3.2 Carriers

Endpoint	/carriers [2]
Type	GET
Return	List of carrier URIs
Query options	airport, content-type

Endpoint	/carriers/< *carriercode* >
Type	GET
Return	Statistics URI + Carrier Name (string).
Query options	airport, content-type

3.3 Statistics

Endpoint	/carriers/< *carriercode* >/statistics [4]
TYPE	GET
Return	Statistics URI for given carrier returned as delay and flight resources.
Query options	month, airport, content-type

Endpoint	/carriers/< *carriercode* >/statistics [4]
TYPE	POST
Return	Success for fail indication.
Query options	airport-code, month, content-type
Form data	flights data, delay-minutes data, delay-amount data.

Endpoint	/carriers/< *carriercode* >/statistics [4]
TYPE	PUT
Return	Success or fail indicaion.
Query options	airport-code, month, content-type
Form data	flights data, delay-minutes data, delay-amount data.

Endpoint	/carriers/< *carriercode* >/statistics [4]
TYPE	DELETE
Return	Success or fail indication.
Query options	airport, month.

Endpoint	/carriers/< *carriercode* >/statistics/flights [5]
TYPE	GET
Return	Flights information list + carrier URI
Query options	month, airport, content-type

Endpoint	/carriers/< *carriercode* >/statistics/delays/minutes [6]
TYPE	GET
Return	(minute) delays information list + carrier URI
Query options	delay-type, month, airport, content-type

Endpoint	/carriers/< *carriercode* >/statistics/delays/minutes/averages [7]
Type	GET
Return	delays-minutes mean list + delays-minutes standard deviation list + carrier URI
Query options	delay-type, airport1, airport2, content-type

4 GET methods summary

- /airports
- /airports/< *airportcode* >?content-type=< *type* >
- /carriers?*airport* =< *airportcode* >?content-type=< *type* >
- /carriers/< *carriercode* >?*airport* =< *airportcode* >?content-type=< *type* >
- /carriers/< *carriercode* >/statistics
  ?*airport* =< *airportcode* >?*month* =< *month* > &content-type=< *type* >

- /carriers/< *carriercode* >/statistics/flights
  ?*airport* =< *airportcode* >?*month* =< *month* > &content-type=< *type* >
- /carriers/< *carriercode* >/statistics/delays/minutes
  ?*airport* =< *airportcode* >?*delay* − *type* =< *type* > &*month* =< *month* > &content-type=< *type* >
- /carriers/< *carriercode* >/statistics/delays/minutes/averages
  ?*airport* =< *airportcode* >?*delay* − *type* =< *delaytype* > &*airport*1 =< *airportcode* > &*airport*2 =< *airportcode* > &content-type=< *type* >

5 POST methods summary

- /carriers.< *carriercode* >/statisticss?*airportcode* =< *airportcode* > &*month* =< *month* >

6 PUT methods summary

- /carriers.< *carriercode* >/statistics?s?*airportcode* =< *airportcode* > &*month* =< *month* >, *content* − *type* =< *type* >

7 DELETE methods summary

- /carriers.< *carriercode* >/statistics?*airportcode* =< *airportcode* > &*month* =< *month* >

8 Query values

Query variable	**Type/values**
month	Integer from 1-12 indicating january-december
delaytype	{carrier, weather, security, national-aviation-system(noa), total}
airportcode	String of the airport code.
content-type	application/json or text/csv

9 Error codes

The error codes used are inspired by amazons rest API design.

Code	**Description**
200	Successful request.
201	Created.
400	Bad request (parameter invalid). Will indicate which parameter is invalid and the expected type/format.
404	Page not found.
405	Method invalid.
500	Internal server error (Vague and to be avoided as much as possible).

10 CSV ordering

Csv returns will take this order (for statistics):
Flights: cancelled, ontime, delayed, diverted, total
Minutes: late-aircraft, carrier, security, weather, national-aviation-system, total
Amount: late-aircraft, carrier, security, weather, national-aviation-system

11 Project structure

The main API functionality is implemented in 'API.py'
Complex database queries are handled in 'Utility.py'
Populate database in 'populate.py'
Json to csv conversion is handled in 'CSVHandler.py'
The project is run with 'run.py'
Object models for the sql database are stored in the 'Core' folder
Webpages design in the 'Frontend' folder

12 Front-end

12.1 Architecture

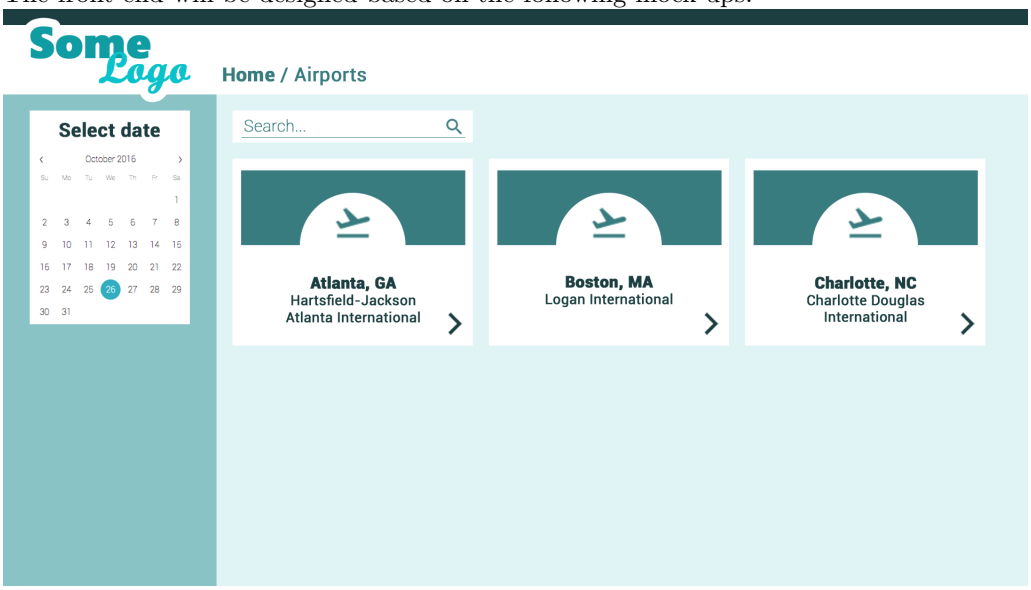
The front-end is a SPA (Single Page Application) and will be built using the Vue framework with semantic-ui. The Vue framework was chosen because it is fully JavaScript based and it handles both component creation as well as routing. It also provides a Node web server. For package management yarn is used (in combination with npm).

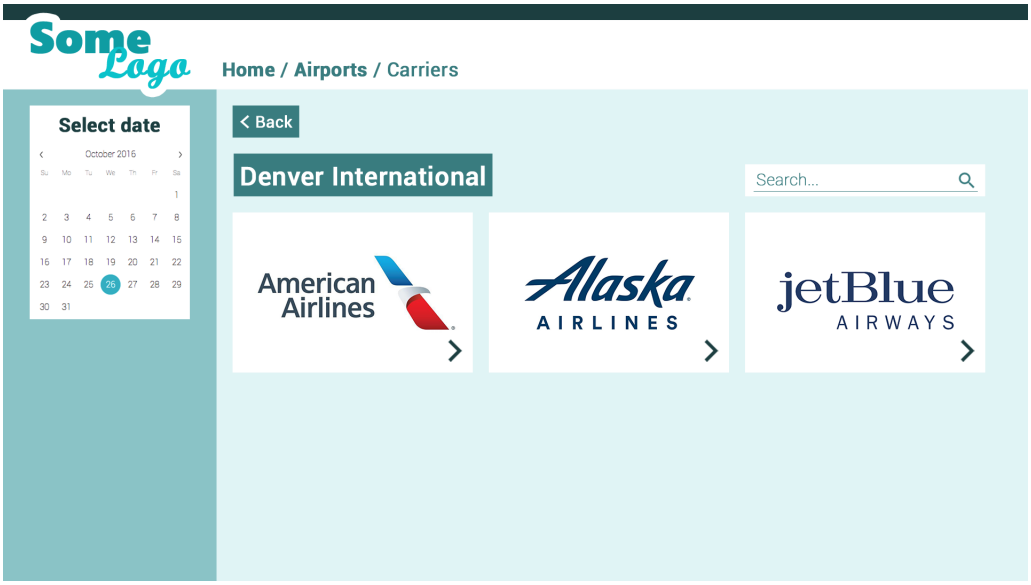
12.2 Design

The workflow of the web app is straightforward to provide an innate user experience, the user either selects their airport and then a carrier, or they proceed straight to carrier for more global statistics on said carrier. After selecting a carrier, the user is presented with graphs and statistics about said carrier's flight statistics, if an airport was selected, the statistics present the carrier for that specific airport. The user also has the option to view combined/calculated statistics for their selected carrier for two airports.

12.3 Concept mock-ups

The front-end will be designed based on the following mock-ups.





13 References

(1) implementation of method 1 from M1 requirements.
(2) implementation of method 2 from M1 requirements.
(3) implementation of method 3 from M1 requirements.
(4) implementation of method 4 from M1 requirements.
(5) implementation of method 5 from M1 requirements.
(6) implementation of method 6 from M1 requirements.
(7) implementation of method 7 from M1 requirements.