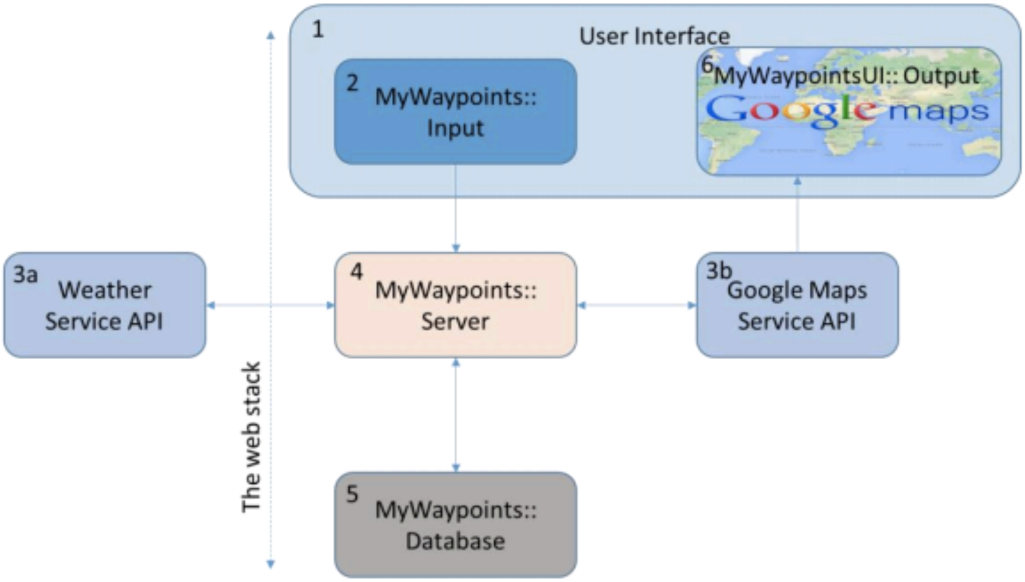
CSE-586 FALL-2018
PROJECT 1: DESIGNING AND DEPLOYING A SERVICE-BASED DISTRIBUTED SYSTEMS

Project Report

1)Phase 1: (50%) Your task is to design and implement the complete services-based distributed system indicated by boxes 1-6 except 5 in Figure 1, and explore the operation of this partial proof of concept (POC) system. Test it thoroughly. Call it version 1.

Soln:
Name of the file of the version 1: rajivranjan_cse586_project1_version1.tar.gz

If we look at the structure of the distributed system given to us for implementation, then we have the following finding:

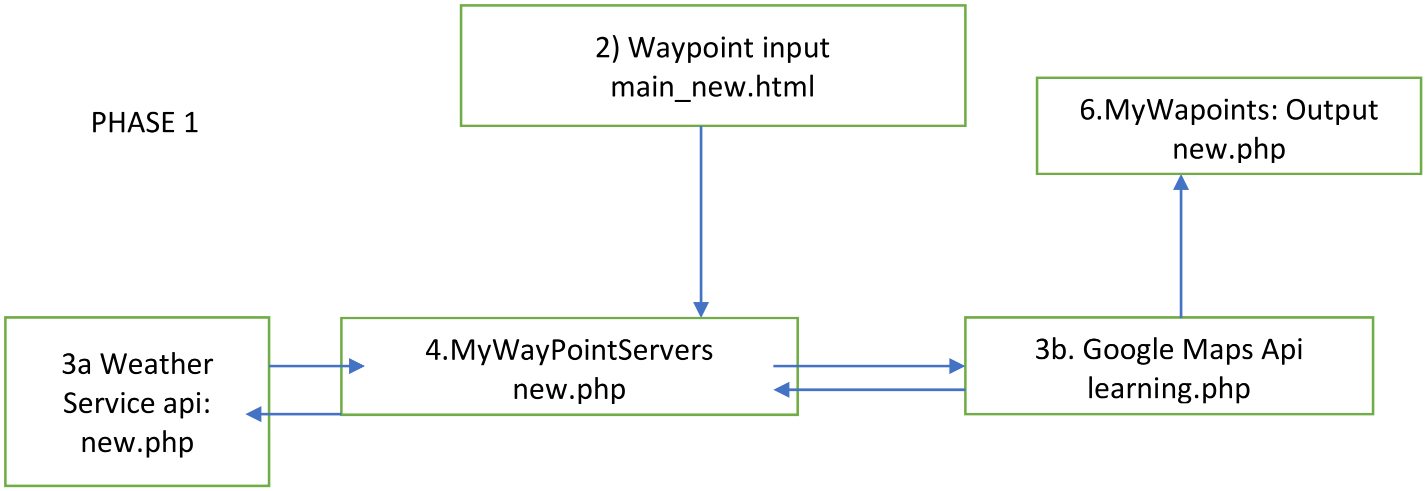


Technology Stack Used:
Operating System Used: Mac OS
Frontend Technology Used: HTML, CSS, JavaScript, JQuery, Bootstrap
Backend Technology: PHP, MYSQL
Server Running: Using MAMP

API Used:
Google Maps: Autocomplete Feature: as you start typing in the name of the place suggestions are automatically shown and a drop-down menu comes up, name can be selected from there.

Google Maps: Direction Service, Routing Service
OpenWeatherApi: Search based on city name and the latitude and longitude of the place(waypoint)

So, the design goes something like this.



Phase 1

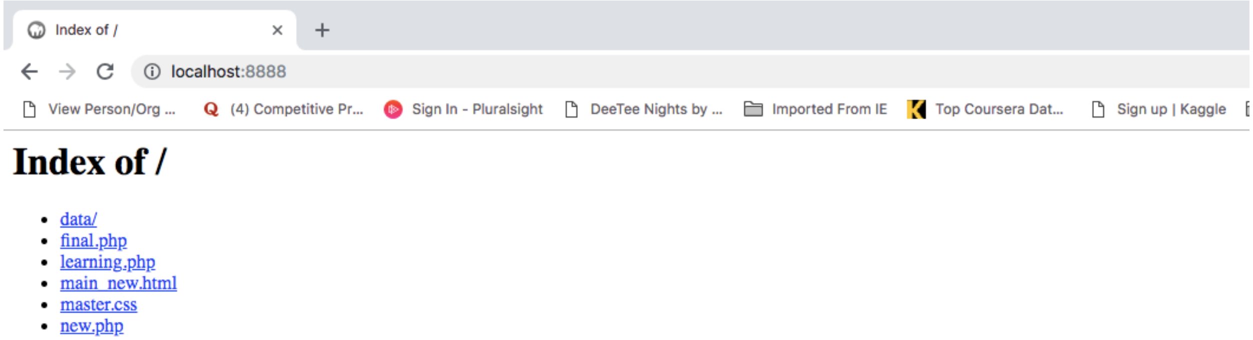
In the boxes, I have shown the file name where a particular component of the whole distributed app belongs, along with the respective components.

Proof Of Concept:
The app will work because of the technology stack selected and their implementibility, with and the APIs provided by the Google Maps and Open WeatherApi that are totally compatible with the choice of technology selected.
I have used HTML, JavaScript, JQuery for the frontend part. Here the input from the user is taken, which is the SOURCE and the DESTINATION places.
Now the backend process written in PHP takes and calls the Google Maps and draws the route between the two cities. This is possible with PHP and the Google Maps.
Now, using the JSON response waypoints are generated. Randomly 5 waypoints are selected. And they are drawn on the map.

Now we call the Weather api on the source, destination and the 5 waypoints and display the weather on the web page in form of text.
This is phase 1.

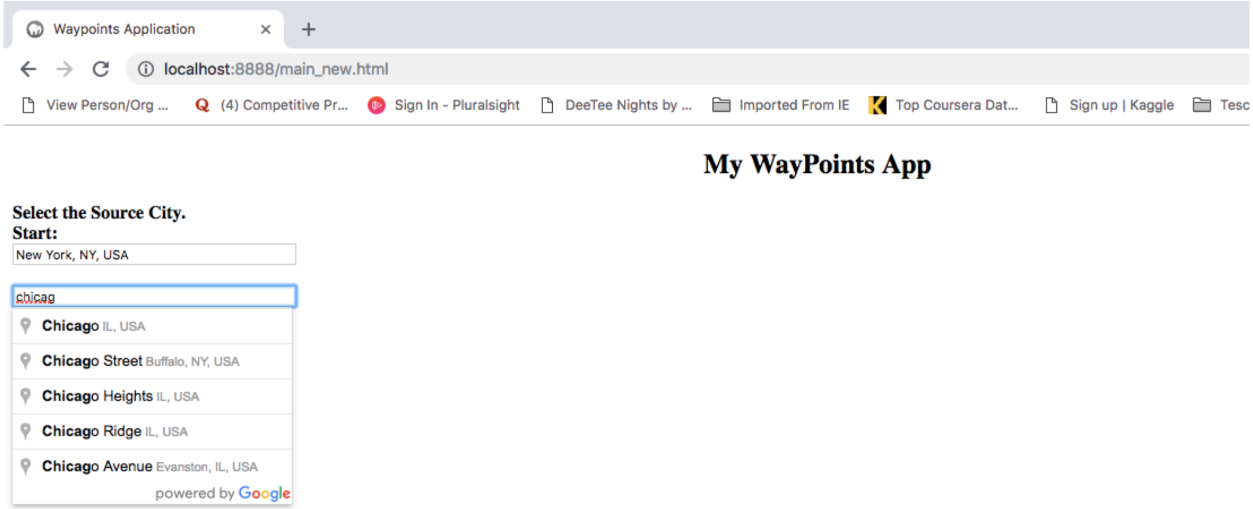
The process has been tested and the output is below:

Input Page:main_new.html



Index of /

- data/
- final.php
- learning.php
- main_new.html
- master.css
- new.php



My WayPoints App

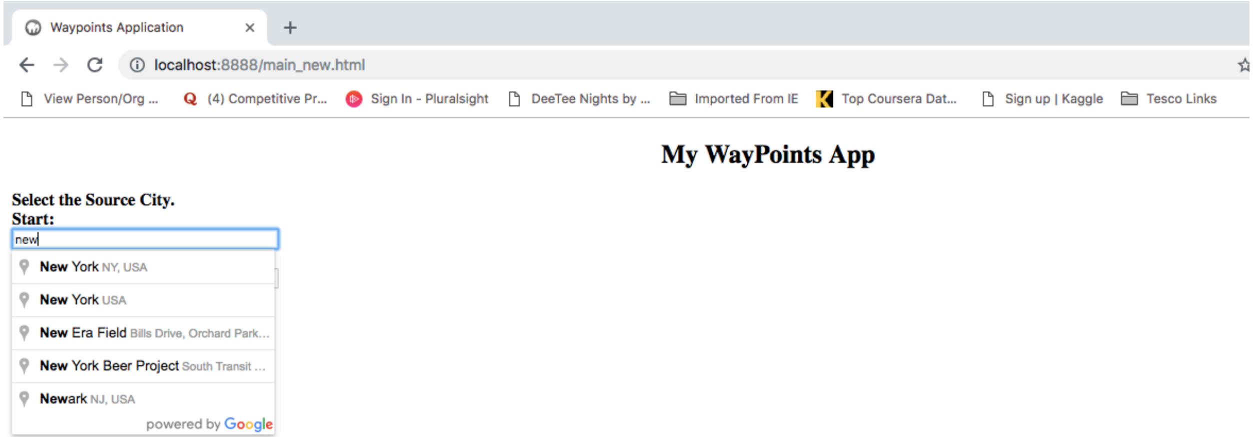
Select the Source City.
Start:

New York, NY, USA

chicag

- **Chicago** IL, USA
- **Chicago** Street Buffalo, NY, USA
- **Chicago** Heights IL, USA
- **Chicago** Ridge IL, USA
- **Chicago** Avenue Evanston, IL, USA

powered by Google



My WayPoints App

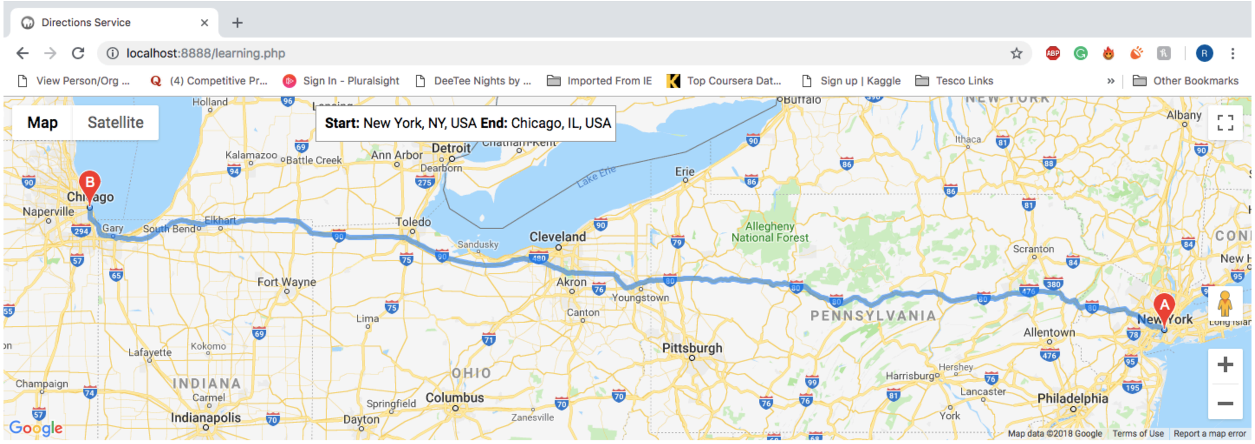
Select the Source City.
Start:

new

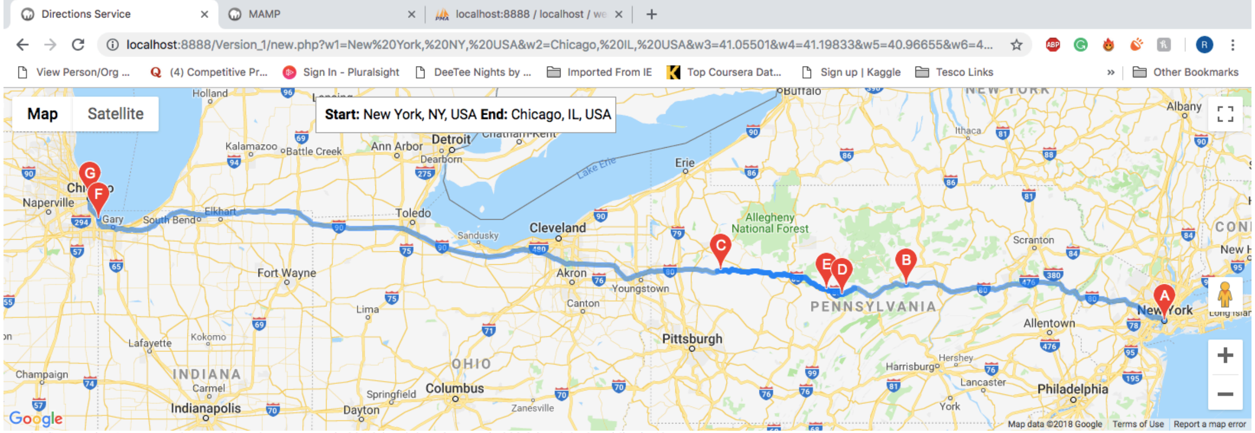
- **New** York NY, USA
- **New** York USA
- **New** Era Field Bills Drive, Orchard Park...
- **New** York Beer Project South Transit ...
- **New**ark NJ, USA

powered by Google

Directions service : filename: learning.php



Final o/p with waypoints and the weather info filename: new.php


Directions Service
MAMP
localhost:8888 / localhost / we
localhost:8888/Version_1/new.php?w1=New%20York,%20NY,%20USA&w2=Chicago,%20IL,%20USA&w3=41.05501&w4=41.19833&w5=40.96655&w6=4...
Map
Satellite
Start: New York, NY, USA End: Chicago, IL, USA
A
B
C
D
E
F
G
New York
PENNSYLVANIA
OHIO
INDIANA
Cleveland
Pittsburgh
Philadelphia

For the Source city A :New York, NY, USA The max temp is 294.25 and the min temp is 292.05 and the humidity is 49

For the intermediate waypoint B with latitude:41.06073 and the longitude -77.38915 The max temp is 292.05 and the min temp is 289.15 and the humidity is 58

For the intermediate waypoint C with latitude:41.61528 and the longitude -86.83019 The max temp is 290.35 and the min temp is 287.15 and the humidity is 83

For the intermediate waypoint D with latitude:41.08346 and the longitude -75.6288 The max temp is 294.25 and the min temp is 289.85 and the humidity is 74

For the intermediate waypoint E with latitude:41.19388 and the longitude -79.58611 The max temp is 291.45 and the min temp is 289.25 and the humidity is 80

For the intermediate waypoint F with latitude:41.05386 and the longitude -75.85151 The max temp is 294.25 and the min temp is 289.85 and the humidity is 74

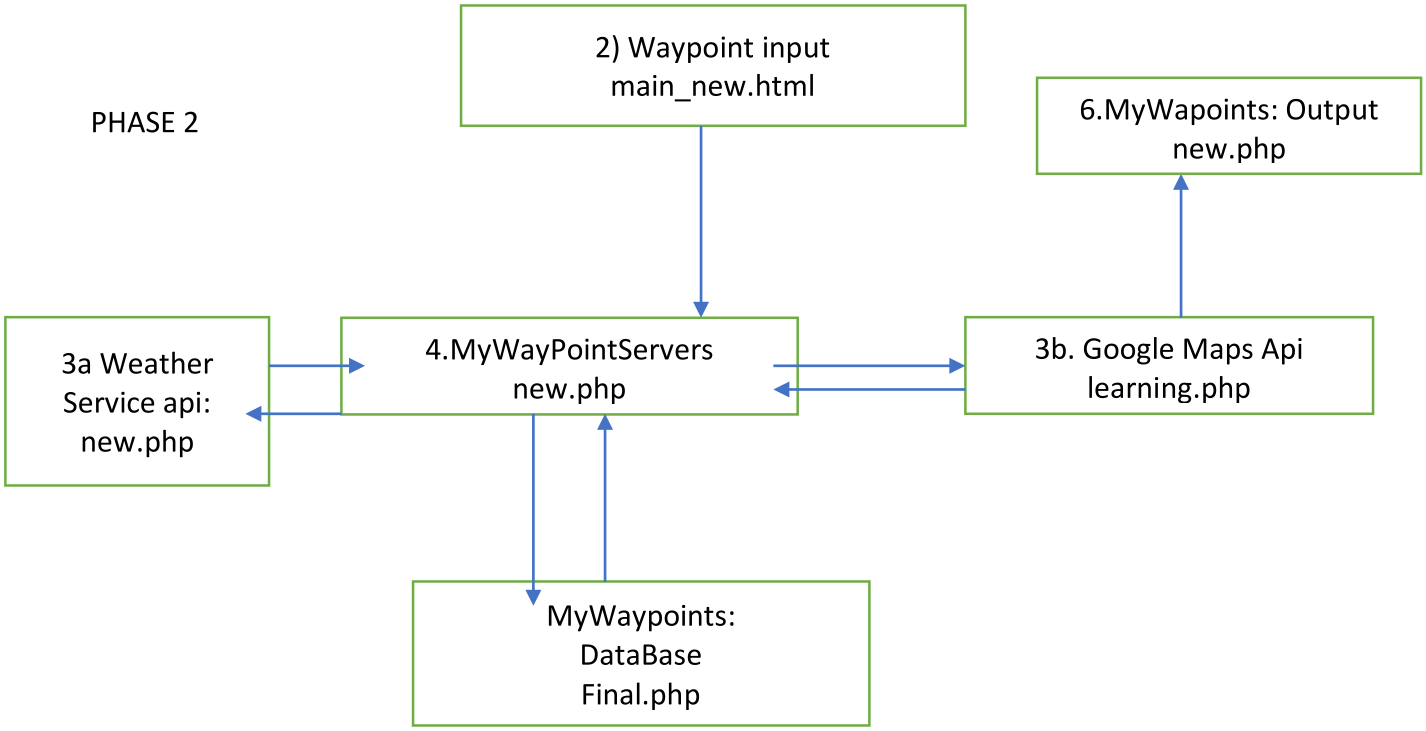
For the destination city G :Chicago, IL, USA The max temp is 291.65 and the min temp is 289.85 and the humidity is 93

So as you can see it shows the Maximum temperature and the Minimum temperature of the source and the destination, along with 5 randomly selected waypoints on the way.

Name of the file of the version 1: rajivranjan_cse586_project1_version1.tar.gz

2)Phase 2: (25%) Let this be a separate fork. Save the code base of version 1. Make a new codebase, a copy of the version 1. Add the persistence layer in a database. You can choose a relational database such as MySQL or any other database you prefer. Test it thoroughly. Here repeated request should be answered from your data base and not by accessing the API. Call it version 2.

Soln: The file for this version solution is in the file rajivranjan_cse586_project1_version2.tar.gz



The design for this project is same as the previous Version 1. **<u>Technology Stack Used:</u>**
Operating System Used: Mac OS
Frontend Technology Used: HTML, CSS, JavaScript, JQuery, Bootstrap
Backend Technology: PHP, MYSQL
Server Running: Using MAMP

API Used:
Google Maps: Autocomplete Feature: as you start typing in the name of the place suggestions are automatically shown and a drop-down menu comes up, name can be selected from there.

Google Maps: Direction Service, Routing Service
OpenWeatherApi: Search based on city name and the latitude and longitude of the place(waypoint)

In the boxes, I have shown the file name where a particular component of the whole distributed app belongs, along with the respective components.

Proof Of Concept:
The app will work because of the technology stack selected and their implementibility, with and the APIs provided by the Google Maps and Open WeatherApi that are totally compatible with the choice of technology selected.
I have used HTML, JavaScript, JQuery for the frontend part. Here the input from the user is taken, which is the SOURCE and the DESTINATION places.
Now the backend process written in PHP takes and calls the Google Maps and draws the route between the two cities. This is possible with PHP and the Google Maps.
Now, using the JSON response waypoints are generated. Randomly 5 waypoints are selected. And they are drawn on the map.

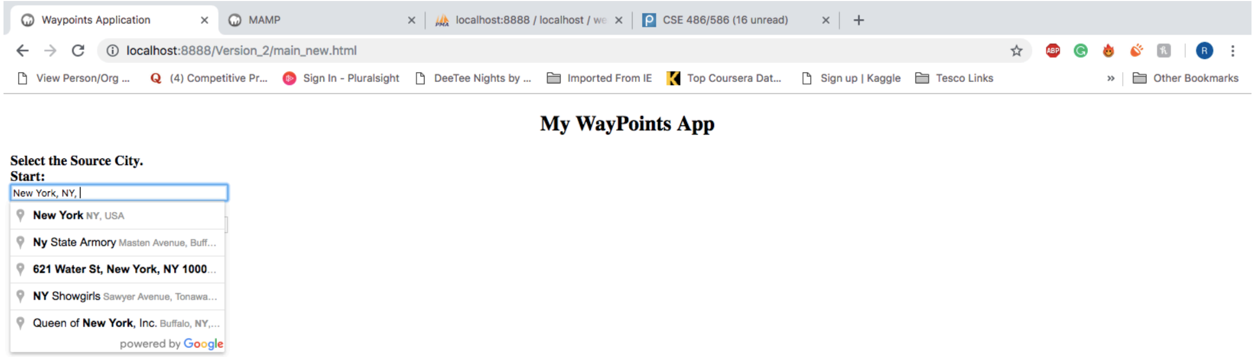
Now we call the Weather api on the source, destination and the 5 waypoints and display the weather on the web page in form of text.
This is phase 2.

The database part has been done using PHP and MySQL. A new tuple of source and destination is always stored in the database. If the same tuple is called again in the same order then instead of using the api, the data is displayed from the database, if a new search appears then Weather api is called. In the weather info, we are showing temperature in KELVIN and humidity percentage.

The process has been tested and the output is below:

Case1: When a new combination of source and destination cities are entered the weather info is fetched from the Openweather API.

Screenshots are below:
Main_new.html

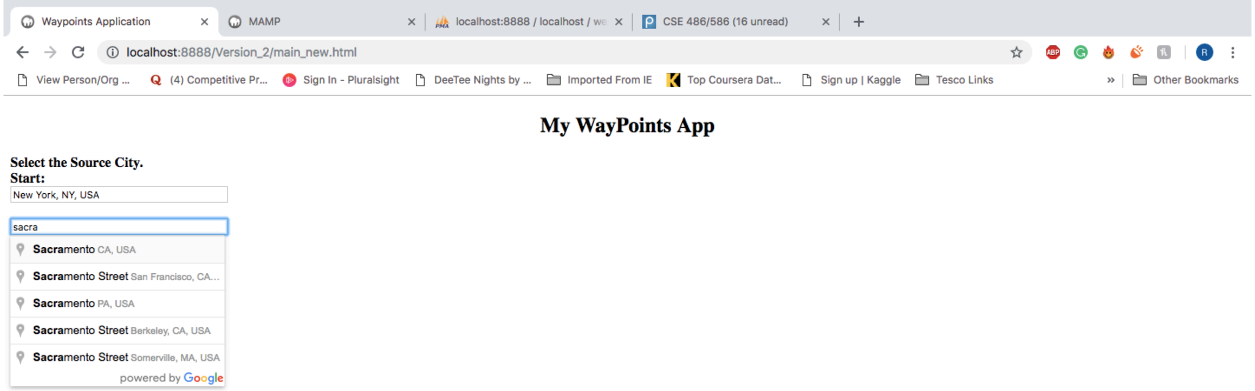


My WayPoints App

Select the Source City.
Start:
New York, NY,

- New York NY, USA
- Ny State Armory Masten Avenue, Buff...
- 621 Water St, New York, NY 1000...
- NY Showgirls Sawyer Avenue, Tonawa...
- Queen of New York, Inc. Buffalo, NY,...

powered by Google



My WayPoints App

Select the Source City.
Start:
New York, NY, USA

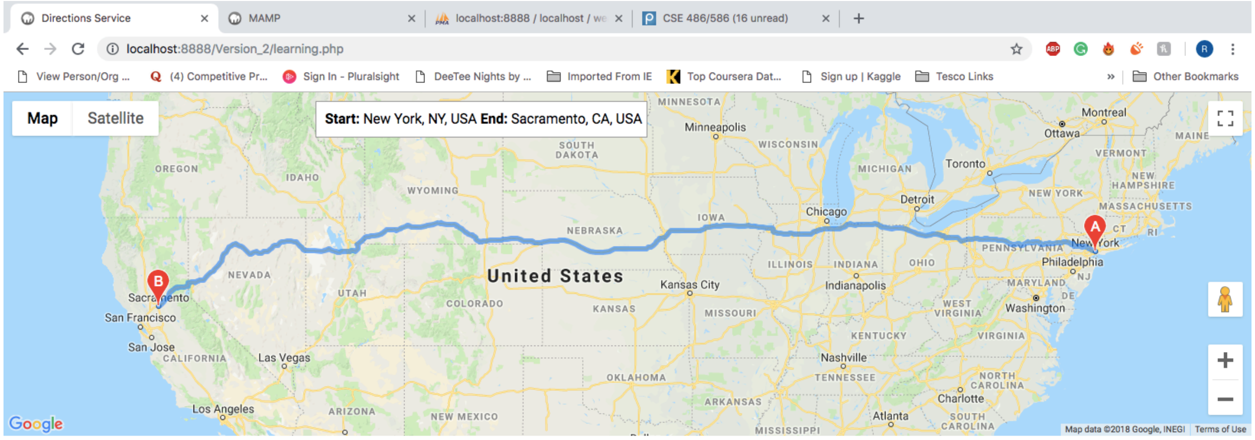
sacra

- Sacramento CA, USA
- Sacramento Street San Francisco, CA...
- Sacramento PA, USA
- Sacramento Street Berkeley, CA, USA
- Sacramento Street Somerville, MA, USA

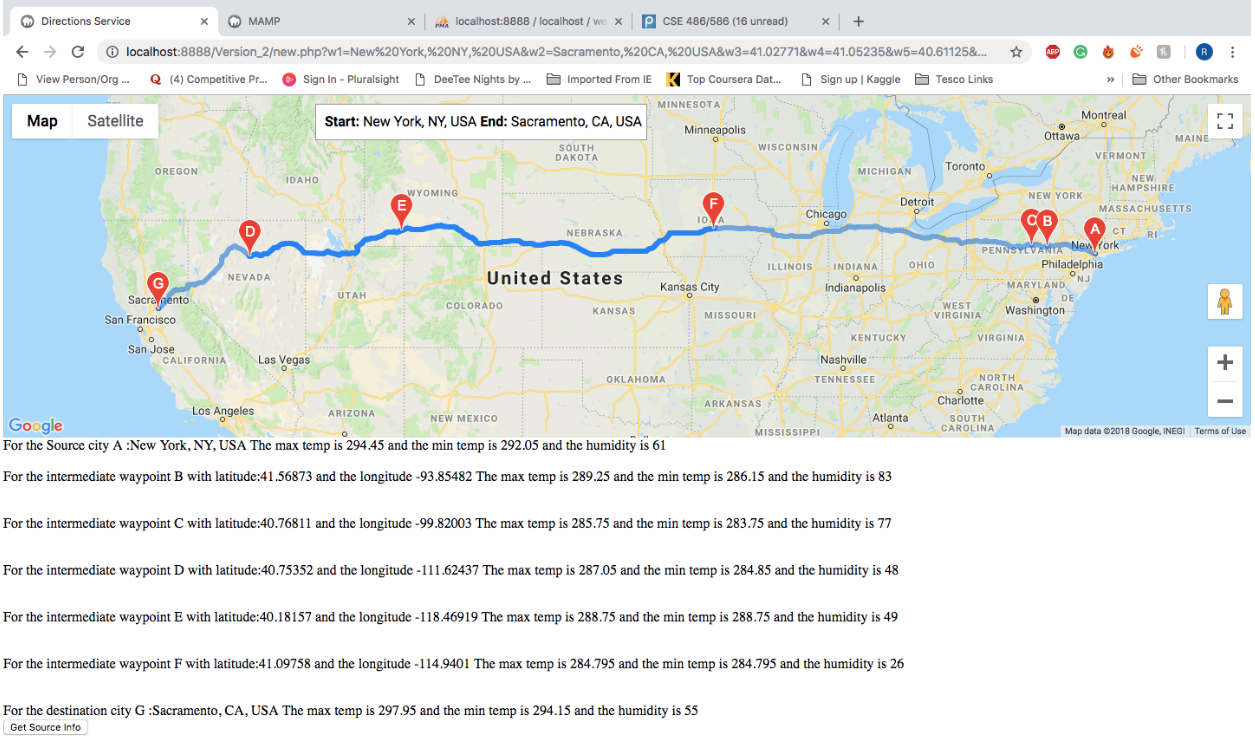
powered by Google

Output of this search is drawn as a route between the two cities. Filename: learning.php

File Name: learning.php


Directions Service
MAMP
localhost:8888 / localhost / we
CSE 486/586 (16 unread)
localhost:8888/Version_2/learning.php
Map
Satellite
Start: New York, NY, USA End: Sacramento, CA, USA
A
B
United States
Google
Map data ©2018 Google, INEGI
Terms of Use

File Name:new.php


Directions Service
MAMP
localhost:8888 / localhost / we
CSE 486/586 (16 unread)
localhost:8888/Version_2/new.php?w1=New%20York,%20NY,%20USA&w2=Sacramento,%20CA,%20USA&w3=41.02771&w4=41.05235&w5=40.61125&...
Map
Satellite
Start: New York, NY, USA End: Sacramento, CA, USA
A
B
C
D
E
F
G
United States
Google
Map data ©2018 Google, INEGI
Terms of Use

For the Source city A :New York, NY, USA The max temp is 294.45 and the min temp is 292.05 and the humidity is 61

For the intermediate waypoint B with latitude:41.56873 and the longitude -93.85482 The max temp is 289.25 and the min temp is 286.15 and the humidity is 83

For the intermediate waypoint C with latitude:40.76811 and the longitude -99.82003 The max temp is 285.75 and the min temp is 283.75 and the humidity is 77

For the intermediate waypoint D with latitude:40.75352 and the longitude -111.62437 The max temp is 287.05 and the min temp is 284.85 and the humidity is 48

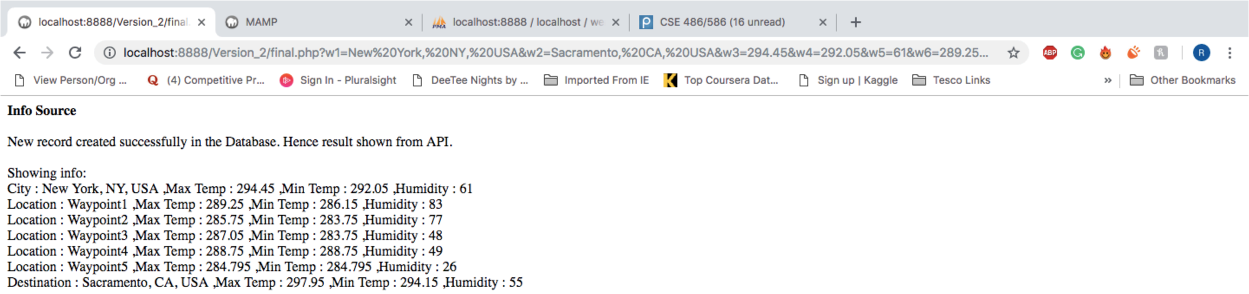
For the intermediate waypoint E with latitude:40.18157 and the longitude -118.46919 The max temp is 288.75 and the min temp is 288.75 and the humidity is 49

For the intermediate waypoint F with latitude:41.09758 and the longitude -114.9401 The max temp is 284.795 and the min temp is 284.795 and the humidity is 26

For the destination city G :Sacramento, CA, USA The max temp is 297.95 and the min temp is 294.15 and the humidity is 55

Get Source Info

To get the source of the info i.e from the API in this case press Get Source info button Filename invoked is final.php

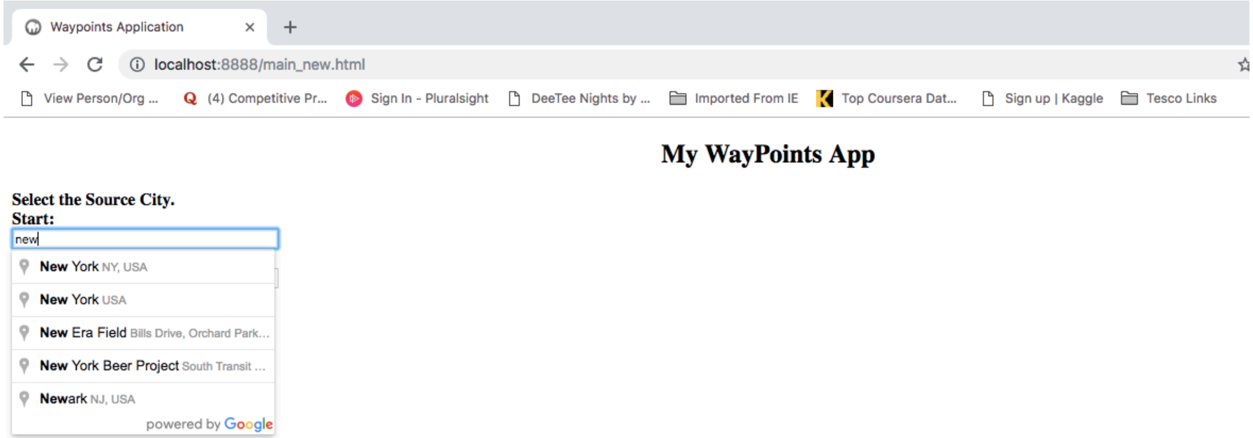

localhost:8888/Version_2/final
MAMP
localhost:8888 / localhost / w
CSE 486/586 (16 unread)
localhost:8888/Version_2/final.php?w1=New%20York,%20NY,%20USA&w2=Sacramento,%20CA,%20USA&w3=294.45&w4=292.05&w5=61&w6=289.25...
View Person/Org ...
(4) Competitive Pr...
Sign In - Pluralsight
DeeTee Nights by ...
Imported From IE
Top Coursera Dat...
Sign up | Kaggle
Tesco Links
Other Bookmarks

```
Info Source

New record created successfully in the Database. Hence result shown from API.

Showing info:
City : New York, NY, USA ,Max Temp : 294.45 ,Min Temp : 292.05 ,Humidity : 61
Location : Waypoint1 ,Max Temp : 289.25 ,Min Temp : 286.15 ,Humidity : 83
Location : Waypoint2 ,Max Temp : 285.75 ,Min Temp : 283.75 ,Humidity : 77
Location : Waypoint3 ,Max Temp : 287.05 ,Min Temp : 283.75 ,Humidity : 48
Location : Waypoint4 ,Max Temp : 288.75 ,Min Temp : 288.75 ,Humidity : 49
Location : Waypoint5 ,Max Temp : 284.795 ,Min Temp : 284.795 ,Humidity : 26
Destination : Sacramento, CA, USA ,Max Temp : 297.95 ,Min Temp : 294.15 ,Humidity : 55
```

Case2: When the source and the destination have already been searched before. Then the output is echoed from the Database.

The screenshots are as follows:

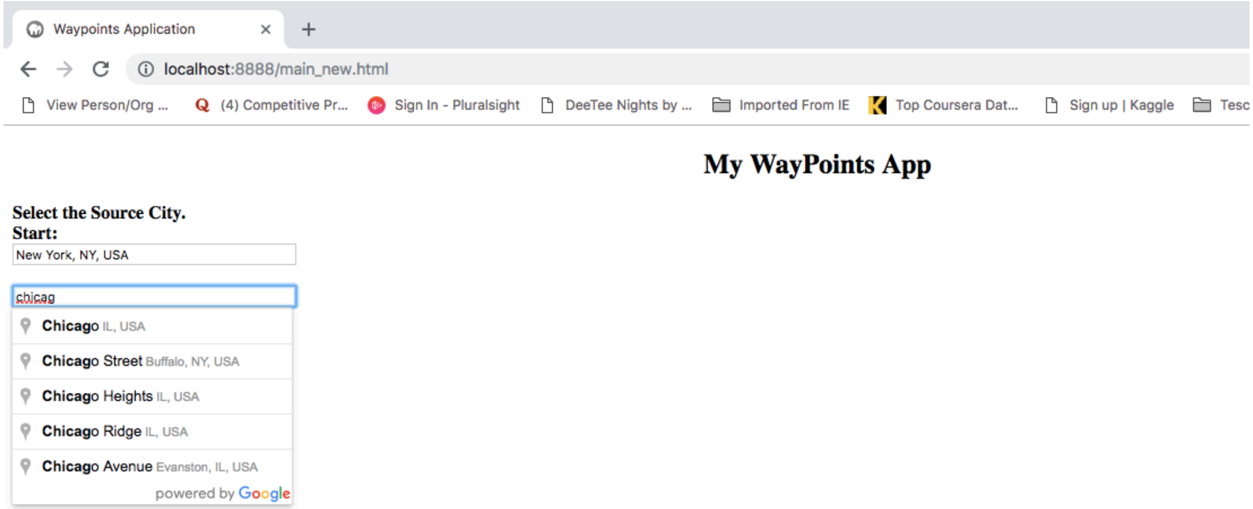
Main_new.html



My WayPoints App

Select the Source City.
Start:
new

ffile:learning.php



My WayPoints App

Select the Source City.
Start:

New York, NY, USA

chicag

- **Chicago** IL, USA
- **Chicago** Street Buffalo, NY, USA
- **Chicago** Heights IL, USA
- **Chicago** Ridge IL, USA
- **Chicago** Avenue Evanston, IL, USA

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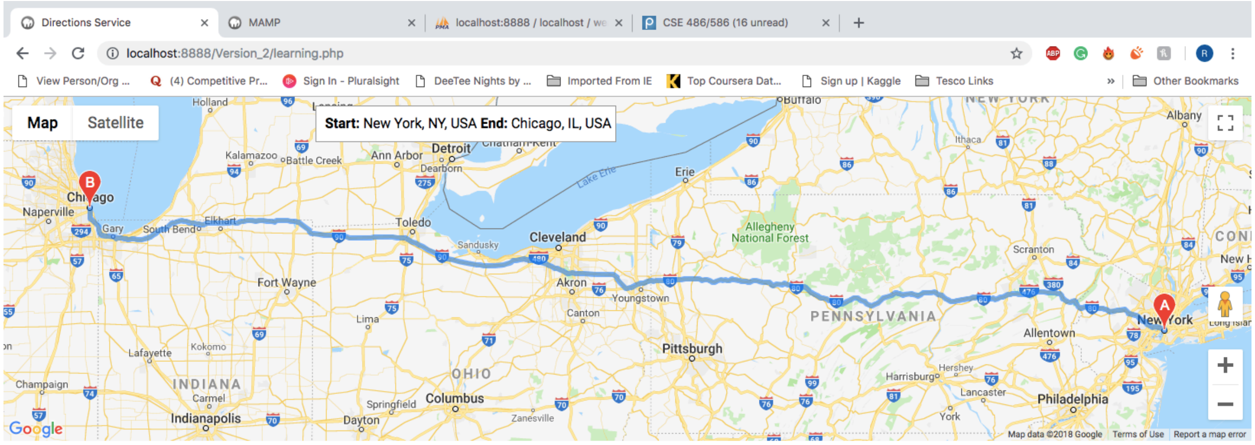
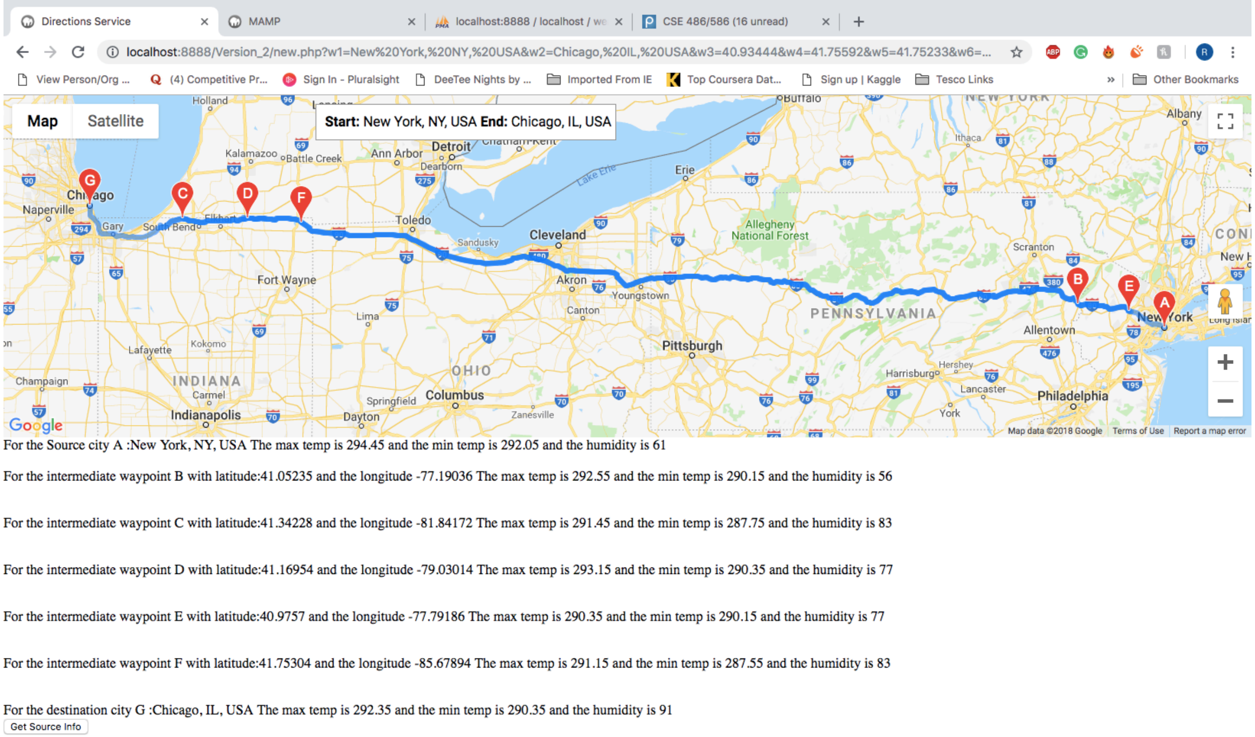
file name : learning.php



Start: New York, NY, USA **End:** Chicago, IL, USA

File name: new.php with the waypoint and the weather information.



localhost:8888/Version_2/new.php?w1=New%20York,%20NY,%20USA&w2=Chicago,%20IL,%20USA&w3=40.93444&w4=41.75592&w5=41.75233&w6=...

Start: New York, NY, USA **End:** Chicago, IL, USA

For the Source city A :New York, NY, USA The max temp is 294.45 and the min temp is 292.05 and the humidity is 61

For the intermediate waypoint B with latitude:41.05235 and the longitude -77.19036 The max temp is 292.55 and the min temp is 290.15 and the humidity is 56

For the intermediate waypoint C with latitude:41.34228 and the longitude -81.84172 The max temp is 291.45 and the min temp is 287.75 and the humidity is 83

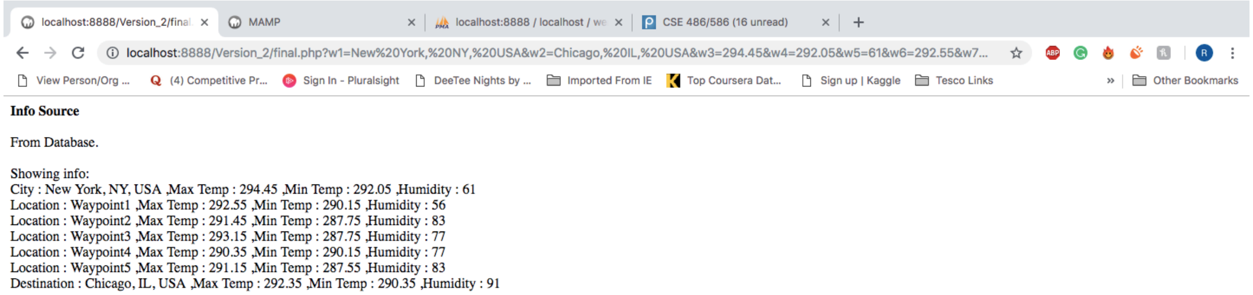
For the intermediate waypoint D with latitude:41.16954 and the longitude -79.03014 The max temp is 293.15 and the min temp is 290.35 and the humidity is 77

For the intermediate waypoint E with latitude:40.9757 and the longitude -77.79186 The max temp is 290.35 and the min temp is 290.15 and the humidity is 77

For the intermediate waypoint F with latitude:41.75304 and the longitude -85.67894 The max temp is 291.15 and the min temp is 287.55 and the humidity is 83

For the destination city G :Chicago, IL, USA The max temp is 292.35 and the min temp is 290.35 and the humidity is 91

Now from here to know the source of the weather info we will have to click on the button Get Source Info. This will run final.php filename.



localhost:8888/Version_2/final.php?w1=New%20York,%20NY,%20USA&w2=Chicago,%20IL,%20USA&w3=294.45&w4=292.05&w5=61&w6=292.55&w7...

```
Info Source

From Database.

Showing info:
City : New York, NY, USA ,Max Temp : 294.45 ,Min Temp : 292.05 ,Humidity : 61
Location : Waypoint1 ,Max Temp : 292.55 ,Min Temp : 290.15 ,Humidity : 56
Location : Waypoint2 ,Max Temp : 291.45 ,Min Temp : 287.75 ,Humidity : 83
Location : Waypoint3 ,Max Temp : 293.15 ,Min Temp : 287.75 ,Humidity : 77
Location : Waypoint4 ,Max Temp : 290.35 ,Min Temp : 290.15 ,Humidity : 77
Location : Waypoint5 ,Max Temp : 291.15 ,Min Temp : 287.55 ,Humidity : 83
Destination : Chicago, IL, USA ,Max Temp : 292.35 ,Min Temp : 290.35 ,Humidity : 91
```

Name of the file of the version 2: rajivranjan_cse586_project1_version2.tar.gz

3)Phase 3: (5%) Compare the two implementations of versions 1 and 2. Assign cost functions c1,c2, and c3 to the API accesses and the DB access. Discuss the saving achieved by version 2. This can be done in the project report.
Soln:
The solution of the two approaches can be compared in the following ways:
Let the cost of the following operations be as follows:

C1: cost of calling the automatic search when we enter the source and the location in the search boxes.
C2: cost of calling the location service api for getting the route between the two cities

C3: cost of calculating the waypoints and mapping it on the route
C4: cost of calling the api for getting the weather info

C5: cost of saving the weather info on the database

C6: cost of fetching the weather info from the database

Total cost for Version 1 is: C1+C2+C3+C4. Let it be T1.

Total Cost of Version 2: We have two cases:
Case1 : When a particular combination of source and destination cities are searched for the first time.
Cost : C1+C2+C3+C4+C5. Let it be T2.

Case 2: When a particular combination of source and destination cities are already searched for. Cost: C1+C2+C3+C4+C6. Let it be T3.

So in general cases T1=(C1+C2+C3+C4) **<** T3=(C1+C2+C3+C4+C6) **<** T2=(C1+C2+C3+C4+C5)

Cost of api hit is more than the cost of db hit.

4)Good design: (10%) Discuss the choice of technologies and UI details in your report. Comment you code appropriately. Provide a detailed design representation like figure 1, customized to your design and technologies.
Soln:
<u>Choice of technologies:</u>
Operating System Used: Mac OS
Frontend Technology Used: HTML, CSS, JavaScript, JQuery, Bootstrap
Backend Technology: PHP, MYSQL
Server Running: Using MAMP

API Used:
Google Maps: Autocomplete Feature: as you start typing in the name of the place suggestions are automatically shown and a drop-down menu comes up, name can be selected from there.

Google Maps: Direction Service, Routing Service
OpenWeatherApi: Search based on city name and the latitude and longitude of the place(waypoint)

UI details: Both the version1/phase1 and version2/phase2

For Both the version1/phase1 and version2/phase2 the starting point is page main_new.html This page has a master.css for its design and layout. I have taken a modular approach and divided the work based on the architecture given in the Project description into multiple different pages so that the output architecture shown below can look like what we have for the architecture of problem description.

1)main_new.html: it has two input boxes. Source and destination then a button named submit, which takes us to backend part for following below mentioned calculations.

2)learning.php: calculates the route between source and destination which is needed for calculating the waypoints, the output at this stage is shown as a route between source and destination on a google map

3)new.php: calculates 5 random waypoints (different every time) between source and the destination cities, then this information is sent to the openweather api for knowing the Max_temp, Min_temp, Humidity at the source city, destination city and the 5 random waypoints selected between the source and the destination city. The output is shown as a google map with markers for source, destination and 5 waypoints in between.

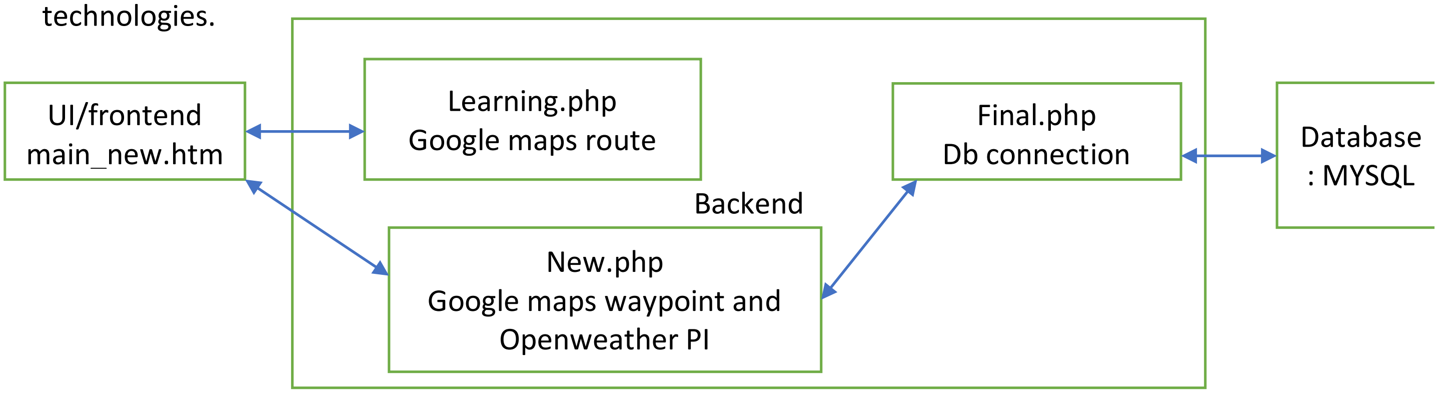
In text below we have the weather information from the openweather api. It has the source and destination city name, latitude and longitude for the 5 randomly selected waypoints and max_temp, min_temp and humidity information for the source, destination and 5 waypoints.

Extra in PHASE2/Version2:

3)new.php: In addition to what I have already mentioned above, there is a button called get source info which kind of shows us the database component of the 2nd phase of this project. When we click this button, it takes us to a new page:

4) final.php: this page shows the source of the weather info i.e. whether it came from api or database. If the database contains the info (search was made earlier) then it comes from the database, if it doesn't then it comes from the API. Then again the info that we show is city name, waypoint info and the max_temp, min_temp and humidity of these places.

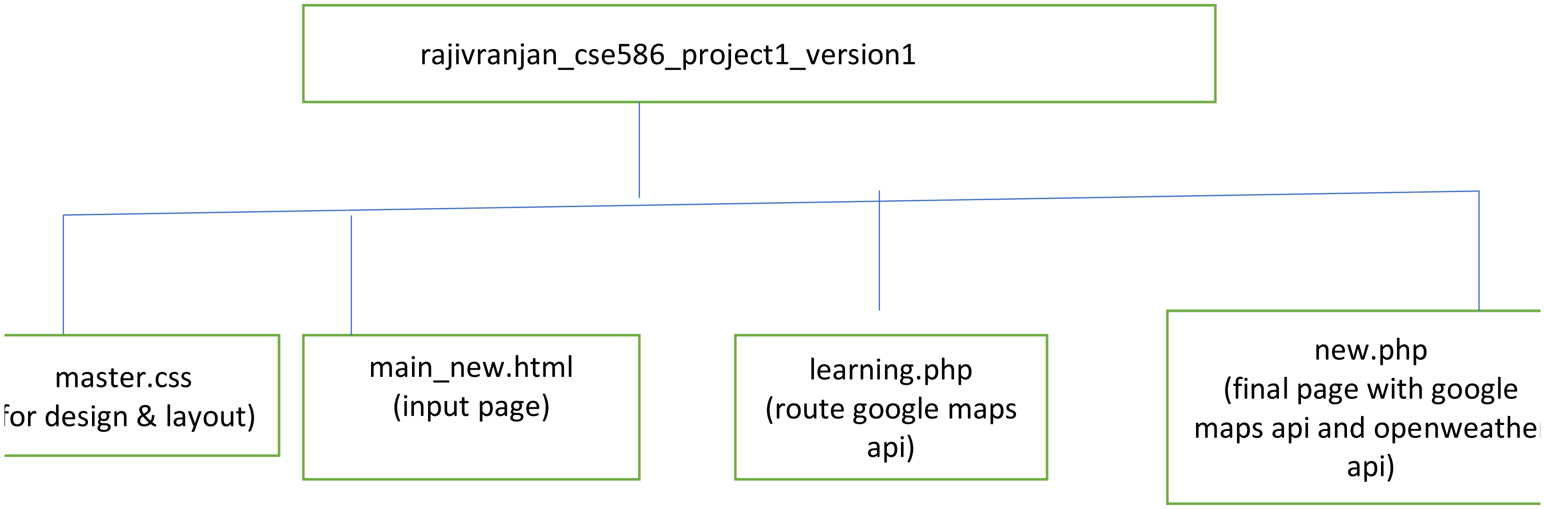
Provide a detailed design representation like figure 1, customized to your design and technologies.



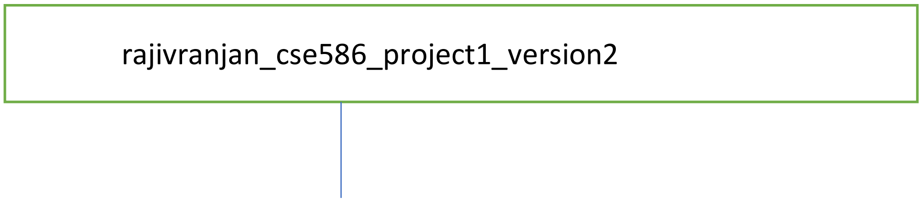
5)Directory structure and readme: (10%) Provide a readme file that provides details of how to run deploy and run your code. Feel free to include screen shots of a working application.

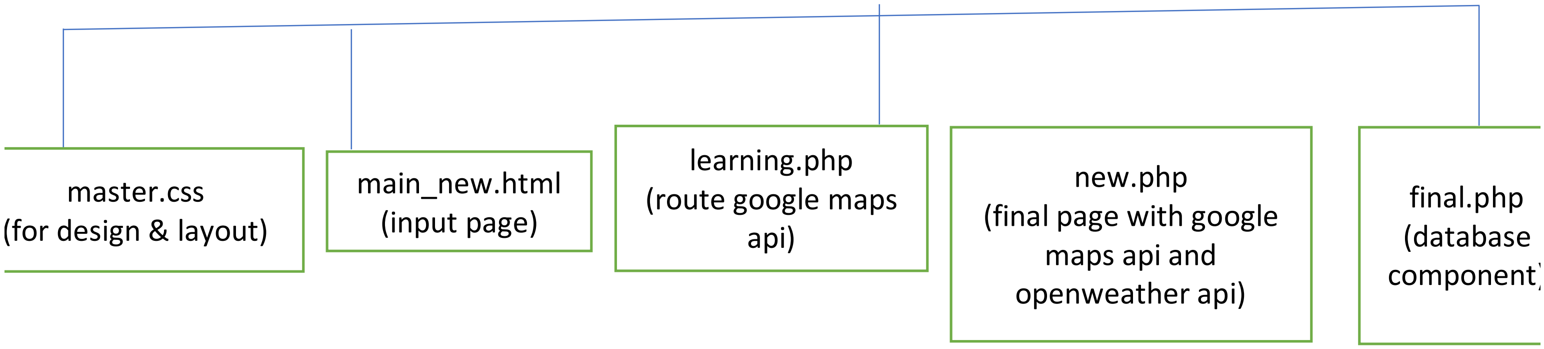
Soln: **The readme file is named readme in both the tar files.**
A common report file name rajivranjan_cse586_project1_report.pdf

Phase 1/Version 1
Directory structure:
Folder name: rajivranjan_cse586_project1_version1



Phase 2/Version 2
Directory structure:
Folder name: rajivranjan_cse586_project1_version2





Screen shots are already provided above with the explanation of Phase 1 and Phase 2.