

# Traffic Monitoring Service

Group No. 7

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### **Breakdown of Contributions**

All members contributed equally for this report.

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## **Customer Statement of Requirements**

Many Services that give information about traffic only account for current traffic incidents. The majority of these services collect and release data at certain intervals and then release their views of the current traffic concentrations. These services, such as those given by “Traffic.com” and “Yahoo! Maps Live Traffic” use this method to monitor traffic. These types of services are the most widely accepted in terms of traffic aggregation and information.

This project attempts to move away from this method of only using current traffic data to give information about traffic concentrations. If traffic data can be continually taken for long periods of time, the traffic trends can be shown for particular routes. This can be taken further as to collect the weather along the route and the time of day for each piece of data. This new method of traffic monitoring is important to understanding the trends that occur in traffic. Current traffic monitoring services only release incidents and congestions as they occur, which are not as useful to someone looking at the current traffic before leaving for their destination. With this service, the user would be able to see the projected traffic for the roads they intend to travel, and they can find the likelihood of traffic congestions in those areas. To supplement this traffic monitoring system, live traffic updates can be included as well. This can help to account for outliers in the traffic probabilities that are created. One of the main focuses of the project will be giving the user enough information to make the correct route choices for their situation.

While previous iterations of this project have only included highways in New Jersey, we intend to extend the scope of the service to the entire Tri-State area. This area includes New Jersey, New York, and Pennsylvania. This change was made to cater to the expected users of this service. Many people who live in the Tri-State area have to travel to other areas or states for their jobs or schools. Therefore the primary users of this service are expected to be commuters. Temporary visitors, such as tourists would not necessarily find meaning in historical traffic data. However, commuters travel the same route many days a week, and they benefit the most from possible route improvement. The time spent using this service will easily be offset by the amount of time the commuter will end up saving with an improved route.

There are several major scenarios that we consider this traffic monitoring system to be useful. The most important scenario is for the user to be able to monitor traffic on major highways during rush hour. By allowing the user to view previous traffic data, the user can make plans for an alternate route, or to find a time where traffic is at a minimum. Another useful scenario is allowing the user to decide which highway to use under certain weather conditions, time of day, and day of the week for road trips or other planned drives. The user can plan ahead for longer drives and achieve minimal traffic through the use of observing traffic history. A final and more interesting use would be to use the traffic history data to observe if road infrastructure can be improved. Through the collection of traffic incidents, the number of damaged highways could be recorded. Similarly, if a certain area sees constant congestions, a recommendation could

be made to either widen the highway or create an alternate route to move drivers away from the congested areas. The traffic monitoring service has many possible applications.

The desired traffic monitoring service will have multiple ways of viewing the traffic predictions. One of the methods should be to view the traffic projections by state. This should allow the user to view the traffic concentrations in their state, so that the user can avoid the roads that typically have traffic in their local areas. This allows the user to see in a broader scale the traffic concentrations that typically occur in the areas they regularly travel. This process is outlined below:

- (1) “Traffic reports within an area” – the user is given the following choices:
  - (A) “Select target area”
    - a. New Jersey
    - b. New York
    - c. Pennsylvania
  - (B) “Time”
    - a. The user can choose from intervals of one hour
  - (C) “Type of day”
    - a. “Weekday” – The traffic projections for Monday to Friday are shown
    - b. “Weekend” – The traffic projections for Saturday and Sunday are shown
  - (D) “Show Live Traffic” – The map will display the current traffic conditions in addition to the projected traffic. The current traffic conditions will have some way that they can be differentiated from the traffic projections.

Another method of viewing traffic reports will involve showing the traffic incidents along a route of the user’s choice. The user will be able to enter a starting point and a destination, and the service will consult a directions service, such as Google Maps or Mapquest in order to find the fastest route. This route will not consider the traffic projections initially, and it will show the user the expected traffic along the given route. The service will ideally be able to suggest routes that avoid areas with a very high projected concentration of traffic. This will allow the user to find an ideal route with minimal exertion. This process is outlined below:

- (2) “Traffic reports along a route” – The user will be able to view traffic along a route
  - (A) “Enter Route” – The user will have two text boxes in which to enter their starting location and destination. The service will display the path of the route on the GUI
  - (B) “Time”
    - a. The user can choose from intervals of one hour
  - (C) “Type of day”
    - a. “Weekday” – The traffic projections for Monday to Friday are shown.
    - b. “Weekend” – The traffic projections for Saturday and Sunday are shown

(D) “Show Live Traffic” – The map will display the current traffic conditions in addition to the projected traffic. The current traffic conditions will have some way that they can be differentiated from the traffic projections.

This method behaves similarly to the first method, but its main function is to allow the user to observe the expected traffic along highways. Commuters generally have to travel along several highways to get to their final destination, and this method will show display the route along with the expected traffic concentrations of the highways they will have to travel on. This can be enlightening information to the user, who might find out that they have been taking a highway that has a substitute with a much lower traffic concentration.

The above descriptions describe the user accessible front-end of the traffic monitoring system. The back-end of the system is comprised of the “Weather collection” and “Traffic collection” services. These services will collect data on weather and traffic conditions, will parse the information into a database, and will perform analyses that can be used to show the traffic projections on the front-end. These back-end services are only accessible by the administrator. The users will not have access to the collection service databases.

The “Weather Collection” provides the following function: it provides the weather along a certain highway, and it gives the time that the weather occurred. This service will update along a time interval of the administrator’s choosing. The weather data will be retrieved through a weather forecasting service such as “Weather.com.” This collection service will be able to retrieve data only specified highways and areas, and the data will be able to be used in conjunction with the “Traffic collection” service to allow the user to observe traffic patterns in different types of weather.

The “Traffic collection” service provides similar functions to the “Weather collection” service. It retrieves data from traffic incidents or congestions and records it in a database. This service will also update at a specified time interval of the administrator’s choosing. This data can be taken from live traffic monitoring services, such as “511nj.org” or “Traffic.com.” The service should update every time interval, making sure that it only records new traffic incidents, as multiple instances of traffic incidents would cause false positives to affect the traffic projection algorithms. The traffic and weather collection services can run in parallel in order to achieve a more accurate prediction of future traffic.

In addition to the version of the traffic monitoring service that the users can access on their computers, there should also be a mobile component to the service. The mobile component of the traffic report system should allow users to use the system on the go. The mobile application needs to offer the user the ability to get traffic reports on the go. This will expand the portability of the system and allow the user to get traffic updates no matter where they are. The app should also allow users to share their current traffic status. This will increase the accuracy of traffic predictions and allow future users to get a more accurate reading of their current traffic situation. The application should focus on simplicity and ease of use as the user will most likely

already be travelling. The phone should automatically collect any the data the user does not need to explicitly provide.

The primary function of the mobile application should allow the user to get a traffic report on the go. The user should just need to enter their destination and allow the application to automatically collect the rest of the required information. This data should be sent to the web system and be processed as if a user of the web service had just entered those parameters. The report should then be returned to the user's smartphone and be presented in a clear manner.

Next, the user should be able to send their current traffic status to the database at any time. The accuracy of the database is limited to information pulled from online sources. The addition of real time updates would increase the accuracy of all future traffic conditions. If the user has found a road with high traffic intensity they should be able to warn future drivers. A simple radio button selection should allow the user to select their traffic intensity and have it be sent to the database with one button. Limiting the traffic intensity to a few selections will aid in quantifying the data for analysis in the database.

The mobile component of the system will expand the functionality of the entire system. The system will now be available to users on the go from their smartphones. Now if a user does not have access to a computer or has suddenly changed their route they will be able to access the system remotely. Furthermore, the addition of real time traffic updates will greatly increase the accuracy of the system. If a user has encountered heavy traffic, they can send a report to instantly update the database. Future users of the system, using either the mobile app or the website will have a more accurate traffic report.

## **Glossary of Terms**

*Administrator* - Someone who oversees the website and is responsible for overseeing the data intake and manipulation

*Current Traffic* – Traffic that is currently stored on the *Traffic Service* websites at the time the user is utilizing the traffic monitoring service. This data is concrete, and describes the known conditions of traffic at the moment

*Database* - server or entity that will contain user data, traffic information, and weather information

*Developer* - Someone who is involved with creating the website's front-end and its back-end

*Dropdown box* - Box with dropdown options that cannot be changed, only selected

*Graphical User Interface (GUI)* – A type of interface that allows the user to interact with the graphical components, including buttons, dropdown menus, and any maps that appear

*Mobile application* - Software for an Android smartphone that is available to all users of the traffic system.

*Mobile application user* - Someone who will use the mobile app

*Mobile device* - A device that is meant primarily for mobile use, including tablets and smartphones

*Mobile friendly site* - site which is easier to navigate on a mobile device

*Radio Button* - A family of buttons from which the user can select their traffic intensity.

*Text box* - Open text box for which letters and numbers can be typed in

*Traffic Service* – A website or web service that contains traffic data that can be collected, parsed, and stored into a database

*Weather Service* – A website or web service that contains weather data that can be collected, parsed, and stored into a database

*User* – A person who intends to use the traffic monitoring system to access historical traffic data



## **System Requirements**

### **Functional Requirements:**

<b>Identifier</b>	<b>PW</b>	<b>Requirement</b>
REQ1	5	The system's interface shall allow the user to select pre-populated options for traffic history based on time, area, and weather.
REQ2	4	The system's interface shall include text boxes in which the user can input their starting location and destination for directions.
REQ3	3	The system shall allow the user to view any part of the map and zoom in and out of different areas.
REQ4	5	The system shall pull data from various traffic sites (511.nj.org, google.maps.com, mapquest.com, and others) to be stored in the database.
REQ5	5	The system shall pull data from weather sites every 1-6 hours.
REQ6	5	The system shall have a mobile app with capabilities similar to that of the website version of the traffic monitoring service
REQ7	5	The system shall collect user data from the mobile app

### **Non-Functional Requirements:**

<b>Identifier</b>	<b>PW</b>	<b>Requirement</b>
REQ8	2	The system shall provide a non-cluttered, user friendly, easy to understand web page.
REQ9	4	The system shall display Google Maps' suggested route as well as the suggested route to take based on traffic history.
REQ10	2	The system shall provide a mobile friendly website which can be viewed on a mobile device.
REQ11	5	The system shall use an algorithm which determines the intensity of traffic.
REQ12	2	The system shall have preferences for route such as toll roads.
REQ13	4	The system shall allow the administrator to control the frequency and time of data gathering scripts.
REQ14	4	The mobile application shall provide a traffic history report and any current traffic in the user's current area.

### **On-Screen Appearance Requirements:**

<b>Identifier</b>	<b>PW</b>	<b>Requirement</b>
REQ15	5	The system shall use a display containing the Google Maps interface.
REQ16	4	The system shall have a concise and simple mobile app GUI similar to the website version of the traffic monitoring system

## Illustration of REQ15

# Google Maps Interface

Time:

Weather:

Day of Week:

Show Live Traffic Data: Yes ☐ No ☐

Radio Buttons

Starting Location:

Destination:

Avoid Tolls: Yes ☐ No ☐

Radio Buttons

Get Traffic History:

## Illustration of REQ16

# Google Maps Interface

Time:

Weather:

Day of Week:

Starting Location:

Destination:

Avoid Tolls: Yes ☐ No ☐

Radio Buttons

Get Traffic History:

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5. Yahoo! Live Maps. <maps.yahoo.com>.
6. View Traffic Reports. <traffic.com>.