Alternate Routes:

Navigation Applications, Trips, and Local Roads

Integrating Waze TrafficView Tool data into DOT and TMC Planning and Operations to understand where navigation apps are sending drivers, which streets, and when

The Eastern Transportation Coalition
5000 College Avenue
Suite 2200, College Park, MD 20742
https://tetcoalition.org/

Prepared by

Brendan Kaplan

Principal, ABKI Inc.

www.abkiinc.com

Introduction

Traffic Management Centers (TMC) are increasingly faced with questions from local government, community, and activist stakeholders regarding the local routes that traffic takes when mainline routes become congested. This whitepaper presents DOTs and TMC operators with a high level strategic concept and technical instruction on how to use Waze's *TrafficView Tool (TvT)* and integrate its data with DOT and TMC data systems to create insights about:

(1) **When** traffic becomes so congested that 3rd party navigation applications direct drivers onto *alternate routes*, (2) **Where** those *alternate routes* are located and, (3) **What** qualities the *mainline routes* and *alternate routes* have in terms of distance, travel time, speed, congestion, and traffic jams.

While this paper is not exhaustive, a creative coder or code-savvy Traffic Operations specialist should be able to follow along and build a proof-of-concept system in roughly 40 - 60 hours, and a full-fledged v 1.0 Application in 45 – 120 days. For questions, please contact the Eastern Transportation Coalition.

About

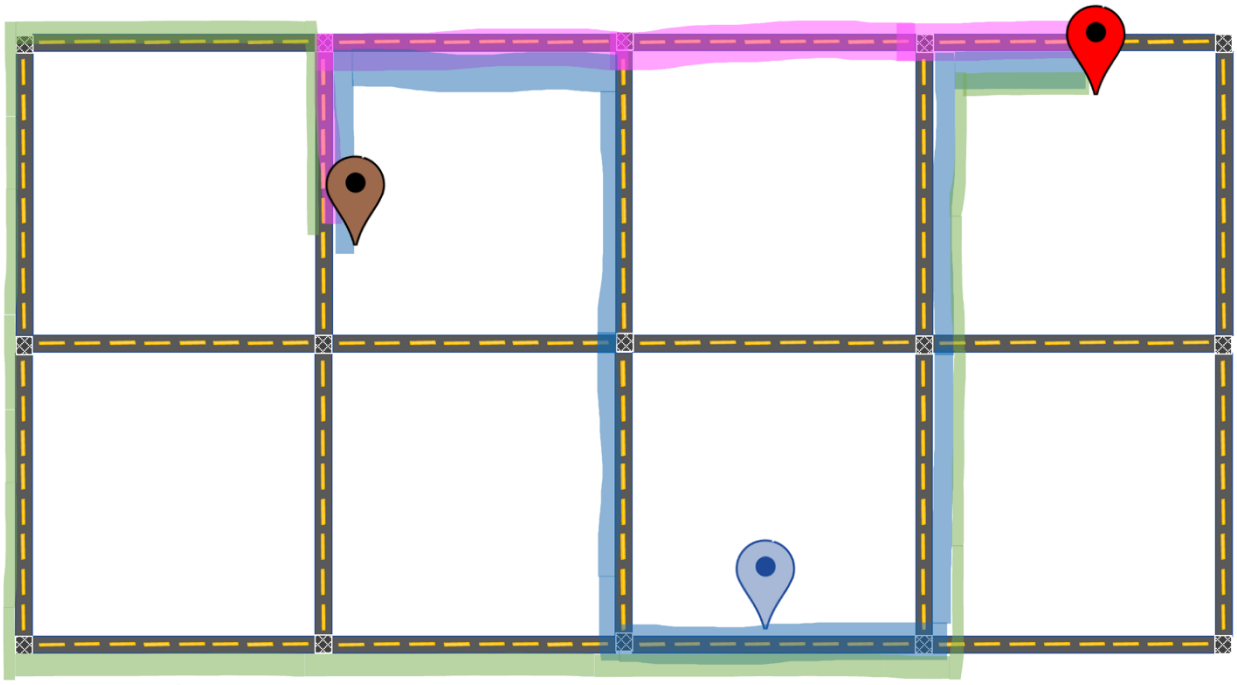
This whitepaper is authored by Brendan Kaplan, on behalf of The Eastern Transportation Coalition (TETC). Brendan Kaplan is a special consultant to TETC and a subject matter expert on the use of navigation applications to connect DOTs and TMCs to the drivers they serve in order to improve situational awareness, improve driver routing, prevent and manage incidents, and support capital plan delivery.

TETC is a partnership of 17 states and D.C. focused on connecting public agencies across modes of travel to increase safety and efficiency. Formerly the I-95 Corridor Coalition, TETC represents the world's second largest economy and nearly 40% of the nation's GDP. TETC brings its members together through virtual workshops, peer-to-peer exchanges, working groups, training, research and demonstration projects. The Coalition strives to keep its members at the forefront of industry innovation through participation in transformative technology, adoption of best practices and unique professional development opportunities.

Overview

Routing

Generally speaking, 3rd party navigation applications including Waze serve drivers routes that takes the least amount of time to traverse. A route is defined as the pathway between the location that a traveler begins their trip (known as the *origin*) and the location that the traveler ends that trip (known as the *destination*). Some routes also include one or more locations that the driver has selected to traverse in between the origin and destination (known as *waypoints*). Each portion of a route is known as a *leg*.



Origin [ ], Destination [ ], and Waypoint [ ], with Shortest Route [ ], Waypoint Route [ ], and Alternate Route [ ]

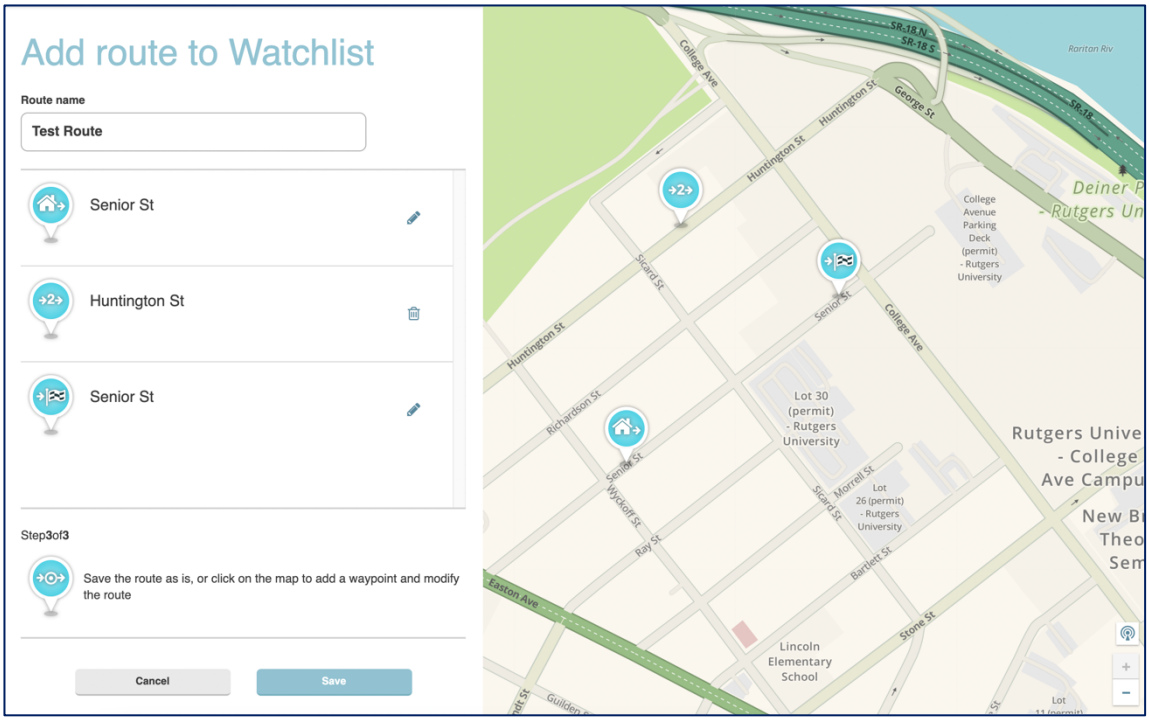
Waze serves drivers the *Shortest Route (SR)* in terms of time between their *Origin* and *Destination*. When a route becomes congested the application will serve a new '*Alternate Route (AR)*' that routes around congestion using other roadways that have lower overall travel times. Of course, if a route contains a *Waypoint*, then Waze will serve the driver a route that includes it, called a *Waypoint Route (WR)*.

In other words, if a driver selects an origin and destination pair, Waze will give the driver the *Shortest Route (SR),* and if there is sufficient congestion such that an *Alternate Route (AR)* takes less time the driver will be given that route instead. If a route has a *Waypoint*, the driver will be given the shortest route between the origin, and the waypoint, and then another shortest route between the waypoint and the destination, collectively the *Waypoint Route (WR).* Waze will present drivers with instructions as they navigate each leg.

TrafficView Tool

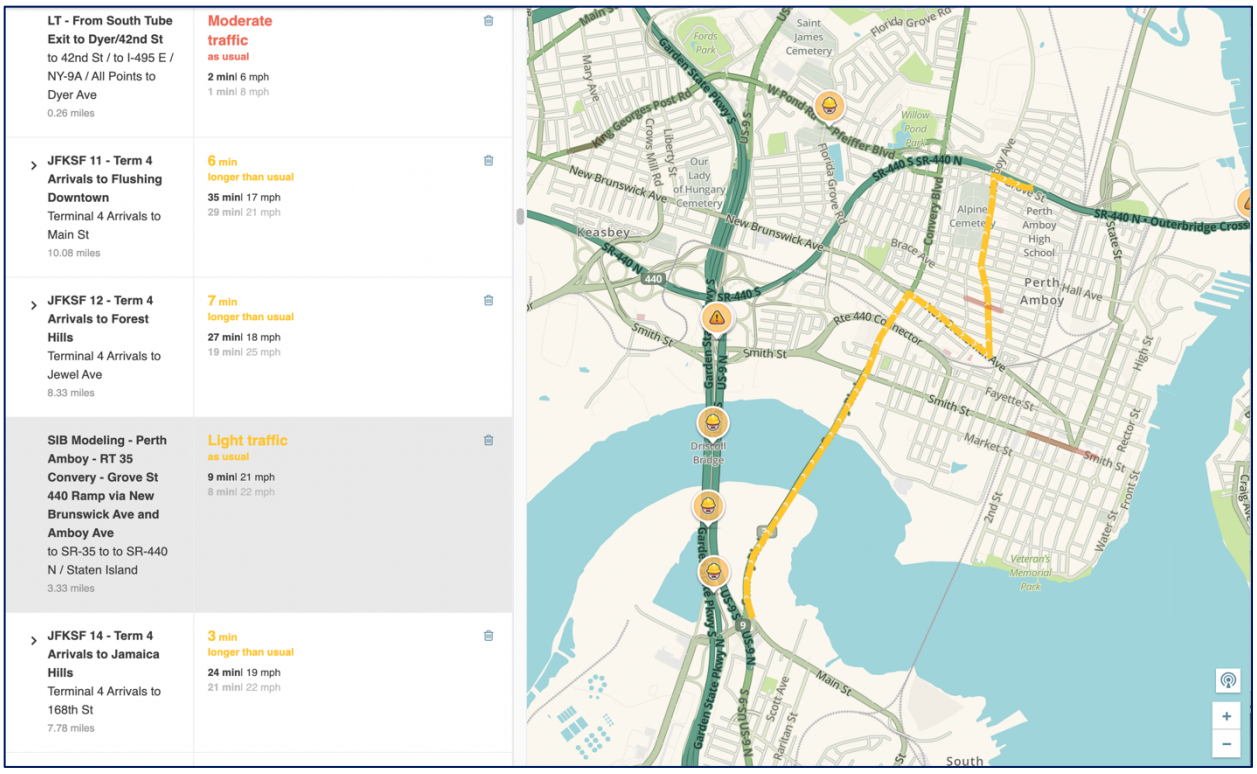
Waze's TrafficView Tool (TvT) is a graphical user interface (GUI) that lets members of Waze's 'Waze for Cities' program measure various aspects of routes that users can define. Staff with access to the program are able to use Waze's GUI to create routes to measure by giving them a **name**, as well as an **origin, destination,** and to set any **waypoints** they wish. Once routes are created, Waze displays the routes on a side-by-side list and map.

Waze TrafficView Tool 'Add Route' Screen



Waze TrafficView Tool interface main view showing user in New Brunswick, NJ adding a new route, including Name, Origin, Destination, and a waypoint. User clicks in order of (1) Origin (2) Destination (3) Waypoint

Waze Traffic View Tool - Alternate Routes



View of a previously entered route, highlighted in grey (left) and displayed on map (right).

Waze also measures and exports (via JSON and XML) a multitude of data about the various real time conditions of the roadway including: **alternateRoute, measurement timestamp, location (geoJSON conforming), distance**, **time to traverse, delay**, and **jam**. Users are able to receive data about the conditions for each leg of each route, and save it to a data environment of their choosing. The **timestamp** is a date and time pair. The location is written as **line**, "line": [{"x": -74.006321, "y": 40.722572 }, { "x": -74.006582, "y": 40.722752 }], which represent the endpoints of the line in GPS and corresponds to each leg of a trip. **Distance** is the length of the leg in meters, and **time** (to traverse) is seconds. Speed is calculated via D/T = meters per second. **delay** is the difference between **historicTime** (which is avg. time) and current time expressed as a percentage, and **jam** is the difference between current time and time at free flow conditions. An important distinction for this dataset is that it's possible to have a high **jam** and low **delay**, because a route can be congested but not delayed because it is regularly congested. **alternateRoute** appears when Waze is sending drivers off the mainline route, and contains all the same fields as children of the **alternateRoute,** which is itself a child of the route ID.

The Solution

A user can take advantage of the way Waze is architected and the various aspects of its TrafficView Tool (TvT) to understand when and where traffic is being routed when traffic becomes congested, by creating a route to be measured for congestion, the *measured route (MR)*. Users derived insights by comparing two *origin and destination pairs* at the start and end of the measured route: one with a simple *origin* and *destination* for the measured route start and finish and no enforced directions, the ***Dynamic Route (DR)***, and the other with the same *origin and destination pair*, but with a *waypoint* set along the *measured route* itself.

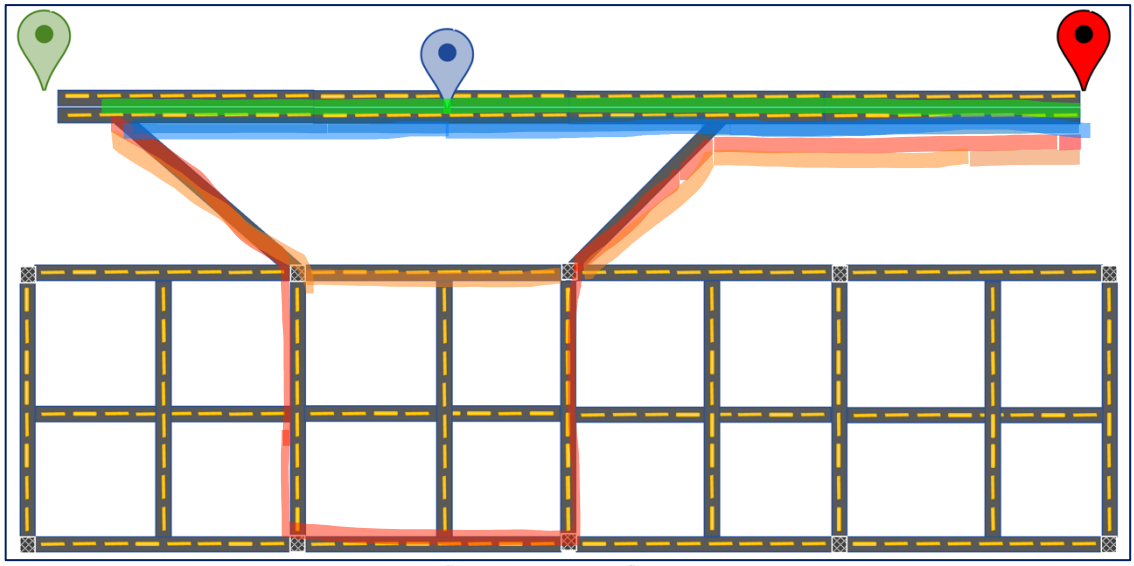


Fig 5. Origin [ ], Destination [ ], and Waypoint [ ]

If congestion becomes heavy enough on the ***Dynamic Route (DR)***, then it will be the case that Waze will direct traffic down the ***Dynamic Alternate Route (AR)***. Waze will continue to update the ***Dynamic Alternative Route*** as traffic builds up. In that case the TrafficView Tool Feed will stop passing data about the *MR* and instead pass the *AR*. However, with the ***Waypoint Enforced Route*** also being measured, no matter how bad traffic gets Waze will always supply data about the conditions on the ***Measured Route***, with no *Alternative Route* measurements supplied.

The following table is a simplified, pseudocode example of the output that Waze will provide for the *measured route* depicted above. It consists of two tables, one for each route in the pair, the ***dynamic route*** and ***enforced waypoint*** route. Ignore the 'Delay' and 'Jam' attributes for now.

Dynamic Route

Timestamp	Distance	Time	Delay	Jam
T1	2200	60	0%	0
T2	4400	80	40%	1
T3	5000	100	50%	1

Waypoint Route

Timestamp	Distance	Time	Delay	Jam
1	2200	60	0%	0
2	2200	90	10%	2
3	2200	120	10%	4

At T1, because there is no traffic, Waze is sending travelers from the origin and destination on the fastest possible route. Thus the waypoint route, which forces Waze to send drivers down the measured route, and the dynamic route, which sends drivers down the fastest route are the same, with the same distance (2200) and time (60).

However, at T2, because traffic has begun to build up on the measured route, the time for the waypoint route (90) is higher than before, and it is now possible for drivers to obtain a shorter time (80) from *origin* to *destination* by using an *alternate route* that takes advantage of capacity elsewhere on the network. Thus, for the *dynamic route* trip Waze calculates and servers the driver this *dynamic alternate route*, because it has a lower time (80 < 90) from *origin* to *destination.* The dynamic alternate route has a different distance (4400) as well, because it is no longer just telling drivers to use the main road, but is using turns through other streets to find the quicker path, while the *waypoint route* keeps the same distance (2200) because it is enforced along the waypoint.

At T3, traffic continues to build up along the *waypoint route* leading to even higher travel times, but has also built up along the original *alternate route* that Waze used for the *dynamic alternate route*, causing Waze to calculate a new *dynamic alternate route* that, while slower than the previous dynamic *alternate route* (80) still has a lower travel time (100) than the *waypoint route* (120).

With this information in mind, the following rules can be applied to "two pairs of the same origin and destination, with one having a waypoint and one being left dynamic", and will yield an understand what is happening in a road network.

1) If DR ≥ WR, then no alternative route is being served to drivers.

2) If DR < WR, then an alternative route (AR) will be served to drivers.

Solution Implementation

A DOT or TMC can create historical logs of routes they wish to measure, with timestamped occurrences of when traffic is directed onto alternative routes and what those routes are. In order to do so, the realtime data that is viewed in the Waze TrafficView Tool must be stored in a location. Once connected to the feed, users will need to architect tools that can store the feed, parse the elements of the feed, and visualize the feed.

Regardless of what architecture one uses, the feed will begin sending information about the routes TMC/ DOT staff have entered in the TrafficView Tool. Store all the data that comes in about routes in a standard table that is on scalable infrastructure. The feed comes in every 2 – 5 minutes. There are a number of fields that the feed will deliver, which should all be stored. There are many use cases for these, and it's not possible to retroactively get data from the past. While this paper presents information on detecting alternate routing, there are many other opportunities for measuring travel speeds, routes, and congestion, jams, and doing historic traffic comparisons to understand crashes, construction or other disruptions. Store the data. It's also important to ensure that all of the data for each route is stored as a child of that route, which can be resolved to an ID (the field is stored in the feed as *id*, and all terms are basically plain English).

Solutions engineers will want to work with their TMC and DOT leaders to best make use of the data, but the following steps provide a skeleton of what to do to produce a basic application.

1) Save data to table of choice.

2) Then, let the user identify which **pair of routes (aka 001 & 002)** they are using to represent the Dynamic Route, and the Waypoint Enforced Route. (Remember, Waypoint Enforced should contain waypoints used to snap traffic to the route they want to measure, and Dynamic Route should only contain an origin and destination.)

3) Write a function that stores the route time in a new data object we will use to resolve the two feeds (Obj1). Let the structure of Obj1 mirror that of the Waze Feed, however, add a column that indicates if data is coming from LR or WR (causeType), and a column that indicates whether more scrutiny is needed for data cleaning (matchCheck).

4) Write a function that checks if DR time < WR, and if True, writes the contents of the AR feed to Obj1, and if False, writes the contents of WR to Obj1. When DR < WR, set causeType to 'alt', and when DR > WR, set *causeType* to 'main'.

5) Write a function that checks for the **alternateRoute** field, and for timestamps at which it appears, check if DR < WR = True. If **alternateRoute** appears and DR < WR are both true, copy **alternateRoute** data to Obj1 as a child object. If **alternateRoute** appears, and DR ≥ WR, then flag those timestamps for scrutiny later using matchCheck.

6) Use a library or tool of choice to render a line chart for the contents of Obj1, using Timestamp for the X-Axis, TravelTime for Y-Axis. Set the color of the line from green → red depending on *delay*.

7) Select one thickness for the line when the *causeType* is *alt* and another for *main*. This allows those reading the graph to understand when an alternate route is being used.

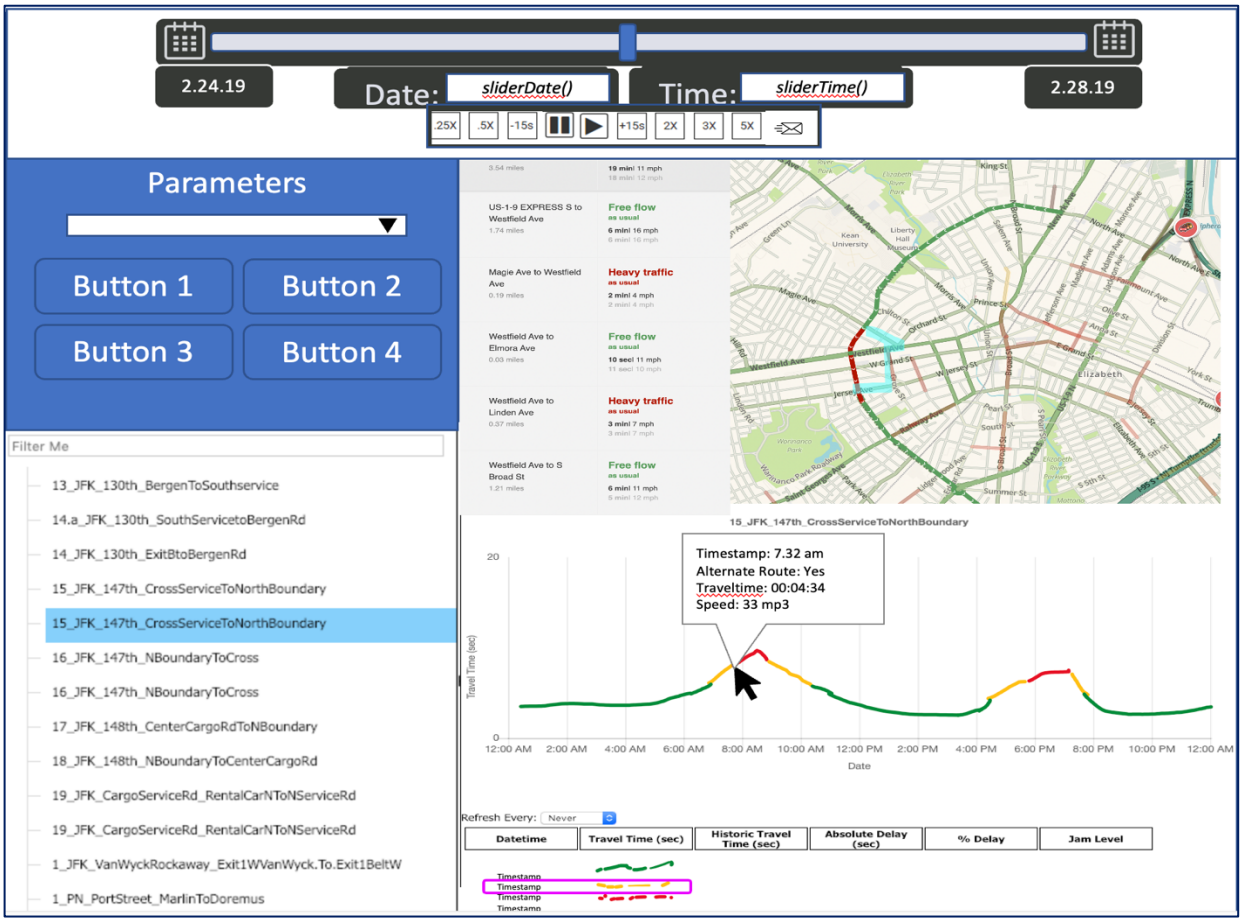
8) Plot the time series data and graph data onto a map, using the geoJSON written into the *line* field of the Waze feed. This lets the user see where each route is.

9) Provide basic autofilters in a dropdown: Show only timestamp entries that have an alternate route + map them, show only timestamp entires that have alternate route and jam level >2 + map, etc.

10) Provide mouseover function for map so that quick info is showed when various relevant elements are hovered by the mouse.

Waze Traffic View Tool - Alternate Routes

Of course, others systems will look as different as the libraries used to render their graphics, but the below is a mockup combining all the elements contained in the feed.



The user can click on different routes and see them on the map, and in the graph. The user can see if an alternate route is being given to drivers and where (turquoise), by use of the DR ≠ WR and the **alternateRoute** fields in the feed. The user can set the start and end time of the graph at the top of the screen, and the user might employ the dropdown menu or buttons to filter valid parameters, for example, causing all times where an alternate route is used to show up bigger in the graph and highlighted on the map, or asking the program to set the start and end times of the graph to autocenter times when alternate routes are shown. Regardless of what features one builds, the basic premise of the tool is simple: check the feed for two different trips with the same origin and destination, plot the trip line on a map, and the parameters on a graph, with a user interface linkage between the two. Create a concept of operations that lets staff take advantage of the insights generated using alerts, flags, report writing, etc.

Conclusion

This paper has discussed use of Waze's TrafficView Tool to define routes on a Graphical User Interface based map tool that Waze provides, access a feed that provides information about those routes, store data from the feed in a time series database, replot the geographic aspects of the data onto a map, and suggested ways to provide analytics and intelligence on the nongeographic aspects, or run other operations such as trigger alerts for TMCs based on specific conditions contained in the data.

Success in this domain involves much more understanding on what questions a particular TMC or DOT needs to ask than what computer code needs to be typed to answer questions. Understanding the different stakeholders that are asking questions, and what logical construction of data types (eg. If DR < AR, then local streets are being used) will answer them.

Inspiration for what insights need to be generated can be found by discussing questions of the day with a Chief Traffic Engineer to understand what traffic conditions and postures need to be monitored and acted upon, and determining if the CTO would be able to produce better results if they had data about local routing. Also valuable to consult is the TMC Director or Planning Director, who will know what realtime and long term data is being collected by the operation, and therefore what gaps these feeds and tacit insights will augment, supplement, or buttress. Additionally, communications leaders such as Press Secretaries, Chief Communications Officers, and Traffic Media Coordinators, will often have ideas about how to use these available insights to improve their communication with the public. Finally, government relations stakeholders can also benefit from better understanding how roads (and jurisdictions) are moving traffic to and from each other.

This paper provides a starting point that can be built quickly and act as a catalyst for further innovation, as well as be integrated into future work. TMCs and DOTs should begin here and then iterate the insights sought and interfaces for querying and displaying data. For additional specs on feed structure, please see the appendix, and for further questions or information, please contact The Eastern Transportation Coalition.

Appendix –

Waze for Cities Hub:

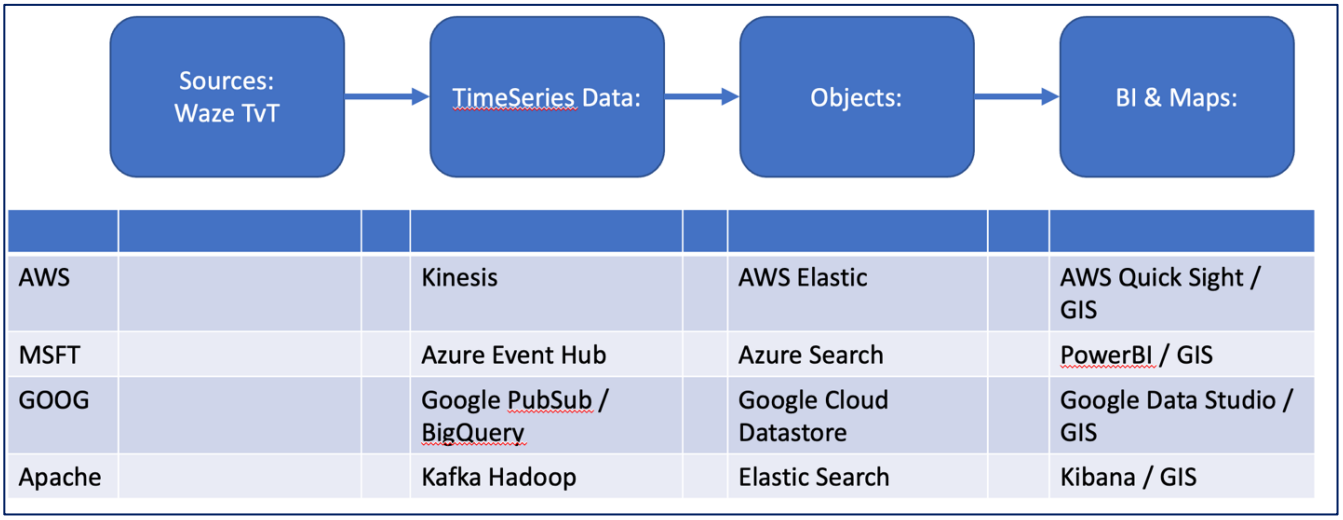
https://www.waze.com/partnerhub/

Waze TrafficView Tool:

https://www.waze.com/trafficview

Sample Architectures:

Here are some examples of architectures you can use to store the data. Those who want more information can reach out to The Eastern Transportation Coalition.



AWS			Kinesis		AWS Elastic		AWS Quick Sight / GIS
MSFT			Azure Event Hub		Azure Search		PowerBI / GIS
GOOG			Google PubSub / BigQuery		Google Cloud Datastore		Google Data Studio / GIS
Apache			Kafka Hadoop		Elastic Search		Kibana / GIS

(Some common ways to store data from Waze Feed, process it, and visualize it)

What you'll see in the Waze Traffic View feed

Here's the information you see in the Traffic View feed:

1. **General traffic information** – routes, unusual traffic, ETAs
2. **Irregularities (also called unusual traffic)** – alerts and traffic jams that affect an exceptionally large number of users
3. **Incidents/reports/alerts** – Waze user generated reports and alerts related to a specific incident causing traffic.

Note: When you change the polygon or routes in the Traffic View tool, your feed changes too.

JSON Element	Value	Description
alternateRoute		A suggested route with a faster ETA for this route. This is only calculated for routes that have a jam level over 1 and ETA more than 2 minutes that free flow (traffic is slower at least by 2 mins)
bbox		Bounding box of the feed
broadcasterId		id of the feed owner in Waze database
type	See alert type table	Event type
subtype	See alert subtypes table	Event subtype - depends on atof parameter
street	String	Street name (as is written in database, no canonical form, may be null)
city	String	City and state name [City, State] in case both are available, [State] if not associated with a city. (supplied when available)
country	String	(see two letters codes in http://en.wikipedia.org/wiki/ISO_3166-1)
envelope		Bounding box of the route
historicTime		Time in seconds it usually takes to cross this route on the current day of week and time
id		Route id in the database
irregularities		List of routes that are found as having high ETA relative to historic ETAs (a.k.a. Unusual traffic events)

Waze Traffic View Tool - Alternate Routes

Under irregularities/route		
name		Route name (i.e. major street name this route goes through, similar to route name a user sees when routes from the app)
id		A counter running starting with 0 that counts the number of irregularities on routes
type		Is always DYNAMIC
fromName, toName		Street names where routes starts/ends
time, line, length, historicTime, jamLevel, envelope, alternateRoute, leadAlert		As described in route definitions
isMetric		Indication to the UI what units to use in the display.
jamLevel		jamLevel - total jam level of the route from 0=no jam to 4=standstill
leadAlert		One of many alerts on the route that's prioritized as the most major one
Under leadAlert:		
id		Alert id (internal id)
type		Alert type
subType		Alert sub type
reportByNickname		Nickname of the reporter user
reportByMood		Mood id of the reporter user
description		Alert description as added by the reporting user (optional)
numThumbsUp		Number of thumbs up given by wazers to this alert
numNotThereReports		Number of thumbs down given by wazers to this alert
City, Street		of the alert (optional)
reportTime		When alert was reported
position		Alert location (latitude, longitude)
length		Length of route in meters
lengthOfJams		List of total length of jams in the bounding box by jam level (indicates how jammed the area is)
line		Route geometry

subRoutes		List of sub sub routes. When a route has any jams on it the route is split into sub routes, each of them with a different jam level. For example, a route could be split into 4 sub routes with corresponding jam levels 0,1,3,0.
Under subRoutes:		
fromName, toName		Street names where subroute starts and ends
line, length, time, historicTime, jamLevel, envelope		route data as described in basic definitions, just for sub route.
name,fromName, toName		Given by the feed owner, describes the route
segments		Segments ids of the route
time		Time in seconds it takes to cross the route right now (i.e. in the last check. Checks happen about every two minutes)
type		Always static
usersOnJams -		Count of users per jam level (these are relative weighted numbers)

Traffic View feed example


```
{
 "usersOnJams": [
  {
   "wazersCount": 1718,
   "jamLevel": 0
  },
  {
   "wazersCount": 0,
   "jamLevel": 1
  },
  {
   "wazersCount": 25,
   "jamLevel": 2
  },
```

```
 {
  "wazersCount": 0,
  "jamLevel": 3
 },
 {
  "wazersCount": 0,
  "jamLevel": 4
 }
],
"routes": [
 {
  "historicTime": 446,
  "line": [
   {
    "x": -74.20689323194252,
    "y": 40.64175770128392
   },
   {
    "x": -74.14963579315261,
    "y": 40.60903444419476
   }
  ],
  "bbox": {
   "minY": 40.60903444419476,
   "minX": -74.22707498420026,
   "maxY": 40.643716689521995,
   "maxX": -74.14963579315261
  },
  "length": 9846,
  "type": "STATIC",
  "jams": [],
   "alerts": [],
   "toName": "",
   "name": "278 E",
   "fromName": "",
   "jamLevel": 0,
   "id": 1376,
  "time": 436
 },
 {
  "subRoutes": [
   {
    "toName": "SR-139 W (lower)",
    "historicTime": 358,
```

```
        "line": [
         {
          "x": -74.006321,
          "y": 40.722572
         },
         {
          "x": -74.006582,
          "y": 40.722752
         },
         {
          "x": -74.085259,
          "y": 40.730522
         }
        ],
        "bbox": {
         "minY": 40.730522,
         "minX": -74.085259,
"maxY": 40.740889,
         "maxX": -74.062409
        },
        "fromName": "SR-139 W (lower)",
        "length": 3520,
        "jamLevel": 0,
        "time": 261
       }
     ],
     "historicTime": 687,
     "line": [
      {
       "x": -74.00632136441801,
       "y": 40.7225729836073
      },
      {
       "x": -74.08525957374057,
       "y": 40.73052272482624
      }
     ],
     "bbox": {
      "minY": 40.7225729836073,
      "minX": -74.08525957374057,
      "maxY": 40.740889,
      "maxX": -74.00632136441801
     },
     "length": 9092,
```

```
    "type": "STATIC",
    "jams": [],
    "alerts": [],
    "toName": "",
    "name": "78 W",
    "fromName": "",
    "jamLevel": 0,
    "id": 1377,
    "time": 735
   }
  ],
  "irregularities": [
   {
    "alerts": [],
    "historicTime": -1,
    "line": [
     {
      "x": -74.016234,
      "y": 40.706399
     },
     {
      "x": -74.010097,
      "y": 40.70187
     }
    ],
    "bbox": {
     "minY": 40.706399,
     "minX": -74.016234,
"maxY": 40.706399,
     "maxX": -74.016234
    },
    "name": "Double tube closure ",
    "length": 1040,
    "jamLevel": 5,
    "id": 0,
    "time": -1,
    "type": "DYNAMIC",
    "jams": [],
    "leadAlert": {
     "numComments": 0,
     "comments": [],
     "city": "Manhattan, NY",
     "numThumbsUp": 0,
     "street": "Battery Park Underpass",
```

```
      "subType": "ROAD_CLOSED_EVENT",
      "id": "alert-2130271205/3c856425-262f-3668-b03c-25d3b02c01f7",
      "position": "40.706399 -74.016234",
      "type": "ROAD_CLOSED",
"numNotThereReports": 0,
      "isLeadAlert": true,
      "reportTime": 1522084545431
     }
    },
    {
     "alerts": [],
     "historicTime": -1,
     "line": [
      {
       "x": -74.050004,
       "y": 40.73128
      },
      {
       "x": -74.062409,
       "y": 40.73913
      }
     ],
     "bbox": {
      "minY": 40.73128,
      "minX": -74.050004,
      "maxY": 40.73128,
      "maxX": -74.050004
     },
     "name": "Construction  ",
     "length": 1414,
     "jamLevel": 5,
     "id": 1,
     "time": -1,
     "type": "DYNAMIC",
     "jams": [],
      "leadAlert": {
       "numComments": 0,
       "comments": [],
       "city": "Jersey City, NJ",
       "numThumbsUp": 0,
       "street": "SR-139 W (lower)",
       "subType": "ROAD_CLOSED_EVENT",
       "id": "alert-2132049084/1c67d40f-2e98-30cb-a64a-ae153bfe850a",
       "position": "40.73128 -74.050004",
```

```
      "type": "ROAD_CLOSED",
      "numNotThereReports": 0,
     "isLeadAlert": true,
     "reportTime": 1522077324308
    }
   }
 ],
 "broadcasterId": "b9c6100b281f316fbc17b6d94f96524f",
 "areaName": "ny_area",
 "bbox": {
  "minY": 40.208,
  "minX": -74.75,
  "maxY": 41.108,
  "maxX": -73.38
 },
 "name": "New York Area | DEMO",
 "isMetric": false,
 "restrictions": {},
 "lengthOfJams": [
  {
   "jamLevel": 1,
   "jamLength": 1872
  },
  {
   "jamLevel": 2,
   "jamLength": 10461
  },
  {
   "jamLevel": 3,
   "jamLength": 9917
  },
  {
   "jamLevel": 4,
   "jamLength": 1470
  },
  {
   "jamLevel": 5,
   "jamLength": 43032
  }
 ],
 "updateTime": 1522138104077
}
```

Alert types

Waze currently supports the following types and subtypes of user-generated alerts:

ID	Alert type	Alert Subtype	
	ACCIDENT	• ACCIDENT_MINOR • ACCIDENT_MAJOR • NO_SUBTYPE	
	JAM	• JAM_MODERATE_TRAFFIC • JAM_HEAVY_TRAFFIC • JAM_STAND_STILL_TRAFFIC • JAM_LIGHT_TRAFFIC • NO_SUBTYPE	
	WEATHERHAZARD / HAZARD	• HAZARD_ON_ROAD • HAZARD_ON_SHOULDER • HAZARD_WEATHER • HAZARD_ON_ROAD_OBJECT • HAZARD_ON_ROAD_POT_HOLE • HAZARD_ON_ROAD_ROAD_KILL • HAZARD_ON_SHOULDER_CAR_STOPPED • HAZARD_ON_SHOULDER_ANIMALS • HAZARD_ON_SHOULDER_MISSING_SIGN • HAZARD_WEATHER_FOG • HAZARD_WEATHER_HAIL • HAZARD_WEATHER_HEAVY_RAIN • HAZARD_WEATHER_HEAVY_SNOW • HAZARD_WEATHER_FLOOD • HAZARD_WEATHER_MONSOON • HAZARD_WEATHER_TORNADO	

		• HAZARD_WEATHER_HEAT_WAVE • HAZARD_WEATHER_HURRICANE • HAZARD_WEATHER_FREEZING_RAIN • HAZARD_ON_ROAD_LANE_CLOSED • HAZARD_ON_ROAD_OIL • HAZARD_ON_ROAD_ICE • HAZARD_ON_ROAD_CONSTRUCTION • HAZARD_ON_ROAD_CAR_STOPPED • HAZARD_ON_ROAD_TRAFFIC_LIGHT_FAULT • NO_SUBTYPE	
	MISC	• NO_SUBTYPE	
	CONSTRUCTION	• NO_SUBTYPE	
	ROAD_CLOSED	• ROAD_CLOSED_HAZARD • ROAD_CLOSED_CONSTRUCTION • ROAD_CLOSED_EVENT	
		• NO_SUBTYPE	

Waze Traffic View Tool - Alternate Routes

Routes example


```
▼ routes [40]
  ▶ 0  {15}
  ▶ 1  {13}
  ▶ 2  {14}
  ▼ 3  {14}
    ▼ subRoutes [2]
      ▼ 0  {8}
          toName : Tol Cikampek (Cikunir-Cikarang)
          historicTime : 2231
        ▶ line [161]
        ▶ bbox {4}
          fromName : Tol Tebet-Cawang
          length : 13117
          jamLevel : 0
          time : 2016
      ▶ 1  {8}
      historicTime : 2938
    ▶ line [228]
    ▼ bbox {4}
        minY : -6.258305891822439
        minX : 106.87574211205309
        maxY : -6.243294000000029
        maxX : 106.99060598481726
      length : 16467
      type : STATIC
    ▶ jams [0]
    ▶ alerts [0]
      toName : Tol Cikampek (Cikunir-Cikarang)
      name : Tol Cikampek (Cawang-Cikunir); Tol Cikampek (Cikunir-Cikarang)
      fromName : Tol Cawang-Tebet
      jamLevel : 2
      id   : 9202
      time : 2723
```

Waze Traffic View Tool - Alternate Routes

Irregularities (unusual traffic jams) example


```
▼ irregularities [2]
  ▼ 0 {15}
      historicTime : 226
    ▶ line [13]
    ▶ bbox {4}
      length : 2199
      type : DYNAMIC
    ▶ jams [0]
    ▶ alerts [0]
    ▶ alternateRoute {6}
      toName : Jakarta Selatan,
      name : Tol Lingkar Luar (TMII-Ulujami)
      fromName : IM2
      jamLevel : 4
      id   : 0
      time : 1406
    ▼ leadAlert {13}
      ▶ comments [0]
        numThumbsUp : 17
        reportByMood : 1
        reportByNickname : On3zt
        type : HAZARD
        numNotThereReports : 0
        isLeadAlert : ☑ true
        numComments : 0
        street : Tol Lingkar Luar (TMII-Ulujami)
        subType : HAZARD_ON_ROAD_CONSTRUCTION
        id   : alert-1049262727/00ec0d36-eea4-338d-a3fa-15407c509987
        position : -6.292342 106.807891
        reportTime : 1516283119173
```