

DEMONSTRATING REAL-TIME WEB MAPPING OF INTER-REGIONAL INTERMODAL PASSENGER TRANSPORTATION

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Regional Context

Cape Cod is a peninsula on the eastern coast of Massachusetts that is a major tourist destination in the summer season.

During the peak season, **the population triples**, with heavy traffic congestion over the two highway bridges connecting with the mainland.

Finding alternative means for tourist access is an important strategic planning objective of state and regional agencies.



Partnership

The Cape Cod Regional Transit Authority and the GeoGraphics Laboratory at Bridgewater State University have had a long-standing partnership creating leading edge web-mapping and smartphone applications for intermodal trip planning and real-time vehicle location.

Cape Cod
Regional Transit Authority



www.capecodrta.org

GeoGraphics Laboratory



Introduction

Planning a trip using public transit is a difficult task.

Even though most transit authorities have their schedules readily available online, digital copies have no advantage over their printed equivalents.

SEALINE WOODSHOLE - HYANNIS																	
Effective September 3, 2013 through June 20, 2014																	
MONDAY through SATURDAY																	
Next Bus Stop# ***	Departs	AM				PM											
31	Woods Hole	--	6:45*	--	8:30*	9:30	10:30	11:30	12:30	1:30	2:30	3:30	4:30	5:30	6:30	7:30	
30	Falmouth Bus Depot	--	6:56*	--	8:42*	9:42	10:42	11:42	12:42	1:42	2:42	3:42	4:42	5:42	6:42	7:42	
29	Falmouth Mall	--	7:02*	7:02*	--	8:49*	9:49	10:49	11:49	12:49	1:49	2:49	3:49	4:49	5:49	6:49	
25	East Falmouth	--	7:11*	7:11*	--	8:59*	9:59	10:59	11:59	12:59	1:59	2:59	3:59	4:59	5:59	6:59	
140	Seacoast Shored Blvd.	--	7:14*	7:14*	--	9:02*	10:02	11:02	12:02	1:02	2:02	3:02	4:02	5:02	6:02	7:02	
24	Comm Health Center of Cape Cod	--	--	--	--	9:07*	10:07	11:07	12:07	1:07	2:07	3:07	4:07	5:07	6:07	7:07	
23	South Cape Village/Marshalls	--	7:20*	--	--	9:11*	10:11	11:11	12:11	1:11	2:11	3:11	4:11	5:11	6:11	7:11	
22	Mashpee Commons/Stop & Shop	--	7:15*	7:26*	7:24*	7:15*	9:18*	10:18	11:18	12:18	1:18	2:18	3:18	4:18	5:18	6:18	
21	Marstons Mills Marketplace	--	7:34*	7:33*	--	9:27*	10:27	11:27	12:27	1:27	2:27	3:27	4:27	5:27	6:27	7:27	
20	Osterville (Tower Hill Rd.)	--	--	--	--	9:37*	10:37	11:37	12:37	1:37	2:37	3:37	4:37	5:37	6:37	7:37	
19	Centerville (Old Stage & Main)	--	--	--	--	9:46*	10:45	11:45	12:45	1:45	2:45	3:45	4:45	5:45	6:45	7:45	
18	West Main Street & Rte. 28	--	7:41*	7:40*	--	9:51*	10:51	11:51	12:51	1:51	2:51	3:51	4:51	5:51	6:51	7:51	
134	West Main @ Star Market	--	--	7:42*	--	--	--	--	--	--	--	--	--	--	--	--	
32	St Francis/Pope John Paul	--	7:45*	--	7:47*	7:45*	--	--	--	--	--	--	--	--	--	--	
17	Cape Cod Mall Entrance/Rte. 28	--	7:44*	--	--	9:55*	10:55	11:55	12:55	1:55	2:55	3:55	4:55	5:55	6:55	7:55	
34	Sturgis Charter School - South St.	--	7:50*	--	7:52*	7:50*	--	--	--	--	--	--	--	--	--	--	
35	Sturgis Charter School - West Main St.	--	7:57*	--	7:59*	7:57*	--	--	--	--	--	--	--	--	--	--	
1	Hyannis Transportation Center	--	7:47*	--	--	9:58*	10:58	11:58	12:58	1:58	2:58	3:58	4:58	5:58	6:58	7:58	

Symbol Legend:

-- No Service.

* No service at these times Saturdays.

- No service weekends and school vacations.

REQ On Request.

Introduction (cont.)

The screenshot shows the Google Maps interface for finding transit directions. At the top, the Google logo is on the left, and a text box contains "from: Hyannis, Barnstable, MA". Below this are buttons for "Get directions" and "My places". A row of icons for different travel modes (car, bus, walking, bicycle) is visible. The origin is set to "Hyannis, Barnstable, MA" (marked with a green A) and the destination is "Woods Hole, Falmouth, MA" (marked with a green B). Below the destination field is a link "Add Destination - Show options". There are also dropdown menus for "Leave now", "10/08/13", and "1:02pm". A blue button labeled "GET DIRECTIONS" is prominent. Under the "Suggested routes" section, two options are listed, both taking "1 hour 50 mins" and using the "Sealine Hyannis-Falmouth/Woods Hole" bus line. The first route is from "1:17pm - 3:06pm" and the second is from "4:17pm - 6:06pm". At the bottom, the text "Transit directions to Woods Hole, Falmouth, MA" is displayed.

Google

from: Hyannis, Barnstable, MA

Get directions My places

Car Bus Walking Bicycle

A Hyannis, Barnstable, MA

B Woods Hole, Falmouth, MA

Add Destination - Show options

Leave now 10/08/13 1:02pm

GET DIRECTIONS

▼ Suggested routes

1 hour 50 mins
Sealine Hyannis-Falmouth/Woods Hole
1:17pm - 3:06pm

1 hour 50 mins
Sealine Hyannis-Falmouth/Woods Hole
4:17pm - 6:06pm

Transit directions to Woods Hole, Falmouth, MA

However, free online interactive mapping systems, Automatic Vehicle Location (AVL) and real-time data hubs by state DOTs, allow transit users to greatly simplify and shorten their trip planning with the most efficient connections among regional transit, inter-city bus, and rail passenger services

Automatic Vehicle Location (AVL)

Automatic Vehicle Location (AVL) allows the public to monitor transit vehicles in real-time.

The AVL data is based on information obtained by Cape Cod Regional Transit Authority (**CCRTA**), Massachusetts Bay Transportation Authority (**MBTA**), and Plymouth & Brockton (**P&B**) Bus Company.

Currently, our web service monitors CCRTA buses, P&B buses, and MBTA commuter rail trains from Boston's Logan Airport and South Station to Hyannis.



Development & Procedures



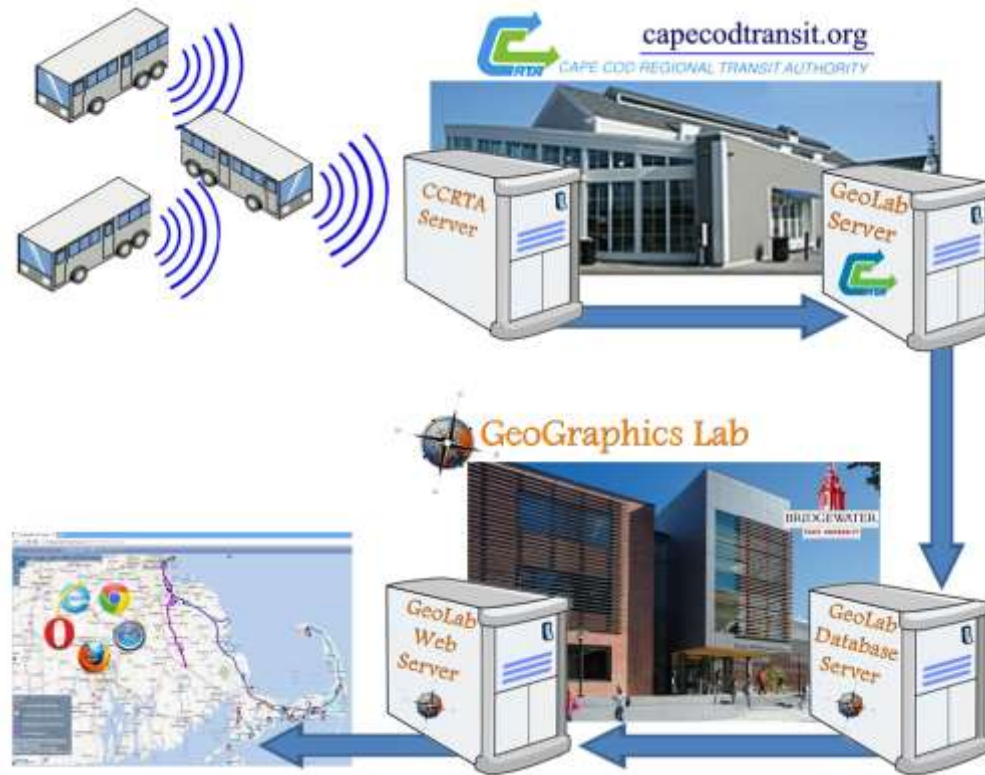
Vehicles equipped with GPS technology send data to these transportation companies, which then send information to BSU's SQL database.

Along with geographical coordinates, the Lab receives information on heading, vehicle ID, speed, route, and date/time.

Real-Time AVL Data Flow

The CCRTA and P&B send their bus data to BSU GeoGraphics Lab servers.

Additionally, MBTA's train data is obtained from their developer's page in XML format.



After the data is stored and analyzed, it is forwarded to the Lab web server and published on websites for public use.

GeoGraphics Laboratory as a Service

GeoGraphics Laboratory as a Service (GLaaS)

A new framework designed with the core concept of keeping data and application logic separate

GLaaS Model

The reusable structure, definition, and protocol for all transit data structures used by GLaaS

GLaaS API

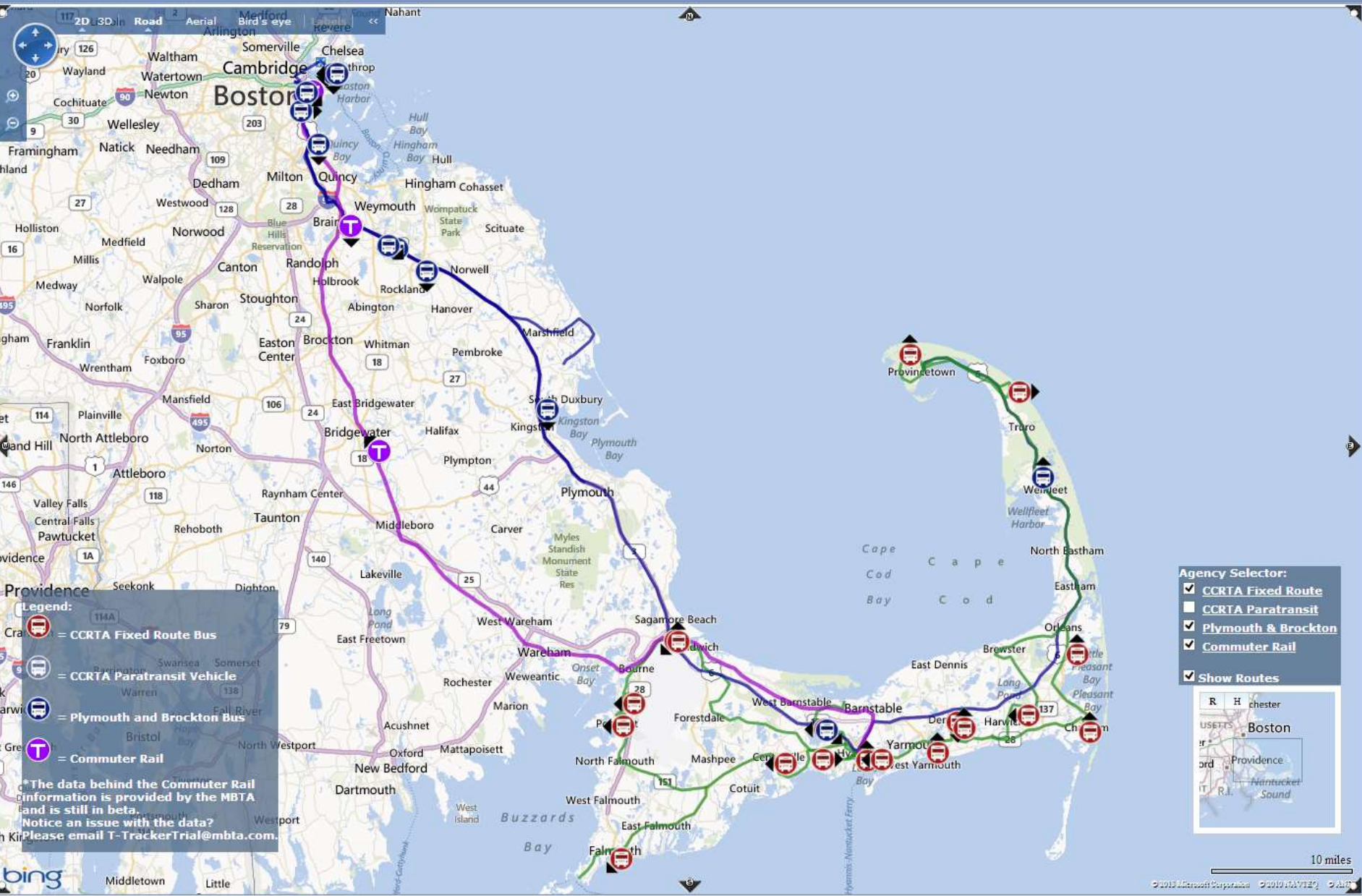
The manager of all data flow, user level authentication, and privacy enforcement; provides a layer of abstraction between users and the database.

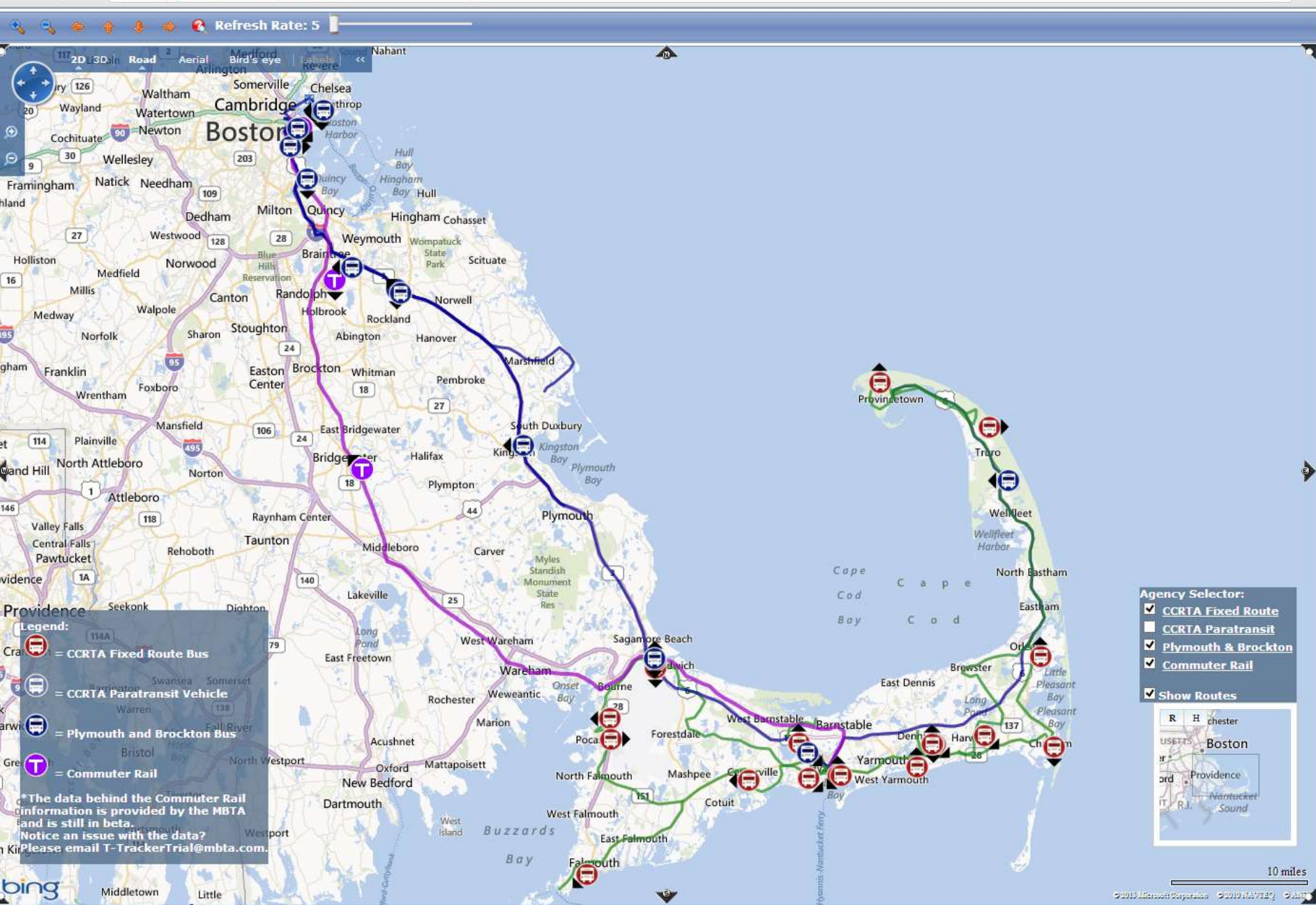
Boston to Cape Cod Inter-Regional and Multi-Modal Real-Time Web AVL

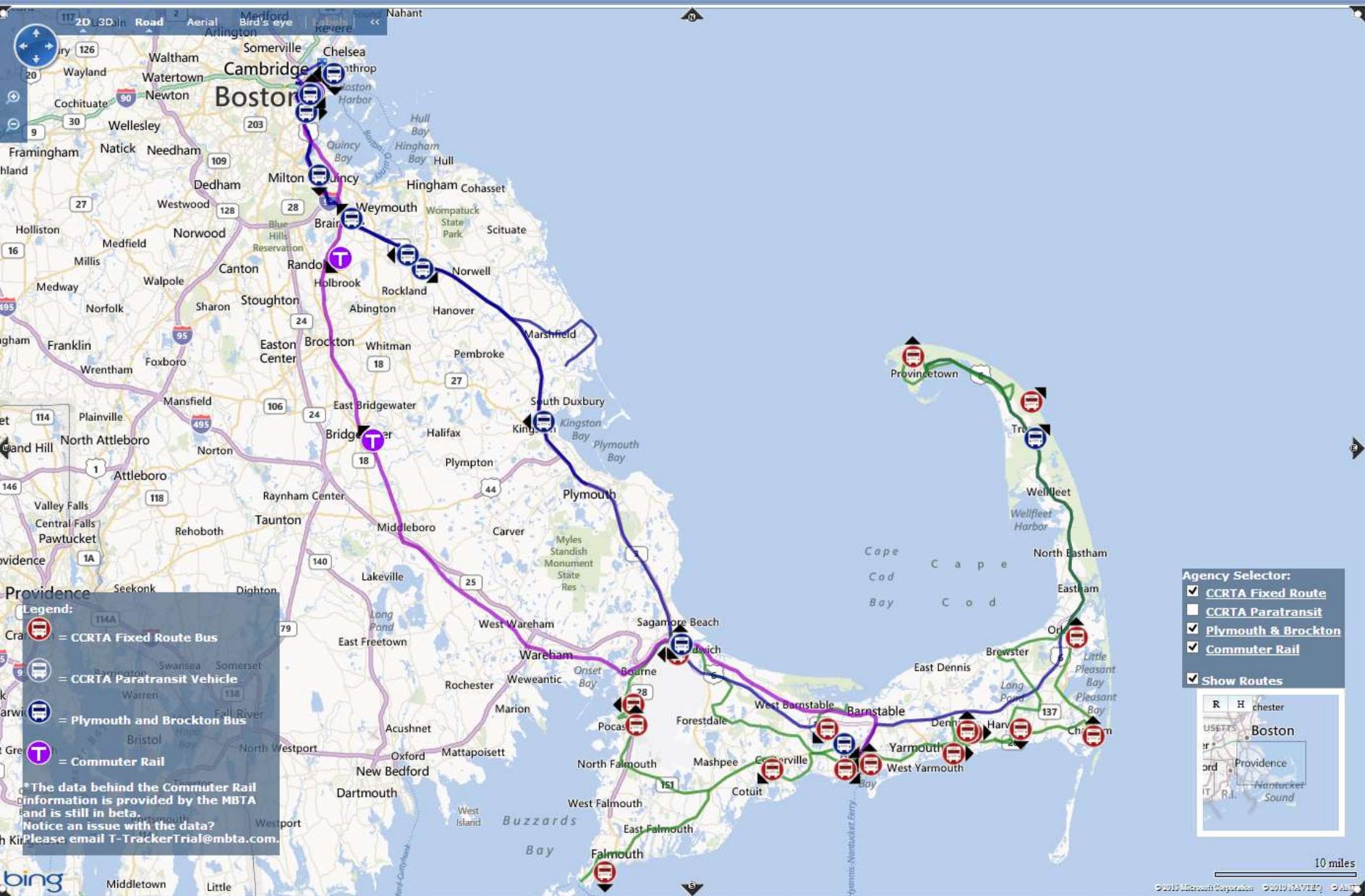
Cape Cod Multimodal Map

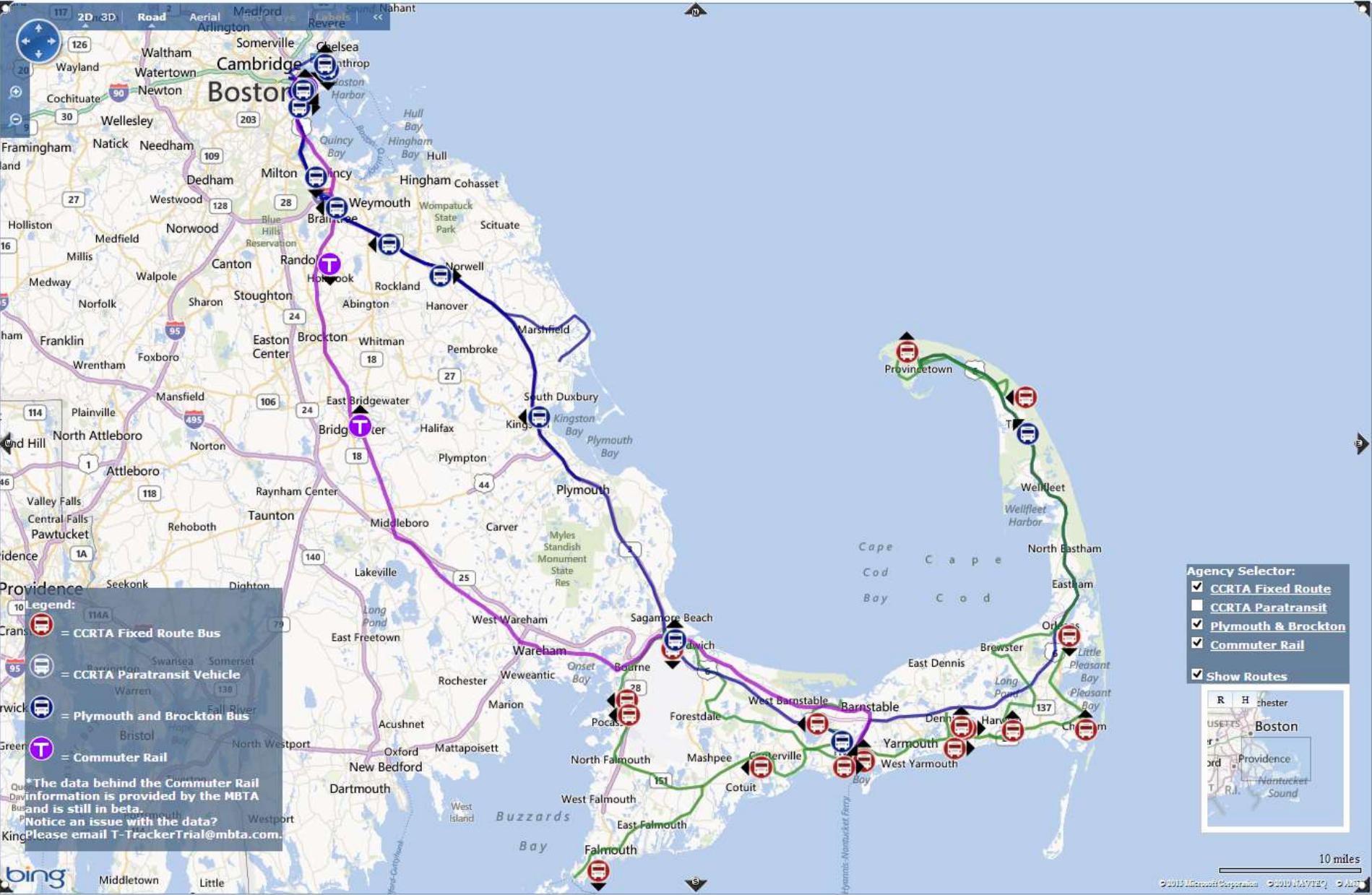
www.geolabvirtualmaps.com/CCRTAMultimodal.aspx

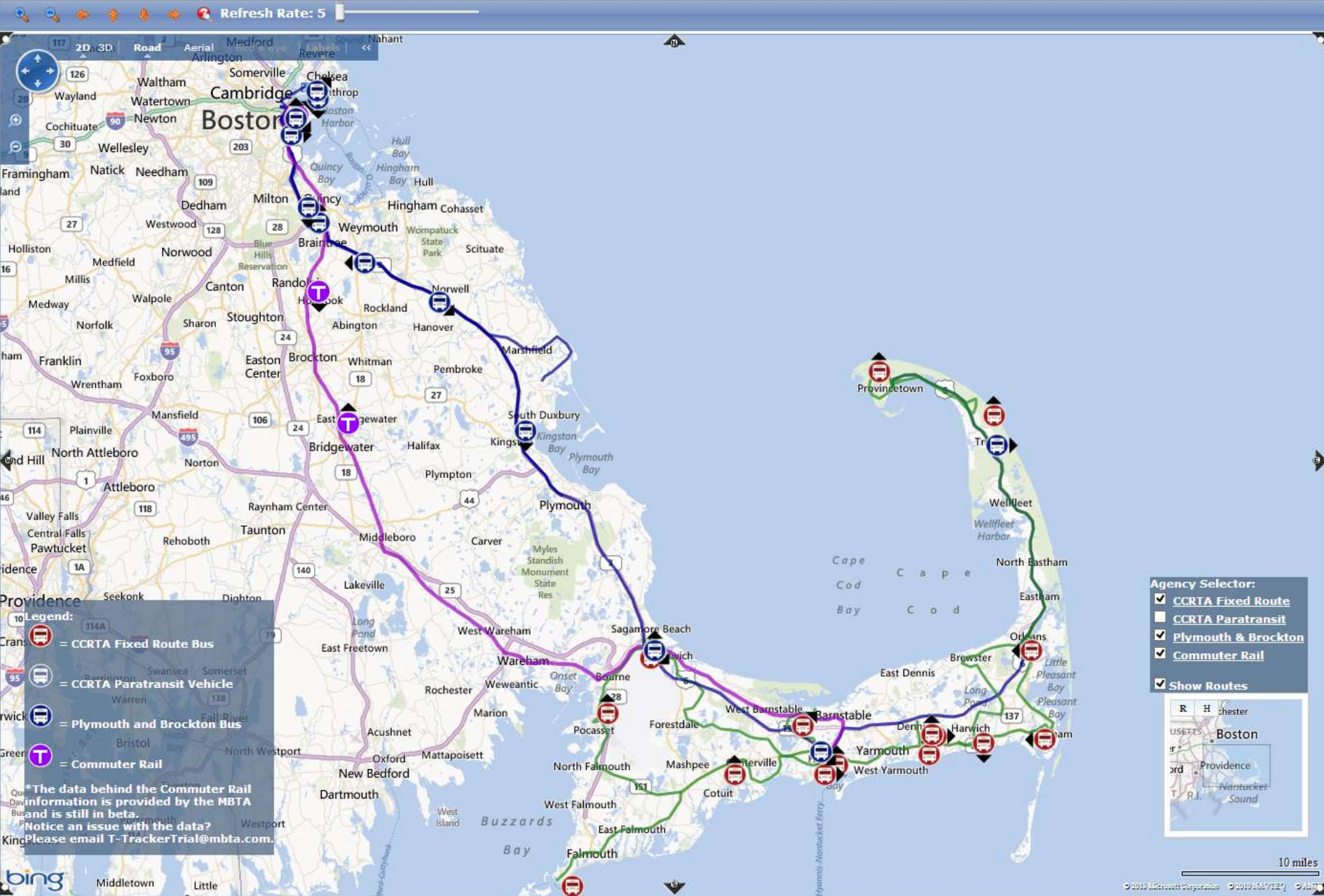














Hyannis Transportation Center Info Booth



Travelers using real-time Inter-City tracking displays at Hyannis Transportation Center



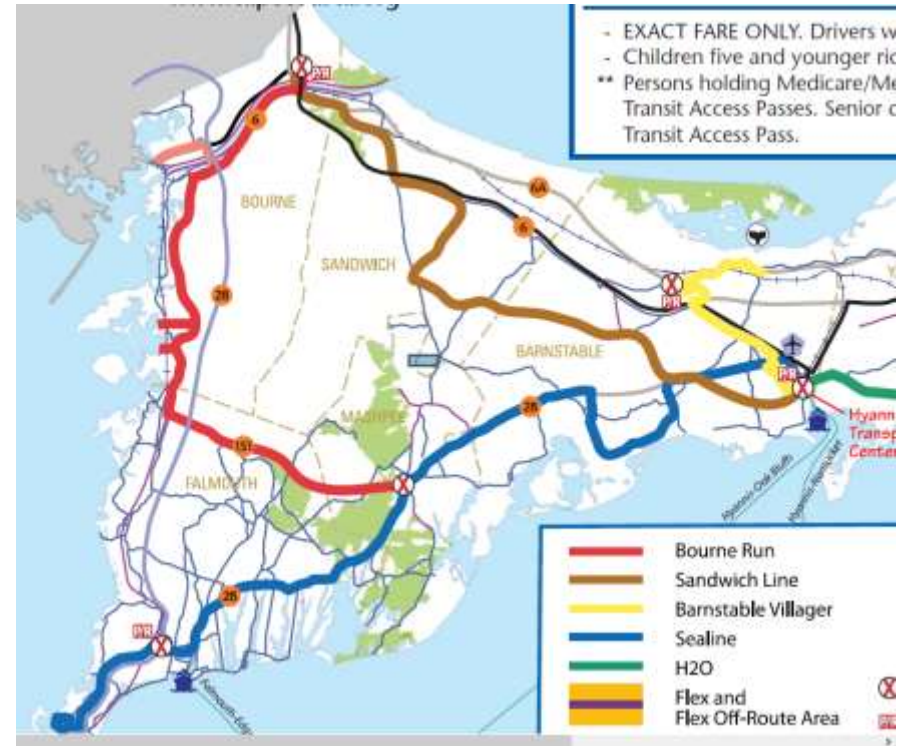
New Inter-City Connector Service: CapeFLYER



The CapeFLYER is a new train service which utilizes the MBTA Middleborough/Lakeville Line from Boston's South Station to Middleborough, and continues to Hyannis via the Cape Main Line.

This service provides an alternate route for people travelling to Cape Cod on Friday evenings, Saturdays, and Sundays.

New Local Services on Cape Cod



At the CCRTA, two new bus routes have been introduced in the Upper Cape region which were previously under-served.

Findings:

- With state and regional leadership, providing free real-time, multi-modal vehicle location on public data hubs improves customer awareness of the level of service of inter-city bus and rail services and regional fixed route connecting service.
- Displaying inter-city rail and inter-city bus services in real-time emphasizes their complementary services and reduces perceptions of modal conflict.

Findings (cont.):

- The “early adopters” of the regional fixed route and inter-regional multi-modal displays were the CCRTA’s transit information booth personnel.
- The MBTA CR feed provided a “proof of concept” to Middleborough station, but never extended the feed to the Hyannis terminal for the Cape Flyer.

Next Steps and Applied Research

- Include feeds from the public and private ferries on Cape Cod Bay and Nantucket Sound into the integrated multi-modal map and trip planner by summer, 2016.
- Secure the MBTA Cape Flyer feed for the summer 2016 season.

External Links:

The GeoGraphics Lab websites:

- www.geolabvirtualmaps.com
- www.geographicslab.org
- www.geolabvirtualmaps.com/CCRTAMultimodal.aspx

Cape Cod Regional Transit Authority

- <http://www.capecodtransit.org/>



GeoGraphicsLab.org

GeoGraphics Laboratory Virtual Maps

Automatic Vehicle Location (AVL) Projects



Cape Cod Regional Transit Authority (CCRTA) Intermodal AVL

The Cape Cod Regional Transit Authority (CCRTA) AVL Program utilizes Mobile Data Terminals installed on the CCRTA Fixed Route and Paratransit vehicles. A computer program has been created that connects to the CCRTA Fleet Operations software and obtains the AVL of the vehicles, which is then presented to the user using the mediums listed below. The Fixed Route vehicles are shown as red bus icons on the mapping mediums. Paratransit vehicles are presented as blue bus icons. The PDA display can be displayed on any mobile device capable of rendering an ASP.Net active server page and can be read using text to speech programs to persons with visual disabilities.

CCRTA services the entire Cape Cod Region of Southeastern Massachusetts.

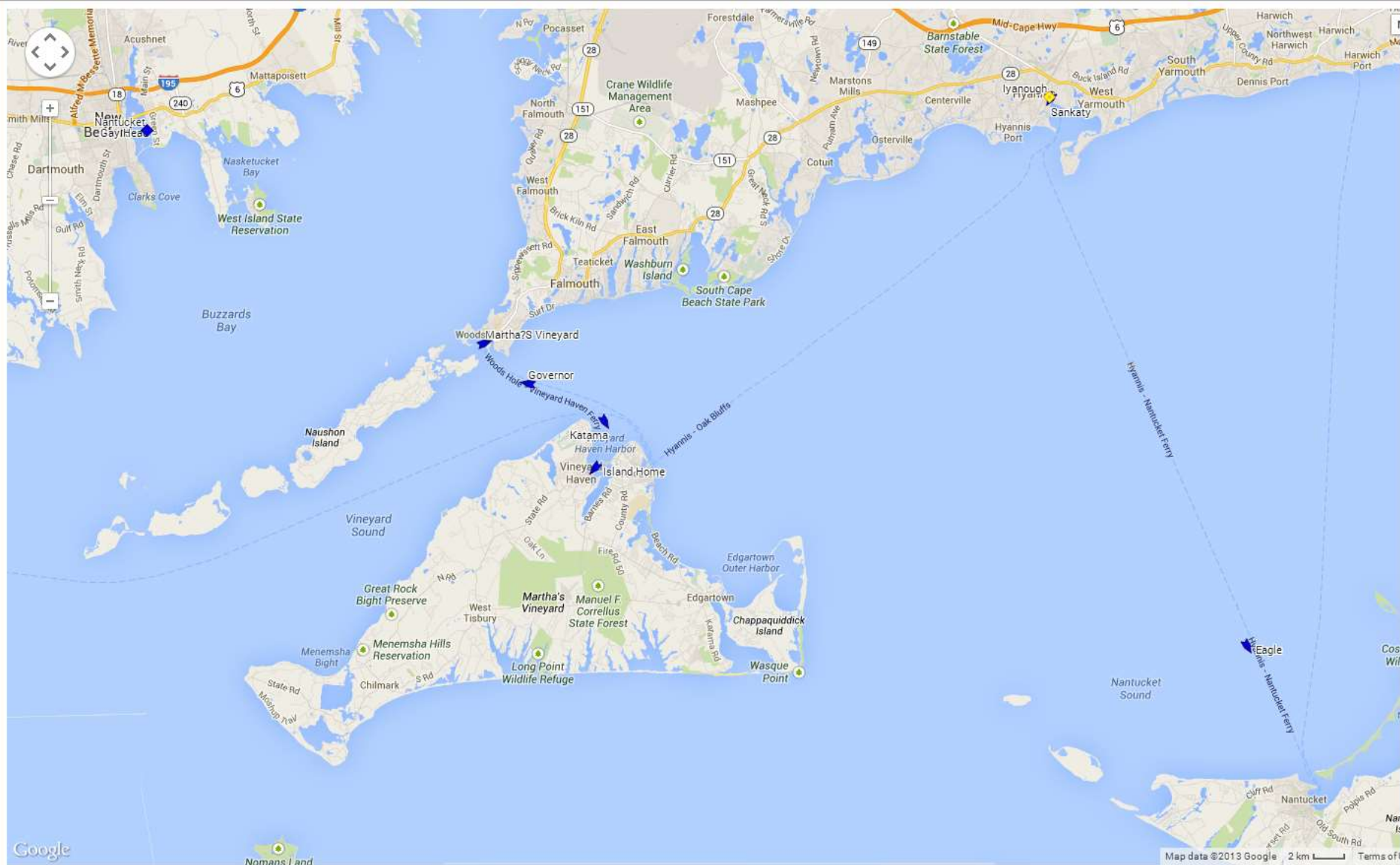
- [CCRTA Fixed Route/Paratransit*](#)
- [CCRTA Paratransit Only](#)
- [Cape Cod MultiModal Map](#)
- [Cape Cod MultiModal Map with BusID](#)
- [Google Mapplets](#)
- [PDA Display](#)
- [Nantucket Sound Ferries](#)
- [Hy-Line Ferries](#)
- [SteamShip Ferries](#)
- [Cape Cod Bay Ferries](#)

*Recommended resolution of 1280x1024 or higher
For schedules please visit [CCRTA's website](#)



MetroWest Regional Transit Authority (MWRTA) (Boston, MA) Mobility Manager

The MetroWest Regional Transit Authority (MWRTA) AVL Program utilizes two different device types to deliver the location of its both Paratransit and Fixed Route vehicles. For the Fixed Route Fleet, MWRTA utilized the 'GeoGraphics Lab' cell phone AVL device, using Motorola i355 cell phones to deliver AVL information directly to the GeoGraphics Lab. The Fixed Route Service vehicles appear as red icons on the mapping interfaces. For MWRTA's Paratransit Fleet, they operate two services, the Dial a Ride service, servicing the towns of Ashland, Marlborough, Southborough, and Wayland, and the MetroWest Ride, servicing the towns of Natick and Framingham. The Dial a Ride service utilizes the same cell phone program as the Fixed Route Fleet and appear as blue bus icons on the mapping interfaces. The MetroWest Ride Fleet utilizes the same Mobile Data Terminal technology that CCRTA uses, and appears as yellow icons on the mapping interface. The PDA display can be displayed on any mobile device capable of rendering an ASP.Net active server page and can be read using text to speech programs to persons with visual disabilities.





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