

Integrating Information for Rural Multistate Trip Itinerary Planning

A Presentation to the
TRB Rural and Intercity Bus
Conference

By

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New England Transportation Institute

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The Challenge

- Dealing with imperfect information over which you have no control

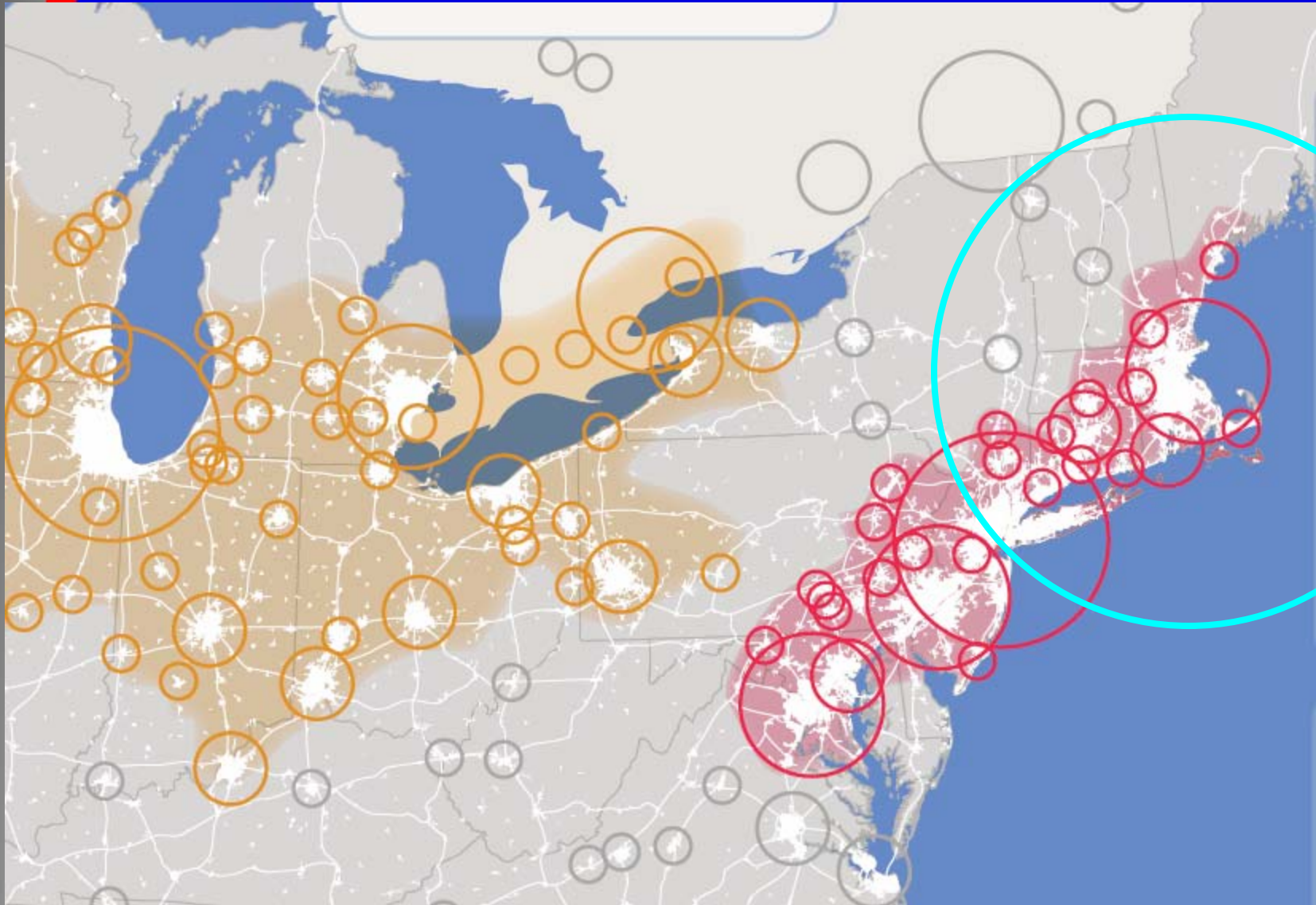
The Philosophy

- Do not damage good information by forced integration with bad information

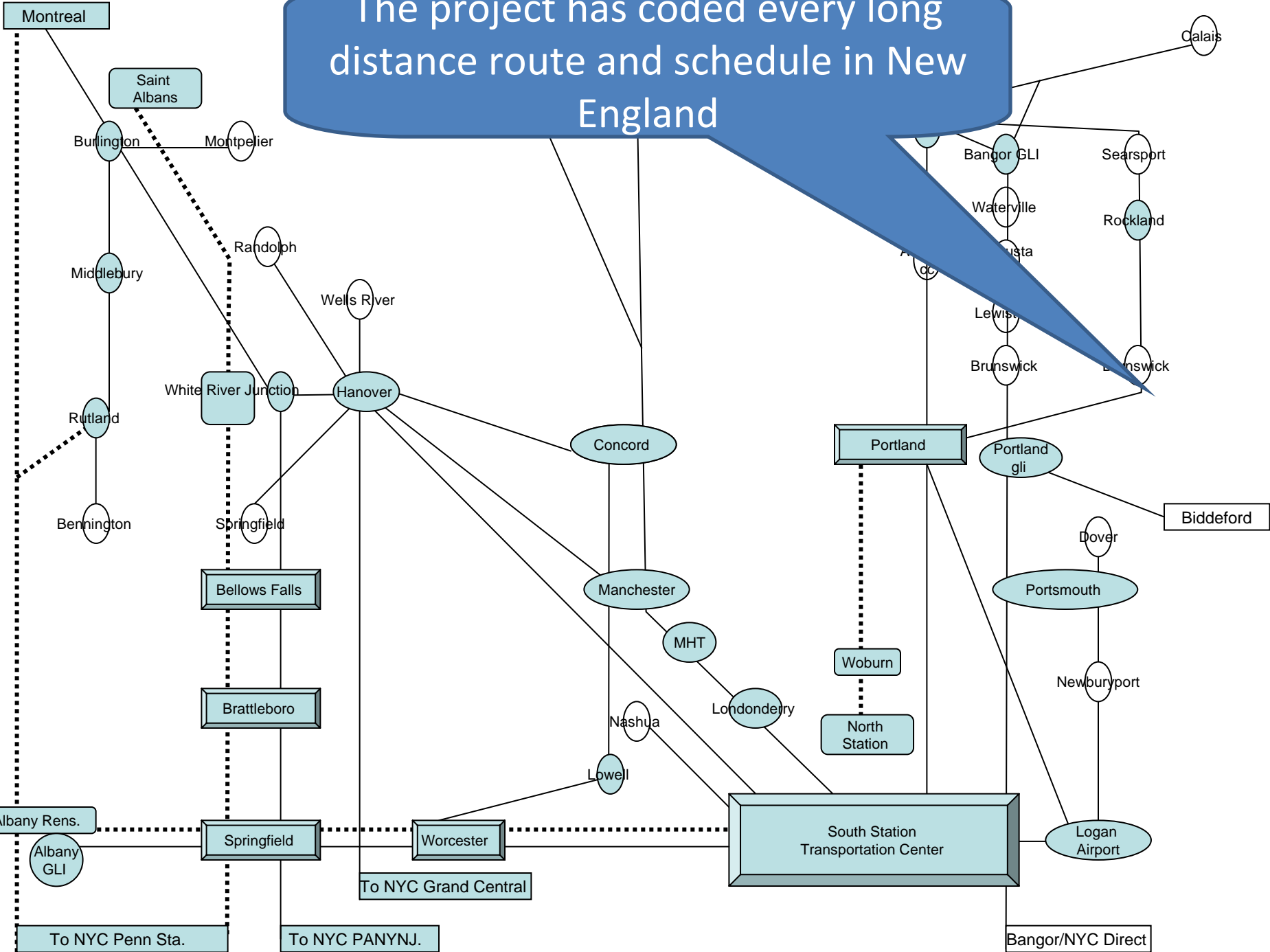
Applicability

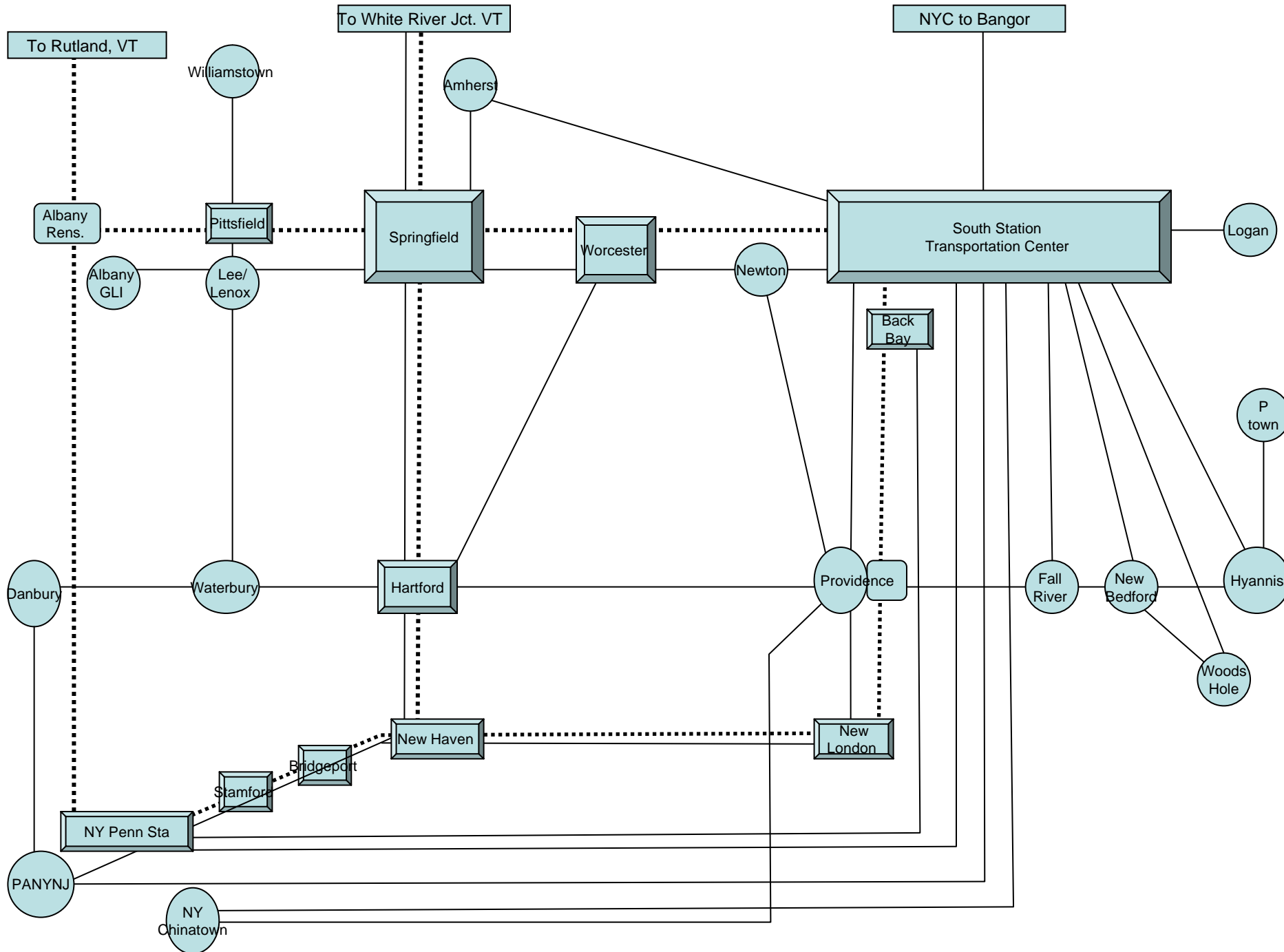
- Program can work when optimal local information is available
- Program can work when poor local information is available.

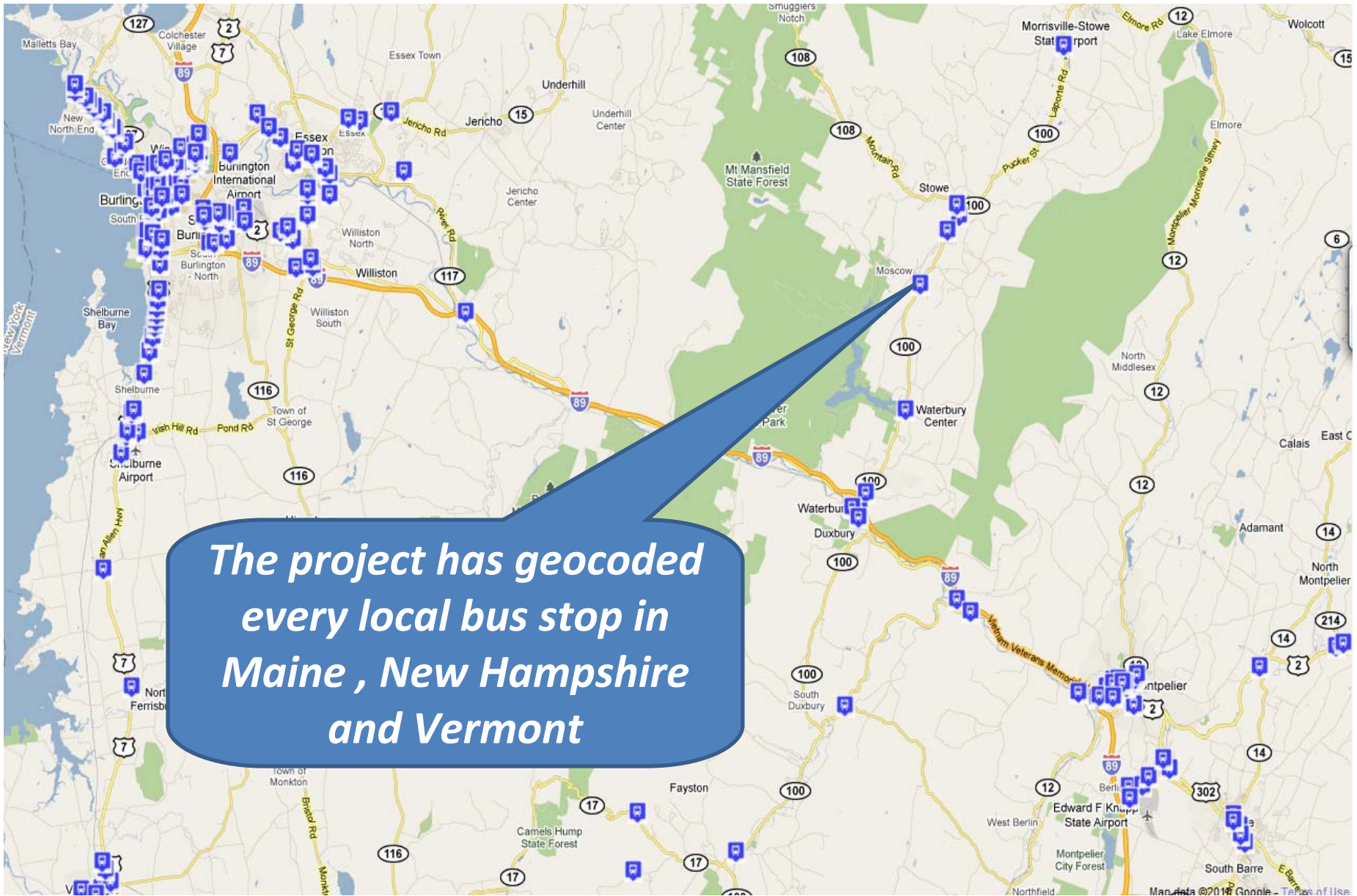
- A travelshed is part of a mega-region



The project has coded every long distance route and schedule in New England

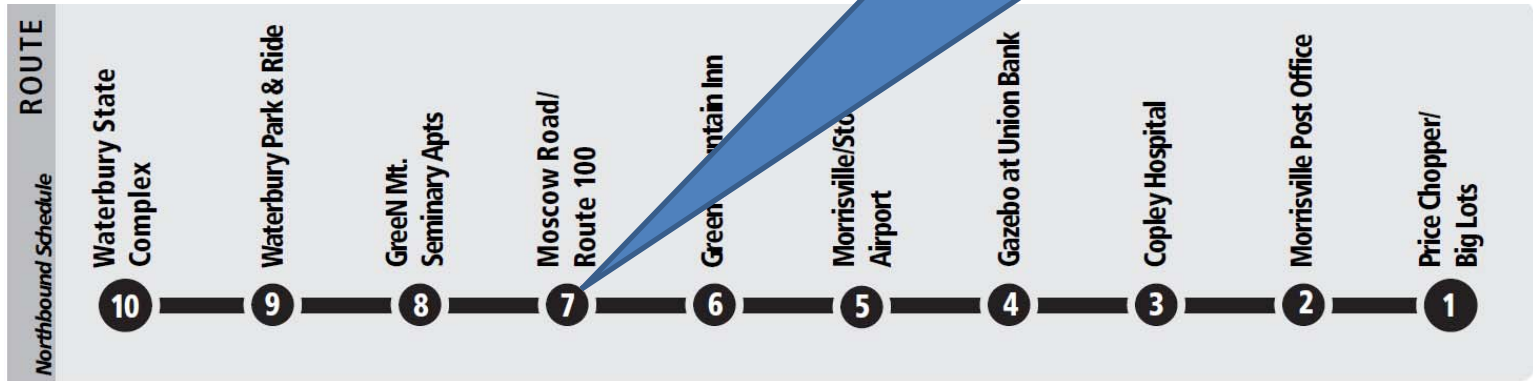






The project has geocoded every local bus stop in Maine, New Hampshire and Vermont

The project has linked every local bus stop in Maine, New Hampshire and Vermont to the best available schedule



SCHEDULE MONDAY - FRIDAY SOUTHBOUND SCHEDULE

10	9	8	7	6	5	4	3	2	1
Price Chopper/Big Lots	Morrisville Post Office	Gazebo at Union Bank	Morrisville/Stowe Airport	Stowe Town Hall	Moscow Rd/Rt. 100	Green Mtn. Seminary Apts.	Waterbury P&R	Waterbury State Complex	
6:15	6:20	6:22	6:30	6:40	6:45	6:51	7:00 L	7:07 W	
7:10	7:15	7:17	7:25	7:35	7:40	7:46	7:55 L	8:02 W	
10:25	10:30	10:32	10:40	10:50	10:55	—	—	—	

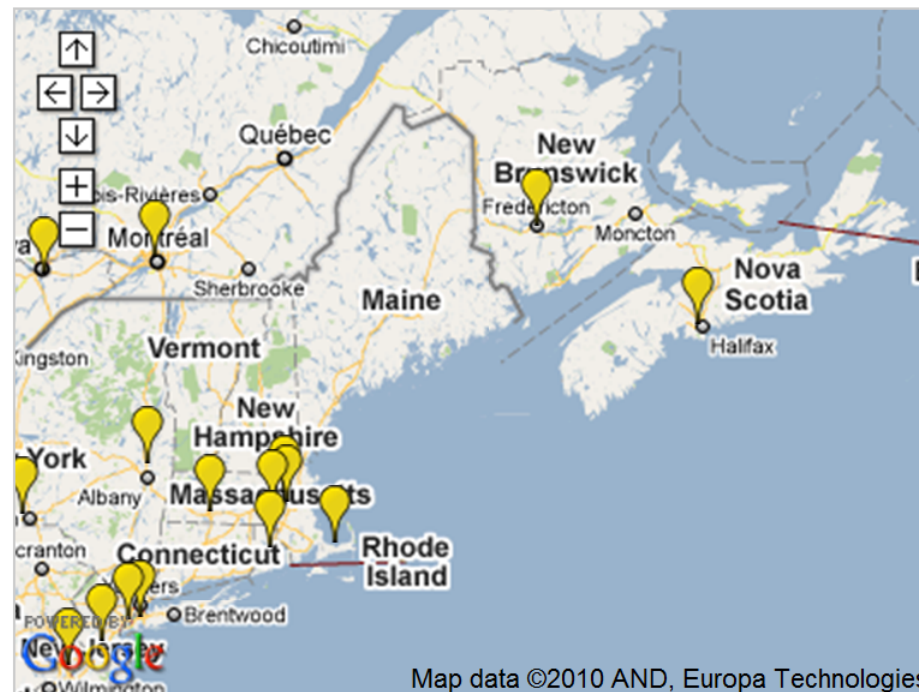
SCHEDULE MONDAY - FRIDAY NORTHBOUND SCHEDULE

10	9	8	7	6	5	4	3	2	1
Waterbury State Complex	Waterbury P&R	Green Mtn. Seminary Apts.	Moscow Rd/Rt. 100	Green Mtn Inn	Morrisville/Stowe Airport	Opp. Gazebo at Union Bank	Copley Hospital	Morrisville Post Office	Price Chopper/Big Lots
—	—	—	5:45	5:50	6:00	6:08	—	6:10	6:15
—	—	—	6:40	6:45	6:55	7:03	—	7:05	7:10
7:07	7:14	7:23	7:29	7:34	7:44 B	7:52	7:55	8:00	8:05

Present Google Transit Coverage

See what cities are covered (more than 446)

Recent highlights: [Boston](#) [Los Angeles](#) [Brussel](#) [D](#)



A Hierarchy for Discussion

1. User enters true origin and true destination
2. Program presents three alternative long distance trips
 - From intercity stop of origin to intercity stop of destination
3. User selects best intercity trip option
4. User can learn about local transit access to intercity stop

Hierarchy, cont.

5. If service from intercity stop to destination is covered by an automated trip itinerary planning system, that program is applied
6. If not, automated transit map links user to transit agency website for more details

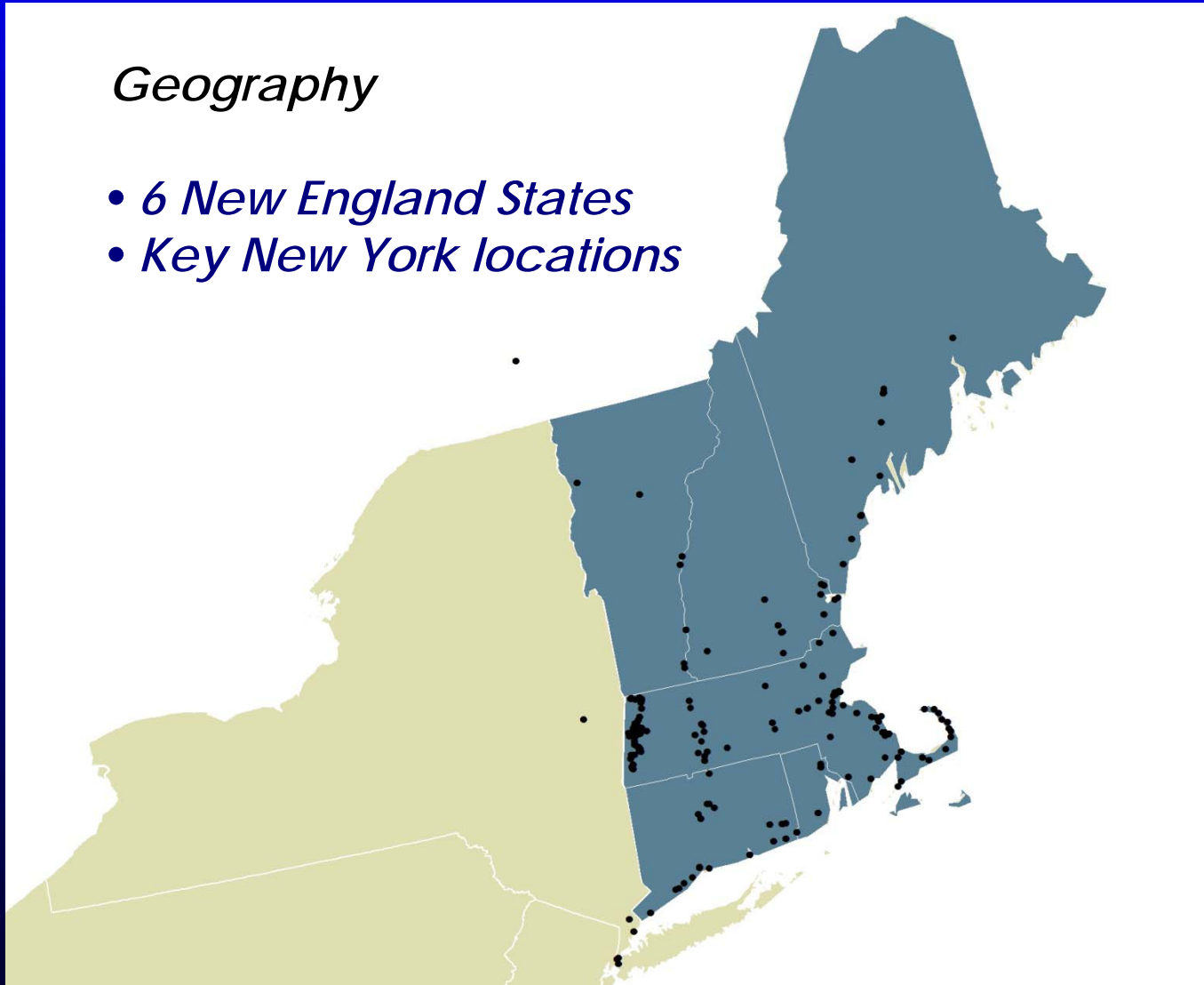
Logic Applied by User

- First learn about the long distance segment
- Second, learn about the destination segment
- Third, learn about the origin segment

- The “Boston Travelshed” Project of the I-95 Corridor Coalition

Geography

- *6 New England States*
- *Key New York locations*



Project Goals

- 1. To build a proof of concept tool that demonstrates long distance and multi-modal trip planning can be successfully automated.*
- 2. A trip planner can incorporate the broad and rich local transit systems to help travelers plan each leg of their trip.*

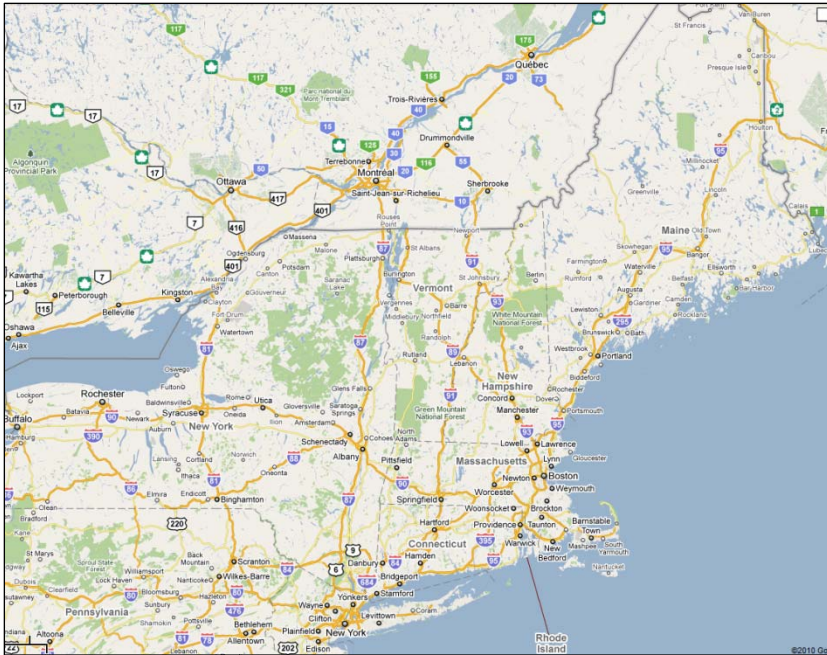
System Components

1. Data: provided by Bridgewater State College, and the New England Transportation Institute. Data are in Google Transit Feed format.

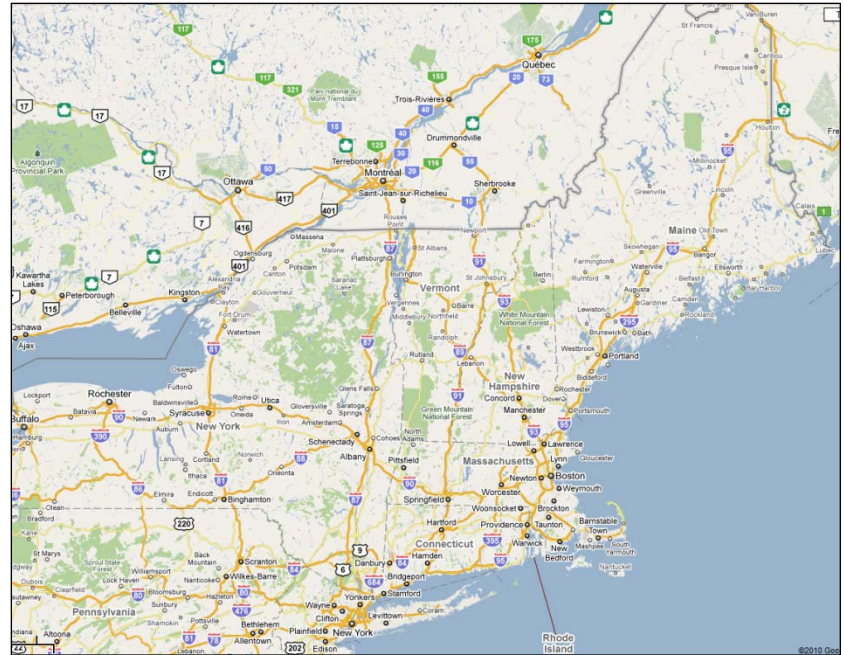
2. System Architecture & Algorithm : Built in an SQL Server 2008 relational database, we use a refinement of Dijkstra's shortest path algorithm written in Visual C++.

3. User Interface: web-based application written in C# .NET using an MVC framework.

1 Origin (type or use map)

[MAP IT](#)

2 Destination (type or use map)

[MAP IT](#)

3 Preferences

4

[GET ITINERARIES for MY TRIP](#)

Use Case #1

- We want to get from White River Junction to the southern edge of Manhattan in New York City. For this, we'll simply select Battery Park.
- We will require local transit information once we reach New York City.

New England Intercity Trip Planner

PLAN A NEW TRIP

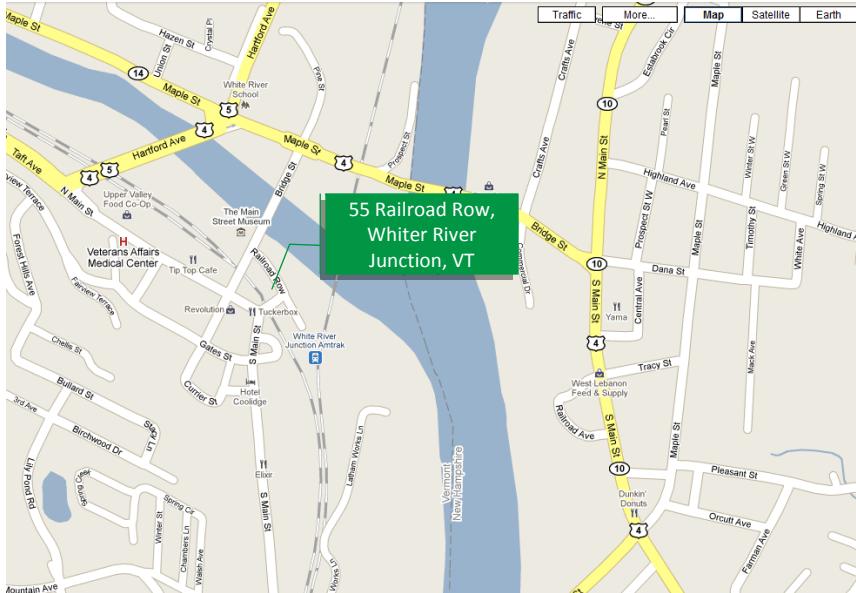
ABOUT US

CONTACT US

1 Origin (type or use map)

55 Railroad Row, White River Junction, VT

MAP IT



2 Destination (type or use map)

Battery Park, New York, NY

MAP IT



3 Preferences

Date

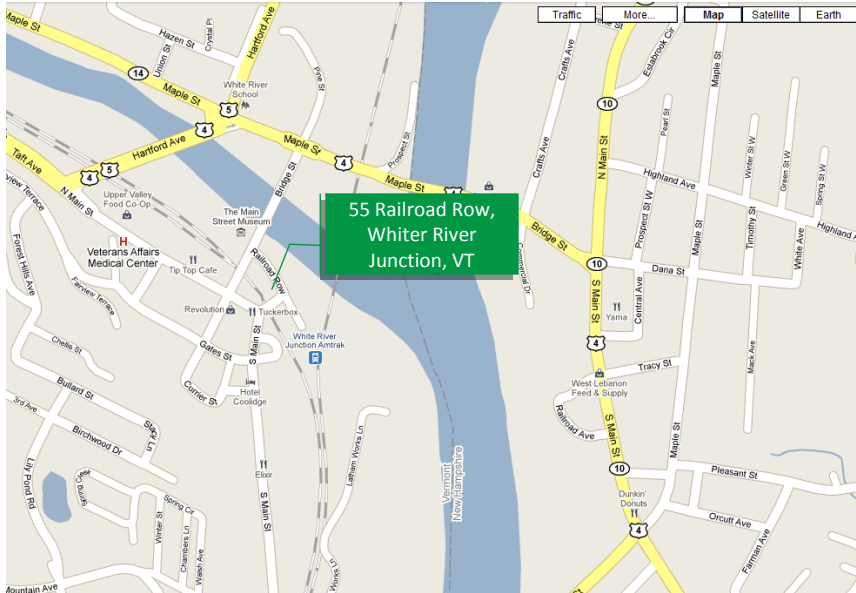
Max Transfers

Departure Time

4

GET ITINERARIES for MY TRIP

1 Origin (type or use map)

[MAP IT](#)

2 Destination (type or use map)

[MAP IT](#)

3 Preferences

4

[GET ITINERARIES for MY TRIP](#)

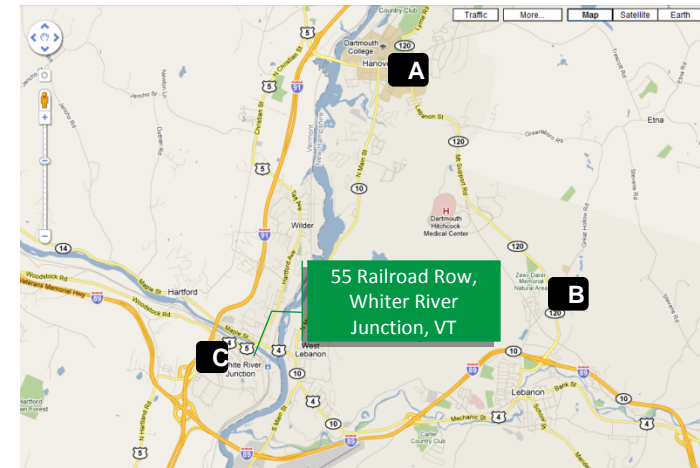
5 Select intercity itinerary

Possible Itineraries

Sort by: Departure Time Trip Time

	Inter-city stop for departure	Departure and Arrival Times	Inter city stop for arrival	Trip Time	Inter City Carriers
<input checked="" type="radio"/>	Hanover Inn, Hanover, NH A	Dep: 6:30 AM Arr: 11:30 AM	Yale Club, NYC D	5 hrs	Dartmouth Coach Direct
<input type="radio"/>	90 Etna Road, Lebanon, NH B	Dep: 6:15 AM Arr: 11:30 AM	Yale Club, NYC D	5 hrs 15 mins	Dartmouth Coach Direct
<input type="radio"/>	White River Junction, VT C	Dep 11:23 AM Arr 6:41 PM	Penn Station, NYC E	7 hrs 36 min	Amtrak Direct

Origin



Destination



Your Selected Intercity Trip

- **Departing:** October 12th, Hanover Inn at 6:30 AM **A**
- **Transfers Required:** no transfers needed
- **Arriving:** October 12th, Yale Club, New York City at 11:30 AM **D**
- **Total Trip Time:** 5 hrs
- **Carrier(s):** [Dartmouth Coach](#)

[Print This Trip Itinerary](#)

Need information on getting to and from the terminals?

Get from **55 Railroad Row** to the Hanover Inn

[Local Transit](#)

[Driving Directions](#)

Get to **Battery Park** from the Yale Club

[Local Transit](#)

[Driving Directions](#)

Origin



Destination



What to do with the local trip legs (getting to and from the terminals).

1. If a quality local transit trip planner service exists, we use it (e.g. NY511)
2. We can use Google Transit for local trips when it is available
3. We can provide local transit agency schedules from the transit map.
4. Where no transit exists, we offer driving directions to the bus stop

Need information on getting to and from the terminals?

Get from **55 Railroad Row** to the **Hanover Inn**

Local Transit

Driving Directions

Get to **Battery Park** from the **Yale Club**

Local Transit

Driving Directions

In the case of Battery Park, we can use NY511. On click, this button could hand off to their tool for transit trip building.

Need information on getting to and from the terminals?

Get from **55 Railroad Row** to the **Hanover Inn**

[Local Transit](#)[Driving Directions](#)

Get to **Battery Park** from the **Yale Club**

[Local Transit](#)[Driving Directions](#)

[Traffic, Travel and Transit Info](#)[TRAFFIC CONDITIONS](#)[TRANSIT CONDITIONS](#)[TRANSIT TRIP PLANNER](#)[RIDE SHARE](#)[TRAVEL LINKS](#)**ALERTS** | There are no service alerts at this time.**MY CUSTOMIZED ALERTS**[Next Best Itinerary](#) [Revise Trip](#) [Return Trip](#) [Onward Trip](#) [New Trip](#)**Trip Summary****Departing:** 11:45 AM on Tuesday, October 12, 2010
From: YALE CLUB**Total Trip Time:** 0:04
To: BATTERY PARK[Rideshare Options for this Trip?](#)**Step** | **Trip Details****Board Line:****Carrier:****Step Time:****Map**

1

Depart at: 11:45 am
Go To: Brooklyn Bridge Cty Hall Sta 4/5/6
Board: N.Y.C.T.A. Subway Train #4/4 - Utica Av-Crown H
Arrive at: Bowling Green Station 4/5 at 11:49 am

4

4 - Utica Av-Crown H



0:04

[Walking Map](#)**1 incident affects this line.** [\[Show Details\]](#)**Print**

Use Case # 2

- A traveler is trying to get from Portland Maine to Bangor Maine
- She is mainly concerned about selecting the best intercity bus

New England Intercity Trip Planner

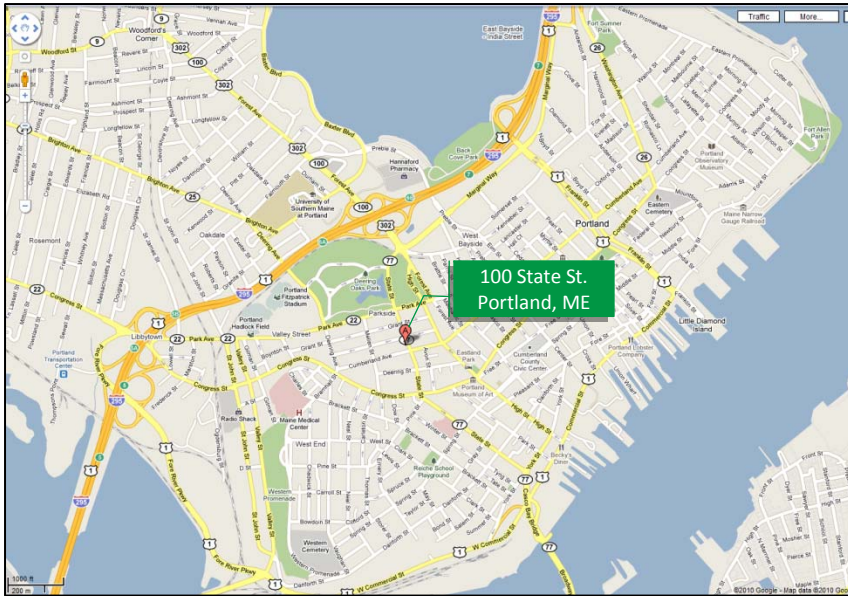
WE CAN PUT NAVIGATION HERE

1 Origin

Type here, or click anywhere on the map

100 State St., Portland, ME

MAP IT



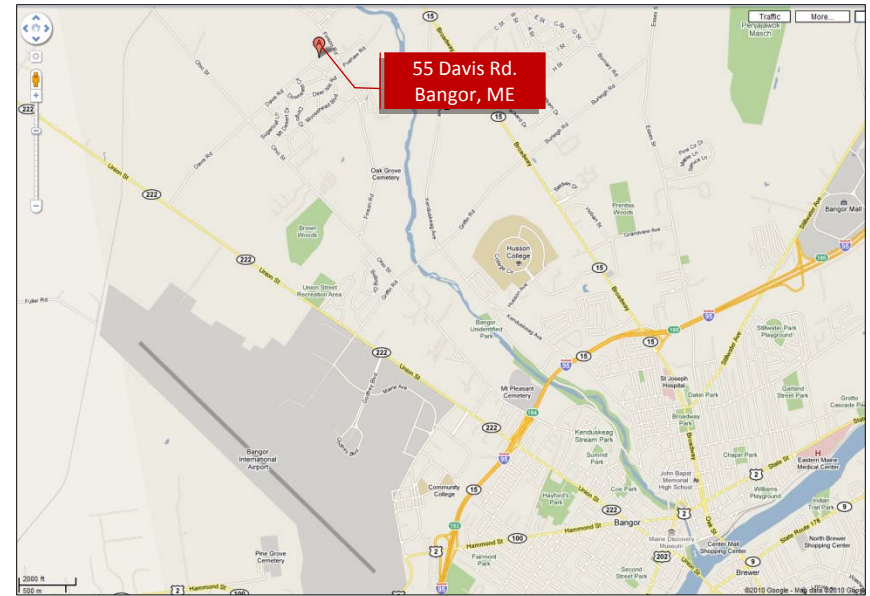
2

Destination

Type here, or click anywhere on the map

55 Davis Road, Bangor, ME

MAP IT



3 Preferences

Pop-up calendar

Date

Departure Time

Pull down for times

Maximum transfers for the intercity part of your trip

0, 1, or 2

4

Get itineraries for the intercity trip..

5 Select intercity itinerary

Possible Itineraries

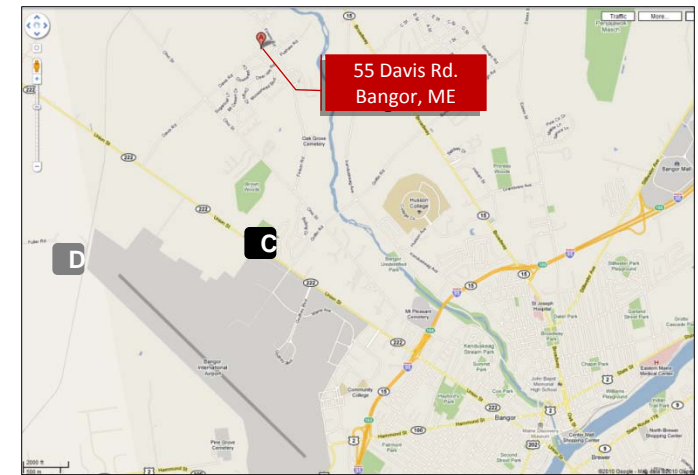
Sort by: Departure Time Shortest Trip Time

	Inter-city stop for departure	Departure and Arrival Times	Inter city stop for arrival	Trip Time	Inter City Carriers
<input checked="" type="radio"/>	Portland Intermodal Terminal 1.5 miles from your origin A	Dep: 6:35 AM Arr: 10:05 AM	Union Street Station, Bangor .5 miles from your destination C	3 hrs 30 min	Concord coach Direct
<input type="radio"/>	Portland Greyhound Terminal .5 miles from your origin B	Dep 11:05 AM Arr 5:29 PM	Union Street Station, Bangor .5 miles from your destination C	6 hrs 24 min	Greyhound/ Concord Coach 1 Transfer
<input type="radio"/>	Portland Greyhound Terminal .5 miles from your origin B	Dep: 1:22 PM Arr: 3:46 PM	Bangor Bus Terminal 3.8 miles from your destination D	4 hrs 25 min	Greyhound Direct
<input type="radio"/>	Portland Intermodal Terminal 1.5 miles from your origin A	Dep 4:20 PM Arr 8:15 PM	Union Street Station, Bangor .5 miles from your destination C	3 hrs 55 min	Concord Coach Direct
<input type="radio"/>	Portland Intermodal Terminal 1.5 miles from your origin A	Dep 5:47 PM Arr 8:44 PM	Union Street Station, Bangor .5 miles from your destination C	4 hrs 58 min	Concord Coach 1 Transfer

Origin



Destination



Your Selected Intercity Trip

- **Departing:** June 21st, Portland Intermodal Terminal at 6:35 AM **A**
- **Transfers Required:** no transfers needed
- **Arriving:** June 21st, Union Station at 10:05 AM **C**
- **Total Trip Time:** 3hrs, 30 minutes
- **Carrier(s):** [Concord Coach](#)

[Print My Selected Intercity Trip](#)

Need information on getting to and from the terminals?

Get from **100 State Street** to the Portland Intermodal Terminal

[Local Transit](#)

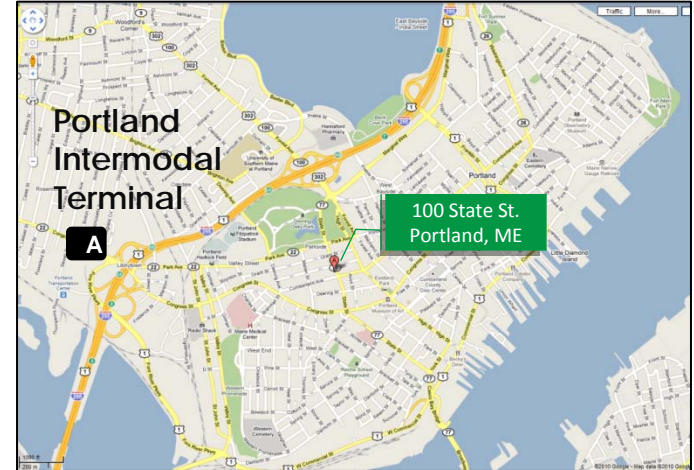
[Driving Directions](#)

Get to **55 Davis Rd** from Union Station

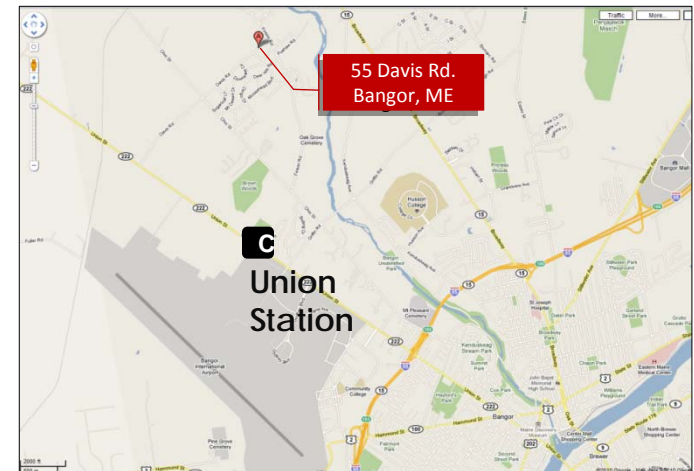
[Local Transit](#)

[Driving Directions](#)

Origin



Destination



Use Case # 3

- A traveler is trying to get from Springfield, MA to Burlington, VT.
- She will need local transit information on both ends of her trip

Your Selected Intercity Trip

- Departing: October 14th, Springfield Amtrak at 3:15 PM **A**
- Transfers Required: no transfers needed
- Arriving: October 12th, Essex Junction Amtrak, VT at 8:44 PM **D**
- Total Trip Time: 5 hrs 29 mins
- Carrier(s): [Amtrak](#)

Print My Selected
Intercity Trip

Need information on getting to and from the terminals?

Get from **55 Alden Road** to the Springfield Amtrak Station

Local Transit

Driving Directions

Get to **Burlington, VT** from the Essex Junction

Local Transit

Driving Directions

If the traveler wants trip planning to the train station, a local trip could be handled by using Google Transit for this area.



from: 42.1017913,-72.5650127 to: 42.10596,-72.59359

Search Maps

Show search options

Get Directions My Maps

Print Send Link

Car Transit Walk Bike

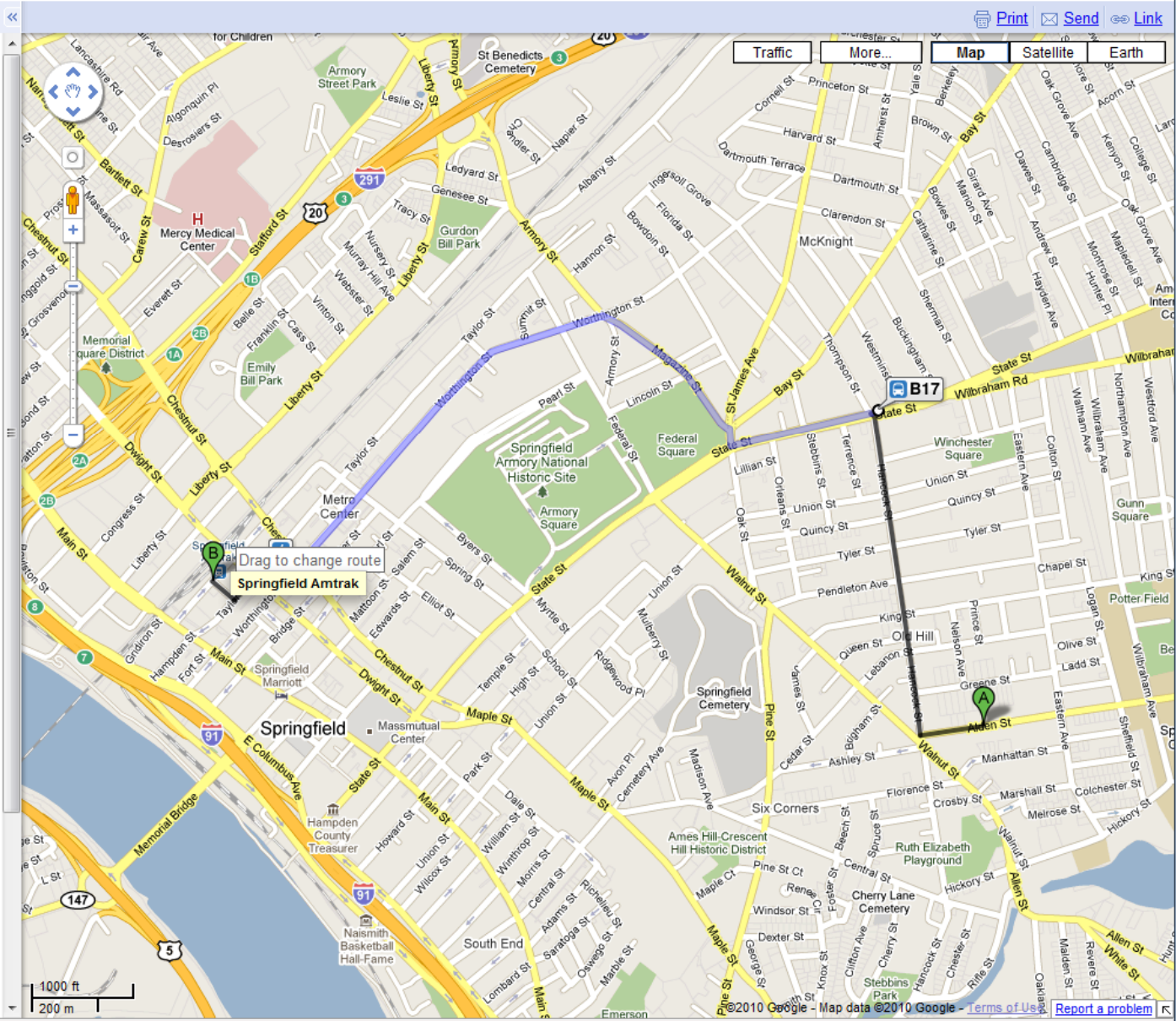
Add Destination - [Hide options](#)

Depart at

Transit directions to Kaynor St

- Suggested routes**
- 9:17am - 9:43am** 26 mins
 - 9:31am - 9:56am** 25 mins
 - 9:46am - 10:09am** 23 mins
 - Walking (32 mins)**

- A Alden St**
- Showing Trip 1 Travel time: about 26 mins
- Walk to State/Thompson**
About 15 mins
[Show details](#)
 - Bus - B17 - Eastfield Mall via Worthington-Wilbraham Rd-Parker - Direction: Downtown Via Wilbraham Road**
Service run by PVTA
9:32am Depart State/Thompson
8 mins (9 stops)
9:40am Arrive Taylor / Dwight
 - Walk to Kaynor St**
About 3 mins
[Show details](#)
 - B Kaynor St**



Your Selected Intercity Trip

- Departing: October 14th, Springfield Amtrak at 3:15 PM **A**
- Transfers Required: no transfers needed
- Arriving: October 12th, Essex Junction Amtrak, VT at 8:44 PM **D**
- Total Trip Time: 5 hrs 29 mins
- Carrier(s): [Amtrak](#)

Print My Selected
Intercity Trip

Need information on getting to and from the terminals?

Get from **55 Alden Road** to the Springfield Amtrak Station

Local Transit

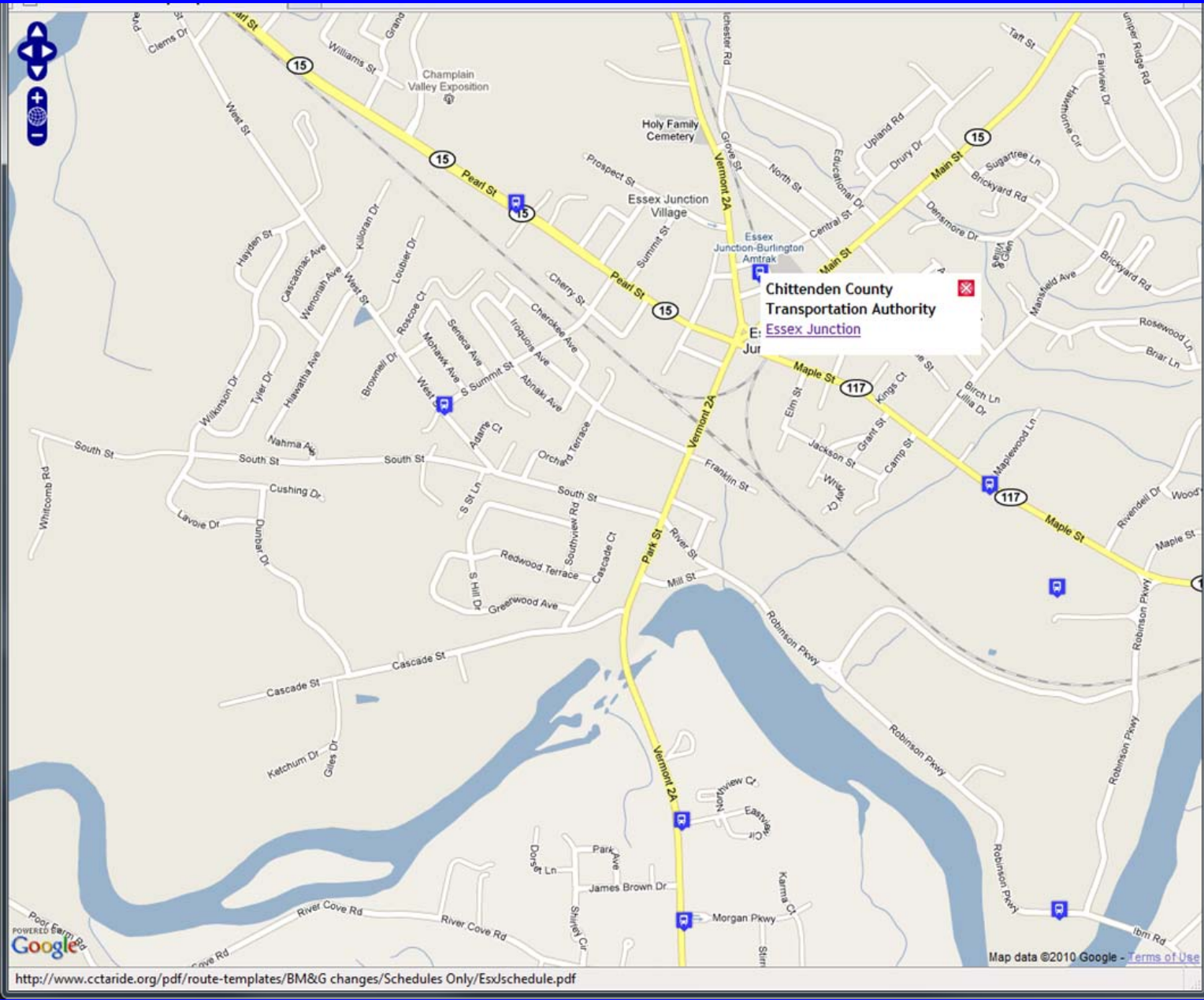
Driving Directions

Get to **Burlington, VT** from the Essex Junction

Local Transit

Driving Directions

Once arriving in Essex Junction, clicking LOCAL TRANSIT will send the traveler to a relevant local provider website with schedules.



ROUTE NUMBER
2

Essex Junction

(Burlington to Essex Junction)



SCHEDULE **MONDAY-FRIDAY**

Cherry Street 1	FAHC 2	Champlain Mill 3	Fort EA / Elly Long 4	West and Summit 5	IBM 6	AMTRAK 7
-	-	-	-	5:55	-	6:00
-	-	-	-	6:10	-	6:15
5:45*	5:50	5:57	6:05	6:15	6:20	6:26
6:00	6:05	6:12	6:20	6:30	6:35	6:41
6:15	6:20	6:27	6:35	6:45	6:50	6:56
6:30	6:35	6:42	6:50	7:00	7:05	7:11
6:45	6:50	6:57	7:05	7:15	7:20	7:26

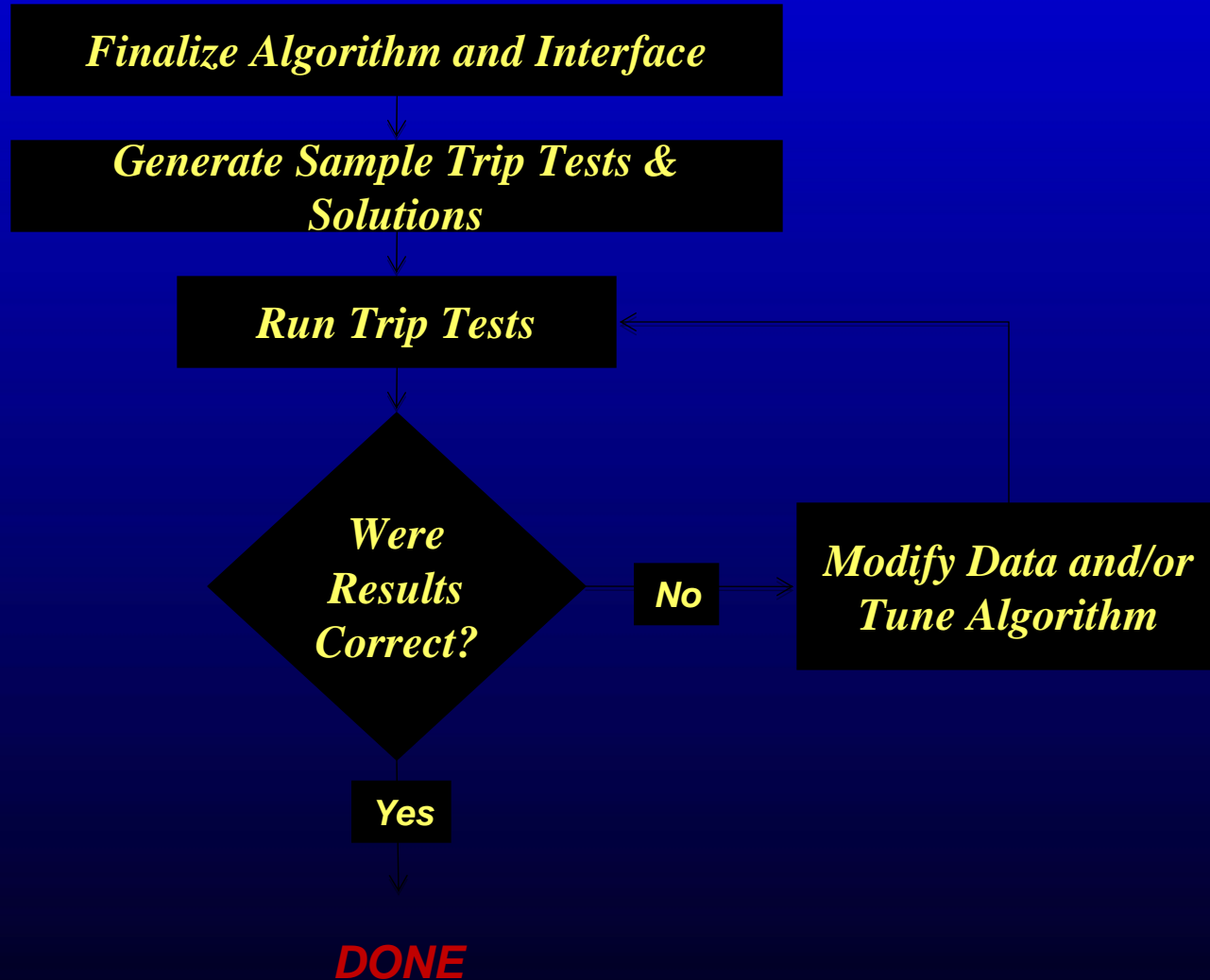
† Transfers to and from the Riverside/Winooski bus can be made at the Champlain Mill.

The Essex Junction bus is not held at Cherry Street

SATURDAY

Cherry Street 1	FAHC 2	Champlain Mill 3	Fort EA / Elly Long 4	West and Summit 5	IBM 6	AMTRAK 7
6:10	6:15	6:20	6:26F	6:35	6:39	6:43
7:15	7:20	7:25	7:31F	7:40	7:44	7:48
8:15	8:20	8:25	8:31F	8:40	8:42R	8:44
9:15	9:20	9:25	9:31F	9:40	9:42R	9:44
9:45	9:50	9:56	10:04	10:13	-	10:18
10:15	10:20	10:26	10:34	10:43	-	10:48
10:45	10:50	10:56	11:04	11:13	-	11:18

NEXT STEPS: Data Review, Algorithm Testing, and Interface Refinements



NEXT STEPS

How to Summarize a full trip:

OPTION 1	OPTION 2
<p>The user will need to print information for all three legs:</p> <ol style="list-style-type: none"><li>1. Collector: Origin Address to Departing Terminal<li>2. Long Haul: Intercity Section<li>3. Distribution: Arrival Terminal to Destination Address	<p>A more advanced interface pulls the three legs into one complete summary.</p> <p>The user could print or email the chosen itinerary to themselves.</p>

To Recap

- Presenting information *about the inter-city segment* is the priority
- Program can work when optimal local information is available
- Program can work when poor local information is available.

The Major Issue Now

- Is this a technical issue?
- No. Long distance trip itinerary planning is done in Europe, and in NY511.
 - Not primarily a question of software
- Rather, it is *an institutional issue*: who is willing to be responsible for the management and quality of the input schedule data?
 - Easy to answer on statewide basis
 - Challenging on a multi-state basis

Thanks

- Thanks to all those who have contributed to this project over the last decade
 - (You know who you are!)
 - The I-95 Corridor Coalition
 - Resource Systems Group, Inc
Smart Mobility Inc.
 - The New England Transportation Institute