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**Innovations Deserving  
Exploratory Analysis Programs**

*Transit IDEA Program*

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## Intercity Transit Trip Planning Web Application

Final Report for  
Transit IDEA Project 75

Prepared by:  
Thomas J. Adler, Principal Investigator  
RSG (Resource Systems Group, Inc.)

*September 2014*

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**TRANSPORTATION RESEARCH BOARD**  
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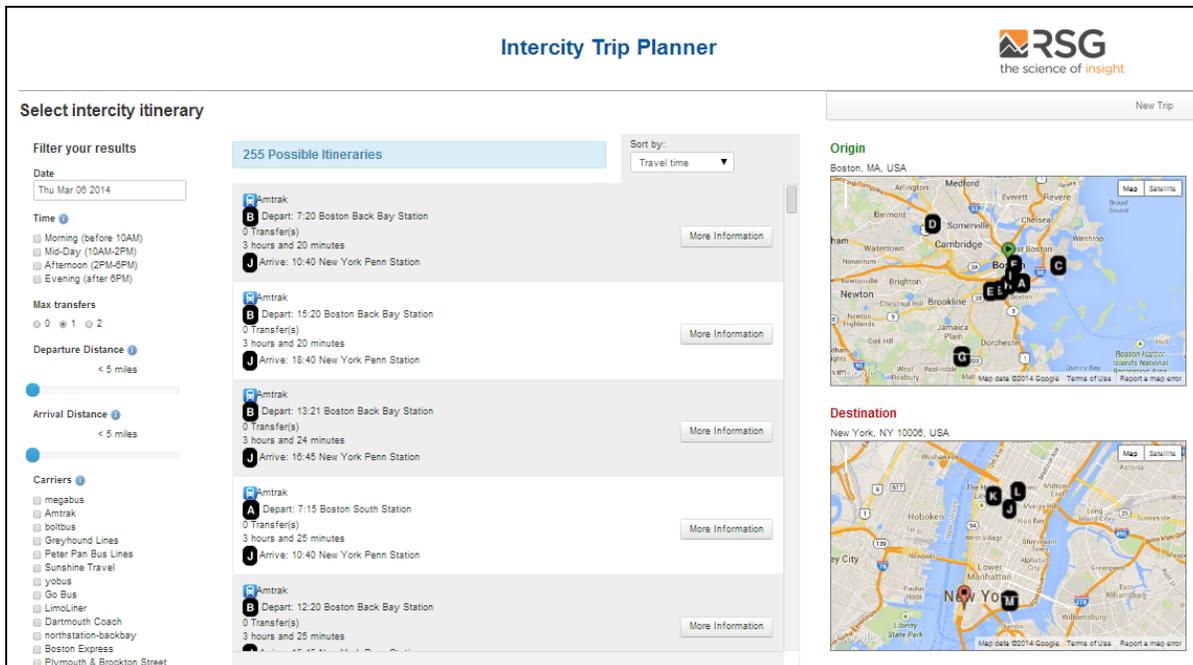
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# Intercity Transit Trip Planning Web Application

## IDEA Program Draft Final Report Contract Number TRANSIT-75

Prepared for the IDEA Program  
Transportation Research Board  
The National Academies

*Thomas J. Adler, Principal Investigator  
RSG (Resource Systems Group, Inc.)  
30 September 2014*

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### **TRB TCRP Staff**

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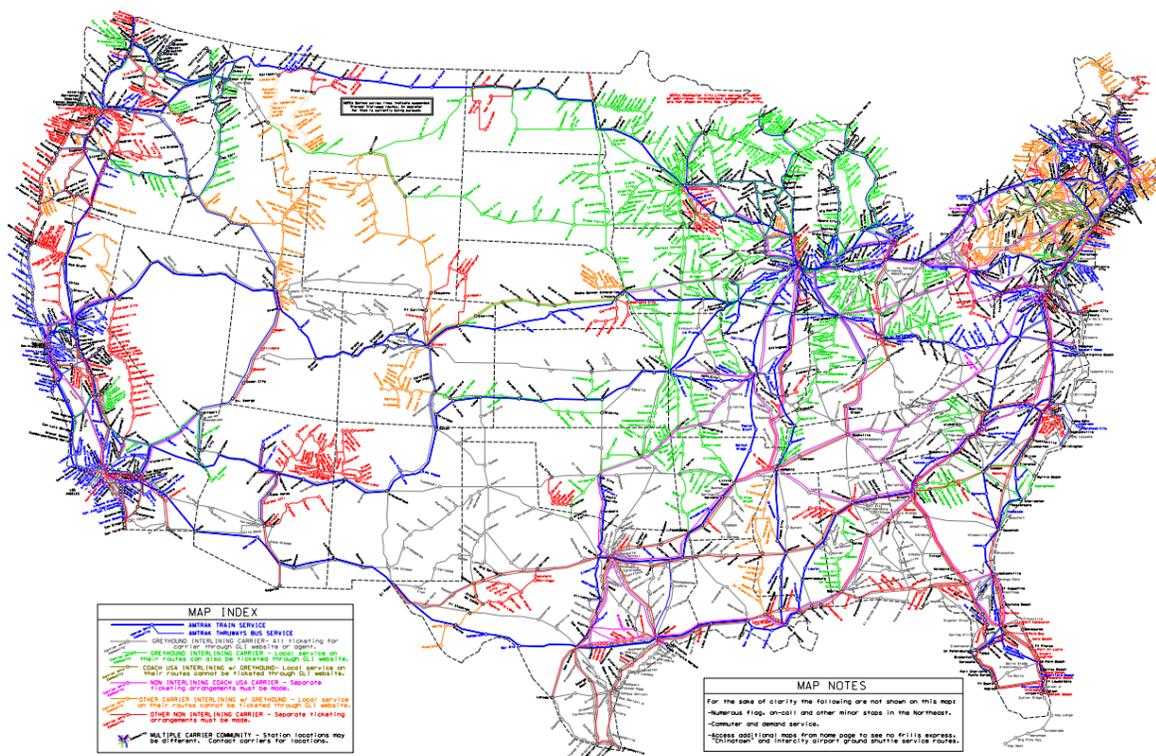
## TABLE OF CONTENTS

Acknowledgements	ii
Executive Summary	2
IDEA Product	4
Concept and Innovation	4
Investigation	5
Task 1: Work with Intercity Rail and Bus Carriers to incorporate their Input	6
Task 2: Develop and apply tools for scalable data importation and updating web service	10
Task 3: Improve interface with private carriers for cost and ticket sale information	10
Tasks 4-6: Revise network model to accommodate true schedule exceptions; Optimize the computation of networks and underlying algorithms; Application of improvements to mapping & user interface	10
Plans for Implementation	20
APPENDIX	21

## EXECUTIVE SUMMARY

After years of decline, intercity bus service has increased by more than 50% over the past six years. However, there are more than 100 intercity bus carriers providing that service. There is no single place that travelers can go to determine which of these bus services best matches their travel needs, let alone how they compare with, or can connect with, AMTRAK rail services. FIGURE 1 shows the general extent of the passenger bus and rail networks.

**FIGURE 1 U.S. intercity bus and rail network (Source: American Intercity Bus Riders Association)**



The overall purpose of the work supported by this project is to provide the traveling public with door-to-door trip planning options for using public modes for longer distance intercity travel integrated with local transit. The work builds on a prior project that was funded by the I-95 Corridor Coalition to build a proof-of-concept system for a region including Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut and New York. Resource Systems Group (RSG) developed a web-based system for that region that was very well-received and more than accomplished its original “proof-of-concept” objective. The goals of this Transit IDEA project were to 1) develop a fully scalable and flexible version of the system and 2) address the key institutional issue of how to cost-effectively assemble reliable schedule data which underlie this system. The key accomplishments toward these two primary project goals are as follows:

- 1) **Scalability and flexibility** – The “proof-of-concept” version of the intercity trip planner developed for the I-95 Corridor Coalition demonstrated that it is possible to provide rich information about intercity trip options that intelligently identifies all reasonable alternatives across multiple bus carriers and rail companies. However, any given intercity trip could provide the “best” service from any of a number of different origin and destination stations. Finding all of those options for a given trip requires a significant amount of computation and it would

be difficult to complete the required computations in “real time” to respond to a trip query. With this IDEA funding, the software implementation was substantially changed to allow for better scalability to the national level. In addition, the data structures and processing algorithms were modified to account for day-by-day schedule differences.

The proof-of-concept was optimized for viewing with a browser on a full-sized PC monitor. This re-implementation provides a more flexible framework that supports both PC-based and mobile devices.

- 2) **Institutional arrangements** – In this work, the project team reached out to carriers and public agencies to determine whether the carriers would provide their data for this effort and/or whether public agencies would provide funding to support data updating. Based on this outreach, the team concluded that it would be a significant effort to convince carriers to share their schedule data on an automated basis. As a result, the project team reached out to Russell’s Guide, an organization that maintains the “official” bus schedules for most of the major U.S. intercity bus carriers. We have reached an initial agreement to license those data for use in our trip planner and have developed procedures to automate the data interchange and translation process. Russell’s Guide is currently working with RSG to expand their schedule data to include the other smaller carriers so that the trip planner will be inclusive of all established intercity carriers. This arrangement solves the key institutional issue that was identified in the I-95 Corridor Coalition project – the difficulty of getting reliable schedule information for all of the carriers.

The resulting product is unique in several respects. First, it is the only existing intercity trip planner that provides detailed schedule information on all available passenger bus and rail services. The planner provides door-to-door travel information, including local transit connections where available. The trip planner uses a sophisticated algorithm to identify all “good” itineraries from the millions of possible alternatives that exist even in limited regions such as the Northeast U.S. And, the information is presented in ways that allow travelers to sort and filter their alternatives in ways similar to those used in air travel itinerary planners.

With the Russell’s Guide partnership, RSG expects to load the full national database into the trip planner system and deploy the service for public use later in 2015.

## IDEA PRODUCT

Travelers making longer distance trips using bus or rail have had no single place to obtain information showing combinations of local transit and intercity ground travel modes (rail, bus) that provide good door-to-door trip options for their travel. This IDEA product provides door-to-door trip planning options for using *public modes* including AMTRAK and intercity bus carriers for longer distance intercity travel integrated with local transit services. The product shows integrated door-to-door trip details for using either Amtrak or intercity bus for the longer distance segment, and available transit or auto directions for access to and from the long distance terminal points.

## CONCEPT AND INNOVATION

While the passenger rail and intercity bus systems in the U.S. have generally reduced their service footprints over the past several decades, the systems still serve a substantial portion of the U.S. The air transportation system has fewer than 400 airports providing commercial service but there are literally thousands of intercity bus and rail stations and stops where travelers can access these systems. As an example, even within the very small community in which RSG's headquarters are located (the Lebanon NH/VT Micropolitan region with a population of about 75,000), there are five different intercity bus and rail stations/stops, each providing unique services, each within relatively easy driving distance and three with local transit access. Several of these services go directly to New York City and others go to Boston, connecting there with many bus and rail services that continue on to New York City, terminating in several possible stations or curbside locations. As a result, there are between 50 and 100 different "reasonable" ground transportation options for going between our small region and New York City (culled from the many more options that involve awkward transfers, long connections, etc.). For the Northeast region alone, there are similarly several million reasonable itineraries connecting the many existing bus and rail stations. As a result, the dimensionality of the bus/rail trip planning problem far exceeds that associated with finding air itineraries. And, the intercity bus system is currently growing significantly in size and coverage, with the advent of many new point-to-point and curbside services.

There are three primary innovations represented in this product:

- 1) **Concept** – The concept for this product is unique in several ways. It is designed to operate much like an advanced air passenger flight itinerary search, displaying all reasonable alternatives between two points, including all proximate intercity rail and bus stations/stops (the equivalent of allowing multiple airports at both ends), all reasonable connections and all carriers. It also supports filtering and search ordering as in air itinerary search engines. As noted above, this results in a computational problem dimensionality much greater than in air flight itinerary searches and very significantly greater than in the simple station-station itinerary searches supported by individual intercity bus and rail carriers. The product also supports true door-to-door trip planning, linking the intercity stations with local auto driving and local transit route directions.
- 2) **Algorithmic**—RSG's software engineering team, working with RSG's transportation network modeling team developed a scalable algorithm that pre-builds and stores many millions of itineraries in the background using cloud computing, based on current service schedules. The schedules for all of the carriers have been converted into GTFS (general transit feed specification) format and treated as a connected network, which can be used for other research purposes.
- 3) **User interface**—The user interface was designed to allow a minimum of initial user input and provide details as needed by each individual user. Trip origin and destination inputs use a familiar and flexible Google map/text interface (RSG is a licensed commercial Google Maps software user). The output displays itineraries along with sorting and filtering options, as well as options for connecting to the carriers for fare information and ticketing and for listing local auto and transit directions to the stations/stops.

## INVESTIGATION

The overall purpose of the work supported by this project is to provide the traveling public with door-to-door trip planning options for using public modes for longer distance intercity travel integrated with local transit. The work builds on a prior project that was funded by the I-95 Corridor Coalition to build a proof-of-concept system for a region including Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut and New York. Resource Systems Group (RSG) developed a web-based system for that region that was very well-received and more than accomplished its original “proof-of-concept” objective. The goals of this Transit IDEA project were to 1) develop a fully scalable and flexible version of the system and 2) address the key institutional issue of how to cost-effectively assemble reliable schedule data which underlie this system. The key accomplishments toward these two primary project goals are as follows:

- 1) **Scalability and flexibility** – The “proof-of-concept” version of the intercity trip planner developed for the I-95 Corridor Coalition demonstrated that it is possible to provide rich information about intercity trip options that intelligently identifies all reasonable alternatives across multiple bus carriers and rail companies. However, there are many bus and rail stations even just in the northeast region, each serviced by different combinations of carriers. And, any given intercity trip could provide the “best” service from any of a number of different origin and destination stations. Finding all of those options for a given trip requires a significant amount of computation and it would be difficult to complete the required computations in “real time” to respond to a trip query. As a result, these computations are done as one large batch job each time the carrier schedule data are updated. The database that is produced by these computations includes all reasonable carrier alternatives for each station pair and a user trip itinerary request simply queries that database. However, the database even for just the northeast region is very large and requires a very efficient structure.

With this IDEA funding, the software implementation was substantially changed to allow for better scalability to the national level. In addition, the data structures and processing algorithms were modified to account for day-by-day schedule differences.

The proof-of-concept was optimized for viewing with a browser on a full-sized PC monitor. This re-implementation provides a more flexible framework that supports both PC-based and mobile devices.

- 2) **Institutional arrangements** – For the proof-of-concept trip planner, schedules for all of the carriers in the northeast region were manually translated into GTFS format and then loaded into the trip planner. This required a significant initial effort which would need to be repeated for all other regions and a continuous manual maintenance effort to update schedules as they change, particularly for the bus carriers whose schedules and routes change frequently.

In this work, the project team reached out to carriers and public agencies to determine whether the carriers would provide their data for this effort and/or whether public agencies would provide funding to support data updating. Based on this outreach, the team concluded that it would be a significant effort to convince carriers to share their schedule data on an automated basis. And, some significant number of the several hundred bus carriers nationwide will simply not understand how it is in their individual interest to share these data until the value of the trip planner in expanding the total intercity transit market is demonstrated. As a result, the project team reached out to Russell’s Guide, an organization that maintains the “official” bus schedules for most of the major U.S. intercity bus carriers. We have reached an initial agreement to license those data for use in our trip planner and have developed procedures to automate the data interchange and translation process. Russell’s Guide is currently working with RSG to expand their schedule data to include the other smaller carriers so that the trip planner will be inclusive of all established intercity carriers. This arrangement solves the key

institutional issue that was identified in the I-95 Corridor Coalition project – the difficulty of getting reliable schedule information for all of the carriers.

The following section of this report details the work conducted in each of the individual project tasks.

## **TASK 1: WORK WITH INTERCITY RAIL AND BUS CARRIERS TO INCORPORATE THEIR INPUT**

### **1.A Formation of the Project Review Panel**

Consistent with the terms of the IDEA project, the RSG Research Team established a Peer Review Panel of experts from the intercity bus industry to comment on the development of the project. A brief description of each of the Panel members is provided here (listed alphabetically);

#### **Chris Andreasson, Advance Transit, Wilder Vermont**

Chris Andreasson is a leader in the inter-city bus community in New England having served as General Manager of the Vermont Transit Company, until that company was integrated into the network of its owner, Greyhound Lines. He worked at Vermont Transit for 34 years, starting as a bus driver, and working his way to become the top executive there. He currently directs bus operations at Advance Transit, one of the most innovative rural transit operators in the United States, and one of the few that offers free bus service to all riders. He is active in professional organizations, and provided advice to the I-95 Corridor Coalition in its initial development of a multi-state transit trip planner while he was at Vermont Transit.

#### **John Bennett, Vice President of Amtrak, Retired**

John Bennett is one of the leaders in the intercity travel sector, having served as Vice President of Amtrak (1995-2012), as a consultant, and at the Long Island Railroad (1990 -1995) . Mr. Bennett served as Co-chair of the I-95 Corridor Intermodal Passenger Committee, where he advocated the development by the Coalition of new tools to provide multi-modal information to the public. He is active in many professional organizations, such as TRB, and currently serves on the National Academy Committee on Long Distance Travel. He was educated at the University of California at Berkeley.

#### **Frederick D. Fravel, Vice President, KFH Group**

Fred Fravel is a transportation planner and consultant with almost 30 years of experience in transit planning and policy development. His background includes intercity bus planning and research, coordination and consensus building, state-level transit planning and program development, human service transportation coordination, and local public transportation operational and facility planning in both rural and urban areas. In addition to local and statewide public transportation planning projects, Mr. Fravel has led a number of transportation research projects for the Transit Cooperative Research Program (TCRP) and the Congressional Office of Technology Assessment (OTA). He serves on the Transportation Research Board (TRB) Committee on Rural Public and Intercity Bus Transportation, and is a member of the American Planning Association, Transportation Planning Division.

#### **Professor Brian Lee, University of Vermont Transportation Research Center**

Professor Lee is an Assistant Professor at the University of Vermont Transportation Research Center, where he is currently leading a major study on the role of information technology on the choice of longer distance transportation modes, entitled “The Application of Attitude-based Latent Factors in Analyzing Public Modal Shares of Intercity Travel in Northeastern Rural Regions,” funded by the Federal Highway Administration. He has been honored in his field with such awards as the Fred Burggraf Award from the Transportation Research Board of the National Academies, for recognition of excellence in transportation research, 2013; and the Dwight D. Eisenhower Transportation Fellowship from the U.S. Department of Transportation, 2007.

#### **Robin Phillips, Oregon Department of Transportation**

Robin Phillips re-joined Public Transit Division of the Oregon DOT in 2012. Robin originally began her transportation career at ODOT after working as a trial attorney for US Department of Justice. As the Intercity Program Manager, she developed policy and implemented ODOT's multimodal intercity bus program. Later, at Washington State DOT, Robin lead the Interagency Transportation Coordination Council and worked closely with MPOs, transit districts, private operators, and agency executives to implement coordinated planning and

pilot projects and to identify successful coordination strategies. She spent the previous five years in Washington DC working with public/private partnerships, mobility management, advocacy on motor coach safety, and multimodal and rural transportation development, including reauthorization, serving as Director of Policy for the American Bus Association.

In order to share ongoing development work on the trip planner with the Project Review Panel, the external website for the trip planner was updated to include the new interface and algorithms. This website includes the software changes described above but uses the original (and now dated) schedule and service data developed for the proof-of-concept version. A link to this site (<http://gothere.cloudapp.net/>) was provided to the panel and their input was requested on the general functionality and usefulness of the trip planner. Their reviews were generally positive, with a few suggestions for additional features and changes that should be considered as the functionality of the site is expanded. The Appendix to this report includes all of the written comments that were received from the Review Panel. Many of the comments related to gaps or deficiencies in the data, which were anticipated given that this version of the trip planner used old, static schedule data. RSG now has an agreement with Russell's Guide to provide current and highly reliable schedule data, which will be loaded into the production version of the software and then updated as schedules are updated.

### **1.B User Testing**

As part of its ongoing evaluation of the multistate intercity trip planner, the RSG team undertook an ambitious process of user-based testing of the instrument. With the close cooperation of the University of Vermont Transportation Research Center, a survey was undertaken in May, 2014 of more than 2,500 participants. All of these participants live in Maine, New Hampshire, Vermont and Massachusetts outside of the major metropolitan areas. Each of the participants was asked to participate in the planning of a trip from their actual home area to New York City, for a standardized trip in the near future. Only those who had some experience in traveling to longer distance destinations were accepted for the survey. (No funds from the Transit IDEA grant were expended on the survey itself, which was financed by the University of Vermont.)

All of the survey participants received an early set of questions about demographics, and attitudes to travel in general, but not about a specific trip. The hypothetical trip from their home to NYC was described in some detail (e.g. they would travel alone, and pay all costs of the travel themselves.)

Then, the sample was split between a Control group of roughly 1,250 and an Experimental group of 1,250. The experimental group was then sent (by hyperlink) to the trip planner where they learned of the actual trip options by bus and rail from their home to NYC. The Control group was not told that there was an experiment of any kind underway.

Then both the Control and the Experimental group answered the same questions about the specific trip, with the experimental group being asked two questions about their reaction to the revealed trip options. This allowed the RSG team to compare a wide variety of attitudinal information between the two groups.

- In highly abbreviated format, we learned that, in general, experiencing the trip planner:
- DOES lower the concern that rail or bus schedules just would not work (p=.000)
- DOES help the user to learn that bus times are not much longer than auto (p=.002)
- DOES help the user to learn that rail times are no much longer than auto (.05, all of which is from the Millennials)
- DOES help the user to feel he has all the info needed to make such a trip (p =.001)

In addition, the experience of seeing all these schedules

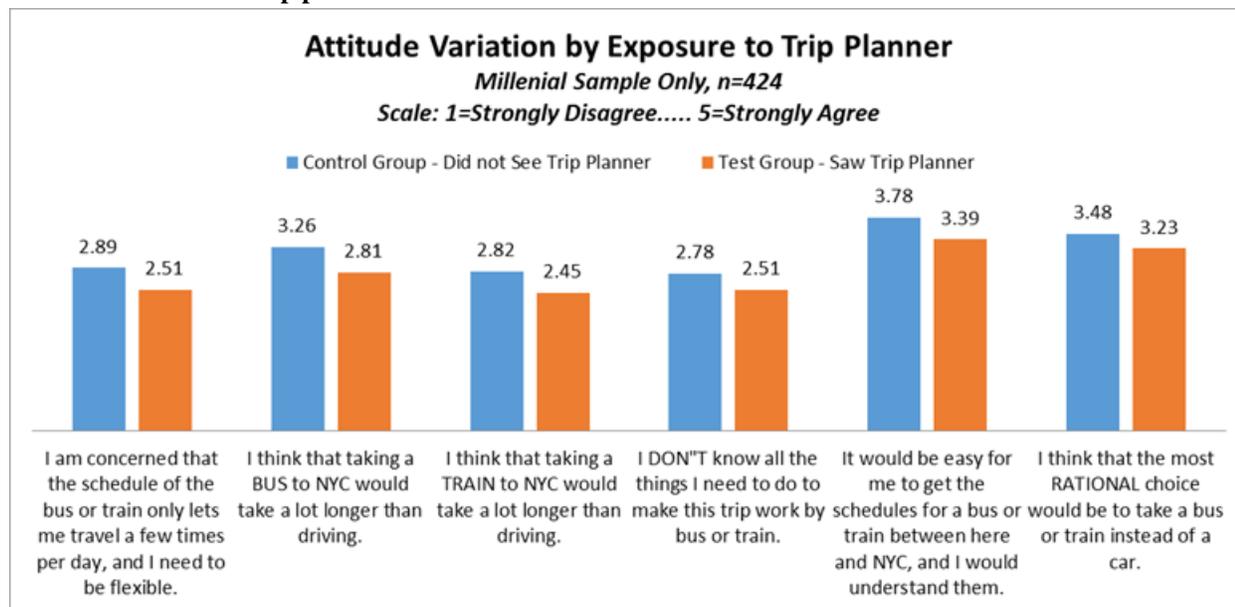
- DOES NOT make the user think that schedules are easy to deal with (p=.001)

- DOES NOT make the user think that bus or rail is more RATIONAL than taking the car (p=.015)

The values contained in the parentheses show the statistical significance of the DIFFERENCE between the mean values of the scoring by the experimental group compared with the control group. A “p value” of less than .05 means it is statistically significant by conventional standards.

These observations are expressed in two formats in the graphics below. FIGURE 2 shows the difference in mean values of scoring for Millennials only; TABLE 1 shows the same for the full sample, (or that portion of which saw the question).

**FIGURE 2 Effects of trip planner on Millennial attitudes**



**TABLE 1 Effects of trip planner on attitudes of the full sample**

VARIATION IN ATTITUDE BY EXPOSURE TO TRIP PLANNER, (FULL SAMPLE)						
	I am concerned that the schedule of the bus or train only lets me travel a few times per day, and I need to be flexible.	I think that taking a BUS to NYC would take a lot longer than driving.	I think that taking a TRAIN to NYC would take a lot longer than driving.	I don't know all the things I need to do to make this trip work by bus or train.	It would be easy for me to get the schedules for a bus or train between here and NYC, and I would understand them.	I think that the most RATIONAL choice would be to take a bus or train instead of a car.
Control Group: Did not See Trip Planner	2.80	3.04	2.74	2.71	3.82	3.51
Test Group: Saw Trip Planner	2.56	2.86	2.62	2.52	3.62	3.38
P value of significance of difference from ANOVA	.000	.002	.049	.001	.000	.015
N=	2135	2171	1978	1773	2464	2309

In general, these results demonstrate that access to the trip planner significantly improves travelers’ perceptions of the available bus and rail options.

### 1.C Outreach to the Affected Communities

The research team also met with both the Federal Transit Administration and the Federal Highway Administration to discuss possible national roles for the provision of higher quality route and schedule information for the inter-city bus industry, given that a single source of schedule information is currently available for Amtrak. Discussions will continue

with these agencies, particularly concerning the role of the government agencies in collecting the service inventory data. We note that, for example, the Massachusetts Department of Transportation requires that all bus companies receiving financial aid for the purchase of inter-city buses are now required to provide the state with the General Transit Feed Specification (GTFS) data. The state then makes that data available to developers via a website.

Members of the RSG Research Team have met with state officials in Massachusetts and Vermont to discuss possible government-based applications for the multi-state trip planner. Additional meetings have been held with transit operators, and with the management of the Peter Pan Bus Company. In many cases the issues dealt not with the functionality of the software, but with the institutional issues associated with gaining accurate schedule data from the carriers. In several cases, interviewees have implied that, if they do nothing, Google Transit will automatically provide the kind of long distance multi-state trip itinerary planning that is desired by the bus industry.

In addition to discussing this project with bus carriers and public agencies, the project team conducted a review of existing intercity bus and rail planning services that are available to travelers. Before the proof-of-concept was developed, the present research team, working with I-95 Corridor Coalition, contacted the Google Transit team to gauge their interest in developing a system for intercity bus and rail trip planning. They expressed interest in following the work of the I-95 Corridor Coalition but indicated that they did not have plans to develop such a system themselves. They have since then added some of AMTRAK's routes to their Google Transit mapping but have not added intercity buses in any consistent manner. Some public agencies still expect Google to eventually add intercity buses but their Google Transit business model would require that the carriers provide data to them and the carriers have clearly indicated both a general reluctance to directly share their data and a resistance to the extra effort required to code their data in a standard (GTFS) format.

Our working assumption is that it will be at least a few years before Google enters this space and they may never choose to do so in the U.S. because of the industry fragmentation. In the meantime, there is a significant unmet need for this type of trip planner and potentially significant public and industry benefits that will derive from providing this service as soon as possible. This is evidenced in part by the emergence of several services that provide information about schedules of a limited subset of carriers. The following are U.S.-based services that focus on intercity bus:

- <http://www.wanderu.com>
- <http://www.routefriend.com>
- <http://www.bustripping.com>
- <http://www.buscatchers.com>
- <http://www.gotobus.com>

All of these services have simplified the trip search function in a number of ways that diminish their utility; for example, they require the stated trip start and end locations to be at bus stations, rather than identifying clusters of stations that could be accessed by car or public transit from the true trip origins and destinations. None of these has complete coverage of all of the bus carriers within the regional geographies that are included and none has a full national scope. In addition, only Wanderu appears to be actively maintained; it has been funded by an initial round of angel investment and has extended coverage to include parts of both the east and west coasts. However, it also includes only a subset of the active carriers in these markets as it relies on direct carrier participation into the ticketing process.

There are also two international services that include some U.S. coverage:

- <http://www.busbud.com>
- <http://www.rome2rio.com>

Busbud is based in Canada and includes only spotty U.S. coverage. The Rome2Rio service is based in Australia and in some ways is closest in concept to our trip planner. It provides full trip origin to destination routing for any origin/destination combination and includes both bus and rail services. However, it only identifies a single bus option for each origin/destination pair, only lists general trip frequency information (e.g., buses every four hours) and does not provide schedule details. The underlying data for the U.S. are from the American Intercity Bus Riders Association, a non-profit group that compiles a national bus route map.

## **TASK 2: DEVELOP AND APPLY TOOLS FOR SCALABLE DATA IMPORTATION AND UPDATING WEB SERVICE**

The current system uses schedules from carriers in General Transit Feed Specification (GTFS) format. The process requires reading these GTFS files into the network builder software, validating those schedules, and then importing the final datasets into the web application's backend. The project team has entered a partnership with Russell's Guide, a company that compiles and maintains bus schedules for all of the major bus carriers in the U.S. The data from Russell's Guide are text files with a different structure and procedures have been developed to facilitate importing these data. Once all of the additional carriers have been included in these data, they will be imported to the trip planner.

## **TASK 3: IMPROVE INTERFACE WITH PRIVATE CARRIERS FOR COST AND TICKET SALE INFORMATION**

The bus schedule data compiled by Russell's Guide, our project partner includes carrier details (ticketing website and other contact information) that will be integrated into the system once the data updates have been completed.

## **TASKS 4-6: REVISE NETWORK MODEL TO ACCOMMODATE TRUE SCHEDULE EXCEPTIONS; OPTIMIZE THE COMPUTATION OF NETWORKS AND UNDERLYING ALGORITHMS; APPLICATION OF IMPROVEMENTS TO MAPPING & USER INTERFACE**

These three task areas were completed together in the form of a completely new software implementation. The proof-of-concept version of the software operated on fixed schedules that describe typical routes and stops for the seven days in a week. However, for ultimate commercialization, the network model must accommodate seasonal schedule changes (which are common) and holiday exceptions. In both instances, the network building phase becomes substantially larger since all the combinations of each carrier's schedules create a growing number of itinerary combinations to process. In order to accommodate this feature, several changes were required in the data structures and underlying software. As a result, the following changes were made to create the new implementation:

- Upgraded the technology used for the site; now using the Python based MVC architecture Django.
- Switched web pages to Twitter Bootstrap for a better look and feel, responsive design, and simpler maintenance.
- Simplified site to three web pages without any functionality in popups. This includes integrating with the Google Directions API for local driving and transit directions.
- Migrated database to PostgreSQL
- Scripted the loading process to go from GTFS data to ready-to-query routes with one step (includes previous manual data munging).

- Deployed to a cloud server using Apache at <http://gothere.cloudapp.net/> (the schedule data being used for software testing are dated from the proof-of-concept version, so the site uses one day in the past instead of 'today')

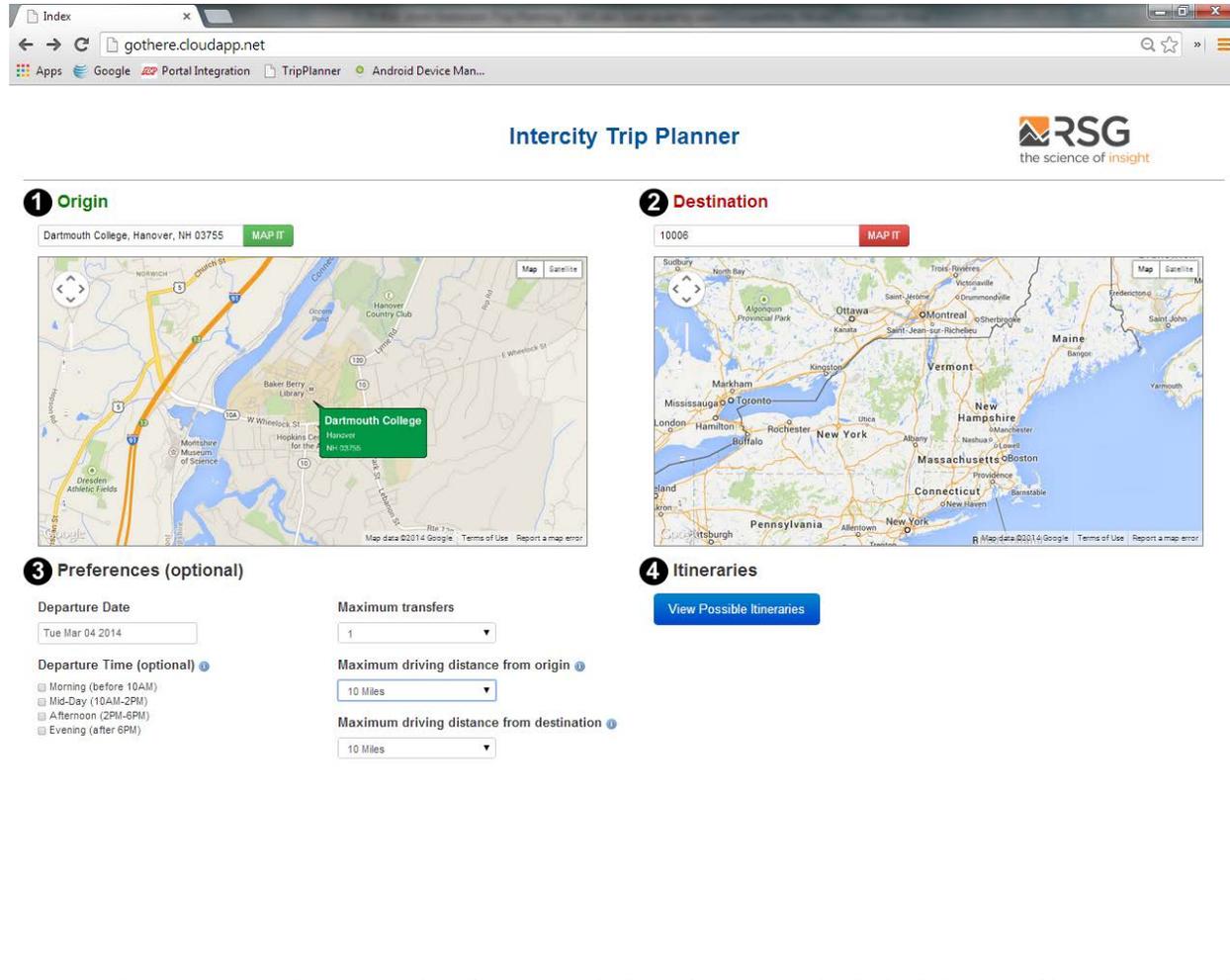
The data currently loaded in the above-referenced web application are static and intended for system validation and testing. They cover the northeast U.S. from Maine to New York and include the schedules for all intercity bus carriers and AMTRAK in this region as of the start of this project. As noted previously, the public-facing site will include current schedules for all carriers in the market at the time the site is referenced. The system as implemented includes the following key features:

- Allows traveler to enter either precise or general trip starting and end points using street addresses, place names, zip codes or just municipality
- Provides options for specifying travel date, departure time, maximum number of transfers, and maximum driving distances from stations at the trips start and end points
- Shows all “reasonable” itineraries for the specified trip including both direct and connecting options involving multiple carriers and bus – rail connections
- Allows connections between carriers that operate out of different stations within a given city – for example, allows connections between the AMTRAK service that operates out of North Station in Boston and the intercity buses and AMTRAK service that operate from South Station (with a time buffer included and alert to the user that this requires a local station transfer)
- Allows itineraries to be sorted by departure time or travel time
- Provides options for filtering itineraries by date, departure time interval, number of transfers, distance from trip start point to departure station, distance from arrival station to trip end point and carrier
- Shows mapped location of all stations used by the listed itineraries
- Provides itinerary summary with driving or local transit directions to the stations used in the selected itinerary
- Links to carrier website for ticketing

These features, together with the new software implementation address all of the major technical objectives of this project.

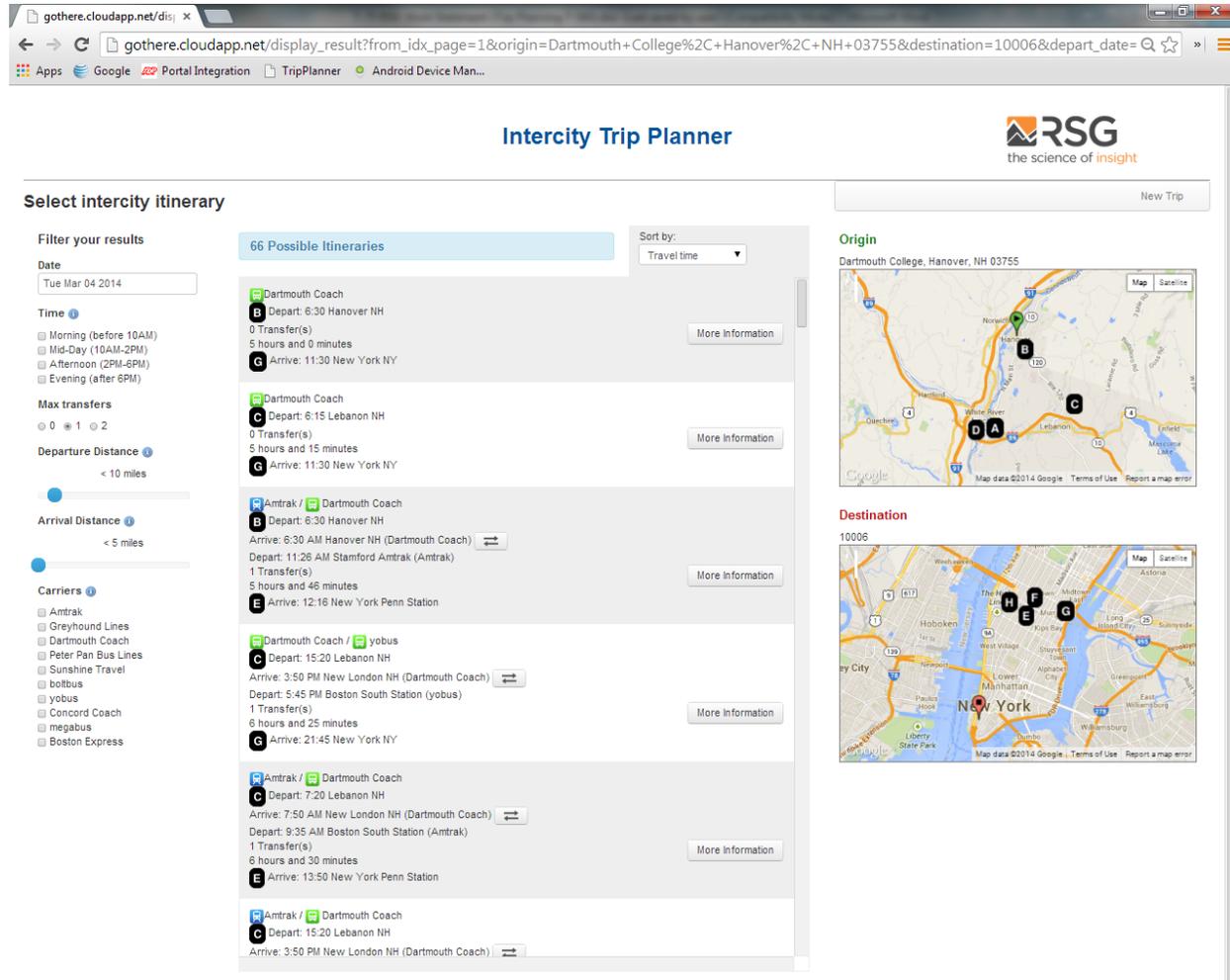
The screen captures that follow show examples of the functions and implementation of the current version of the system. The first set describes travel options for a trip from Dartmouth College in Hanover, New Hampshire to Lower Manhattan. FIGURE 3 below illustrates that trip start and end locations can be entered as place names (e.g., Dartmouth College) or by physical address (here, by zipcode 10006 though a full or partial street address can also be used). Travelers can optionally also provide a departure date and time, preferences for maximum number of transfers and maximum driving distance on both ends of the trip.

**FIGURE 3 Trip origin and destination input screen**



The next screen (FIGURE 4) shows the itinerary options that are available for the trip start and end locations that were provided. In this case, 66 reasonable bus, rail and bus/rail combinations were found for this trip. The trips are by default sorted by beginning station to ending station travel times, but can also be sorted by departure time. The 66 options cover the departures for an entire day and, for intercity trips, many travelers have flexible timing and so they may want to see the best options across the full day. The column on the left of the screen provides options to filter the options by time of departure, number of transfers, distance from trip start location to origin station, distance from trip end location to destination station and by carrier. The maps on the right show locations of origin and destination station locations in reference to the chosen trip start and end locations.

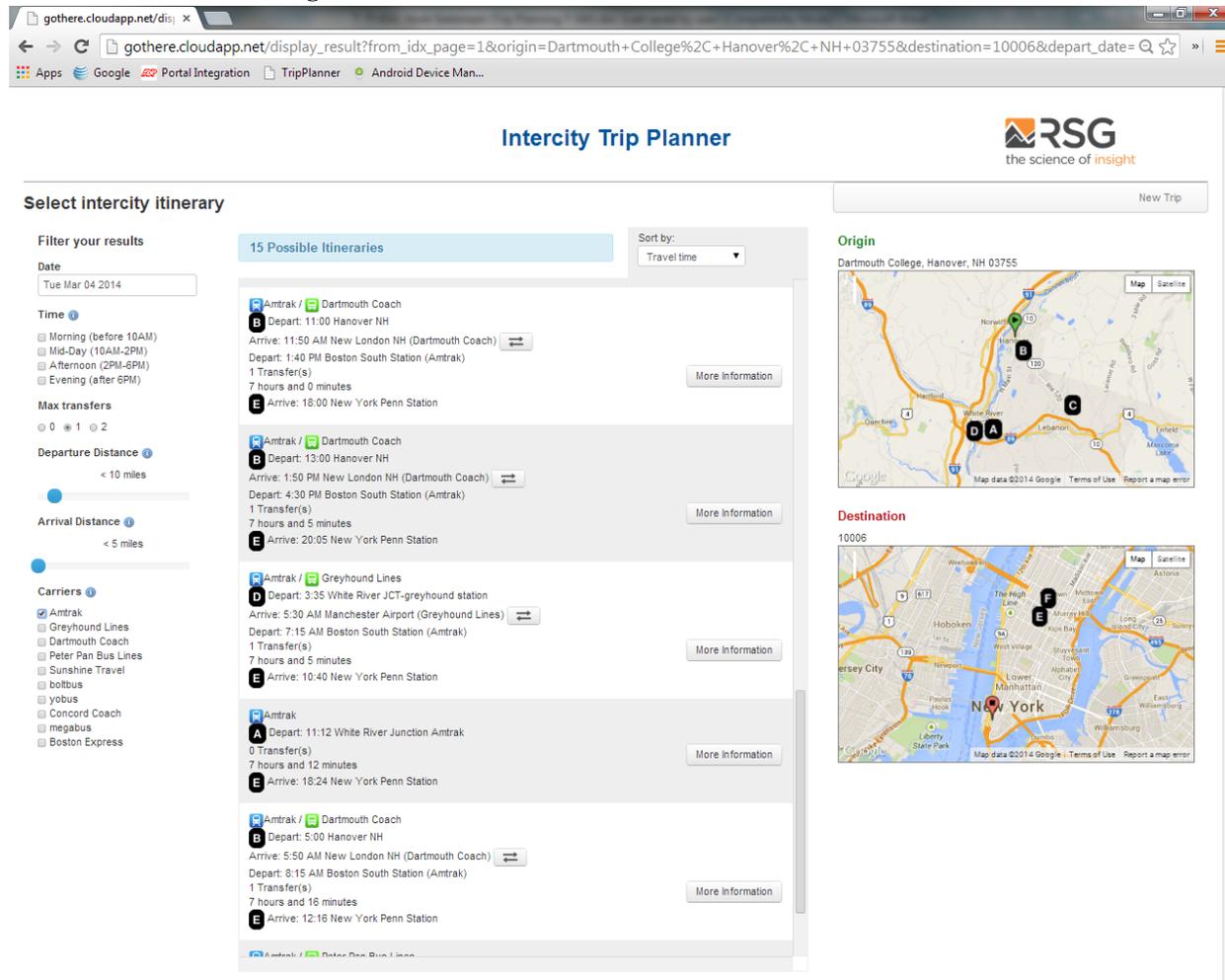
**FIGURE 4 Itinerary list**



The next screen (FIGURE 5) shows an application of the carrier screening – here AMTRAK is chosen and so only options with an AMTRAK segment are shown. There are several options here, the fastest involving bus connection to AMTRAK either in Stamford, CT<sup>1</sup> or in Boston. There is also a direct AMTRAK service to New York City but it is slower than the bus connect options.

<sup>1</sup> Stamford, CT was a transfer point for Dartmouth Coach at the time these schedule data were prepared; it has since then been discontinued and the bus now goes express all the way to New York City.

**FIGURE 5 Carrier filtering**



The final screen (FIGURE 6) shows the information that is provided for a selected options (in this case, the bus to Boston connecting to AMTRAK to New York City). Access options and information are provided for the origin and destination stations, using Google’s mapping and transit API. Once the full data from our schedule data partner firm are loaded, this will also provide direct links to the chosen carrier’s for ticket booking.

**FIGURE 6 Local transportation to/from stations**

**Your Selected Intercity Trip**

- **Departing:** 11:20 (Lebanon NH with Dartmouth Coach)
- **Transfers Required:** 1  
 Arrive: 1:35 PM Boston South Station (Dartmouth Coach)  
 Depart: 1:40 PM Boston South Station (Amtrak)
- **Arriving:** 18:00 (New York Penn Station with Amtrak)
- **Total Trip Time:** 6 hours and 40 minutes
- **Carrier(s):**

**Need directions on getting to and from the terminals?**

**From**

**A** 55 Railroad Row, White River Junction, VT 05001, USA

**To**

**B** Lebanon NH

None Local Transit Driving

Walking directions are in beta. Use caution – This route may be missing sidewalks or pedestrian paths.

**A** 35 Railroad Row, White River Junction, VT 05001, USA

6.0 mi – about 52 mins

**A** Walk to Main St. West Leb NB  
About 15 mins

**Main St. West Leb NB**

**B** Red Bus towards Lebanon City Hall SB

**From**

**A** New York Penn Station

**To**

**B** New York, NY 10006, USA

None Local Transit Driving

Walking directions are in beta. Use caution – This route may be missing sidewalks or pedestrian paths.

**A** 267-293 West 31st Street, New York, NY 10001, USA

3.4 mi – about 23 mins

**A** Walk to 28 St  
About 6 mins

**28 St**

**B** Subway towards South Ferry Loop

The filtering functions can also be used to screen out itineraries that the traveler finds undesirable. For example, FIGURE 7 shows the itineraries that were found for a trip from Springfield, Massachusetts to Hoboken, New Jersey for which itineraries that require AMTRAK connections are the fastest among all available.

FIGURE 7 Transfer itineraries can be fastest

## Intercity Trip Planner



### Select intercity itinerary

#### Filter your results

60 Possible Itineraries

Sort by:

Travel time

#### Date

Wed Oct 15 2014

#### Time

- Morning (before 10AM)
- Mid-Day (10AM-2PM)
- Afternoon (2PM-6PM)
- Evening (after 6PM)

#### Max transfers

0  1  2

#### Departure Distance

< 10 miles

#### Arrival Distance

< 10 miles

#### Carriers

- Amtrak
- Dartmouth Coach
- Greyhound Lines
- Peter Pan Bus Lines
- boltbus
- Sunshine Travel
- yobus
- Go Bus
- megabus

- Amtrak**
  - A** Depart: 7:10 Springfield Amtrak
  - Arrive: 8:35 AM New Haven Union Station (Amtrak)
  - Depart: 8:45 AM New Haven Union Station (Amtrak)
  - 1 Transfer(s)
  - 3 hours and 10 minutes
  - D** Arrive: 10:20 New York Penn Station
- Amtrak**
  - A** Depart: 16:05 Springfield Amtrak
  - Arrive: 5:35 PM New Haven Union Station (Amtrak)
  - Depart: 5:50 PM New Haven Union Station (Amtrak)
  - 1 Transfer(s)
  - 3 hours and 15 minutes
  - D** Arrive: 19:20 New York Penn Station
- Peter Pan Bus Lines**
  - A** Depart: 8:15 Springfield Amtrak
  - 0 Transfer(s)
  - 3 hours and 15 minutes
  - F** Arrive: 11:30 New York NY-Port Authority Bus Terminal
- Amtrak**
  - A** Depart: 19:25 Springfield Amtrak
  - Arrive: 8:50 PM New Haven Union Station (Amtrak)
  - Depart: 9:12 PM New Haven Union Station (Amtrak)

More Information

More Information

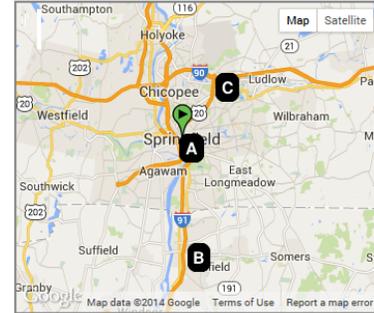
More Information

More Information

New Trip

#### Origin

Springfield, MA, USA



#### Destination

Hoboken, NJ, USA



These can be filtered out by selecting “0” for “Max transfers” in the filter column, with the result shown in FIGURE 8. Here, only direct bus and rail itineraries are shown.

FIGURE 8 Itineraries with no transfers

## Intercity Trip Planner



### Select intercity itinerary

**Filter your results** 8 Possible Itineraries

**Date**  
Wed Oct 15 2014

**Time**

Morning (before 10AM)  
 Mid-Day (10AM-2PM)  
 Afternoon (2PM-6PM)  
 Evening (after 6PM)

**Max transfers**  
 0  1  2

**Departure Distance**  
 < 10 miles

**Arrival Distance**  
 < 10 miles

**Carriers**

Amtrak  
 Dartmouth Coach  
 Greyhound Lines  
 Peter Pan Bus Lines  
 boltbus  
 Sunshine Travel  
 yobus  
 Go Bus  
 megabus

**Sort by:**  
Travel time

**Peter Pan Bus Lines**

**A** Depart: 8:15 Springfield Amtrak  
 0 Transfer(s)  
 3 hours and 15 minutes

**C** Arrive: 11:30 New York NY-Port Authority Bus Terminal

More Information

**Amtrak**

**A** Depart: 5:55 Springfield Amtrak  
 0 Transfer(s)  
 3 hours and 25 minutes

**B** Arrive: 9:20 New York Penn Station

More Information

**Peter Pan Bus Lines**

**A** Depart: 7:15 Springfield Amtrak  
 0 Transfer(s)  
 3 hours and 30 minutes

**C** Arrive: 10:45 New York NY-Port Authority Bus Terminal

More Information

**Peter Pan Bus Lines**

**A** Depart: 10:15 Springfield Amtrak  
 0 Transfer(s)  
 3 hours and 30 minutes

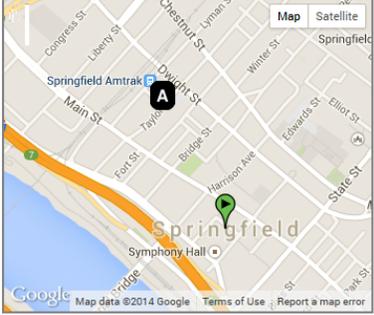
**C** Arrive: 13:45 New York NY-Port Authority Bus Terminal

More Information

**Amtrak**

New Trip

**Origin**  
Springfield, MA, USA



**Destination**  
Hoboken, NJ, USA



The following screens (FIGURE 9, FIGURE 10) show results of the same trip search from the two other services that we view as the best available: Wanderu and Rome2Rio. The Wanderu results illustrate a key shortcoming of that service – it provides results for only the subset of bus carriers (no AMTRAK and primarily the low cost carriers such as Bolt and Megabus) who have agreed to the site’s terms and thus excludes many available options. It also appears to rely on a fairly simple routing algorithm that does not identify many good options.<sup>2</sup>

Rome2Rio (FIGURE 11) by contrast is very robust and appears to support AMTRAK routes plus a wider variety of bus carriers . Their routing algorithm is also a much simpler one than the one developed for our trip planner – it identifies only the one “best” option for each mode (rail, bus, auto: FIGURE 12). In addition, it does not use actual schedule data and so only provides general trip frequency information rather than matched schedules for connections.

<sup>2</sup> For example, routes trip from Concord, Massachusetts (a suburb of Boston with good commuter rail service to Boston) to New York City through the Concord, NH bus station which is 61 miles away in the wrong direction

FIGURE 9 Wanderu front page

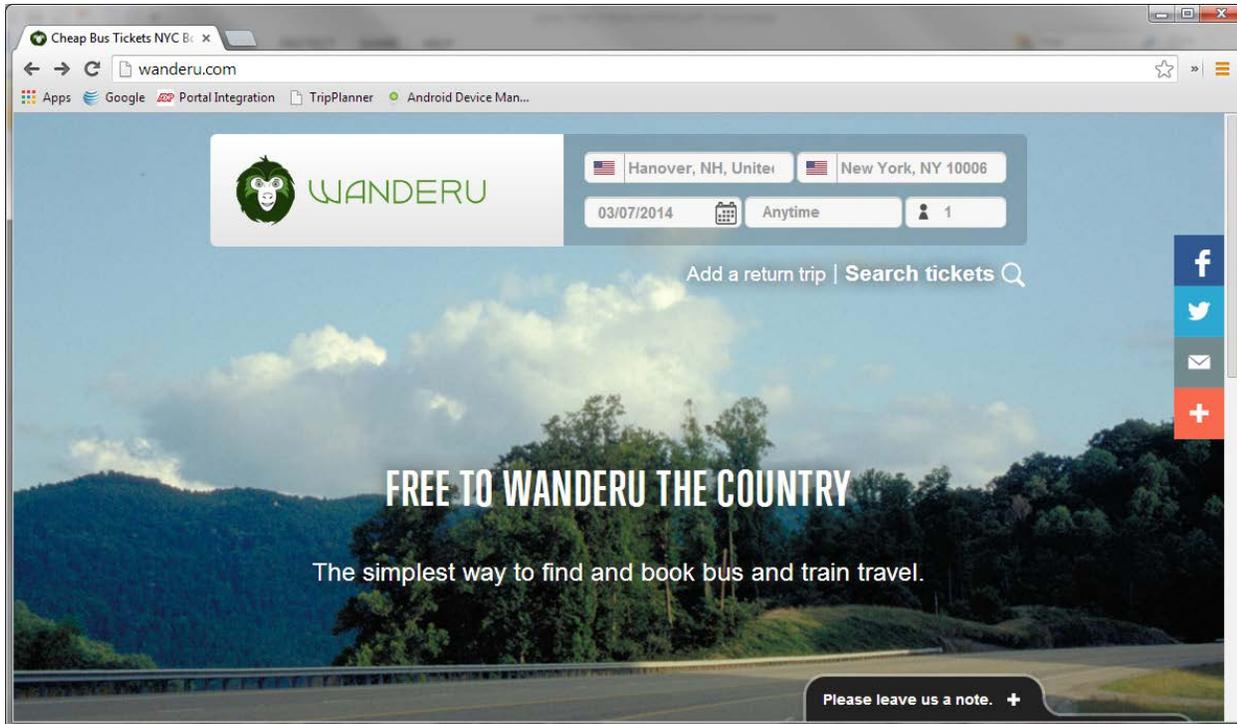


FIGURE 10 Wanderu itinerary page

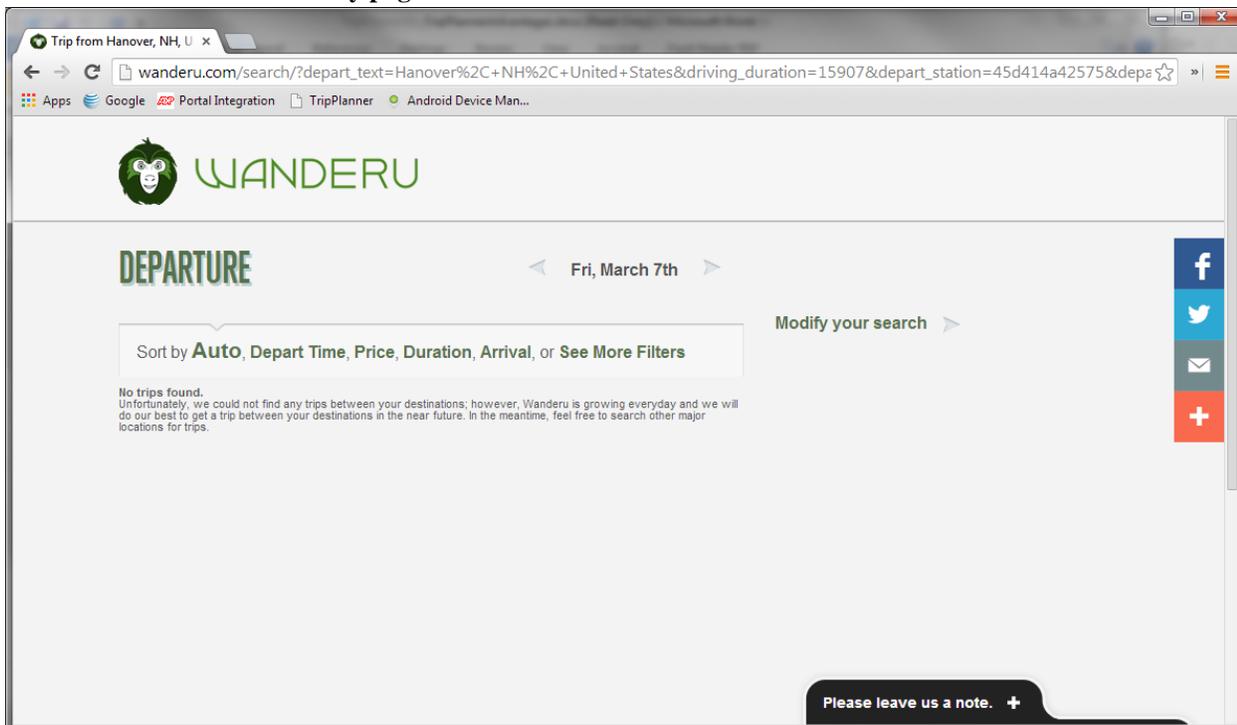


FIGURE 11 Rome2rio front page

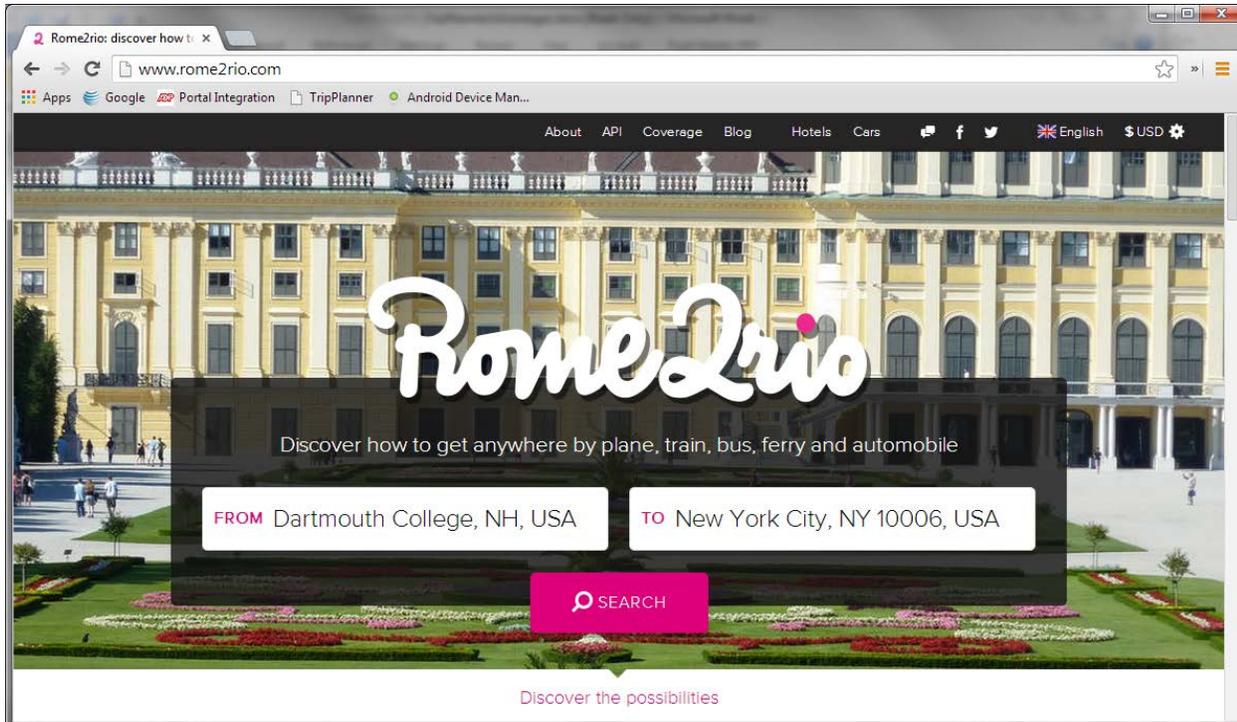
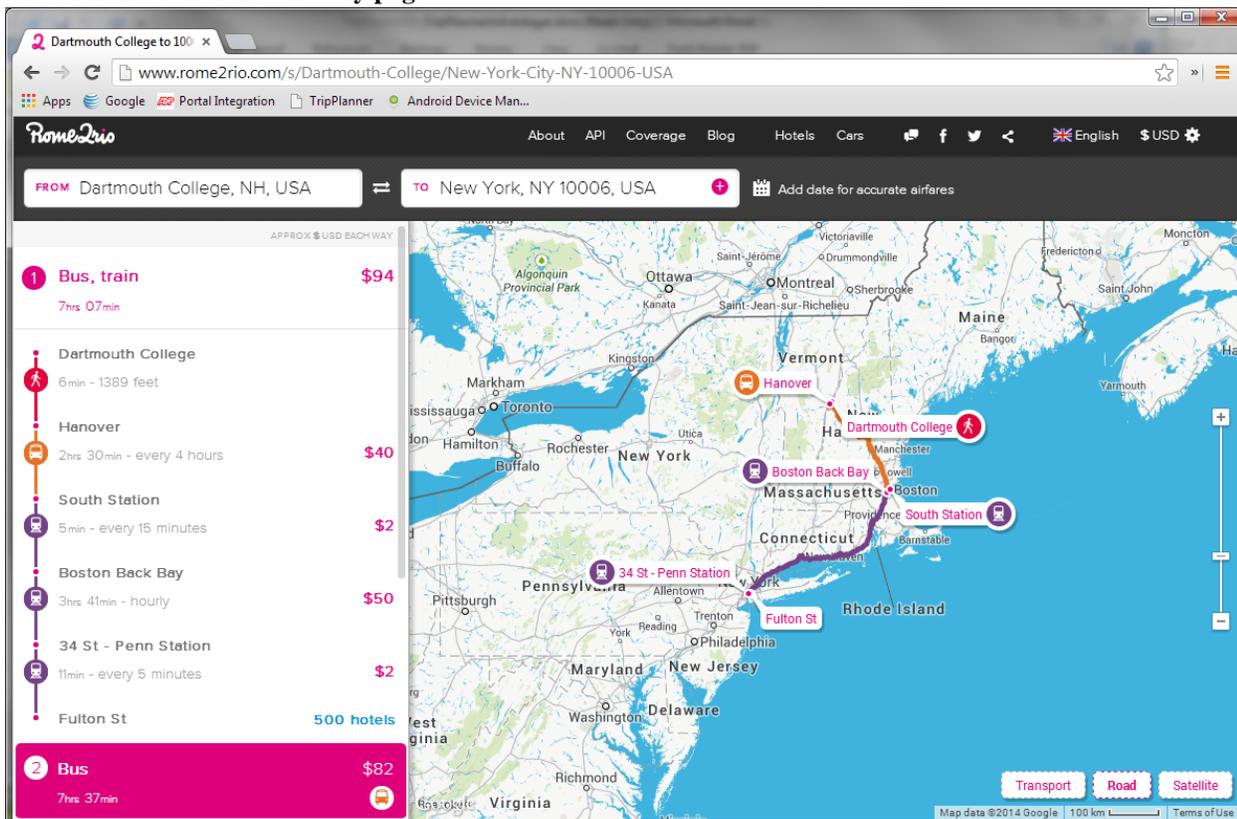


FIGURE 12 Rome2rio itinerary page



## PLANS FOR IMPLEMENTATION

As explained above, the trip planner software implementation is complete and the coverage/data issues identified by the project's Review Panel will be addressed by the link to Russell's Guide data which will provide access to continuously-updated schedule data. RSG expects to complete the data work necessary to show national service coverage and to deploy a public-facing site in 2015.

The trip planner has already been used to support a study of the service provided by intercity buses on National Highway System airport connectors.<sup>3</sup> In addition, RSG has been awarded two projects to develop schedule data to support bus ridership estimation for U.S. DOT/FHWA and for the Northeast Corridor Commission. These projects both include support for the development and updating of bus trip schedules to complement the Russell's Guide data. The Review Panel and others who were consulted as part of this work suggested that there is a significant public interest in the provision of an integrated bus/rail trip planner. RSG will continue to pursue public funding for work related to the trip planner but is concurrently developing private-sector interests in this product.

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<sup>3</sup> *Mobility Assessment of the National Highway System (NHS) Connectors to Airports in the New England States*, report prepared for the U.S. DOT FHWA, forthcoming, 2014.

# **APPENDIX**

Written Review Panel Comments

## COMMENTS OF REVIEWER 1 (FROM MOST RECENT TO EARLIEST)

MAY 27, 2014

Looks good!

I have already sent some comments so I won't repeat them here. I think you solved the 'mysterious long-transfer link' problem that put a very long, problematical transfer link into the path. A minor nit: I would use either all military time or all 'civilian' time, but not mix the two.

As for its potential uses... The best opportunity, it seems to me, is if a TIGER grant (or similar multimodal opportunity with an operational orientation) could be applied for and granted to a 'hub city' that would provide some federal money to do an implementation with support funding to operators and implementer to 'stand up' the application including a joint ticketing arrangement as a mechanism to provide improved non-auto travel accessibility and/or opportunities. If it has both rail and intercity rail this might work best. Perhaps this is fundable through some form of rural transportation program? Or an elderly/disabled program? Or maybe a series of smaller grants to rural/semi-rural medical facilities with the facility being the transportation coordinator/facilitator that works with travelers to support travel choices (like a travel agent) linking travelers to a specific set of facilities (e.g., hospital/medical center) via service (bus or train) providers? This could have a strong social service appeal as well as a maximize-transportation-options flavor. Maybe a joint Amtrak/bus depot (like South Station) arrangement could be promoted that improves the overall public transportation mode split through a location-specific (paid) 'travel coordinator' that uses this software but with a ticketing/information portal linkage to the carriers—ideally with a joint ticket? Maybe it would be good to 'shop' the idea around some federal agencies—transportation and HEW—to see what might be appealing to them and how it might be supported.

Anyway, good work!

THE FOLLOWING WAS ADDED ON MAY 28,

Here is a federal program that I didn't know about. It could be a source of federal funding for a state sponsored program. I think CA would be a good bet as it is a big state and is multimodal in approach. As you know they sponsor a lot of bus service that is linked to Amtrak, but I bet they would be interested in extending the public service network to include more than just the CA supported service. (In reference to: New in the Fast Lane--San Diego region benefits from Integrated Corridor Management, 5-1-1 App)

Editorial clarification for the Transit IDEA Report, (MAC). Presented below are the comments of Mr. Bennett AFTER it was clarified that the trip planner is only populated with data for the six New England States and metropolitan NYC. This was clarified in the following email from Coogan to Bennett:

John, I have contacted the others on the Peer Review Panel to emphasize that the trip planner is only operational for the six New England States etc. The problem may have stemmed by from my use of a formal letter attachment, rather than putting all the details in the text of the email. The attached letter does explain that the model only works for New England-- but, given your experience maybe we should put such a statement in the prototype program itself.

COMMENTS OF MARCH 13, 2014

Matt,

Well, that actually is a relief as it explains a lot of the problems I uncovered. I will experiment with the Planner for the New England states and get back to you.

I suspect that the attitude of both Amtrak and the bus companies will continue to be insular and non-cooperative given their competitive concerns. That is why the best option for the Planner is to seek a public sector entity or entities that will have overall mobility as an objective rather than maximization of company ridership and revenue.

I looked over the Planner using New England origins and destinations and—surprise—it works much better!

General observations:

1. The logic of the Planner is intuitive and useful. Picking the origin (first), destination (second), the date and desired departure time (third), the maximum number of transfers (fourth) and the criteria for terminal location in terms of distance (fifth) makes sense and is understandable. The criteria for terminal location is a bit more of a challenge, but it is reasonable when you think about it.
2. The locations of alternative terminals near the origin and the destination has some over writes so that the mark for terminal A may be not visible because it is over written by the mark for the B or other terminals.
3. The driving maps from origin to terminal and from destination terminal to destination works well.
4. The description of the path in terms of transfer point is still a bit confusing. For example, I tried St. Albans, VT to Fenway Park with a 30 mile limit on origin and destination terminals and I got several good non-transfer options by Megabus and Greyhound. But the first one-transfer option indicated a 1:50 AM departure from the Burlington Greyhound Station (within the 30 mile terminal distance) using Greyhound and arriving at Manchester Airport. The second leg is from Boston South Station (Greyhound) by Plymouth and Brockton Railway. To me it would be better if the legs were more clearly identified. For example: Leg 1: Leaves Burlington Greyhound Station at 1: 50 AM using Greyhound arriving at Manchester Airport at 5:30. Leg 2: Leaves Boston South Station at 6:30 and arrives at 6:40 at Boston Park Square. But, more fundamentally, something is wrong here. How does a traveler get from Manchester Airport to Boston South Station? Some of this is formatting information in a better way. But, more importantly, one needs to understand the criteria for matching the first leg's destination to the second leg's origin—the transfer point.
5. The follow-up screen that is intended to provide more information on how to get from the origin to the origin station and from the destination station to the final destination should also, ideally, be augmented with information about the transfer location(s). Maybe a map of the transfer location terminal? This may be too big of a challenge, but, perhaps the user could be pointed to another site that has maps of the larger, more confusing terminals?
6. I had the same problem—the phantom connection link—for a trip from Palmer MA to Bangor, ME. The one transfer arrives at Newton, MA but leaves from Boston South Station. How does the traveler get from Newton to Boston South Street Station?
7. The flagging of carriers to use seems to work well. I tried it from Stamford to Boston. Picking Greyhound gave good results. Amtrak, of course, is the obvious choice and that worked well.
8. As indicated in an earlier e-mail, the advertising is annoying, but I understand that it may necessary. Oh, well. (Editorial note: there is no advertising on the site and this must have come from his browser)
9. This is very encouraging; I am sure the bugs can be worked out.

Editorial clarification for the Transit IDEA report, (MAC). Presented below are the comments of Mr. Bennett BEFORE it was clarified that the trip planner is only populated with data for the six New England States and metropolitan NYC.

COMMENTS OF MARCH 9, 2014

Matt,

Well... I looked at your multi-state trip planner (Planner, I am calling it for short).

I want to congratulate you on the work so far and the progress you have made. There are many features of the Planner that are excellent and well thought through. However, while I am sure that much effort has gone into the search algorithm, the Planner needs considerable work to be a useful tool. Here are a bunch of points/concerns in no particular order:

Advertising. While I suppose this is necessary if the tool is to be financial self-supporting (or at least partially funded), the location of the ads next to the right side means that one can't shut them off as the cancel icon (x) is set in the right hand side where the scroll bar is (probably by intention) and if you try to get to it, you can't. It took me a while to figure out how to get rid of the black box that was left after the ad was screened (and I wasn't always successful.). This is a very annoying feature. (Editorial note: Again, there is no advertising on the site and this must have come from his browser)

Geographical range of the multi-state trip planner. If there are limits where this tool is supposed to work (e.g., the states along the NEC), then the program should so state at the outset. I did note that the Planner would not let me travel to fairly obscure locations and gave me choices it thought were somewhat close. That may be enough, but I would like some front end advice indicating that alternative destinations (or origins) may be suggested.

Origin location specification. I tried my home address (31864 Creek Shore Court, Ocean View, DE) and the screen kept giving me a location in Florida with a similar address. When I tried to use simply Ocean View, DE (which is a small town), it was able to locate me on the map, but when I did a search for an itinerary for a trip to Patchogue, NY (on Long Island), it gave me a message that the destination was outside the boundary of the Planner. Hence the note above about where the Planner is workable. Maybe this should include states and counties? It than gave me terminal choices along the NEC, for my origin and I chose Wilmington, which seemed reasonable.

Itinerary limits. The particular O-D (Wilmington-Patchogue) pair would not yield any itineraries even though this is a pretty straightforward, one-transfer trip via Amtrak to Penn Station and from Penn Station to Patchogue via the Long Island Rail Road. Then I noted that the carrier options only include Amtrak, Peter Pan and Greyhound. So, is that a limiting factor? You can only pick O-D pairs that are served by one or more of these carriers? If that is the case, perhaps you should have a network map of those carriers available for the user to peruse prior to digging into the Planner? Or, at a minimum, disclose that the Planner is only workable for intercity connections between and among these three modes. (Is LIRR considered 'transit' for the Planner? It seems to me that commuter rail and/or rapid transit should be included as a possible 'major' leg of an intercity trip—not just in the NEC but also in Chicago, SF, LA, Denver, Atlanta, etc.)

Search results. So I tried a couple of easy O-D pairs: Wilmington-New Haven (a direct shot by Amtrak), Baltimore-Albany (also a one-transfer trip via Amtrak using Penn Station as the transfer location. Here is what happened:

#### Wilmington-New Haven

I got 38 itineraries from Wilmington to New Haven. Most of them were the Amtrak options with different departure times reflecting the multiple frequencies (I used Tuesday March 10 as the departure time with no specification about time of departure). I also got one Peter Pan transfer at Stamford (a good sign!) even though that was much slower. There is a mixture of military time and civilian time (e.g., AM and PM) which is confusing. Plus one of the itineraries says departure from Wilmington at 1311 and the first line below that says Arriving Wilmington 1:11 PM. And, yes, that train is arriving at Wilmington at 1:11 PM (or 1311) but what is relevant is when it leaves Wilmington. So something is confused in the algorithm or the specification of outputs from the algorithm

The Peter Pan transfer itinerary has a transfer at Stamford with arrival times by train and departure times by bus. This works out OK. When I click on 'need more information', I don't get anything about the transfer location and how to make the transfer. Rather, I get questions about whether I need to know how to get to the terminals. It gives me driving

directions to/from the two terminals but, in this instance, no local transit (probably because I simply specified Wilmington and New Haven and the Planner picked a center of CBD location (presumably). And, of course, if I were to take an intercity non-auto trip from Wilmington to New Haven, I probably wouldn't have a car at the destination end unless someone was picking me up. Should I know that taxis are available? (Yes, that means one would need to have current information about services available at stations—something that Amtrak does but may not be as readily available for other carriers.)

The trip option/itineraries that resulted in higher trip times included some blatantly illogical options. The 'worst' option included back-tracking (S/B) to New Carrollton and then taking a north bound train to New Haven. Any itinerary that passes the same station twice, once upon boarding and a second time going past should be automatically eliminated as a nutty option (elegant professional term!). Obviously, no one would take that option but the Planner should be smart enough to not present illogical options to the user.

### Baltimore-Albany

The Planner picked 56 itineraries. Each of the Amtrak legs to Penn Station also indicated a stop at Newark, which, while true, is irrelevant to the traveler and should be left off.

Two origin stations were picked (BWI and Baltimore) and two destination stations (Albany/Rensselaer for Amtrak and the Albany Bus Station just west of the Hudson River in Albany). The only itineraries that used the bus station were those that took the train to Back Bay Station (yes, next to Boston!) and took a bus (Greyhound or Peter Pan) to Albany—all of which were at least 4 hours longer than the many train only trips. Shouldn't the distance traveled or the added duration of travel time (say 1.8 time the minimum?) be used as a screen to take out nutty trips?

For the heck of it, I put in 2 transfers as an acceptable option and this gave me even more nutty options! I got one that transfers to the Go bus (never heard of them, but maybe I am just out of touch!). For the life of me I couldn't tell where the transfer points are. It looks like Go bus starts and ends at Penn Station. Or does it go to Newton MA with a connection by Greyhound to the Albany bus station? This is a major problem—the transfer points need to be extremely well defined!

I tried some locations on the west coast. UC Berkeley to Eureka, CA for example, as well as some on the SF peninsula to points in northern and southern California as well as Utah.

Eureka was out of the Planner's area and I picked Dunsmuir instead (though that is a long way from Eureka!) And, by the way, Amtrak provides a connecting coach service to Eureka that is apparently not in your inventory of services!

There were 5 locations indicated as origins in the proximity of the Berkeley campus—as it happens they are all Amtrak stations. No intercity bus stations are in close enough proximity to the campus for the Planner. Of course, one can take BARTD to San Francisco and access the Greyhound Station at Folsom Street. Again this opens up the challenge of linking an urban transit network to the intercity network, which I am sure is a much bigger challenge. But it is a realistic travel choice for intercity travelers. If you don't try to link urban transit to the Planner, you should at least inform the user that transit is available in many locations and point them to a local transit web site for added information.

The only destination in Dunsmuir was the Amtrak station but I am pretty certain that you can get a Greyhound in SF and it will drop you somewhere in Dunsmuir, even if there isn't an officially sanctioned bus station in Dunsmuir. Actually I checked the Greyhound web site and Dunsmuir isn't an officially listed site. Nevertheless, I believe that one could buy a ticket to Dunsmuir and they would drop you off on their way north to central Oregon. Maybe not?

The only itineraries I could get from the peninsula were Amtrak trips. I suspect that the Planner hasn't got Greyhound in its network yet.

Other observations:

The “Departure Distance” filter was, at first, a mystery to me. Apparently it is a limiter on the “results” where “results” means candidates for originating station, but the text on the “i” icon was not at all clear (and it is misspelled).

The search routine is very fast, even if it does come up with some ‘nutty’ options. I am impressed. Linking the time(s) of departure to the times of arrival at transfer and final locations makes the search issue more challenging.

Information on the train number or bus number should ideally be provided.

Is there (eventually) going to be a link to the carrier(s) for ticketing/reservations etc.? Ideally, of course, there would be one-stop shopping and tickets would be available through the Planner site. Schedule availability/options on how to make a trip is obviously important. Can I even get from A to B without flying or driving? But also important (as you know) are the travel prices and accommodations/baggage, etc. Ultimately a filter on cost would be ideal—perhaps a later generation.

The transfer locations and address information is imperative. Making a transfer at Stamford, for instance, if I haven’t been there or never tried to transfer would be daunting without more information on how to make the transfer from rail to bus, for example.

Transfer times are very important (as you know), so a ‘legal’ transfer in terms of your algorithm needs to be understood and perhaps put in your front end that describes the Planner

Information on station services (parking, transit access, baggage, etc.) similar to the front end of the Amtrak System Timetable and the Greyhound station locator data base would be very useful

Keeping the service/schedule data base information up to date is a real challenge. Hopefully, you have worked out cooperative agreements to that the carriers can provide digital schedules to the Planner software. I am not sure what kind of incentives you could provide as an individual system provider. It may be better to try a big, progressive state (such as California) and see if you can interest them in a collaborative working relationship—a PPP—in which an agency of the state is involved in the data collection/transfer on the basis of trying to maximize public benefit and providing, therefor, a public service that links bus to bus and rail and provides land based network services to the public through the Planner. Since the state has already worked with Amtrak to extend the rail network through bus services, this seems like a logical extension. The NEC Commission could be a broker for this kind of effort—if they could get money from the states or the feds. It seems to me that the bus industry is a forgotten mode and some public support in a limited way such as supporting public access to the land-based transportation network (other than driving) would be useful. It could be supported on the basis of potential mode choice shifts through better information. Even a small mode choice shift would make a big difference, it could be argued, in GHG etc. Plus it provides options for those who don’t have access to automobiles for whatever reason.

COMMENTS OF REVIEWER 2, MAY 27, 2014

Matt:

I spent a little time with it today and found the program easy to use. Very practical is the ability to either click on your desired point on the map or type in the address. At this juncture I can find local transit options for the bigger cities (Boston or New York) but not for smaller communities. Allowing the user to either click on local transit or drive option is very useful and the information looks accurate where provided.

I think it would be useful for a user to be able to return to the opening page to correct or change a origin or destination – right now we go back to blank entries when we return (“New Trip” is the only option) and have to start over. When one enters a trip that requires relaxed filters it may be helpful to highlight with color change the filters that had to be adjusted.

Some folks might like to see fares but I think that is impossible to show accurately – there are so many fare contingencies (advance purchase, round trip vs one way, multiple carriers and so on) that it is not practical. Perhaps at least we can allow users to click on a carrier’s website so they might get information on fares, parking availability, rental cars (important for more rural areas) and hours that terminal is open.

Being away from Vermont Transit for over 5 years now I was surprised at the number of different carriers there are to choose from when using the planner for travel between larger communities. I am wondering what determines the order of that listing – it might be something a carrier may get upset about if they are last on the list.

On the distances – I would like more options – for example I did Pomfret to Boston but Dartmouth Coach did not come up – I suspect it must be just over the 10 mile threshold but the frequency level of their service provides so many more travel options.

Going forward:

My biggest concern is getting accurate information from this planner. The program is reliant on good and timely information from the listed carriers. Unfortunately I don’t think the carriers have a single database that schedule information is provided – Russell’s Guide is issued monthly so may not have changes just as they happen.

The same issue lies with local transit schedules – there it is probably an even bigger issue.

Vermont spends a lot of taxpayer dollars on local transit throughout the state as well as financial support for Amtrak and intercity bus – right now the intercity bus and rail information is provided in the planner but none of the local transit options. I would try to make that live and consider a presentation to VT AOT (Rail Council meets quarterly).

This planner is more usable for shorter trips but would be useful nationwide for folks flying and then looking for regional transportation options at their destinations (or points of origin).

Finally, this program works fine on my tabletop and my iPad but is not very usable on my iPhone – while I think most people would be looking at this initially on their bigger units it might be nice to save a trip and be able to pull that particular trip up on a smaller device.

ON MAY 28, MR ANDREASSON ADDED

Matt:

I checked the site again and noticed I can do increments over 10 miles – didn’t see that yesterday – solves that problem. On the local transit side I tried to find local buses in Rutland, Burlington, Portland (Me), Concord (NH) and was not able to.

We are in Google Transit – Tony can verify that so I am not sure why we are not showing up as a local transit option.

Chris

COMMENTS OF REVIEWER 3, JULY 2014

Comments of the Intercity Trip Planner

Background/Understanding:

The overall concept of an intercity trip planner that includes intercity bus, intercity passenger rail, and transit (regional and eventually local) is highly desirable, and I have completed a number of statewide intercity bus planning studies that have included a recommendation that state departments of transportation use some of their Section 5311(f) rural intercity funding to support the development of such multi-modal information systems (and the marketing of them). Initially Oregon and Washington tried to develop their own trip-planning system, but at some point this seemed to be a larger project than anticipated, and I believe Oregon was left to go on its own, and it has created its own trip planner which includes transit and Amtrak along with intercity bus. Google Transit became available, and others focused on putting intercity service data into the required GTFS format, and maintain the data. For local transit this has become a standard format that systems use to make service and fare data available to Google and other developers of transit trip-planning apps.

However, for intercity services this development has not taken place to the same extent. Although Amtrak has provided its service data, the major private intercity carriers have not agreed to provide this information on an ongoing basis, citing a number of reasons—but primarily the issue is that their schedule and fare systems are seen as part of their competitive advantage, and firms that are investing heavily in such systems are not interested in providing the service data to platforms where all providers are included and treated the same way. The model for them is more like Southwest Airlines, which does not interline with other air carriers, and has its own web site and ticket sales, not allowing their information or tickets to be sold by other systems. However, the states have found that there is really an unfulfilled need for such a system, and I think the current IDEA project is really an effort to develop such a product by including the publicly-available schedule and route information in one system that allows users to plan trips using multiple carriers.

The Test Drive:

I was quite interested in how this tool would perform, given that I have done several intercity plans for states in New England that included documentation of the potential connectivity between places in the region. So I approached it as a knowledgeable user, and also one that understands that timetables are always changing and so the test version might not be absolutely up to date. Also, I had a pretty good idea of the available connections and carriers.

Burlington Airport-Keene, N.H.

The tool provided a logical answer—though a novice user might not know that the Greyhound station is at the Burlington Airport, not downtown—it appears in the system to be downtown.

Littleton, NH to New York, New York

It showed no usable results with the basic filters in place (nearest station with service was shown as Hanover, NH, then relaxing the filter on the number of transfers (once I figured out what that meant) resulted in a trip from Littleton to Boston on Concord Coach, with a connection to an Amtrak train to Stamford, Connecticut (rather than New York City). Maybe this was at the end of the region with available data, but most intercity trip-makers in New England are going to/through Boston or New York.

Bennington, VT to Burlington, VT

For this one I used a local street address (for the bike shop “The Old Spokes Home”) at the destination to see if it would come up with a local transit connection (it did not—said no transit available). The routing was crazy—it would have the user drive to Bellows Falls, take Greyhound to White River Junction, take Greyhound to Montpelier-Rhapsody (?), and then drive to Burlington. Not even close. How about Yankee Trails to Albany, and then Megabus to Burlington? Or a combination of the local transit operators on Route 7 (it would take a long time and many transfers). The travel time and number of transfers required to make this trip is one of the reasons that Vermont has funded the Vermont Translines service in that corridor (service started June 9).

It was not clear how the tool chooses the road links—for example determining that one should drive from Bennington to Bellows Falls to catch a bus, rather than to Albany, or Saratoga Springs (park and ride lot where Megabus stops on the way to Burlington). Or a Rutland-Boston trip suggests driving to New London, NH (a Dartmouth Coach stop) rather than Hanover—shorter as the crow flies? Or shorter drive time?

Montpelier, VT to Portland, ME.

On this trip the tool offered one departure times from Montpelier—14:05, with arrivals in Hanover (to transfer at 12:40 p.m. or 3:05 p.m. both of which were shown as arriving in Boston at 6:30 p.m.) Let's see, if I left Montpelier at 2:05 p.m. I don't think I could arrive in Hanover at 12:40 p.m.

The tool was inconsistent in clock time information—sometimes it seemed to use a 24-hour clock, others it did not.

Burlington, VT to Montpelier, VT

Although serviced by CCTA Link commuter services with multiple frequencies, and by Greyhound, the tool found no service in this corridor.

For all of these it is entirely possible that continued adjustments with the filters or other tinkering could have resulted in better trips, but I think a typical user will punch in the origin and destination, see what happens, and if it says there is nothing they might “relax the filters” and look at the top few options—which is what I did.

Overall Comment:

The concept of the tool is quite valuable, and I can appreciate that it has taken considerable effort to input the schedules from many carriers and develop the systems that allow it to compute options with “relaxed filters”. I think it would need continued development to improve user friendliness by doing things such as adding city names and state boundaries to the base maps and making the “relax filters” or filter setting process more intuitive. But more fundamentally, additional work needs to be done on the transit information so that it produces usable results. I think this not a basic flaw but that it needs continued development to achieve its full promise. The marketplace is recognizing the need of transportation users as ticket-selling/information systems such as Wanderu are being developed—but they will always be partial sources of information, without local transit or omitting carriers who would not pay, would not provide data, or only put some routes into the system. The issue is who would pay to finish developing and maintain a complete and unbiased information system—it would seem to be a public role, but hard to do without carrier cooperation.

#### COMMENTS OF REVIEWER 4

The Multistate Trip Itinerary Planner is an easy-to-use, intuitive, and clean-looking tool that can help connect virtually any two cities/towns (given the appropriate constraints) by intercity bus or rail (often with the help of driving on either end). This tool uses a format that should be familiar to anyone who has used a typical transit trip planner or online travel search engines such as Travelocity, Expedia, or Kayak. Even if one is a first time user of such tools, the user interface has four simple steps that are logical and require straight forward inputs.

As with any tools, there is always room for some improvements. This Planner would be even more useful if the following three items were addressed. First, the results page show possible interchange points near both the origins and the destinations. These points are not connected by lines to the origins/destinations (like most mapping tools would for directions/routing purposes) and it would be helpful if the routes are included to help show how those interchanges are related in space to the origins/destinations. Second, while one may appreciate knowing that there are 79 choices available, this overwhelming list may not be particularly useful and may turn some users off. Producing all the available choices is similar to other online travel engines but is not what typical transit trip planners or mapping software applications do. Having only the top 10 choices (or setting that allows only the top 10 choices shown) may be more suitable. Lastly, the

only two choices for sorting are by travel time and destinations. It would be great if it is possible to sort by fare prices. This information may not be available in the test version but could be incredibly useful for an actual tool.