

Facing the Barriers to Real-Time Integrated Multimodal Traveler Information in American Metropolitan Areas

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Introduction

Real-Time Integrated Multimodal Traveler Information (RT-IMTI) can have transformative effects on a region: commuters can choose *what mode* of transport to take based on travel time instead of habit; travelers can decide *what time* to leave when incidents cause traffic and delays; and user satisfaction of transportation services can improve just by knowing what to expect during a trip. The benefits of providing this kind of information to the traveling public are wide reaching. But to develop the applications and to power the devices that contain the relevant information, our industry needs to focus on making the data readily available. The ability to achieve the benefits of RT-IMTI is limited by the availability of standardized data across the different modes.

Traveler Information

Traveler information can typically be broken down into two main categories: trip planning and condition monitoring. Trip planning uses street networks and transit service data to assist travelers considering new trips. Condition monitoring, however, relies on current real-time information to inform users about congestion, delays and service interruptions. Neither trip planning nor condition monitoring is widely deployed as a multimodal system, but trip planning has had more success in recent years. The two most comprehensive examples of these multimodal trip planners are a product called Goroo in Chicago and an open-source application called OpenTripPlanner. Goroo relies on proprietary software to create its own database of roadway and transit information using dozens of data sources resulting in a trip planner that compares all modes for users based on travel time and emissions (Biernbaum, Rainville, & Spiro, 2011). The main limitation of this project is that it is not transferrable to other metro areas. OpenTripPlanner

contrasts Goroo because of its free, open development. Any region with publicly available data, referred to as open data, now has the ability to implement a multimodal trip planner with many similar features. These two examples lead the industry in their ability to fuse data from different modes for trip planning at the regional level.

Even with the modest success in multi-modal trip planning, the industry has had many challenges implementing robust, integrated real-time applications for traveler information. Implementing RT-IMTI at a practical regional scale has been challenging and, in fact, only one project in the United States has attracted national attention: the Connected Traveler project on the US-101 Corridor in the San Francisco Bay Area. This large-scale project is federally funded and involves many layers of coordination among university and agency partners to create a one-stop-shop for highway and transit information along the commute corridor (L. Zhang et al., 2010). Even with all that support and the pending success of its testing, the project is a large and complicated task that suffers from many challenges.

Challenges for Real-Time Multimodal Information Delivery

While the capacity to develop comprehensive end products for travelers is within our grasp, the ability to make RT-IMTI widely available has been limited. The limiting factors are three-fold: there are technical challenges to generate real-time information databases; the real-time data for transit and highways have been developed in separate silos; and the notion of creating publicly available data for application developers is still challenging for many agencies and DOTs.

RT-IMTI is fundamentally a three-part system comprised of sensors, a user interface, and a database in between those components. In the field, sensors like loop detectors, Bluetooth MAC

readers, and GPS enabled vehicle location systems all provide some insight into the real-time operations of a highway facility or transit service. The National ITS Architecture attempts to codify the transmission of data through several layers of complicated protocols. On the consumer end, user interfaces take many forms as well, including dynamic message signs, mobile phone applications and online maps. The remaining, and often most challenging element, is the creation of a real-time database. Many state departments of transportation have the benefit of transportation management centers which are designed with significant physical and digital infrastructure to manage incoming feeds of highway data. Transit agencies with real-time information usually get it from devices installed on their own vehicles and use the information in-house for operations and management. In both cases, data were intended for use by operations staff and its role as ‘traveler information’ was often an afterthought. Because of that, the databases on which these systems run are less accessible to traveler-facing applications.

The technical challenges associated with each mode’s real-time databases are only part of the challenge; a second problem is that highway and transit information have developed separately in two distinct silos. The fundamentally different information types mean that combining the data is not a simple task. Buses and trains can report their individual location and predictions of their arrival time whereas traffic reports identify the speed and congestion levels on different roadway segments. Even though both modes have emerged independently on the Internet to great acceptance by travelers, they rarely integrate. With the exception of only a few examples like the Regional Integrated Transportation Information System (RITIS) in the Baltimore-Washington region, real-time information has not been easily aggregated across modes. RITIS itself included a considerable effort in standardizing data architecture as it is an “automated data fusion and dissemination system that compiles transportation data from each participating

agency, standardizes it, and makes it available to other participating agencies.” (Pack, Bryan, & Steffes, 2008) Theirs is an impressive achievement because it has succeeded in serving as a local clearinghouse for many different sources of data from both transit and highway operators. Unfortunately, this is one of the only examples of a successful implementation of this sort of tool.

Even though the information in RITIS is fused and made available to agencies, the architecture was designed to foster collaboration among operators, not to provide information to travelers¹. The avenues through which information can reach travelers come from a diverse market of application developers, but those developers require access to the data. *Open data* refers to an agency’s willingness to publish information about its operations in a standard, machine-readable format without logistic or institutional barriers. Transit agencies, almost 200 in the United States, have reaped the benefits of open data by allowing third parties to develop applications to serve customers using agency-generated data (City-Go-Round, 2011). This notion of providing the combined real-time data from highway and transit sources to the public is less of a technical nature and more policy-oriented. In interviews with agency staff who implemented open data policies, many individuals reported early concerns about the additional workload, legal liability and general discomfort associated with releasing data. Later, however, they all came to favor the practice as they saw application developers creating services for their riders (Pessoa, Tzegaegbe, Reed, Wong, & Yan, 2011). The traveling public can see great benefits when agencies work together to publish and provide free access to operations data.

¹ RITIS documentation reports that its data drives traveler information applications, but it is unclear the extent to which this information is being used.

Paths to Better Integration of Real-Time Multimodal Traveler Information

One of the most important considerations is the scale of the project. The 511 traveler information hotline is a national movement (implemented by states) to provide travelers with the information they need based on real-time and static transportation information. While these primarily serve highway users, the best 511 interfaces are those built on the regional scale with multimodal elements involved. A review of all the statewide 511 traveler information websites in the U.S. reveals that only New York and New Jersey provide any useful real-time transit information; the others all rely on highway data alone. Conversely, those information sites at the regional scale tend to be better integrated. Probably the two best traveler information websites in the country are regionally-based sites in San Francisco (www.511.org) and Los Angeles (www.go511.org). RT-IMTI is best consumed at the regional scale. While intercity trips may require information about the local incidents and conditions in another city, travelers are more often traveling within metropolitan areas. Information systems should be designed at a similar scale.

Many other considerations for providing multi-modal real-time traveler information to users are predicated on the open data approach discussed earlier. The application developer community plays a critical role in the open data environment. Agencies can provide valuable tools to riders such as regional transit trip planners, but these come at tremendous public expense. There are now tools to provide products that compete with Google Transit at little or no cost to agencies with open data, and they are built by software developers. These developers release their projects for small fees or, more often, for free. As active participants in the pursuit of serving travelers, developers should have the full support of public agencies. The best way to support them is to make the data freely available with minimal legal disclaimers so that they can feel free

to innovate. Our industry must recognize that multi-modal trip planners are not the pinnacle of traveler information; armed with the data to fuel their projects, application developers will continue to find new ways to use traveler information to benefit the public².

Another way to support the open development of traveler information tools is to transition the industry towards *simple* and *practical* information exchange standards. In this area, transit has been far more advanced than highways in using these formats. The General Transit Feed Specification (GTFS) (formerly a Google protocol, now openly developed) took the transit industry by storm beginning in 2006 as a way for transit service to appear on Google Maps. It quickly became the de facto standard for the industry with hundreds of agencies now publishing schedule and route data in this easily understandable and accessible format. The focus of GTFS on practical, traveler-based applications has led to the development of the many applications discussed using open transit data. GTFS-Realtime is now in development as an Application Program Interface (API) which will likely replace dozens of customized API's developed by anxious agencies around the country. Because ITS Architecture focuses primarily on center-to-center communication strategies, the protocols and communication profiles for supplying information to travelers are cumbersome. If a simplified set of data structures were available, there would be more opportunities for individuals and agencies to fuse the highway and transit data as multimodal information.

² For a look at some of the latest and most innovative products that arise from open transit data, visit www.city-go-round.org/apps.

Conclusion

The transportation industry should strive to provide travelers with comprehensive, real-time integrated multimodal traveler information at the regional level so that individuals can make rational travel decisions. Access to this information improves traveler satisfaction and has the potential for many unanticipated benefits. Providing that information is a complex undertaking because of the disjointed development of data systems between the two modes and the technical challenges of fusing the data. Still, regions like San Francisco have successfully developed extensive traveler information systems led by regional coordination among agencies and departments. This is a terrific approach where strong local champions and sufficient organizational collaboration among different agencies allowed the project to succeed. For areas that lack this advantage, the other recommendations will benefit any region that makes data available to developers. The simplification of data exchange standards is a critical component to the success of open data. The open data model is growing in acceptance in transit, and is beginning to make its way into highway operations as well. Agencies and departments that embrace it will be the first ones to benefit when application developers look for regions in which they can build their multimodal traveler information tools.

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