An Open-source Transit Traveler Information System

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Summary
Publishing information about a transit agency’s stops, routes, schedules, and status in a variety of formats is an essential part of improving the accessibility of a transit system and the satisfaction of a system’s riders. As such, transit agencies employ transit traveler information systems to share this essential information across a variety of interfaces: phone, web, mobile device, and others. Unfortunately, these systems are expensive to build, complex to maintain, and subsequently out of reach for many small to mid-size transit agencies. We propose the development of a common open-source transit traveler information system that can be deployed easily and cheaply for a variety of transit agencies. By focusing on open data standards and strong user evaluation, we can minimize the barrier to entry for transit agencies while maximizing the utility of transit riders.

Background
No longer the domain of just printed schedules, transit traveler information systems have grown to include route maps and timetables, trip planners, real-time services and alert systems, available across cell phones, web browsers, and new internet devices as driven by rider demand. Transit agencies are well aware of the increasing usage of cell phones and the internet. As of June 2008, the US had almost 263 million wireless phone subscribers, equivalent to 84% of the US population. As of 2007, there were 222 million internet users. Despite these figures, transit provider use of cell phone and internet user interfaces to provide traveler information is limited in many areas. Larger agencies have transit user information tools available on their websites, but often the interface is geared to the frequent transit user. Many small and mid-size agencies do not have the resources to develop traveler information tools at all. Transit traveler information systems are often developed in-house or by a private contractor, with the resulting system specifically tied to a particular transit agency. Best practices and new features from one agency’s system are not easily transferred to other agency. In effect, many transit agencies are currently reinventing the wheel with respect to traveler information, if they can afford these systems at all.

Today, a new model is possible. In the last few years, there has been a growing movement to standardize the underlying data that often feeds traveler information systems. Common formats for transit databases, generalized interfaces for real-time location tracking systems and service alerts, and other standardization efforts mean that data from multiple transit agencies can be represented in a unified way. This common data model approach allows us to develop tools that can immediately be used by any transit agency providing their data in the common model. A prime example of this movement is the Google Transit Feed Specification (GTFS), it is now possible to build a trip planner once and immediately integrate data from a large and disparate set of transit agencies.

Advanced Tools
In addition to the four primary components, the One Bus Away system is able to support advanced user planning tools, including a Commute Calculator and an Arrival Search tool. The Commute Calculator builds on the trip planner component to help potential transit commuters answer a common question: “Given that I work at location X, where can I live that’s less than a 9 minute commute away from that bus or train?” This is a difficult question to answer using just maps and timetables or even a standard trip planner. Instead of picking various points one by one and seeing how far away they are using maps to get there, a transit rider would ideally be able to see all the places they can travel to in a certain amount of time. The example shows locations accessible from downtown Seattle within 60 minutes by bus.

Route Maps and Timetables
Typical route maps and timetables are enhanced using of Web 2.0 to make searching for stops, routes, and trips easier. Routes and stops are displayed in a graphical interface, with stop travel-direction indicated on the map and routes servicing a stop indicated in a pop-up dialog. When the timetable for a stop is examined, we display the complete service calendar, highlighting different service due to weekends and holidays. We also display specific route timetables in stem and leaf format to highlight frequency of service over the course of the day.

Trip Planner
Although the trip planners found on many larger transit agencies websites and the Google Transit trip planners are excellent tools, they remain closed-source. This means that programs expanding and extending the transit planner functionality cannot be easily developed. Although the planner will be functionally similar to existing ones, we wish to enhance it with two additional data sources: real-time tracker data and up-to-date service alerts. Real-time tracking data will be integrated into our trip planner to automatically promote or demonstrate an upcoming trip plan based on the real-time status of the transit vehicle. In addition, up-to-date service alerts will allow trip plans to be adjusted based on current service outages.

Real-Time Tracker
The ability to determine when the next vehicle is coming brings travelers perception of wait time in line with the true wait time experienced. Transit users value knowing how long their wait is or if they have just missed the last bus. Our real-time tracker includes various interfaces, including a telephone number users can call to have arrival time to them, an SMS interface for receiving arrival information as text messages, an iPhone optimized website for the iPhone and other mobile devices, and a standard web interface.

The program interfaces with existing tracking systems with a focus on providing well-designed, usable interfaces to tracking data. The example shows locations accessible from downtown Seattle within 60 minutes by bus. The Attractions Search tool allows users to find restaurants, parks, and libraries near their current location. The program interfaces with existing tracking systems with a focus on providing well-designed, usable interfaces to tracking data.

Benefits
The benefits of the system include: increased transit ridership, more convenient travel, increased security, and cheaper operations due to fewer service reps. The biggest benefit of an open-source transit traveler information system is giving agencies the ability to make use of the transit traveler information programs for free. Therefore, every transit agency in the nation would be able to have basic schedules, a trip planner, service alerts and other tools on their websites. Other developers could also make use of the code or the data to create further tools.

Our initial deployment at http://onebusaway.org/ for King County Metro currently provides real-time arrival information to 5,000 riders every day, whether they are using the web interface, calling into their phone, or using a smart mobile device. What's more, the source code for the deployment is all available at http://onebusaway.org/license under an open-source license. In addition to our own development efforts, we have already received and integrated feature contributions from actual users of the system. Such is the power of the open-source development model.