



Modes: bringing multi-modal information to the ITS architecture

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ABSTRACT

Real-time transit management systems that can inform the public about transportation options and availability are gradually being deployed in many parts of the world. While many larger cities have been able to provide this information on web sites or through automated telephone systems for several years, smaller municipalities often lack the resources to develop their own transit management systems. Addressing this issue as a joint effort, transportation agencies in the multi-state North American CARS Program have cooperatively developed a real-time, multi-modal transit tracking and incident reporting system called Modes. Modes builds on the CARS road condition reporting system developed by 17 transportation agencies in North America. Modes extends the CARS software to include ferry, bus, and passenger rail services to the basic highway network information it manages. Modes was initially created to track the Alaska Marine Highway System's extensive ferry system and has been successfully applied to New England's popular Acadia National Park bus tracking system, three bus systems in Maine, 13 bus systems in Idaho (in progress), three bus systems and a light rail line in the Sacramento, California area (in progress), as well as the Amtrak Downeaster and Capitol Corridor rail lines.

KEYWORDS: multimodal transport, transport operations, economic elements

1. Introduction

Modes is a real-time public transit tracking and incident reporting software suite designed to offer a multimodal source of information about transit systems in a particular state or region. Modes builds upon an existing traffic condition reporting system called CARS (Condition Acquisition and Reporting System), developed and deployed by seventeen states and public agencies in the U.S. and Canada. The CARS software acts as a central statewide database of traffic and travel events that have potential to disrupt traffic or to create difficult driving conditions.

Modes was initially developed for ferry tracking on the Alaska Marine Highway System, one of the most extensive ferry services in the world. Another early deployment of Modes tracked buses in New England's popular Acadia

National Park, where private car traffic is restricted at busy times. Now, Modes is being deployed throughout the states of Maine and Idaho, as well as the Sacramento region of California, and will include coverage of metropolitan bus systems, light rail, and Amtrak train lines.

The Modes software adds ferry, bus, and passenger rail services to the basic highway network information managed by the CARS system. Modes was designed to handle transit's special characteristics, including schedules, routes, vehicle locations, and connections. The core Modes system includes a Graphical User Interface (GUI) that allows authorized agency users to enter and manage schedules and transit "events," such as incidents, delays, and service cancellations. A back-end database stores the static and updated transit schedules, as well as the real-time events and updates entered by operators. A series of add-on modules enable the automated sharing of this

information with the public through the web, 511 phone systems, and dynamic message signs.

The Modes GUI and database have been designed to support multiple transit properties within a single state or region. This concept emerged because many smaller to mid-sized transit properties typically lack the resources to develop their own transit management software packages. The Modes design enables multiple transit properties within a larger jurisdiction (e.g. state or province) to share a single system, reducing overall costs and allowing individual properties to share their data with one another. This model also enables a larger jurisdiction to make information about many or all of its transit properties available from a single source. In Maine, the Department of Transportation (DOT) is directly supporting this project for those reasons. In addition to financial support for the development and operation of Modes, the Maine DOT also plans to offer back-up operation of the system during times of disruption, such as during winter weather events or when the participating transit agencies are understaffed.

2. Modes bus system integrations in the state of maine

The Maine Modes deployment includes integrations with three bus properties in the state: Bangor Area Transit, Portland Metro, and the South Portland City Bus Service. Bangor Area Transit, also known as BAT, is a transit property serving Bangor, the third-largest city in Maine. The BAT bus system is relatively small in size—operating only seven routes—but complex enough to serve as an ideal pilot for the Modes software package.

For the first phase of BAT system deployment, the Modes operator GUI includes displays of bus routes and schedules. Using the Modes GUI, BAT dispatchers can enter real-time transit event information for a bus route, a bus station, or a particular bus run. They can also make real-time updates to the published, static bus schedules. Bus icons are plotted on a Google map background to show their current locations according to the published schedule or updated information entered by an operator. Operators are able to quickly adjust bus schedules, using real-time information, by manually dragging the bus location symbol on any map to the actual location reported by the bus driver.

Modes calculates “scheduled” bus locations using an algorithm that assumes the bus moves at a uniform speed between each published time point. “Delayed” bus locations can also be shown based on information entered by authorized operators. In future phases, AVL data may be integrated to enable automated updating. Figure 1

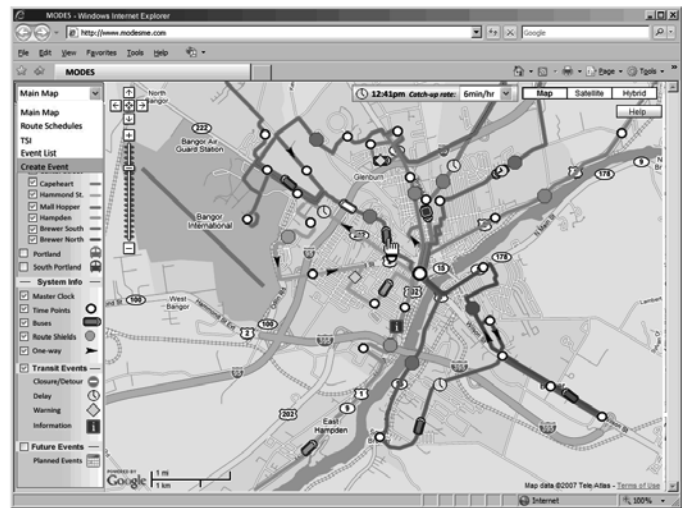


Fig.1. Bangor Area Transit system in Modes

illustrates the Modes GUI, showing how Modes overlays the bus routes and event icons on a Google map.

Shortly after transit events or timetable updates are entered using the Modes GUI, they are shared with the public on Maine’s public traveler information web site. Transit information for Modes is displayed alongside traffic and other highway system events entered into Maine’s CARS system by DOT staff, such as accidents, roadwork, and winter driving conditions. Public users of the website can choose to view one or multiple transit properties by clicking check boxes in the legend next to the map. Users can zoom in for best views of routes, bus stops, and current transit vehicle locations. Clicking on an individual bus stop opens a window displaying the next three bus arrival times for that stop, along with information about delays or interruptions.

Following BAT, the Portland Metro and South Portland City Bus Service properties have been integrated into the statewide Modes system. Once the system is launched for operational use, Modes operators will be able to see data about all of the transit properties in the system, though they will only be able to edit information about the property with which they are affiliated. Current vehicle locations can be viewed by all users—whether or not they have editing permission for that system. Select Maine State DOT employees will be made “super-users” that can view and edit information for all transit properties.

3. Expansion of modes

The Idaho Modes deployment recently joined the Modes effort and will ultimately integrate 13 bus properties throughout the state with an Idaho version of the Modes software. The bus properties to be integrated include

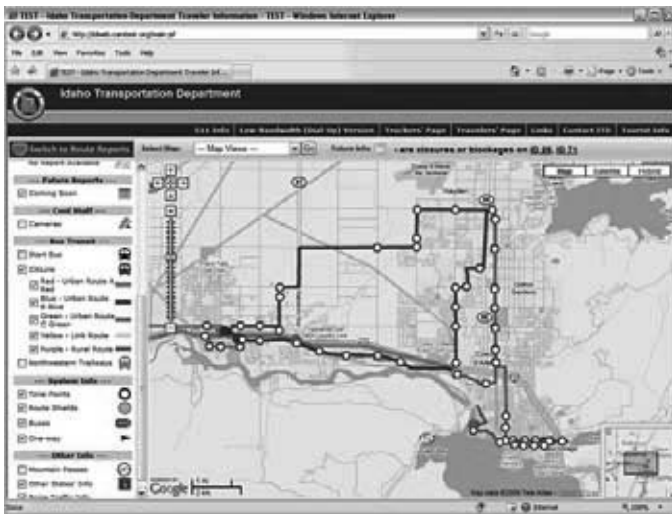


Fig.2. Idaho Public Website with Bus Routes and Schedules

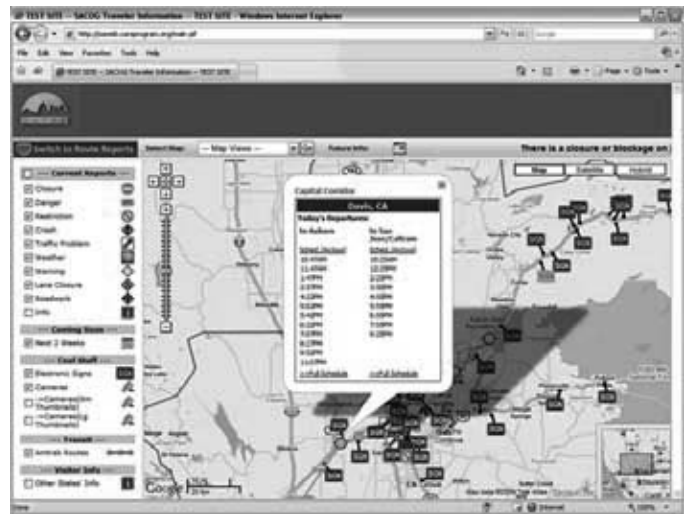


Fig.3. SACOG Public Website with Amtrak Train Schedules

regional, local, and inter-state systems. Through Modes, the Idaho Transportation Department plans to integrate the bus schedule information managed via the Modes software with Idaho's 511 Traveler Information website. Illustration 2 shows a test version of Idaho's website with integrated bus schedules.

Modes is being developed with both AVL (automated vehicle location) and DMS (dynamic message sign) capabilities to support an extended integration with the Amtrak Downeaster, a 116-mile passenger train service operating four daily round trips between Boston, Massachusetts and Portland, Maine. Amtrak publishes AVL-derived real-time train arrival and departure information via an XML (Extensible Markup Language) feed. Modes will import real-time train schedule information directly from the Amtrak XML feed.

Modes will make the real-time train information from Amtrak available in the Modes operator GUI, as well as on deploying agencies' public websites. In California, as part of a suite of major new ITS software deployments in the greater Sacramento area, the Sacramento Council of Government (SACOG) plans to deploy Modes to integrate Amtrak Capitol Corridor rail service schedules with its public travel information website. The Capitol Corridor route runs through Sacramento, between Auburn and San Jose. Illustration 3 shows a test version of the SACOG travel information website with integrated Capitol Corridor schedules.

Modes will also generate the display of "next 3 train" messages on electronic signs installed at Amtrak Downeaster real stations in Maine. Operators will be able to use the Modes GUI to create custom messages for display on the station signs, such as messages about service delays and other special announcements.

4. Conclusion

The agencies that have worked together to shape Modes envision a migration path that will successively add further transit properties operating in their respective jurisdictions into their Modes deployments. These transit properties will include modes such as bus, rail, ferries, and (perhaps, eventually) paratransit. As Modes deployments expand and evolve, more and more transit information will be available to the public.

Work is currently in progress to support the displaying of highway-related event reports from an agency's condition reporting system in Modes. The aim of this data integration is to give transit (primarily, bus) dispatchers thorough and up-to-date information about events and conditions on the roads which their systems use.

Granting conditions-reporting privileges to transit dispatchers could harness a very effective means of traffic event reporting on city streets. Transit drivers and conductors are well placed to report roadway incidents, delays, adverse conditions, or even roadwork that may not yet be available to state and local officials. Coordination of conditions reporting between transit systems dispatch and larger jurisdictional transportation agencies could increase roadway reporting coverage in urban areas and help to improve information latency.

Preliminary discussions are underway to design a messaging system that could allow 'subscribers' to receive alert messages about real-time service disruptions for particular transit systems, via e-mail or SMS (i.e. cell phone text message). The system is also envisioned to support request-response functionality, allowing a user to send a specific text message to a 5-digit SMS short code in order to receive a report about the current status of a particular transit system, bus, or train.

Additionally, several North American transportation agencies are joining together to pursue the North American Event Hub, which will share state or local information about road events between transportation agencies. With the deployment of Modes, the North American Event Hub group may also choose to share public transit data. This

transit data may also be shared with external private-sector companies who specialize in managing information or transportation data, such as Google, creating a unique partnership between a large group of public agencies and the private sector.