

SECTION 5

TTI SYSTEMS

This section identifies and describes specific TTI systems in North America and Europe. These systems are presented in this section to provide comprehensive examples of successful TTI deployments around the world. Many of these systems do not just provide one type of TTI (e.g., pre-trip vs. en-route)—they provide a multifaceted approach to providing TTI. Please note that some of the systems described in this section may have been mentioned briefly in Section 4.2. The reason for including them here is to provide more detail than what was previously presented.

Also, it is important to note that in-depth case studies of several of these systems was conducted as part of TCRP Project J-09, Task 4, the results of which were published as *TCRP Report 84, Volume 4 (I)*. Each case study presents the following information:

- System design and functionality for each website feature,
- Project objectives,
- Implementation issues,
- Outcomes/benefits, and
- Planned improvements.

5.1 NORTH AMERICAN SYSTEMS

Table 8 summarizes the North American TTI systems that are presented in this subsection.

5.1.1 Cape Cod Regional Transit Authority

In Dennis, Massachusetts, the Cape Cod Regional Transit Authority (CCRTA) system is an Internet application (www.thebreeze.info) that provides information on the location of CCRTA buses by tracking and displaying the vehicles' real-time locations on a map. The real-time vehicle location is collected from the GPS-based AVL system. All collected data is processed by the operations center as part of the CAD/AVL system. The locations of the buses are then displayed on a service map on the Internet. As shown in Figure 24, the buses are represented as (directional) arrows on the map and as circles when they are stopped. The bus routes are represented by thick, colored lines. To get information on any of the icons on the map, there is an "Info" button that users can select, and a pop-up screen provides detail on the routes and the stops.

There is an option to select and zoom in or out of an area based on the locale that a user is interested in. The user can

choose to view a specific area of the map by entering addresses or common names for an origin and destination. Once the selection is made and "Return to Map" is clicked, the map will automatically zoom in on a 1½-mile area surrounding the chosen points of interest. The page (map overview) is automatically refreshed every 90 seconds. Currently, the Internet application provides bus location information as well as information on routes and stops. The RTA is planning to add LED DMSs at the Main Bus Terminal and eventually at bus shelters.

5.1.2 LACMTA/LADOT

In Los Angeles County in 2000, LACMTA deployed a new bus rapid transit system, called Metro Rapid, to make riding the bus more attractive to the traveling public. The new service uses the city's computerized Automatic Traffic Surveillance and Control System (ATSCS) to provide signal priority for these buses. As part of the signal priority system, LADOT developed a passenger information system that uses wireless electronic displays at its Metro Rapid bus shelters to provide real-time arrival information to the rider. Currently, real-time information is available at stops along both Metro Rapid lines. The one-line LED DMSs in specially designed bus shelters are mounted 9 feet above pavement level and display a next bus arrival message in 2-in. bright red characters (see Figure 25). DMSs are also used to display delay messages whenever a bus is running 3 or more minutes late. In this case, the DMS will display "Next Bus Delayed."

Every morning, LACMTA provides the LADOT command center staff with the schedule for each Metro Rapid bus that day. A transponder mounted on the chassis of each bus is used to track the bus's progress along its route via loop detectors installed in the roadway at each intersection. Throughout the day, the ATSCS computer compares that schedule with the actual location of each bus. If the bus falls behind schedule, the computer can extend the green light at the traffic signal in the bus's immediate path so that the bus can get back on schedule. Since the computer knows the location and speed of the bus—and the fact that lights in its path will remain green—the computer can accurately calculate the time that the bus will take to reach its next stop. This information is transmitted to downstream stops. The message travels from the ATSCS center to AT&T's nationwide cellular data network, which then

TABLE 8 Summary of North American cases

Location or Agency	Description
Cape Cod RTA, Dennis, MA	Internet application provides information on the location of the Cape Cod RTA buses by displaying the vehicles' real-time locations on a map.
Los Angeles DOT/ LACMTA	The system uses loop detectors to determine location of buses and provides real-time arrival information on DMSs at Metro Rapid bus stops.
San Luis Obispo Transit, CA	A GPS-based AVL system providing real-time arrival information at selected bus stops.
Washington State Ferries	An Internet application that provides real-time information on the location of vessels by displaying their real-time location on a map; also Ferry Cams show images of ferries and ferry docks.
Denver RTD	Internet interactive voice response telephone and mobile applications to provide real-time arrival information.
Seattle, WA (King County Metro)	<i>BusView</i> , which provides real-time bus location and other real-time information, and <i>MyBus</i> , which provides to the Internet and mobile phones real-time arrival information.
Montgomery County Transit (Rockville, MD)	Cable TV channel with traffic cameras and other traffic and transit information. Web page, kiosks and electronic signs provide static schedule information.
Société de Transport de la Communauté Urbaine de Montréal (Montréal, Quebec)	<i>Tous Azimuts</i> itinerary-planning system provides door-to-door public transit directions using a web interface.
Ohio State University (Columbus, OH)	<i>Bus Location and Information System</i> provides real-time bus arrival and location information via a website and message signs at bus stops.
Tri-Met (Portland, OR)	<i>Transit Time Internet Access</i> web application that allows users to receive real-time schedule information about a bus they intend to ride. Real-time arrival information is also available at a number of bus shelters via DMSs.
Baruch College and MTA Long Island Rail Road (New York, NY)	<i>Talking Directory Display System</i> , a "talking kiosk" providing station information for the visually impaired.
San Francisco Bay Area	<i>TakeTransit</i> is an itinerary planner for the whole Bay Area and <i>TravInfo</i> is a telephone-based traveler information system.
Utah Transit Authority	<i>UTA Itinerary Planner</i> , <i>UTA My Way!</i> and <i>UTA on the Go!</i>

relays the message to a wireless CDPD/IP modem built into the DMS at the target bus stop. Each modem in the DMS has its own unique IP address, so a series of stop-specific messages can be cascaded along the route to update passengers as to when a Metro Rapid bus will arrive at their particular location.

Real-time bus arrival information is available only through the DMSs at Metro Rapid bus stops at this time, although providing this information on other media is planned for the future. LACMTA and LADOT are considering expanding the system to the Internet and possibly WAP mobile telephones and PDAs. The agencies are also discussing providing real-time information for rail (both heavy and light rail).

5.1.3 SLO Transit

In 2001 in San Luis Obispo, SLO Transit completed the installation of a prototype ITS system on its buses and at bus stops to test the operational suitability of ITS technology in a small transit agency environment. The project con-

sisted of installing CAD software at the dispatch center; equipping 18 vehicles with GPS-based AVL hardware and software (including MDTs); and equipping eight bus stops with DMSs. The signs display the number of minutes until the bus arrival (see Figure 21). The signs are solar powered and controlled by wireless links.

The system utilizes a GPS-based AVL system. Rather than transmit the location information from the vehicles to dispatch over a specialized communication system, the system developers chose to "piggy-back" the digital data on the standard analog voice radio system that is used by SLO Transit to communicate with the drivers. This technique is possible in a smaller system because there is often unused radio channel capacity, and short data transmissions can use the "gap" between voice transmissions without interfering with normal voice communications. The onboard MDTs calculate schedule adherence status for arrival and departure from scheduled stops. Schedule adherence status is displayed to the driver and transmitted to the dispatch center (see Figure 26). The

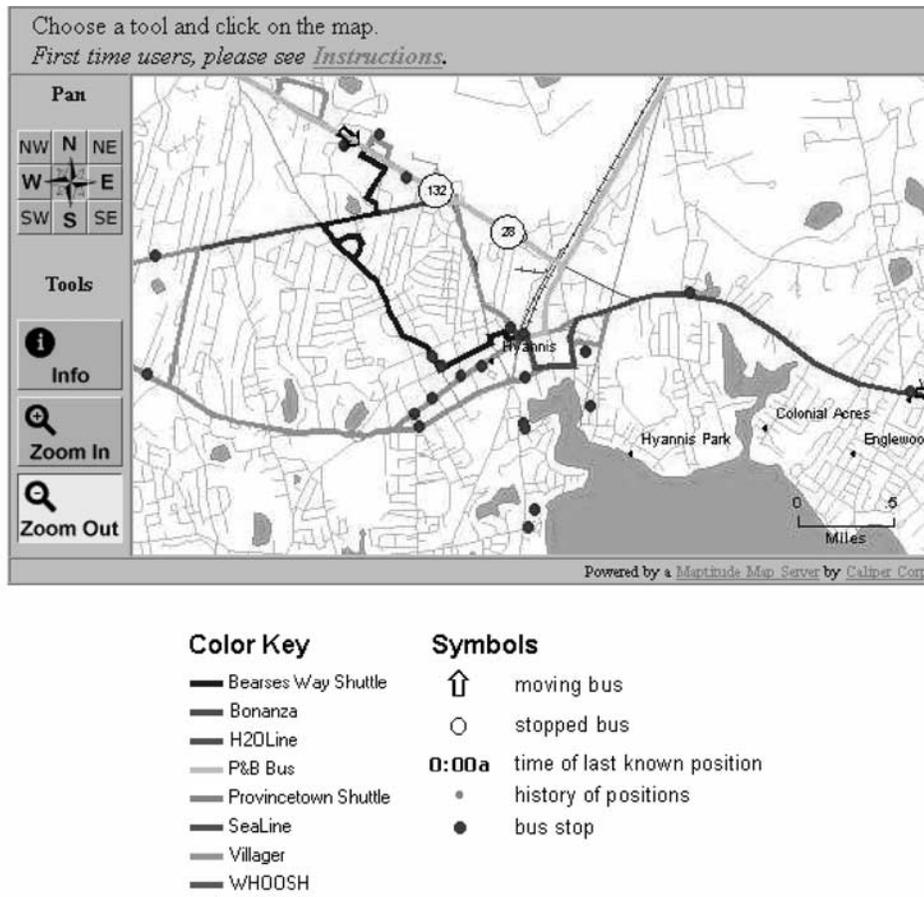


Figure 24. CCRTA advanced travel planner.

MDTs also notify the drivers of when they should be departing a stop with a layover.

Another innovative technique being used at SLO Transit lowers the operational cost of communicating with the DMS units deployed at the bus stops. These units have a built-in intelligence module that allows all deployed signs to listen to a single, bundled text message sent by way of a pager. This one message contains the updated data for all signs at all

stops. Each Smart Transit Sign is programmed to know the bus stop(s) and bus route(s) it is servicing. Once the text message is received, the “smart” sign strips out irrelevant information and uses only the information meant for its specific location. It then uses this information to inform the waiting passengers of the time remaining until the bus arrives at that specific bus stop. This technique allows the transit agency to limit its Smart Transit Sign communication costs.



Figure 25. LACMTA Metro Rapid bus stop shelter sign.

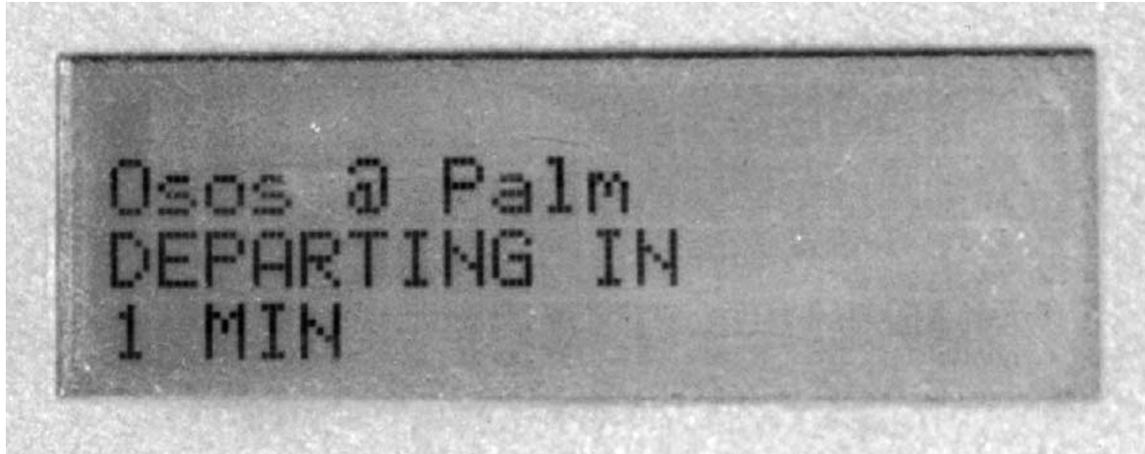


Figure 26. SLO Transit MDT screen (2).

The current system provides real-time information on arrival times of buses, location of buses, and service delays or disruptions. However, vehicle locations are available only on the dispatchers' monitors because the DMSs do not have the capability to display graphics. SLO Transit has considered the possibility of providing vehicle location and real-time arrival information via media such as the Internet.

5.1.4 WSF

In Washington State, WSF's Vessel Watch is an Internet application that provides information on the location of vessels by tracking the vessels and displaying their real-time location on a map. The real-time vehicle location is collected from the vessels through a GPS-based AVL system, which was installed 10 years ago in 1993 as part of Coast Guard operations. The vessel locations are shown for a route selected from a drop-down menu. The route names are also represented on the map alongside the moving arrows, which indicate vessel movement and direction (see Figure 16). The location information is updated every 3 minutes. This system was developed in-house with help from contractors from Washington State DOT.

The location information from the vessels' onboard AVL system is relayed to WSF through a private provider. The provider owns the infrastructure (towers and the frequency) and relays the information from the vessel to the WSF dispatching center as part of the AVL system. The AVL system also provides WSF with more detail on each vessel's operation, detail that is used to generate reports for analysis. WSF pays the provider a flat rate per hour per vessel to use the communications infrastructure. The location data that is relayed from the provider is then displayed on Vessel Watch.

The agency provides information through e-mail alerts to its subscribers. The alerts can be personalized to a selected route. These alerts are not in real time and are currently sent 24 hours

prior to a vessel not being available for service and removed from the schedule. WSF currently has over 9,000 subscribers to the e-mail alert system.

WSF is currently providing real-time images of ferries through "Ferry Cams." WSF owns and operates some of the cameras and provides shots on www.wsdot.wa.gov/ferries/cameras/ (see Figures 27 and 28). In the locations that did not originally have cameras, a partnership between WSF and private companies that wanted to advertise enabled the installation and maintenance of the cameras at some locations.

5.1.5 Denver RTD

After acquiring its AVL system in 1996, Denver RTD was interested in using this technology to provide better service to its customers by means of supplying more reliable and accurate information. Currently, RTD provides traveler information to its customers through a variety of means including the Internet, telephone, wireless devices, and kiosks.

Since 1999, Denver RTD has been providing ETAs for its bus and rail services through its Bus Locator application on the Internet (www.rtd-denver.com). Bus Locator provides the ETAs for the next two to three vehicles at a particular stop. The application automatically switches to showing scheduled arrival times whenever real-time data is not available. Real-time location for buses is provided via the existing AVL system, while train location is provided via loop sensors.

In December 2001, Denver RTD implemented its Talk-n-Ride system. Talk-n-Ride is an IVR system that provides real-time bus and train arrival information. To use the system, users are prompted to speak the route number, direction, stop name, and time of their intended trip. The system also prompts the user to select whether he or she wants the scheduled or real-time arrival information. Once all the necessary information is entered, the system presents ETAs for the next three vehicles. Talk-n-Ride uses the same server that is used to provide real-

WASHINGTON STATE FERRIES

Select a Route Schedule



Ferry Cams

Washington State Ferries in conjunction with private industry has developed and placed cameras at various docks to help you make transportation decisions on traffic patterns. Watch this page for more cameras to come on line.

Terminal Ferry Cams

- [Orcas Island](#)
- [Friday Harbor](#)
- [Anacortes](#) WSF operated
- [Clinton](#) WSF operated
- [Mukilteo](#) WSF operated
- [Kingston](#) WSF operated
- [Edmonds](#) WSF operated
- [Fautleroy](#) WSF operated
- [Bainbridge Island](#)
- [Seattle to Bainbridge](#)
- [Seattle to Bremerton](#)

Other WSDOT Cameras

- [Seattle Area Traffic](#)
- [Tacoma Traffic](#)
- [Hood Canal Bridge](#)



Figure 27. WSF Ferry Cam selection.



Figure 28. Ferry Cam image.

time arrival information in Bus Locator. Talk-n-Ride uses text-to-speech (TTS) technology to convert information generated by the system into voice. It is estimated that the call volume for Talk-n-Ride has been approximately 1,800 calls per month, with an average of 1 minute and 26 seconds per call. RTD pays the company that hosts the Talk-n-Ride system a flat rate of 12¢ per minute. At a minimum, RTD pays the host \$500 per month if call volumes do not reach the equivalent of \$500.

Mobile-n-Ride is another application through which Denver RTD provides real-time arrival information to its customers. RTD provides PDA and web-enabled mobile telephone access to real-time information in this system, using the same customer inputs as Talk-n-Ride. The same server and software is used to provide ETAs via a PDA and mobile

telephone as is used for the Talk-n-Ride and Bus Locator applications. An interpreter program determines the type of device that is requesting ETA information and the operating system being used by that device. Once the system determines the device type and the related operating system, the ETA prediction is calculated and provided to the requesting device in the correct code (which is determined by the device's operating system). For example, data is returned in WML 2.0 if the mobile telephone that is requesting the ETA information is running WML 2.0. A total of 440 devices and multiple versions of XML, WML, and HTML are supported.

Denver RTD also provides various types of information to its customers via kiosks (see Figure 29). Currently, there are about 60 kiosks located across the city at most RTD facilities and at many public facilities. At the kiosks, users can check route and schedule information, view maps, get information on RTD programs and services, and plan their trip using the RTD Itinerary Planner. Users also have access to real-time information as the kiosks provide access to RTD's Internet site.

Finally, Denver RTD is currently testing the use of DMSs at selected stops along five routes (B, B Local, B Express, 2, and 12). This demonstration system, which will consist of 20 electronic signs, is expected to be operational by the end of 2002. This system, provided by a third-party vendor, will use RTD's location data (generated by the existing AVL system) with the vendor's algorithm to predict arrival times. Also, the vendor will provide this real-time information on RTD's website, where users can access route maps and get arrival times at all stops along the route.

5.1.6 King County Metro

Seattle's King County Metro is another agency that provides comprehensive traveler information to its customers.



Figure 29. RTD's kiosk.

The agency provides an itinerary-planning system (see Section 3.1.2, Figure 1) in addition to specialized real-time applications called BusView and MyBus. These applications were developed in part with funds for Seattle's Smart Trek MMDI.

BusView is an Internet application developed at the University of Washington. It displays a map of the current locations of all Metro buses currently in service (see Figure 14). The service became available via the Smart Trek website in 1998. BusView is capable of displaying the location of 1,300 Metro buses traveling on 250 routes throughout its service area. In order to use the raw bus location information from Metro's AVL system to predict real-time arrival times, onboard hardware and software had to be upgraded. The Internet interface for BusView is a Java software application that runs on almost any computer platform, including Macintosh, personal computers (PCs), and Unix.

BusView displays a window showing a map of a specific area with bus routes highlighted and bus locations displayed along the routes. A specific geographical location can be selected from a preselected list of locations from a drop-down menu. The user can pan the map as well as zoom in and zoom out (although zooming is limited to 1-mile and 2-mile views). When several routes run on the same alignment, within the displayed map the view becomes cluttered with routes and buses. Hence, the application allows the user to filter out all unwanted routes by entering the route number that most concerns him or her in the "Busses to Display on Map" box.

Another interesting feature of BusView is that it allows the user to request that the system alert him or her when his or her bus is approaching a specific location. To achieve this, the user can either right click on a bus icon and then select "Bus Progress" or enter a route number in the "Route Progress" box. Using the right-click method will show a linear representation of the bus route (see Figure 15). Using the "Route Progress" box method allows the user to enter an origin and destination. A window will then display the segment of the route indicated by the origination and destination entered. With the linear representation of the route displayed, using either method, the user can click anywhere along the route to place an alert request. When the next bus arrives at the location where the alert was placed, the application will produce an audible and visual notification. This is helpful as one can insert an alert several blocks from where the customer catches the bus, allowing the customer enough time to get to the bus stop.

MyBus is another application that provides real-time arrival information on Metro's bus routes via the Internet or on wireless devices such as mobile phones and PDAs. MyBus was initially developed at the University of Washington, with funding partially provided by the federally sponsored "SmartTrek" MMDI project (3). King County Metro does not currently maintain MyBus, but the agency is planning to take over the operation and maintenance of MyBus in 2003.

The web service was initially developed to provide real-time predictions of bus arrival and departure times at eight

key transfer points in the King County Metro transit network, particularly at selected transit centers and park-and-ride lots. The original system even showed the customer which bus bay each route was arriving at or departing from. MyBus has now been expanded to so many locations that a map of the region broken into smaller zones is provided to help customers find the desired MyBus transit node. Note that customers can bookmark any “MyBus location” once they have found the locations that interest them. MyBus also uses information from King County Metro’s AVL system and the prediction algorithm developed by the University of Washington to make its arrival and departure estimates (4). Readers may want to note that the vehicle location information comes from a signpost-based AVL system.

The Internet version of MyBus prompts the user to click on a King County map to select a particular section of the county. Then the user selects the bus stop of his or her choice. MyBus then lists all the buses running on the routes that serve the selected bus stop in a table format. The user has the option to sort the table by scheduled time, destination, or route (see Figure 30). The user can also click a button on the screen to generate a map showing the location of the bus stop he or she has selected.

Another recent development is that MyBus information can be accessed by WAP-enabled cell telephones or networked Palm Pilot PDAs (5). This option has been available since 2001. The information is edited and formatted differently for these devices than for PC web browsers. Figure 31 shows an example screen for WAP-based information. Figure 32 shows the information displayed on a Palm Pilot.

5.1.7 Montgomery County Transportation Management Center

In Maryland in September 1996, the Montgomery County Transportation Management Center (TMC) started integrated traffic and transit operations (6):

The Ride On transit dispatchers and supervisors were relocated to the TMC and joined traffic technicians and engineers to manage the County’s transportation system. This integration of traffic and transit operations was made to improve coordination between traffic engineering and transit services, and ultimately, to ensure the efficient utilization of transportation capacity in the County. Through one system, the Advanced Transportation Management System (ATMS), transit and traffic operations are performed.

37 AV SW & SW ALASKA ST(farside)

MyBus WAP site: www.mybus.org/wml/
This Metro location is number 6055

Last Updated: Fri Oct 04 11:12:32 PDT 2002

Route	Destination	Scheduled	Depart Status
22	Downtown Seattle	11:21am	1 Min Delay
22	White Center	11:23am	On Time
51	West Seattle Junctn	11:29am	No Info
54	Downtown Seattle	11:12am	3 Min Delay
54	Downtown Seattle	11:42am	No Info
54	White Center	11:30am	On Time
55	Admiral District	11:15am	9 Min Delay
55	Downtown Seattle	10:57am	No Info
55	Downtown Seattle	11:27am	On Time
570E	INT. DISTRICT STA. (DOWNTOWN SEATTLE)	11:18am	4 Min Delay
570E	SEA-TAC AIRPORT	11:25am	2 Min Delay

Created by ITS-UW, Data from MetroKC, Funding from Sound Transit

Figure 30. King County Metro MyBus information.

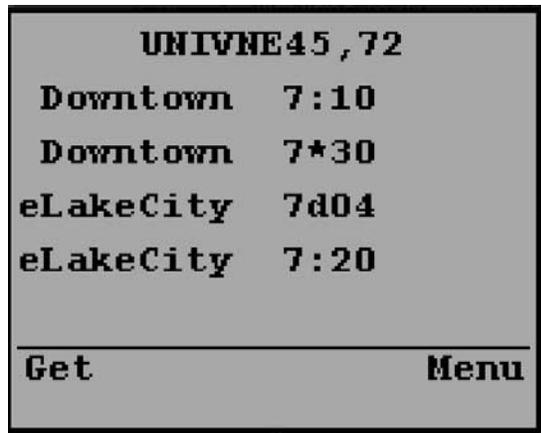


Figure 31. MyBus display on WAP-enabled cell phone.

Montgomery County's Department of Public Works and Transportation provides traffic and transit information via cable television, radio, a website (7), three kiosks, and four DMSs. Two of the kiosks are near the county government center in Rockville; the third is within a shopping mall. The electronic signs are installed at subway stations and bus shelters. The

Travelers Advisory Radio System (TARS) covers approximately 10% of Montgomery County with 12 low-wattage transmitters using 590 AM or 1070 AM. The same audio used for the TARS is broadcast on County Cable 55 and the Internet. TARS messages provide motorists with information on incidents, construction, maintenance activities, and special events. TARS is also used to enhance safety and to manage traffic flow by diverting travelers to less congested roadways. TMC technicians update TARS messages with real-time transportation information related to traffic and transit.

Via the cable TV channel and radio broadcasts, passengers can receive updated information on traffic conditions, accidents, and public transit delays. The web page provides route, schedule, and fare information. The website offers the user links to websites of all transit providers in the region (including Washington, D.C., and northern Virginia), including WMATA's RideGuide. The website also offers information on road delays and incidents, as well as real-time snow-removal information. The electronic signs provide static route and schedule information although real-time information is expected to be added in the near future.

5.1.8 Société de Transport de la Communauté Urbaine de Montréal

In Québec, the website for Montréal's Société de Transport de la Communauté Urbaine de Montréal (STCUM) includes a sophisticated itinerary-planning system named Tous Azimuts (8). The system provides complete bus and subway trip-planning information between any two points within Montréal. Service is provided in French and English. Passengers accessing the website use a point-and-click map of Montréal to specify their origins and destinations (see Figures 33 and 34). If users do not want to use the map to specify origins and destinations, they can use a text search. The text search can find an intersection, an address, a Metro or train station, and key points of interest by name. The system asks for the day and time of the trip, the preferred mode (bus or subway), and whether the routing algorithm should include a penalty for walking (see Figure 35). From this information, the system calculates and presents one or more optimal itineraries (see Figure 36). Passengers are asked to telephone the STCUM's automated bus information system to verify the bus arrival times on the itinerary.

5.1.9 Ohio State University Bus Location Information System

The Ohio State University (OSU) Center for Intelligent Transportation Research was approached by OSU Transportation and Parking Services with a proposal to provide real-time information about bus arrivals to riders waiting at bus stops. A joint project, known as the OSU Bus Location Information System (BLIS) and funded internally by Transportation and Parking Services, arose from those meetings. OSU BLIS provides real-time bus location and arrival time information to passengers of the extensive campus bus system. The

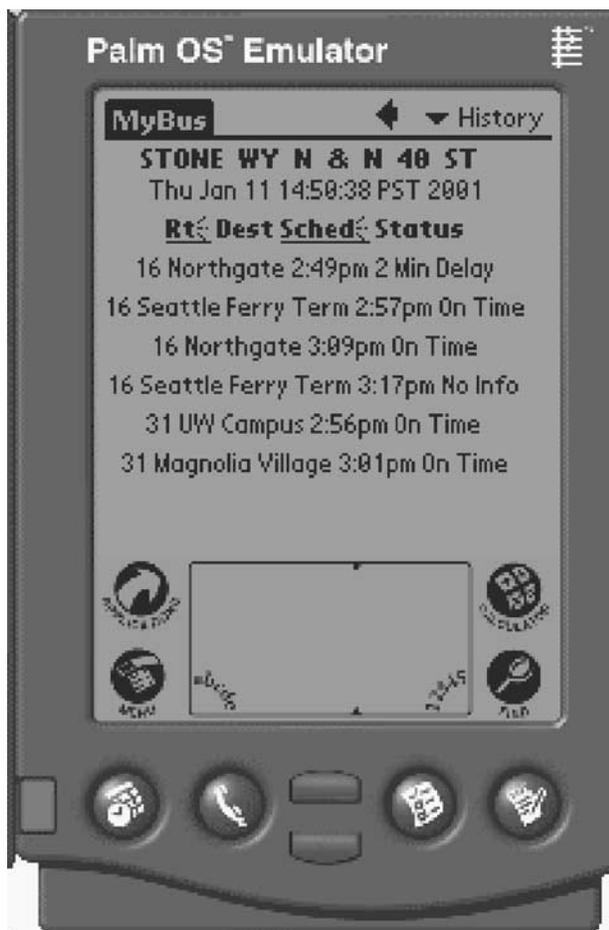


Figure 32. MyBus display on a wireless PDA.

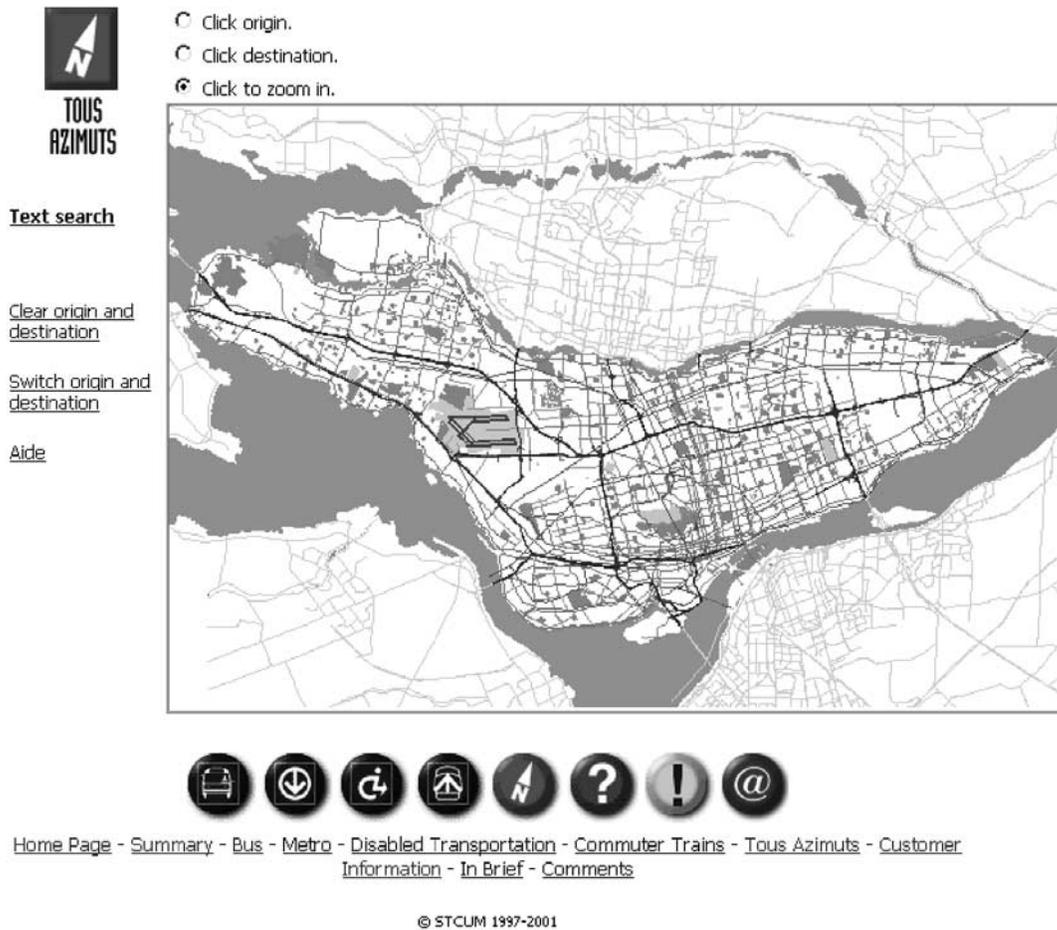


Figure 33. Tous Azimuts initial screen.

system uses a GPS-based AVL system to provide bus location information over the Internet and bus arrival information via DMSs installed at the bus stops. The system also archives the bus location data, and these are used by OSU Transportation and Parking to evaluate bus service. The hardware and software used in this project were designed, manufactured, and implemented as a student project within the OSU College of Engineering and the OSU Center for Intelligent Transportation Research. The system was deployed in September 1997.

A GPS-based AVL system was designed, manufactured, and installed on each of the 18 campus buses. Via CDPD modems, data from the buses are relayed to a central computer. This data is used to provide real-time bus location information through a Java-based website (9), waiting time estimates that are displayed on DMSs at the bus stops, and historical and statistical information about the performance of the campus bus service. The system provides three types of information. First, at each bus stop, passengers can obtain minimum estimated wait times for each bus on the route via programmable message signs installed at the stop. Second, pre-trip information is also available via a website that displays, in real time, the location of all campus buses. Third, the central computer stores his-

torical and statistical information about the performance of the campus bus service, which is used both by OSU Transportation and Parking to evaluate bus service and by students in a traffic management course.

5.1.10 Tri-Met's Transit Tracker

In Oregon, Portland Tri-Met's Transit Tracker is a traveler information system that provides real-time transit information via the Internet and through LED DMSs at several bus stops and light rail stations. Transit Tracker uses a GPS-based AVL system to determine bus locations and loop sensors to determine train locations. The first Transit Tracker sign was installed in January 2001 at one key bus stop. As of September 2002, 11 displays have been installed at 10 bus shelter locations and 28 signs at 11 MAX stations (see Figures 2 and 22). Tri-Met plans to install 50 signs by mid 2003, with an ultimate goal of installing a total of 250 signs throughout the service area. The difference between signs at bus shelters and those installed at MAX stations is that the former provide real-time arrival information while the latter show only scheduled arrival time. Bus stops that serve more than one route

TOUS AZIMUTS

Origin: **boul. Alexis-Nihon / rue Hufford (Saint-Laurent)**

Destination: **av. Dresden / rue Fleet (Mont-Royal) ←**

Click to zoom in. **Calculate!** ←

Map showing Montreal (Cartierville), St-Laurent, and Mont-Royal.

Navigation icons: Home, Power, Refresh, Up, Compass, Question, Exclamation, At.

Home Page - [Summary](#) - [Bus](#) - [Metro](#) - [Disabled Transportation](#) - [Commuter Trains](#) - [Tous Azimuts](#) - [Customer Information](#) - [In Brief](#) - [Comments](#)

Figure 34. Tous Azimuts origin and destination selection.

TOUS AZIMUTS

Map

Text search

Switch origin and destination

Aide

Itinerary parameters	
Origin : boul. Alexis-Nihon / rue Hufford (Saint-Laurent)	Destination: av. Dresden / rue Fleet (Mont-Royal)
Day of itinerary : <input checked="" type="radio"/> Weekday <input type="radio"/> Saturday <input type="radio"/> Sunday	Minimize walking distance : <input type="radio"/> Yes <input checked="" type="radio"/> No
Starting time : 08 : 00	Use metro: <input checked="" type="radio"/> Yes <input type="radio"/> No Use train: <input type="radio"/> Yes <input checked="" type="radio"/> No
Calculate	Default options

Navigation icons: Home, Power, Refresh, Up, Compass, Question, Exclamation, At.

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Figure 35. Tous Azimuts itinerary parameters.



Calculated itineraries

- [Route\(s\) 121, 2, 5 \(44 minutes\)](#)
- [Route\(s\) 177, 2, 5 \(50 minutes\)](#)
- [Route\(s\) 216, 2, 5 \(50 minutes\)](#)

[Parameters](#) [New itinerary](#)

Route(s) 121, 2, 5 (44 minutes)					
Origin: boul. Alexis-Nihon / rue Hufford (Saint-Laurent)					
Destination: av. Dresden / rue Fleet (Mont-Royal)					
Day: <i>Weekday</i> , Time: <i>08:00</i> , Walk penalty: <i>no</i> , Metro: <i>yes</i> , Train: <i>no</i>					
Trip duration: 44 minutes					
Dep. Time*	Arr. Time*	TELBUS	Walk / route	Direction	Stop
8h00	8h04	-	Walk for 325 metres	-	COTE VERTU et ALEXIS-NIHON
8h06	8h12	520-5372	121 SAUVE / COTE-VERTU	EST	métro Cote-vertu
8h15	8h25	-	LIGNE 2: ORANGE	Henri-Bourassa	métro Snowdon
8h27	8h37	-	LIGNE 5: BLEUE	Saint-Michel	métro Acadie
8h37	8h44	-	Walk for 600 metres	-	-

*Approximate times. Please verify schedule with TELBUS system or with A-U-T-O-B-U-S information centre: (514) 288-6287.

Valid until , Itinerary calculated on 2002/12/04.

Figure 36. Tous Azimuts itinerary.

are outfitted with a multiline LED display to list arrival information for three or four buses.

The Transit Tracker Internet application (www.tri-met.org) provides real-time information for almost all bus stops in the Tri-Met system (approximately 8,000 bus stops) (see Figure 13). The Internet application has been in use since September 2002. The user is prompted to select the route, the direction, and the specific bus stop of his or her choice. The application then displays the ETA of the next bus.

Arrival times of buses are not generated by means of a prediction algorithm as in the case of most other systems; a bus's arrival time is, however, based on the schedule adherence status of the bus. Transit Tracker, using location and schedule data, determines how early or late a bus is running. This information—schedule adherence and block number—is then broadcast to all signs that already have stored all the schedules by block numbers in an internal memory unit. Once a sign receives an arrival time message, it compares the received data with the schedule. The sign's internal processor determines what the offset from the schedule is and then displays the expected arrival time in a countdown fashion.

Tri-Met is currently developing an in-house application to provide real-time information on wireless devices such as PDAs and mobile telephones. It is expected that this application will be operational in the early part of 2003. A recent

survey study conducted by Tri-Met (see Section 3.1.2.5) revealed that its passengers place a very high value on having Transit Tracker at their stop. When asked how much value they place on having Transit Tracker at their bus stops, 60% of the respondents assigned a value of 5 on a scale of 1 to 5 (with 5 being the highest) and 25% gave it a value of 4. Moreover, 75% of all respondents indicated that they “check the information” on the Transit Tracker display *always* and 21% check the Transit Tracker *sometimes*.

5.1.11 Metropolitan Transportation Authority Long Island Rail Road

The Talking Directory Display System (TDDS) is a joint project of the Baruch College Computer Center for Visually Impaired People (CCVIP) and New York's Metropolitan Transportation Authority (MTA) Long Island Rail Road (LIRR). TDDS, nicknamed the “Talking Kiosk,” was specially designed to assist persons who have visual impairments with locating LIRR facilities throughout Penn Station and in New York City. The kiosk was deployed in July 1999.

TDDS was developed at the Baruch College CCVIP in close collaboration with the American Foundation for the Blind and the Stein Partnership (10). Baruch College staff were responsible for system design, software development, and maintenance.

LIRR staff were responsible for identifying a suitable location for the unit and briefing personnel about the kiosk's existence and function. TDDS employs state-of-the-art multimedia technology and uses a raised line map, large print, and speech to present expertly crafted way-finding information to help users who have visual impairments navigate through complex spaces. The pilot use of the kiosk began in September 1996.

TDDS is a three-sided structure housing computers, speakers, a touch tablet with a tactile map, and a touch-tone type keypad. When not in use, the system remains in attract mode in which it speaks, announcing its presence and inviting the user to try it. As users approach the kiosk, a proximity detector senses them and the session begins. Users are invited to place their hands on the counter in front of them, where they find a raised line tactile map with large print underneath and a keypad similar to that used on a touch-tone telephone. Information can be accessed either through a voice mail-type menu system activated through the keypad or through a "touch-and-tell" mode activated by pressing a point on the raised line map and hearing the information spoken. In the "touch-and-tell" mode, three levels of information are available:

1. The user can touch a point on the map and hear the location spoken by the system;
2. If the user keeps his or her finger on that point, the user will hear additional information concerning the way to find it; and
3. If the user continues to hold his or her finger on that point, the user will hear what is available at that point.

The "touch-and-tell" mode is always active; thus, a user can choose to work primarily through the menu system and can then explore the map to reinforce his or her mental picture of the route from the kiosk to the destination. All spoken messages are displayed in large print for the benefit of the many people with visual impairments who have some useable vision. It has been found that the TDDS is useful for many customers who do not have severe visual impairments, but who find it difficult to deal with the customary sources of information. Information provided at the kiosk includes a station overview and complete information on the railroad, including information on LIRR destinations, specific tracks, specific boarding corridors, the ticketed customer waiting room, the lost and found, and more. Location information is provided for New York City Subway service, Amtrak, New Jersey Transit, and the locations of major station exits.

The kiosk has a call-in feature that allows Penn Station personnel to call and record by phone a message so that the user gets the information immediately—for example, such a message might be that an exit has to be closed for a day or an elevator is out of service. Finally, the system collects data on each user, including the length of each session, what type of information was requested, and which modes of information access were used. At the end of the session, the user is offered the opportunity to respond to several short questions assessing his or her satisfaction with and the usefulness of the TDDS.

In a 3-month period during the demonstration, the TDDS was used almost 13,000 times. It was estimated that around 99% of the usage was by persons with no visual impairment. A detailed evaluation of the system involving a series of trials by the visually impaired showed that TDDS was user-friendly, that more people use the key pad than the map, and that 18 out of 20 people who successfully completed the trial would use the TDDS again (11). Although the keypad was used more frequently, the evaluation found that users would also employ the map once they had become familiar with the general working of the system. The majority of participants indicated they would like to have similar installations in other locations.

5.1.12 San Francisco Bay Area Metropolitan Transportation Commission

The Metropolitan Transportation Commission (MTC) in the San Francisco Bay Area provides two TTI systems: the web-based TakeTransit itinerary-planning system and TravInfo, a multimodal telephone and Internet traveler information system. As part of its overall commitment to multimodal traveler information, MTC took the lead in creating the multi-organizational TravInfo system (12). The multimodal effort was initiated in 1993 as a field operational test (FOT) sponsored by U.S. DOT. One of the first projects was to create a telephone operator-based system of integrated travel information and trip planning. Both the telephone services and the AIP systems are available in MTC's nine-county service area.

The itinerary planner was launched on the MTC web page in July 2001. MTC's itinerary planner was designed to provide transit customers with consistent trip itinerary information across modes and transit service providers. This means that a customer wanting to take trips that involve more than one agency or cross service areas or modes need not be concerned with different agencies and their service boundaries. This approach is especially important for multimodal services with dense transit service across an entire region. The web-based AIP information is available to customers at their fingertips, 24 hours per day.

As shown in Figure 37, the MTC trip planner allows its customers to identify origins and destinations by address, intersection, or landmark. Customers can also define the day of their trip, departure time, and other options as follows:

- Itinerary preference (e.g., fastest itinerary, fewest transfers, minimal walking, or lowest fare);
- Fare category (e.g., adult, senior, disabled, child, youth, or school trip); and
- Maximum walking distance to the first leg of a trip (e.g., 1/8, 1/4, 1/2, 3/4, or 1 mile).

This interface provides a high degree of flexibility for defining trip-planning criteria. Like many other AIP systems deployed in the United States, all of the trip information is input on a single page. Another useful component is the "coverage area" map link on the main AIP page. Shown in Figure 38, the map allows customers to identify where

1. Where are you starting from?

Origin Address, Intersection or Landmark: (e.g. 100 Market St, or 14th and Broadway, or SFO)

City: (optional) ZIP: (optional)

2. Where are you going?

Destination Address, Intersection or Landmark:

City: (optional) ZIP: (optional)

3. What day is your trip?

4. What time is your trip?

- I'm leaving my starting point now
- I'm leaving my starting point at [2:34pm]
- I'm leaving my starting point as early as possible
- I'm leaving my starting point as late as possible
- I must arrive at my destination by [2:34pm]

5. Other Options:

Itinerary Preference:

Fare Category:

Max. Walk Distance:



[Get a closer look at the coverage area](#)

Figure 37. MTC TakeTransit input page.

The TakeTransit trip planner can currently plan trips on the following agencies:

- AC TRANSIT
- ACE*
- BART
- CALTRAIN*
- COUNTY CONNECTION
- EMERY GO-ROUND
- SAN FRANCISCO MUNI
- UNION CITY TRANSIT
- TRI DELTA TRANSIT*
- WESTCAT*
- FERRIES

* newly added transit agency

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The grey area on the map shows where TakeTransit can help plan your trip. Roll your cursor over the transit service name to the left or over the map above to view the areas served by each agency.

Figure 38. TakeTransit coverage area link.