Canada’s transit systems continually seek ways to deliver better service, more efficiently. After two decades of rapid advancements in information and communication technologies, the field of intelligent transportation systems (ITS) offers many such opportunities.

Practical and affordable ITS applications for transit are now being implemented across Canada at an unprecedented rate. They are helping the transit industry to achieve its vision of providing efficient, seamless mobility with a customer focus. This issue paper gives a brief overview of ITS, describes key ITS applications in the transit industry, and profiles several successful projects.

What is ITS?

ITS is defined by the ITS Society of Canada as the application of advanced and emerging technologies in transportation to save lives, time, money, energy and the environment.

Technology offers the potential to improve almost every aspect of transit services, from vehicle maintenance through traveller information. Transit managers have the ability to optimize all aspects of their operation — from vehicle maintenance to on-time performance, fare collection and customer security — with the help of real-time information, instant communication and sophisticated decision-making tools.

Since 1999, transportation stakeholders have been developing the ITS Architecture for Canada as a common framework for ITS applications. It describes how the various transportation system components (travellers, vehicles, roadside devices, and control centres) should interact, how data should be shared and used, what information and communications systems are required, and how to ensure that various system components are compatible, interoperable and interchangeable.

Managing complex operations

Managing transit service delivery is a complex activity that can require dispatching and monitoring hundreds of vehicles at once. ITS applications have revolutionized the once-laborious tasks of gathering information, making rapid decisions and communicating instructions — making them faster, easier and more effective.
Longueuil, Quebec

Improving operations for a mid-sized transit system

The Réseau de transport de Longueuil (RTL) serves a rapidly growing suburban community of 400,000 people on Montreal’s south shore. RTL has used ITS to improve its services for several years, with real benefits in a number of areas.

In 1999, RTL began installing automated passenger counters on dozens of buses to gather information on passenger activity. In 2003, the system implemented a transit priority system that reduced delay for 38 buses at 23 key signalized intersections. In the following year, it added onboard computers and GPS systems to its fleet to enable automated vehicle location. The RTL is now working towards the implementation of a contactless smart card-based electronic fare system.

Through these ITS applications, RTL staff have been able to reduce running time for some routes by up to 8% in peak periods. They can track average, minimum and maximum passenger occupancy levels on specific routes, which improves service planning. Many more applications are being developed to make use of the quality information that is now automatically collected on a daily basis.

Visit www.rtl-longueuil.qc.ca for more information.

Significant operational benefits led automated vehicle location (AVL) and computer-aided dispatch (CAD) to be among the first ITS applications for transit. They enable transit managers to optimize on-time performance, improve planning, and locate vehicles in times of emergencies. AVL systems use sophisticated global positioning systems (GPS) devices to monitor the location of each bus and determine whether it is ahead of, on or behind schedule.

Passenger counting is also crucial to effective transit planning. Automated passenger counters (APC) collect comprehensive information on passenger occupancy levels, and offer an affordable alternative to labour-intensive manual methods. Infrared or ultrasound sensors register passengers as they board or disembark each vehicle, and information is stored in an on-board computer until it is automatically downloaded to a central database when the vehicle returns to the depot. APC systems are most effective when integrated with AVL systems, so that passenger occupancy data can be tied to precise locations along a route.

To deliver the best possible service through fixed bus routes, demand-responsive paratransit services and even rail systems, transit supervisors frequently make split-second decisions in response to actual operating conditions. Transit operations software can help by automatically synthesizing available information, considering a range of options, selecting the optimal course of action, and issuing instructions for dispatch, routing and scheduling.

In St. John’s, NL, an automated vehicle location (AVL) system allows Metrobus staff to monitor operations in real time

Giving priority to transit vehicles

Traffic congestion and unpredictable road conditions are real barriers to effective transit service delivery. Slower and more variable travel speeds can reduce service levels, increase costs and discourage ridership. Much of the delay experienced by transit vehicles occurs at traffic signals, where ITS can offer a number of tools to make transit service faster and more reliable.

Transit signal priority (TSP) strategies give buses and rail vehicles some control over traffic signals. They are particularly valuable for bus rapid transit systems, which rely on fast, predictable travel times to attract customers.

Pre-emption of traffic signals can eliminate the need for transit vehicles to stop at an intersection by simply changing the signal to green whenever required. More subtle approaches can extend a green signal or shorten a red signal by a few seconds to let an approaching transit vehicle squeeze through. Other sophisticated approaches give transit vehicles priority only when they are behind schedule.

In the most common approach to TSP, a transmitter mounted on an approaching bus sends a signal to a receiver that is linked to the traffic signal controller. In a more integrated approach, the transit vehicle’s automated vehicle location system communicates directly with the centralized traffic control system, which instantly optimizes traffic signal timing to balance the needs of different users.
Halifax, Nova Scotia

**ITS yields bus rapid transit on a budget**

Halifax Regional Municipality’s new MetroLink service has shown that bus rapid transit (BRT) services can be created without a huge investment in infrastructure. The project, funded partly through Transport Canada’s Urban Transportation Showcase Program, uses ITS methods to achieve BRT-quality service in mixed traffic conditions.

- MetroLink buses receive priority at 20 intersections in two corridors leading to downtown Halifax. Traffic signal priority systems are activated by on-bus transmitters, and extend green lights or shorten red lights to reduce bus delay. Queue jump lanes let buses pass other vehicles waiting at intersections by activating a special transit-only signal in advance of the green light.
- To cross bridges into downtown Halifax, MetroLink buses use transponders to travel through toll lanes without stopping.
- Travel and schedule information is provided on plasma displays at MetroLink stops through Metro Transit’s automated vehicle location system, known as GoTime.

Together with other BRT characteristics like park-and-ride lots, limited stops and strong branding, these ITS measures make MetroLink a fast, reliable and comfortable transit option for Halifax residents.

Visit www.halifax.ca/metrortransit for more information.

Greater Toronto Area, Ontario

**Enabling “seamless” travel in Canada’s largest metropolitan area**

Agencies in the Greater Toronto Area (GTA) have been working since 2002 to implement a common GTA Farecard. The project is being led by the Ontario Ministry of Transportation (MTO) and involves GO Transit as well as the transit systems of Brampton, Burlington, Hamilton, Mississauga, Oakville, Toronto, and Durham and York Regions.

The GTA Farecard, a plastic card containing a computer chip, will offer “seamless” transit travel across many transit systems. Its holders will be able to board any GTA transit vehicle without tickets, passes or exact cash fares. It will cover all fare categories (adult, child, student, senior) and transfer increments. A central computer system will handle all financial information, tracking farecard transactions, storing each card’s “e-purse” value in a separate account, and reconciling daily with each transit service.

The GTA Farecard will be implemented by the Greater Toronto Transportation Authority (GTTA). A preferred vendor will be selected in 2006, and the first phase of implementation in 2007 will involve Mississauga Transit, GO Transit’s Milton commuter rail line, and turnstiles at TTC’s Union subway station.

Visit www.mto.gov.on.ca for more information.

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**Opening the door to electronic fares**

**Automated fare payment** is a customer-focused ITS application with huge potential to make transit a more flexible, affordable and attractive option. “Smart cards” are recognized by on-board readers, with a central computer recording each user’s transactions and account status. Passengers boarding a vehicle need only bring their smart card near the reader to receive instant acknowledgement of their fare payment.

The Société de transport de l’Outaouais in Gatineau has used smart cards for several years as a replacement for paper-based monthly passes. Other transit systems are planning comprehensive electronic fare systems using smart cards as an alternative to passes, tickets and cash fares. The advantages of electronic fare payment include:

- Enhanced customer convenience by eliminating the need for customers to purchase passes or tickets, and by enabling subscription-based transit passes through automatic bank withdrawals or credit cards.
- Reduced fare fraud by enabling transit systems to “lock out” stolen cards or non-paying subscribers.
- Improved demand management by modifying fares according to route type, time of day or day of week, or in conjunction with special events or marketing initiatives.
- Seamless integration of fares among neighbouring transit systems, eliminating the need for customers to acquire multiple passes or types of tickets, and simplifying the payment of fare increments when transferring from one service to another.
- Integration with other transportation services like car sharing operations, municipal parking operators or taxi companies.
Keeping travellers informed

Information and communication technologies have revolutionized the ways that transit customers can get the information they need.

Pre-trip transit information was once limited to paper media and customer service telephone calls. Now, Internet and telephony technology offer communication through email, web sites and automated voice response (AVR) systems. In some cases, “static” information on routes and schedules is being complemented by “real-time” information with continuous updates on actual arrival times and system disruptions.

Several Canadian transit systems (including those in Greater Vancouver, Calgary, Edmonton, Winnipeg, Ottawa, Montreal, and St. John’s) offer sophisticated travel planning services through their Web sites. These services produce customized travel itineraries according to each user’s origin, destination and agenda, and can even propose alternative itineraries to minimize transfers, waiting times or walking distances.

En-route transit information keeps customers aware of their status during travel by offering static or dynamic information through displays on-board vehicles or in stations, and through wireless devices like cell phones and personal digital assistants.

Multimodal traveler information (511) systems link multiple jurisdictions and offer travellers a simple, unified point of access to vital information on transportation services and conditions — a premise similar to 311 municipal information and 411 directory assistance services. Transit is an integral element of 511 systems, on an equal footing with road and weather information. While these categories of information are already available to many Canadians, in general they are not shared by the responsible agencies and are inconsistent in style, quality and delivery. In the United States, 511 deployment started in 1999 and is now available to 50 million Americans. In Canada, work towards a national 511 system is progressing (see profile).

The future is bright

There is considerable momentum among Canadian transit systems in planning and implementing ITS measures. One emerging area of ITS application is safety and security, where technology promises to enhance surveillance, enforcement and emergency response coordination. Another area to watch is intelligent vehicle systems (IVS), which will help bus operators detect and avoid on-road obstacles and collisions. Even ideas like fully automated vehicle control, once the realm of science fiction, are nearing reality.

The work of Canadian transit systems and suppliers to develop, test, refine and implement ITS strategies does have a cost. Provincial and federal investment offers vital support, and there are real returns to be gained from increased funding for future ITS research and development. A coordinated effort can ensure that today’s successes are only an indicator of things to come.

REFERENCES

a) See www.itscanada.ca for more information

A 511 system for Canadians

CUTA is a member of the “Canada 511 Consortium” led by the Intelligent Transportation Systems Society of Canada (ITS Canada). Its partners include Environment Canada, Transport Canada, the Transportation Association of Canada, all ten provinces and the Yukon. The consortium has been working since 2002 to establish the 511 telephone number as an automated “weather and traveller information service” number in Canada.

The Consortium’s vision is for a system that augments static information with continuously updated real-time information. Route and schedule information from public transit systems would be available along with road congestion and construction reports, and intercity bus and rail schedules.

The Consortium has created a Canadian 511 development plan and guidelines to ensure uniformity with respect to key issues including user interface, greetings, language compatibility and quality of information.

Before a 511 service can be offered in Canada, the number must be reserved for “weather and traveller information services” by the Canadian Radio-television and Telecommunications Commission (CRTC). In January 2005, the Consortium submitted its application to reserve the 511 number to the CRTC, which is consulting with stakeholders and considering the issue.

After approval, 511 implementation in Canada will be coordinated by local, regional and provincial agencies that provide travel or weather information, in conjunction with private sector partners. CUTA is excited about participating in this groundbreaking Canadian initiative, and looks forward to its success.

Visit www.itscanada.ca for more information.

The Canadian Urban Transit Association (CUTA) is the voice of Canada’s public transit industry. For additional information including research reports, industry updates, news bulletins and more, please contact us or visit our website.

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