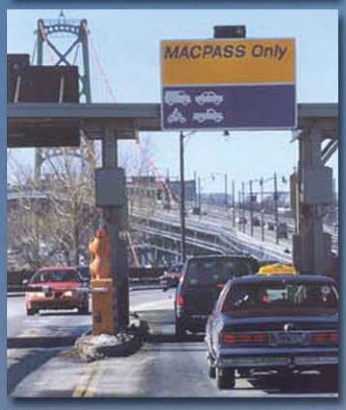
ATLANTIC PROVINCES INTELLIGENT TRANSPORTATION SYSTEMS STRATEGIC PLANNING STUDY



Final Report

Prince Edward Island

NOVA SCOTIA

New Nouveau Brunswick CANADA

Government of Newfoundland & Labrador

Atlantic Canada Opportunities Agency

Transport Canada Transports Canada

November, 2002

IBI GROUP MRC ADI

New Brunswick Department of Transportation
Nova Scotia Department of Transportation & Public Works
Prince Edward Island Department of Transportation & Public Works
Newfoundland & Labrador Department of Works, Services & Transportation
Transport Canada
Atlantic Canada Opportunities Agency

Atlantic Provinces Regional Intelligent Transportation System Strategic Planning Study

Final Report

November 2002

IBI GROUP

Table of Contents

Table of Contents (Cont'd)

Table of Contents (Cont'd)

Table of Contents (Cont'd)

Table of Contents (Cont'd)

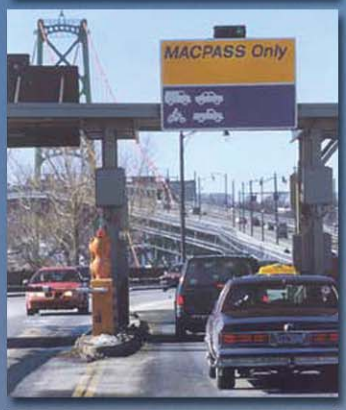
Appendices

Table of Contents (Cont'd)

List of Exhibits

Table of Contents (Cont'd)

ATLANTIC PROVINCES INTELLIGENT TRANSPORTATION SYSTEMS STRATEGIC PLANNING STUDY



Executive Summary

Prince Edward Island

NOVA SCOTIA

New Nouveau Brunswick CANADA

Government of Newfoundland & Labrador

Atlantic Canada Opportunities Agency

Transport Canada Transports Canada

November, 2002

IBI GROUP MRC ADI

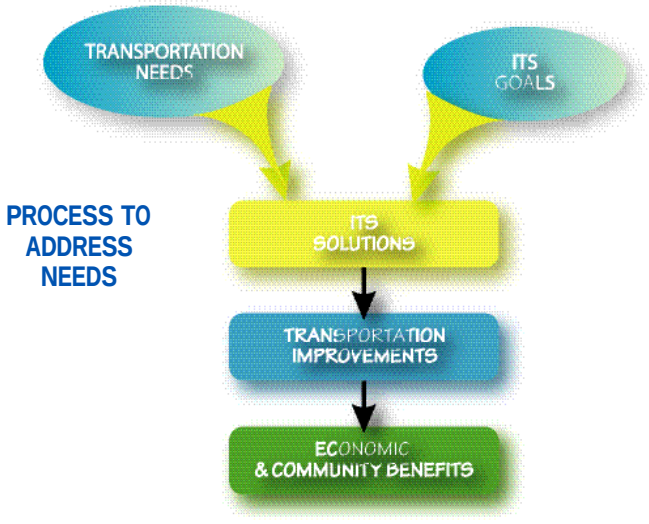
Introduction

There are a number of unique transportation challenges faced by the Atlantic Provinces. The region has a widely dispersed population interconnected via a network of critical road, bridge, and ferry links. Inclement weather can induce severe and sudden impacts on the transportation network. Some areas of the region are quite remote to major North American markets and therefore rely on an effective transportation network to minimize costs. Other areas within the region, namely New Brunswick, are in relatively close proximity to the large northeastern U.S. market and rely upon the associated trade corridors. Trade and the movement of commercial vehicles are critical to the economic viability of the region, and tourism plays a large and ever increasing role in the economy.

Intelligent Transportation Systems (ITS) refers to the use of technology to improve the efficiency, safety, convenience and accessibility of surface transportation systems. In the context of the Atlantic Region, ITS provides the opportunity to:

- improve road safety and emergency response, with an emphasis on the rural environment;
- improve accessibility for tourism;
- improve efficiency for intermodal facilities, commercial vehicles and border crossings; and
- enhance the economic prosperity of the region.

The Strategic Plan incorporates the requirements and ambitions of a broad range of stakeholders who have an interest in the advancement and implementation of ITS in the region. The work began with an initial outreach to the stakeholder community and an environmental scan to assess the needs of each province. The needs were translated into an ITS vision for the region which in turn was refined to form the User Service Plan. Through stakeholder involvement, 22 specific strategic projects were ultimately developed, resulting in an implementation plan. An Economic Development and Academic/Research component was performed in parallel to the main project, focusing on advancing the Atlantic Region ITS industry.



Prince Edward Island
NOVA SCOTIA
New Nouveau Brunswick
Newfoundland Labrador
Atlantic Canada Opportunities Agency
Transport Canada Transports Canada

Participation

The Strategic Planning effort was led by a project steering committee that included:

Nancy Lynch, New Brunswick Department of Transportation
Doug Shea, Newfoundland and Labrador Department of Works, Services and Transportation
Mike Kendrick, New Brunswick Department of Transportation
Cathy Worth, Prince Edward Island Department of Transportation and Public Works
Janice Harland, Nova Scotia Department of Transportation and Public Works
Shannon Sanford, Business New Brunswick
Mark Gourley, Atlantic Canada Opportunities Agency
Daryell Nowlan, Atlantic Canada Opportunities Agency
Michael Zinck, Atlantic Canada Opportunities Agency
Andrew Parsons, Atlantic Canada Opportunities Agency
Harold Hefferton, Transport Canada
Roger Saunders, Transport Canada

The involvement of all project stakeholders was vital to the development of the Strategic Plan. Effective methods of maintaining stakeholder dialogue were used to receive input from stakeholders that shaped the ITS vision, goals and objectives. A project website was developed to interact with project stakeholders. The website was used to conduct an on-line survey of stakeholder activities and interest in ITS. The website was also used to post meeting announcements, background information, and completed documents. A series of meetings were held to maintain stakeholder dialogue:

Meetings	Attendees
The initial sessions were held in Moncton, Charlottetown, Halifax, and St. John's. The one-day sessions were used to introduce the study, describe ITS, and obtain input on the Atlantic Region transportation needs, the ITS vision, the higher priority ITS User Services, and some potential "early winner" ITS projects.	80
The second round consisted of a one-day workshop held in Moncton. This workshop was used to obtain input on the resources necessary to implement ITS projects in the Atlantic Region, the potential barriers, and the steps that would be required for delivery of ITS projects.	60
The third round consisted of half-day workshops held in Halifax and in St. John's. The Halifax workshop was partnered with an ITS Capabilities Showcase. The St. John's workshop was held in conjunction with the Canadian Transportation Research Forum (CTRF) Conference. These workshops were used to obtain additional input on the project profiles, and the proposed deployment plan.	42

It was through the dedication and interest of eighty stakeholders within the region that the Strategic Plan evolved to reflect the needs of the Atlantic Provinces.

Stakeholders included:

- owners/operators of transporation infrastructure
- emergency service providers
- commercial vehicle operators
- tourism industry representatives
- suppliers and service providers
- academia
- special interest groups

Benefits of ITS

ITS has become a mainstream element of the transportation industry, with a proven ability to improve service delivery and reduce costs.

Efficiency

Roadway sensors are used to identify areas of congestion on the road network. This allows for route-guidance through changeable message signs or radio announcements. Electronic Payment methods efficiently collect tolls and tariffs, increasing through-put at border-crossings and toll facilities. Urban areas optimize road-usage with adaptively controlled traffic signals.

Productivity

Commercial Vehicle Operators use asset management systems to increase the productivity of their fleets and containers. Technology allows trucks to be monitored and inspected without losing time. Electronic Clearance can be incorporated at border crossings and inspection areas to eliminate or greatly reduce the length of stoppages.

Safety & Security

Drivers can be alerted of potential hazardous conditions. Incidents can be detected automatically, allowing for greatly reduced emergency vehicle response times. Electronic identification improves the process for screening cargo and drivers at border points.

Environment

Electronic Tolling and Advanced Traffic Management mitigates congestion leading to a reduction in emissions. Improving public transit systems by incorporating ITS can lead to increased ridership, and less dependence on automobiles.

Economy

Tourism benefits through the application of advanced Traveller Services to provide pre-trip and en-route trip planning, reservations, and current travel and weather information. Trade benefits through increased accessibility resulting from Commercial Vehicle Operations applications

Examples of Atlantic ITS projects are:

St. John's Metrobus Schedule Management System - Automatic Vehicle Location system that tracks the location of the 50-bus fleet, facilitating schedule management and the provision of real-time information on bus arrivals.

Electronic Toll Payment and Bridge Traffic Management - Electronic payment systems and dynamic signage on the Halifax-Dartmouth (H-D) bridges and the Confederation Bridge. The MacPass system reduces transaction times on the H-D bridge by 85%, thereby mitigating plaza congestion.

Halifax Adaptive Traffic Signal Control System (SCOOT) - Real-time data continuously updates traffic signal timings, thus increasing operational efficiency and providing more throughput on the existing road system. Fuel savings are estimated at $2-3 million over 3 years.

Weigh-In-Motion, New Brunswick - Automated weighing of vehicles at speed to eliminate the need for trucks to stop, thereby reducing delays to commercial vehicle operators and collision risk at the access points. The Longs Creek installation avoided substantial capital costs associated with relocation of the main scale facilities.

Road Weather Information Systems (RWIS) - RWIS implementations in New Brunswick, Prince Edward Island and Nova Scotia provide current conditions monitoring/forecasting to optimize winter maintenance and provide advisories to travellers.

For commercial vehicles - On-board safety systems, electronic clearance and automated roadside safety inspections are estimated to reduce fatalities by 14 to 32%. Automated administrative processes yield benefit/cost ratios of 4:1 for medium sized carriers and 20:1 for large-sized carriers
(source: U.S. D.O.T.)

For rural areas - Use of mayday emergency notification devices could reduce the time it takes to discover a rural accident from an average of 9.6 minutes to 1 minute.
(source: U.S. D.O.T.)

ITS Vision

In developing the Strategic Plan, it was important to first set out an ITS vision for the coming twenty years...

> *... People and goods move seamlessly throughout the Atlantic Region. Technology performs a key role in improving the performance of transportation systems. Information technology is a driving force behind how people get to work, do business, and sell and transport goods. The role of the public transportation right-of-way has expanded to include a telecommunications backbone making "e-solutions" for mobility and commerce possible in the region. Consider...*

Travellers can:

- pay tolls electronically without having to stop;
- receive current region-wide travel and weather condition updates before or during their trip; and
- readily communicate with their places of business, make hotel or ferry reservations, and have advance information regarding routes, schedules and space availability.

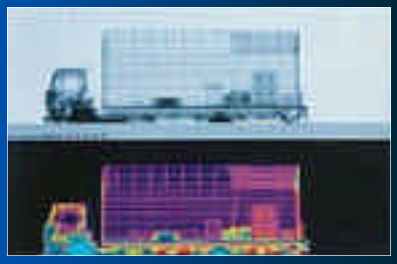
Commercial Vehicle Operators can:

- pay tolls and tariffs electronically at toll facilities and the New Brunswick - Maine border crossings;
- use enhanced tracking and real-time management of shipments en-route and at intermodal terminals; and
- obtain electronic clearance past weight/inspection stations.

Public Authorities can:

- receive automatic notification of an incident and dispatch Emergency Services along the fastest route to the site, based on real-time travel information and dynamic route guidance in the vehicle;
- improve public transit system performance using sophisticated vehicle monitoring and customer information systems; and
- optimize the application of winter maintenance resources using forecasting based upon region-wide real-time conditions monitoring.

Electronic Toll Tag


Automated Cargo Inspection


Public Transportation Automatic Vehicle Location

The Strategic Plan

"The Government of Canada is committed to the implementation of a comprehensive ITS strategy for Canada"
Transportation Minister
David Collenette

Transportation Needs & ITS Goals

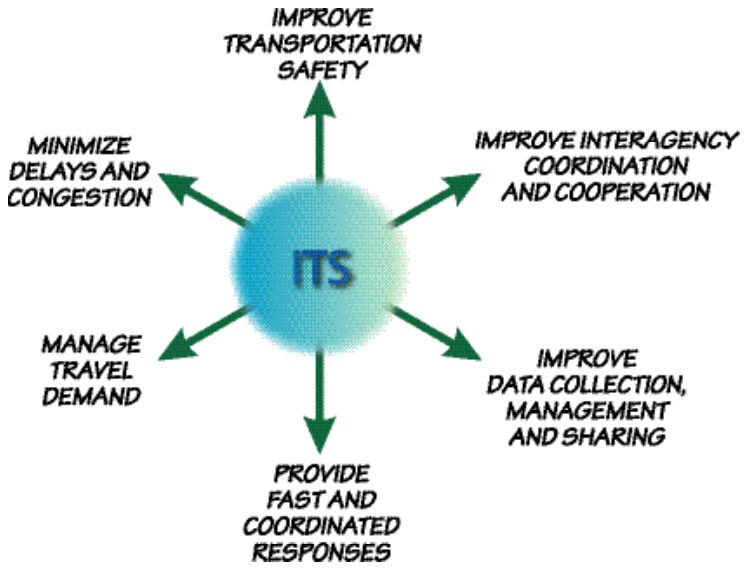
ITS is a useful tool for developing and enhancing the transportation system to accommodate the growth potential of the region. Through input from the participants in the region, fifteen critical Transportation Needs were identified:

Transportation Needs

1. Expedited Border-Crossing Inspection and Clearance for Commercial Vehicles
2. Reduced Rural Road Collisions Through Early Detection of Adverse Conditions
3. Reduced Incidence, Severity and Cost to the Community of Road Collisions
4. Improved Safety in Road Work Zones
5. Enhanced Management of Winter Maintenance Operations
6. Expedited Weight, Credential, and Safety Checks for Commercial Vehicles
7. Road Emergency Notification and Information System for Rural Areas
8. Improved Ferry Services
9. Travel Incentives and Traveller Information to Promote Tourism in Atlantic Canada
10. Enhanced Safety and Security for Travellers and for Transportation Operators and Facilities
11. Enhanced Ability to Detect, Verify, and Respond to Incidents on Major Roadways
12. Enhanced Tracking and Real-Time Management of Containers and Other Goods at Intermodal Terminals
13. Real Time Transit Service Monitoring and Public Needs
14. Improved Management of Fleet Transportation Services
15. Real-Time Management of Parking Operations

ITS Goals

The Strategic Plan features a set of ITS Goals that structure how ITS should be used in addressing the identified needs. The following goals were recognized as being fundamental to the successful application of ITS in the region:



The Strategic Plan

User Services

The proposed ITS solutions were based on the ITS Architecture for Canada. The following is a description of each User Service Bundle (in bold) and the sixeen applicable User Services (in italics) as defined in the Architecture.

Traveller Information Services use advanced systems and technologies to manage information to help drivers decide when and the best route to drive, as well as reserve rides and other traveller services. For the region, *Traveller Information* and *Traveller Services* and *Reservations* are applicable.

Traffic Management Services consist of advanced systems and technologies to improve the efficiency and operation of the surface transportation infrastructure and create safer conditions for travellers. Included in this bundle are *Traffic Control, Incident Management, Environmental Conditions Management, Operations and Maintenance,* and *Automated Dynamic Warning and Enforcement*.

Public Transport Services use technology and advanced systems to improve performance, security and convenience of urban, suburban and rural transit systems. The most applicable User Service in this bundle is *Public Transport Management*.

Electronic Payment Services provide travellers with an electronic payment option for different transportation modes and services. The User Service identified as relevant to the region is *Electronic Payment Services*.

Commercial Vehicle Operations is concerned primarily with freight movement and focuses on services which improve private sector fleet management and freight mobility, and streamline government/regulatory functions. *Commercial Vehicle Electronic Clearance, Intermodal Freight Management*, and *Commercial Fleet Management* have potential applications in the Atlantic Region.

Emergency Management Services relate directly to the detection, notification and response to emergency and non-emergency incidents that take place on or adjacent to the roadway. Services applicable to the region include *Emergency Notification and Personal Security, Disaster Response and Management*, and *Emergency Vehicle Management*.

Vehicle Safety and Control Systems use sensors in vehicles and roadways to diminish both the number and severity of collisions. Services in this bundle were deemed less appropriate for the immediate needs of the region.

Information Warehousing Services include the gathering, fusion, and dissemination of weather and other data, as well as the archiving and sharing of historical transportation data. *Weather and Environmental Data Management* has potential application to the Atlantic Region.

The ITS Architecture for Canada provides a common framework for planning, defining, and integrating intelligent transportation systems.

The Strategic Plan

Strategic Actions

There are four important aspects of the Strategic Plan that must be considered when deciding to undertake a project and which stakeholders to involve. The critical Strategic Plan attributes are:

- Key Beneficiaries;
- Delivery Participants;
- Availability of Technologies; and
- Operations and Maintenance Considerations.

An analysis of these attributes identified a number of actions that could reduce institutional barriers:

- Continued regional coordination meetings among the Provinces, under the direction of the Council of Atlantic Premiers, and in coordination with other related forums, such as that for the harmonization of trucking regulations;
- Education of the purchasing agencies within the public sector owner/operators on the nature of the systems procurement process, and the distinguishing features relative to the conventional construction process;
- Pursuit of joint procurement by public agencies within the region in order to employ common equipment specifications, and take advantage of economies of scale;
- Identification and engagement of a champion(s) from the tourism industry associations and Provincial Departments of Tourism in order to help realize opportunities with traveller information services;
- Continued representation of the four Atlantic Provinces and the related transportation stakeholders as a common voice in dealing with peer agencies such as Transport Canada, and the I-95 Corridor Coalition;
- Identification of lead agencies, or joint ventures among peer agencies in order to take the initiative on multi-party, back office applications, such as that required for data warehousing and potentially electronic payment;
- Advancement of the development and deployment of various applications, such as those related to border crossings and intermodal terminals, through the scoping of pilot projects; and
- Utilization of opportunities to implement ITS applications related to commercial vehicle operations and border crossings under the Smart Borders Initiative.

Container Security

Road Weather Information Systems

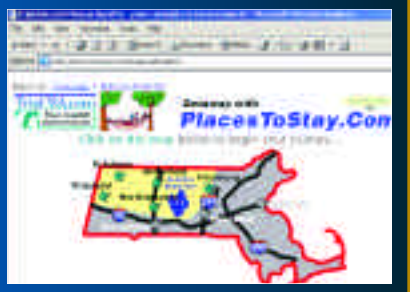
Smart Cards

The Strategic Plan

Strategic Projects

Stakeholder participation resulted in the identification of 22 Strategic Projects. The lead participants or "Champion" for each project will drive the process from strategic concept to reality. These projects are intended to directly address the transportation needs and include the potential for 'early winner' deployment to illustrate benefits. The proposed projects include:

Traveller Information Services	
TI-1	Atlantic Provinces Advanced Traveller and Tourist Information System
Traffic Management Services	
TM-1	Atlantic Provinces ARWIS Expansion
TM-2	Wildlife Detection in Atlantic Canada, Scoping Study and Pilot Project
TM-3	Implementation of Fixed Automated Spray Technology for Bridge De-icing
TM-4	Red Light Camera Pilot Project
TM-5	Portable Changeable Message Signs for Work Zones
TM-6	Smart Snowplow Expansion
TM-7	Bridge Incident Management Scoping Study
Public Transport Services	
PT-1	Urban Transit Real-Time Information Service
PT-2	Community Transit Fleet Management
Electronic Payment Services	
EP-1	Parking Electronic Payment and Monitoring
EP-2	Atlantic Canada Transaction Tag
EP-3	Smart Card Pilot Project
Commercial Vehile Operations	
CV-1	Integrated Intermodal Information System
CV-2	Atlantic Trade Corridor Border Security and Electronic Inspection
CV-3	Atlantic Canada Electronic Permitting for Oversized and Overweight Vehicles
CV-4	Port Operational Information Extranet
CV-5	Port Container Security
CV-6	Airport Groundside Transportation Management
CV-7	Commercial Fleet Management Program
Emergency Management Operations	
EM-1	Wireless Network Expansion
EM-2	Atlantic Provinces Disaster Response Plan Scoping Study



Traveller Information

Advanced Public Transportation Systems

Electronic Permitting for Oversized and Overweight Vehicles

The Strategic Plan

The Strategic Plan recommendations will promote coordinated and efficient deployment of ITS in Atlantic Canada.

Atlantic ITS Website

Deployment Program

In order to better guide the implementation, allow for evaluation of progress, and permit proper allocation of financial resources, the deployment schedules for the various projects were sub-divided into the following categories, as applicable:

- Planning, legislation and research activities;
- Design of the system or infrastructure;
- Procurement of the required technologies and pilot project installation; and/or
- Full deployment or construction of the project.

A key component of the Deployment Program is the Action Plan for Ongoing Evaluation. The goal of the Ongoing Evaluation is to provide a framework for the stewardship of the overall Atlantic Provinces Regional ITS Strategic Plan.

The specific elements include:

- Project tracking;
- A resource group to make suggestions if a project is encountering difficulties; and
- Dissemination of information on the ITS activities to stakeholders in the Atlantic Region.

The tools to be used to oversee the Action Plan include:

- Establishment of a permanent Atlantic Provinces ITS Steering Committee;
- Maintenance of the ITS Roundtable; and
- Ongoing engagement of stakeholders.

The ongoing engagement of stakeholders should be pursued through:

- Use of the Atlantic ITS website to post announcements concerning new projects, relevant events, and project progress reports. A permanent host, and website administrator will need to be established; and
- Participation in industry assocations such as ITS Canada.

A regional ITS architecture for the Atlantic Provinces would identify the functions, organizations, and information flows that are relevant to the region. Furthermore, the regional architecture provides stakeholders with customized views from their perspective, allowing for identification of integration/cooperation activities.

The Strategic Plan

Economic Development and Academic/Research

An analysis has been undertaken to identify the Economic Development and Academic/Research opportunities associated with the expansion of the ITS industrial base in Atlantic Canada. The objective of this effort was to profile the existing ITS industrial capabilities within the region in the context of the North American and world markets, and provide recommendations to strengthen the industrial base. The approach included an outreach and profiling of the relevant resources within the region, and a high level market analysis. The analysis was undertaken under the direction of an ITS Roundtable comprised of public sector, private sector and academic representation from the four Atlantic Provinces. This effort builds upon the foundations as set forth by past efforts undertaken by Transport Canada, Industry Canada, and the Atlantic Canada Opportunities Agency.

The industry scan identified 38 companies within the region that offer products or services relevant to the ITS industry. Some firms already participate in the industry, in areas such as road weather information system deployment and related services, commercial vehicle tracking and fleet management, and geographic information systems.

There is a general trend wherein the companies which are participating in the ITS market have transferred technologies from other related industries which have an industrial presence in the region. Drawing upon the resources of related companies, or partnerships with other organizations, there is the opportunity to deliver more complete applications and expand geographic reach. There is a strong network of potential support for the further development of an ITS industry in the form of industry associations (particularly information technology), centres of excellence, incubators/accelerators, and high-level academic institutions.

Post secondary training in ITS (or related fields) is offered at the University of New Brunswick, New Brunswick Community College, Dalhousie University, Memorial University, and the University of Prince Edward Island. There is benefit in linking centres into networks for collaboration and information sharing.

A review of the Atlantic industry in the context of the international ITS market yielded some key observations, as follows:

- Canada has historically been at the forefront of ITS deployment, with several examples of successful firms active in the world market. However, a recommitment to funding is required from stakeholders if Canada is to maintain its competitive advantage in the world market.
- The North American market is the most accessible and best matches the capabilities of the Atlantic ITS industry. In addition, there is potentially a very large market in the developed and emerging economies worldwide, particularly in Latin America and Southeast Asia.
- The primary weakness of most Atlantic Region firms is the relatively small size and level of capitalization in comparison to U.S. market participants.
- Increased opportunities to access the market may lie in the current efforts in the ITS industry to develop ITS standards, and through participation in international funding and marketing support initiatives.

Niche ITS areas where Atlantic Canadian resources can excel include:

- Road Weather Information Systems;
- Infrastructure Maintenance Management;
- Freight and Transit Monitoring;
- Fleet Administration; and
- Emergency Response Management.

Future Directions

Next Steps

The Strategic Planning process has been critical in terms of engaging stakeholders, rationalizing needs, and developing strategic action items for advancing the applicable ITS solutions. It should be emphasized that the plan extends beyond the strategic perspectives and identifies specific action items and a series of projects. This underscores the need to set in place and maintain a regional program to oversee the follow-on activities. It is recommended that, under the direction of the Council of Atlantic Premiers, the project Steering Committee Group remain intact beyond the course of the project to fulfill a number of functions including:

- Ongoing engagement of the stakeholder community through the ITS Atlantic.com portal and various meeting forums in an effort to oversee the enactment of strategic action items to address institutional considerations;
- Oversight and coordination in the definition and undertaking of projects contributing to the deployment plan; and
- Ongoing monitoring role to track progress against the plan.

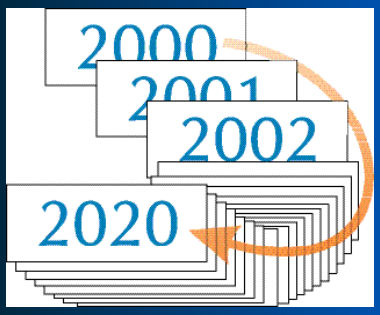
It is important that the ITS community in the Atlantic Region maintain this common point of reference, and common representation to other industry participants such as Transport Canada and the I-95 Corridor Coalition.

The Economic Development and Academic/Research analysis yielded a number of recommendations, including:

- All levels of government should continue to promote ITS applications through showcase projects in Atlantic Canada, involving local resources active in the targeted niche ITS areas.
- Private sector industry participants should exercise opportunities to access a variety of Canadian and international funding programs. Furthermore, firms should seek strategic partnerships with complementary Canadian and U.S. firms with a view to accessing the increasingly developed and well-funded U.S. ITS market.
- Selected academic institutions should explore the possibility of developing a centre of excellence for ITS focussing on the Atlantic niche areas, in partnership with other universities and private sector interests.

Entities such as ITS Canada and various regional clusters should help to reinforce the opportunities as set forth in this analysis through ongoing outreach and information exchange with the stakeholder community. Specific opportunities include the ITS Canada Annual General Meeting in early 2003 and the opportunity for the ongoing stewardship of the ITS Roundtable.

In conclusion, the plan has taken the initial steps in terms of engaging the stakeholders and undertaking analysis. Success will depend on continued involvement and actions among the stakeholders at the strategic and deployment level, under the stewardship of the Steering Committee.



The Atlantic Provinces are in a position to be a more active partner with rest of Canada and the U.S. in using advanced technology in transportation.

II. ACKNOWLEDGEMENTS

The Atlantic Provinces Intelligent Transportation System Strategic Plan is a critical advancement in the evolution of ITS applications and industry within the region. The Plan sets out a course of action which will enable sustainable development of transportation systems applications in the region. The Plan is unique in the Canadian context in that it addresses such a broad, diverse geographical area encompassing stakeholders from four provinces.

This Plan was made possible through the active participation of the Steering Committee members and ITS Working Group, comprised of:

Mike Kendrick, New Brunswick, Department of Transportation

Janice Harland, Nova Scotia, Department of Transportation and Public Works

Harold Hefferton, Transport Canada

Daryell Nowlan, Atlantic Canada Opportunities Agency

Shannon Sanford, Business New Brunswick

Mark Gourley, Atlantic Canada Opportunities Agency

Doug Shea, Newfoundland and Labrador Department of Works, Services and Transportation

Cathy Worth, Prince Edward Island, Department of Transportation and Public Works

Roger Saunders, Transport Canada

Michael Zinck, Atlantic Canada Opportunities Agency

Andrew Parsons, Atlantic Canada Opportunities Agency

The success of the planning process is very much dependent upon the active participation of the stakeholder community. Throughout the course of the project, the Project Team called upon a broad range of stakeholders from the four provinces to participate in the form of submitting survey responses, attending focus groups, and attending workshops. The Project Team expresses sincere appreciation to the stakeholder community and the ITS Roundtable for their strong level of participation and commitment to the project.

On behalf of the Project Team, it has been our pleasure to serve the transportations stakeholders in the Atlantic Region, and we look forward to continued success in the advancement of the ITS program and industry within the region.

Nancy Lynch, Assistant Director
Transportation Policy,
New Brunswick Department of Transportation

Kevin Bebenek
Associate Director
IBI Group

III. GLOSSARY

The following is a summary of generally accepted acronyms that are referred to in this document.

TERM	DEFINITION
AM	Amplitude Modulated
APTS	Advanced Public Transportation System
ATIS	Advanced Traveller Information System
ATM	Asynchronous Transfer Mode
ATMS	Advanced Traffic Management System
AVI	Automatic Vehicle Identifications
AVL	Automatic Vehicle Location
CAD	Computer Aided Dispatch
CCRA	Canada Customs & Revenue Agency
CCTV	Close Circuit Television
CDMA	Code Division Multiple Access
CVISN	Commercial Vehicle Information Systems Network
CVO	Commercial Vehicle Operations
D/I	Driver Interface
DAB	Digital Audio Broadcast
DSRC	Dedicated Short Range Communication
ETC	Electronic Toll Collection
FM	Frequency Modulated
GPS	Global Positioning System
HAR	Highway Advisory Radio

TERM	DEFINITION
HAZMAT	Hazardous Material
HOV	High Occupancy Vehicle
I/F	Interface
ISP	Information Service Provider
ITS	Intelligent Transportation Systems
LCD	Liquid Crystal Display
LED	Light Emitting Diode
PCS	Personal Communication Service
SONET	Synchronous Optical Networks
TDMA	Time Division Multiple Access
T/I	Traveller Interface
TMC	Traffic Management Centre
UTC	Urban Traffic Control

IV. BACKGROUND

In Atlantic Canada and elsewhere, the introduction of new roads and additional road capacity is becoming less popular as a method of improving congested conditions. Environmental and financial constraints are becoming critical and often eliminate some potential projects from contention. Issues of insufficient road capacity and road safety are always at the forefront of transportation priorities and yet solutions are evolving from major infrastructure projects to other approaches that use Intelligent Transportation Systems (ITS). Intelligent Transportation Systems refers to systems that use technology to improve efficiency, safety, convenience and accessibility of surface transportation systems. The use of ITS offers the opportunity to implement improvements to transportation systems and provide community – wide benefits as a result.

An ITS strategic plan for Atlantic Canada is required to incorporate the needs and ambitions of a broad range of stakeholders that have an interest in the advancement and implementation of ITS. As such, the plan is intended to accomplish several tasks:

- Respect the goals and interests of the many stakeholders;
- Assist stakeholders in addressing their travel and operational needs;
- Promote coordination and integration of User Service development activities;
- Provide direction in the implementation staging of User Services; and
- Reduce intermodal transitioning and integrating national and international transportation systems.

WHY IS ITS IMPORTANT TO ATLANTIC CANADA?

There are a number of unique transportation challenges faced by the Atlantic Provinces. The region typically has a widely dispersed population distribution interconnected via a network of critical road, bridge, and ferry links. Some areas of the region are quite remote to major North American markets and therefore rely on an effective transportation network to minimize costs. At the same time, other areas within the region, namely New Brunswick, are in relatively close proximity to the large northeastern U.S. market and rely upon the associated trade corridors. Trade and the movement of commercial vehicles are critical to the economic viability of the region, and tourism is playing a large and ever increasing role in the economy. As was evident this past winter, weather can be severe and unpredictable. Other considerations include:

- The region must attract and maintain its existing business and tourism and transportation is a major consideration in this regard;
- The region must continue to forge links that tie together communities that are dispersed over a wide area separated by land and sea;
- The region must protect its unique nature and environment and look for new and innovative solutions to its transport needs;

- Conventional improvements in transportation infrastructure are costly and the delivery timeframes can be significant; and

- The ITS industry is itself new and growing and through its successful application in the region there is the potential to export the expertise and approach adopted by the local partners involved in its deployment.

Whereas the traditional development of transportation infrastructure focuses on civil infrastructure, there is an increasingly prominent role for information technology. It is recognized within the transportation industry that the application of ITS provides the opportunity to apply advanced technologies to leverage off the existing civil infrastructure to maximize safety and mobility. In the context of the Atlantic Provinces, these ITS benefits would translate into:

- Improved road user safety, with a particular emphasis on early warning of inclement weather conditions;

- Improved accessibility for tourism/recreational areas;

- Improved inter-modal transport efficiency;

- Improved mobility for commercial vehicles within the region and across the U.S. border;

- Improved emergency services;

- Reduced congestion delays, and the associated fuel consumptions and emissions in urban areas; and

- Enhancement of the overall economic prosperity of the region.

The industry can point to a number of functioning examples of ITS applications which have proven benefits in this regard. It should also be recognized that it is important to stimulate the coordination and integration of these various discrete ITS applications in order to access the higher order synergies and benefits associated with a seamless integrated transportation system.

WHY IS THE STRATEGIC PLAN IMPORTANT?

The Strategic Plan sets out a process to evaluate and select the most appropriate initiatives in keeping with an organized, supported, cohesive and coordinated plan. One of the most important outcomes from past efforts has proven to be the stakeholder outreach. Through this process we can put in place an organizational structure to provide ongoing administration and implementation of the ITS program. This plan will set out priorities, prerequisites and responsibilities for deployment building on the needs identified for the region. Innovative and creative solutions to these needs will be identified complete with early winners to help build program momentum.

The Federal Government has embarked upon the National ITS Program that incorporates a number of areas of focus that speak to the needs of the Atlantic Provinces. These include:

- An emphasis on commercial vehicles and trade corridors;
- Stimulation of increased deployment;
- Focus on the integration of various new and existing ITS applications to promote seamless interoperability; and
- Development of a National ITS Architecture to help facilitate the planning, deployment and integration processes.

In developing the ITS architecture for Canada, IBI Group incorporated a number of User Services which extend beyond those identified for the U.S. market and are particularly applicable in Atlantic Canada. Examples include measures targeted at infrastructure operations and maintenance and the optimization of the surface transport network interface with intermodal terminals.

The need to coordinate the movement of commercial vehicle traffic across the New Brunswick–Maine border is well recognized. Through this planning effort, the Atlantic Provinces will be able to work closely with, and engage other key stakeholders at the federal and international level. Note for their part, the U.S. program is very well defined and established at both the federal and regional levels. The I-95 Corridor Coalition has been in existence for nearly ten years.

Mainly as a result of geographic location and travel distances, Atlantic Canada has been disadvantaged by a lack of industrial investment and development. It has been proven many times that the Atlantic population can compete in hi-tech industry particularly where shipping costs to North American markets are not a prime concern. In this light, the ITS Strategic Plan can help to focus the regional opportunities for development of high-tech industry and commerce and for advancement of product and system research and development suitable to the ITS industry.

THE APPROACH

The approach to the work reflects a user needs based approach which is well proven through application under the U.S. National Program, and is consistent with the application of the ITS architecture. The successful engagement of the stakeholder community was critical to the success of the project. The outset of the work focused on the definition and initial outreach to the stakeholder community, and identifying methods to maintain stakeholder dialogue throughout the course of the project.

Once an initial outreach to stakeholders was initiated, the focus was collection of their input as part of the environmental scan, which resulted in the documentation of needs assessment. These needs were translated into a vision for ITS in the region which in turn were refined in terms of User Services.

Having established the User Service Plan, the project entered an analysis phase wherein we once again engaged the stakeholders with a view to respective roles and partnership opportunities.

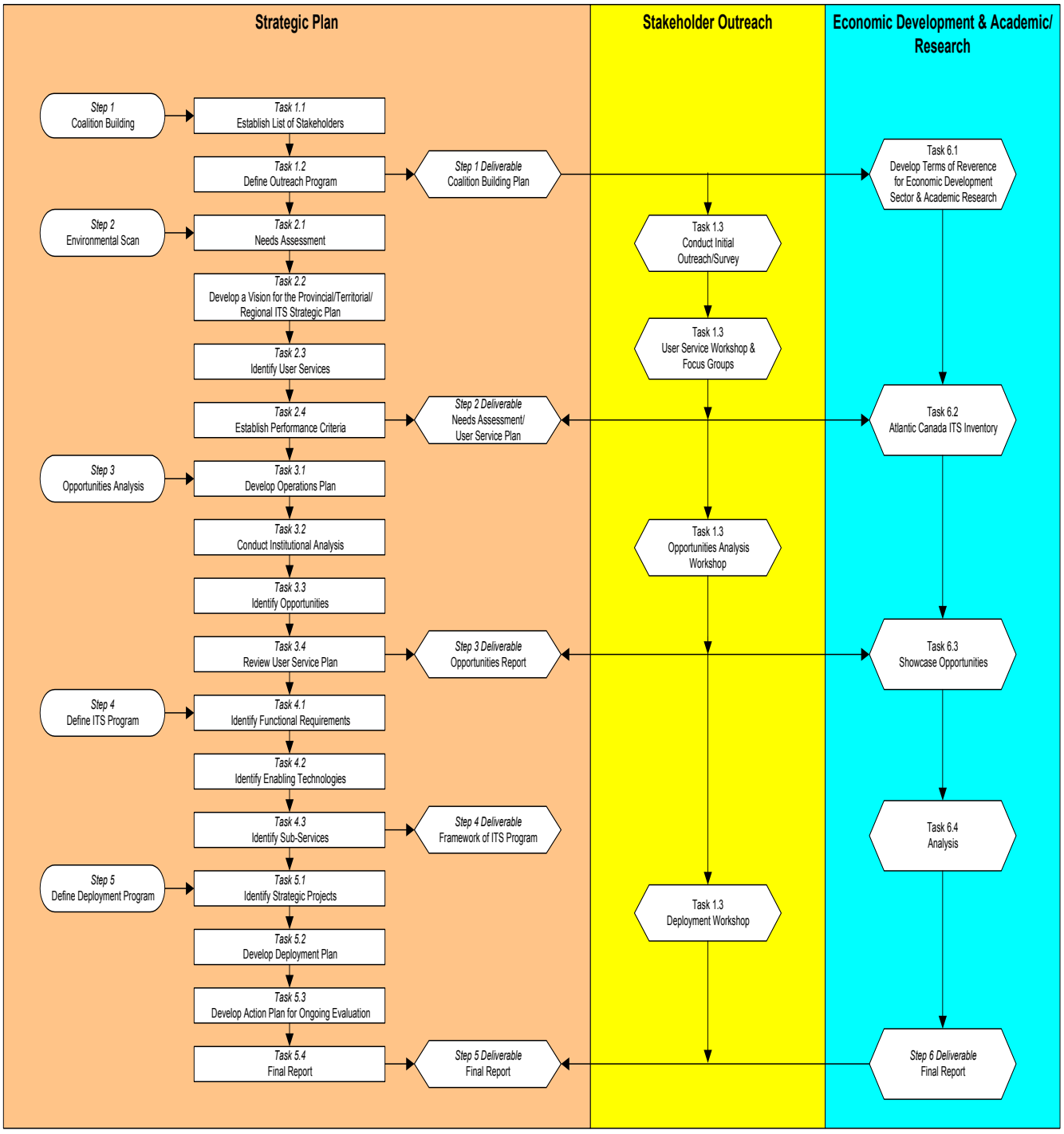
The National ITS Architecture was used to further define the ITS program in terms of functional requirements, key enabling technologies, and ultimately User Sub-Services. These sub-services directly relate to deployment-focussed aspects of the architecture, known as market packages.

From the framework of the ITS program, we identified and prioritized specific strategic projects, resulting in an implementation plan, finalized in consultation with the stakeholder community.

At the outset of the work, the project team developed terms of reference for Economic Development and Academic/Research component of the project. Subject to the ITS Working Group approval, the subsequent terms of reference tasks were undertaken in parallel with the rest of the study activities, drawing upon opportunities for interrelationships, and feeding into the overall final report.

Exhibit IV.1 on the next page illustrates the Strategic Plan workflow process, illustrating the stakeholder outreach activities as the input to the Strategic Plan development, and the simultaneous progression of Step 6 (Economic Development & Academic/Research) of the project.

Exhibit IV.1 – Strategic Plan Work Flow Process



1. COALITION BUILDING

The constructive involvement of all project stakeholders is vital to the development of an effective strategic plan and to achieving coalition building. When collected properly, input from stakeholders can be used to shape the ITS vision, goals and objectives. The purpose of this chapter of the report is to document the Coalition Building Plan and results from the stakeholder outreach. The plan represents the first step undertaken in the development of the Atlantic Provinces Regional ITS Strategic Planning Study.

The first task, Establish List of Stakeholders, identified all stakeholders in the region who could have a direct interest in the ITS Strategic Plan. The stakeholder list provided in this document was used to contact stakeholders representing all modes of transportation.

The second task, Define Outreach Program, outlines the stakeholder outreach approach and methodology through a consultation plan. The consultation plan, using the stakeholder list as a starting point, focused on gathering input from stakeholders on current ITS needs and practices in the region, serving as the input into the visioning exercise. In addition to outlining an approach, the consultation plan forms a baseline reference for subsequent activities.

The remainder of this section outlines in detail the methodology and approach that was used to implement the Outreach Program and a summary of the results gained from each step in the program, including:

- Web Survey;
- Focus Groups; and
- Opportunities Workshop.

1.1 GOALS AND APPROACH

The goals of the Coalition Building Plan were as follows:

- Define a stakeholder community capturing the broad geographical and economic diversity of the Atlantic Provinces in order to ensure that the local ITS needs of the region are built into the Strategic Planning process;
- Provide the materials that will effectively solicit the input required to build a comprehensive understanding of local transportation needs and issues; and
- Establish a means by which the stakeholder group will survive the project and continue to work towards further ITS development in the region.

These goals were achieved by engaging the stakeholder community through an environmental scan (refer to Section 1.3). In order to assure quality stakeholder input to the planning process, a series of objectives for the consultation plan were identified. These objectives may be summarised as follows:

- **To identify potential stakeholder roles in ITS deployment.** The stakeholder consultation can achieve input on the perceived and actual respective roles of the public, private, and non-

profit sectors in ITS deployment. Opportunities for co-operative deployment of ITS applications with other jurisdictions or institutions, through partnerships, delegation, or contracted services were explored.

- **To provide a strategy to obtain input from the stakeholders.** Stakeholder input was solicited regarding current problems and issues, existing ITS deployments (if any), and future requirements. This information will be used as a basis to define the Atlantic Region ITS program and to prioritize user needs and projects.

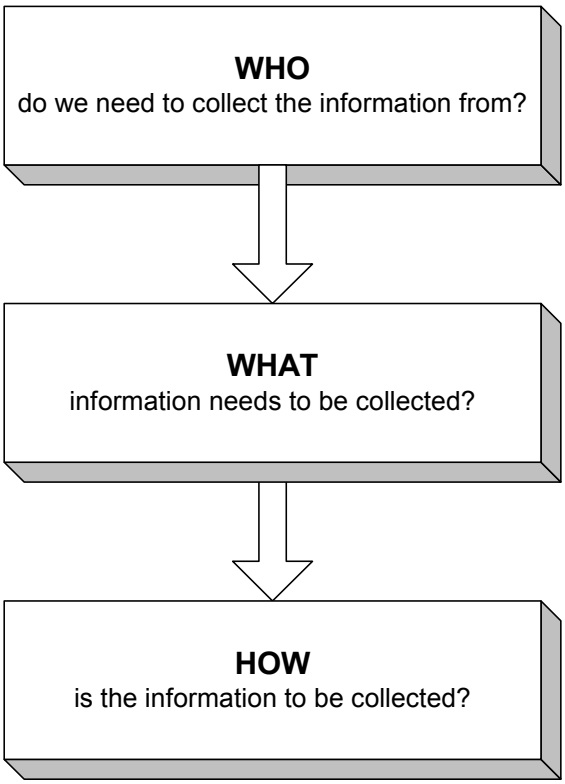
- **To identify measures of success and associated criteria.** Public sector, private sector and non-profit sector agencies may have different criteria for evaluating the success of ITS deployment. The stakeholders provided valuable input on methods which should be used to evaluate the success, in terms of efficiency and effectiveness, of the ITS strategy. Since individual stakeholders had different objectives, and therefore different measures of success, a key task for this plan was to recognize these differences and determine how to incorporate them into an integrated ITS program.

- **To identify institutional and other barriers to ITS deployment.** Stakeholders provided input on real and perceived institutional, technological, operational, financial, or other barriers to ITS deployment based on their business operations and constraints. They also suggested methods to overcome or reduce those barriers.

- **To build consensus for ITS deployment in the Atlantic Provinces.** In addition to the objectives cited above, stakeholder consultation served as a valuable opportunity to achieve buy-in to the ITS strategy. Typically, individuals and organizations are more receptive to ideas, and committed to a product, if they have had an opportunity to understand the goals, and to help shape the strategy. The consultation process assisted in establishing the predisposition of the private, public and non-profit sectors to a widespread ITS deployment in the Atlantic Provinces, thus providing the input required to identify "early winner" ITS projects.

The overall approach to soliciting input under this Coalition Building Plan was based on three primary stages illustrated in Exhibit 1.1:

Exhibit 1.1 – Coalition Building Plan Approach



The first stage involved defining the stakeholder community. The stakeholder list was developed using potential stakeholders throughout the public, commercial, institutional and special interest transportation sector in addition to stakeholders identified through the project team's local knowledge of the Atlantic region. It is important to note that the stakeholder list, as included in this document, has been "ever-greened" throughout the duration of this project. This has assured the broadest possible stakeholder outreach by allowing stakeholders to view and suggest other potential stakeholders.

The second stage of the approach involved the development of consultation materials to be used during the stakeholder outreach. These materials include the Web based survey and consultation workbooks and were made available on the project Web site and at the stakeholder workshops. The consultation materials were designed to inform the stakeholder on the goals and objectives of ITS in the context of the Atlantic planning study and to solicit input on their needs.

The third stage of the approach involved defining the instruments that were used for the consultation approach, primarily the Web based survey and the focus groups/workshops.

Each stage is discussed in further detail in the following sections.

1.2 STAKEHOLDER IDENTIFICATION

Prior to actual stakeholder consultation, the Steering Committee convened to provide input on the proposed Consultation Plan. The Consultation Plan was then modified as necessary and resubmitted to the Steering Committee for approval.

Once the Consultation Plan was approved, stakeholders were engaged in the consultation process. The stakeholder contact database that has been used and maintained throughout the project includes:

- Stakeholder name and contact information; and
- Method of ongoing communications to be used (e.g. email, meetings, etc.).

Exhibit 1.2 includes a summary of the types of stakeholders contacted:

Exhibit 1.2 – Stakeholder Categories

Public Sector Owners & Operators
Private Sector Owners & Operators
Government/Regulators
Customers & Service Providers
Suppliers & Consultants
Researchers
Special Interest Groups

We recognize that the general public is also a stakeholder, and represents the ultimate end user of many of the ITS services. Thus, it was important to ensure that the cross-section of stakeholders adequately represented the interests of the general public. Appendix A contains a list of the stakeholders along with their contact information.

1.2.1 Public and Private Sector Owners & Operators

The owners/operators are predominantly public sector agencies and include:

- **Provincial Government –** The Departments of Transportation from the four provinces operate highway networks. Provincial Government also has a major role in defining, funding and operating emergency services, including police and ambulance; and
- **Municipalities –** The municipalities operate roads, traffic control systems, transit systems, and emergency services.

There is a growing private sector presence in road operation. For example:

- The Confederation Bridge, Saint John Harbour Bridge, Halifax-Dartmouth Bridge, and Maritime Road Development Corporation (MRDC);
- The expansion of telecommunications companies into the transfer of traffic data; and

- The participation of financial institutions in transit "smartcard" projects.

The owner/operator category incorporates various private and public sector interests operating other modes such as rail, air terminals, and ports.

Owners/operators are able to provide input on:

- The current performance of their systems;
- Funding/financial issues;
- Institutional, legislative and technical barriers they have experienced;
- Perceptions of what can be achieved through the development of the regional ITS infrastructure; and/or
- Opportunities for ITS expansion and integration.

1.2.2 Government/Regulators

Government/Regulators represent branches of the government at either the national, regional or local level, that support the transportation infrastructure through regulatory legislation, policy setting measures or educational campaigns through constituent outreach programs, distribution of materials, etc. This stakeholder category overlaps with Public Sector Owners/Operators that own and/or operate ITS systems. However, while not all government/regulatory agencies own and/or operate ITS systems, most either directly affect or have an impact on existing or future ITS deployments.

Government/Regulators are able to provide input on:

- Institutional, legislative and technical barriers in both the regional and international context;
- Effects of policy and regulatory changes on the performance of the existing transportation infrastructure;
- Opportunities for ITS to address existing challenges in maximizing the efficiency of the existing infrastructure; and/or
- Identifying environmental, economic and social policies that can contribute to the development of the ITS infrastructure in the region.

1.2.3 Customers and Service Providers

The customers and service providers are predominantly private sector firms and/or associations representing private sector firms and individuals. They are identified as "customers" since in most cases they directly receive an ITS service for commercial purposes. In some cases, they are in the business of "information service provider" or value-added service provider, by repackaging ITS information and distributing it to the ultimate end user.

Customers are able to provide input on:

- Quality of the services they are currently receiving;
- Additional ITS services which are considered to be marketable and would enable them to expand their business interests;
- Institutional, legislative and technical barriers in dealing with interoperability among ITS service providers;
- Partnership opportunities; and/or
- Pricing structures that suit their business ventures.

1.2.4 Suppliers & Consultants

The suppliers category consists predominantly of private sector firms involved in manufacturing ITS components, designing and developing ITS products and services, installing ITS, and integrating ITS applications.

Suppliers are able to provide input on:

- Current advances in the development of ITS products and services;
- Their experiences in dealing with various owner/operators within the Atlantic Provinces and abroad;
- The characteristics and considerations related to the communications industry in the Atlantic Provinces which need to be reflected in the plan;
- Their perception of institutional, legislative, and technical barriers, and the role that local and regional governments and other regulatory bodies can play in addressing these barriers; and/or
- Methods in which they would look to government to play a leadership role in ITS business development within the Atlantic Provinces.

1.2.5 Researchers

The researchers category primarily consists of universities in the Atlantic Provinces that have current involvement in the development of ITS applications. The research institutions are able to provide input opportunities:

- To promote and apply ITS research in the Atlantic Provinces; and/or
- For partnerships and the role of research centres of excellence in developing and implementing “early winner” ITS deployments.

1.2.6 Special Interest Groups

The special interest groups category is also often referred to as the non-profit sector, and it covers the broadest range of stakeholders. The agencies in this category play a key role in advising the public sector, and integrating public sector and private sector needs. The category includes advisory organizations, professional bodies, advocacy groups, volunteer groups, and consumer groups.

Environmental groups have become major stakeholders in transportation, and can play key roles in advocating transit-friendly, multi-modal transportation policies and programs. Professional bodies play a key role in information transfer, standards setting, education and training. They need to participate in developing appropriate institutional and technical support for the final ITS deployment plan for the region.

The special interests groups are able to supply input on the:

- ITS services desired by motorists;
- Role of ITS in addressing environmental issues;
- Role of ITS in promoting commerce in cities; and/or
- Role of ITS in improving safety.

1.3 INFORMATION NEEDS AND GATHERING

The type and detail of information required varied by stakeholder group, and in some cases by specific stakeholder depending upon their interest and involvement in ITS. Key areas of information collected for a stakeholder included:

- **Mandate:** The mandate of the stakeholder is important in defining their "circle of influence" both internally and externally, and identifying what areas of ITS may be relevant to their operations.
- **Transportation Modes and Services:** The modes and services that a stakeholder is responsible for is a key input for the subsequent identification of the initiatives in the ITS Strategic Plan.
- **Needs:** The needs of the stakeholders must be established objectively, and compared against their mandate and the transportation modes they cover. The needs identification will focus on the stakeholder's fundamental business and operating needs. Where available, supporting documentation and reports justifying needs are supplied by the stakeholders. The relevant needs (that can be addressed through ITS) are then mapped to the User Services in the Canadian Architecture for ITS.

Exhibit 1.3 includes a summary of the type of information that was collected from the stakeholder categories. The collection of this information was facilitated through the Web survey and focus groups, as discussed in the next section.

Exhibit 1.3 – Summary Of Information To Be Collected

Entities	Types of Information Required
Public and Private Sector Owners and Operators	• Current transportation needs; • Current performance of their systems and future system requirements; • Funding/financial issues; • Institutional, legislative and technical barriers that have experienced; • Opportunities for expansion and integration
Customers and Service Providers	• Quality of the services they are currently receiving; • Additional ITS services which would enable them to expand their business interests; • Institutional, legislative and technical barriers in dealing with ITS service providers; • Partnership opportunities
Suppliers	• Current advances in the development of ITS products and services; • Their experiences, positive and negative, in dealing with public agencies in the Atlantic Region • Their perception of institutional, legislative, and technical barriers; • Methods in which government can play a role in ITS business development within and outside of the Atlantic Region.
Special Interest Groups	• The ITS services desired by users; • The role of ITS in addressing environmental issues; • The role of ITS in promoting commerce and benefits to the Atlantic Region economy. • The role of ITS in improving safety and addressing the insurance industry needs.
Researchers	• Opportunities to promote ITS research; • The current and potential supply of ITS professionals through universities; • Opportunities for partnerships; • Funding/financial issues affecting research.

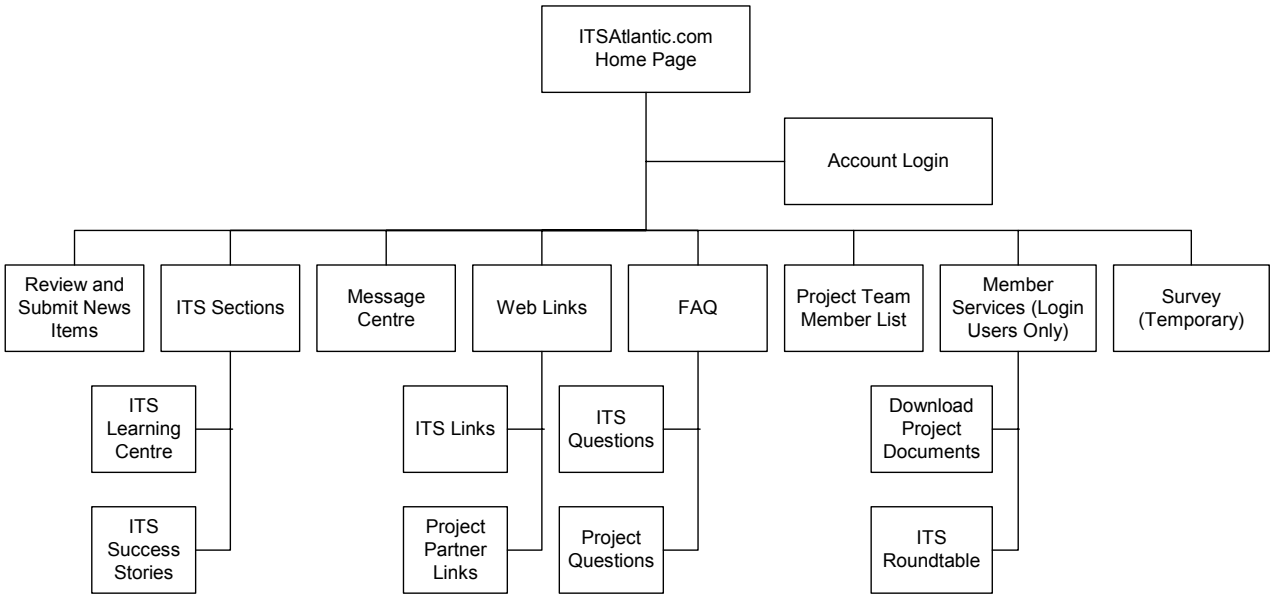
The following sections outline the instruments that were utilized in soliciting stakeholder input into the planning process. Information was solicited using a variety of media including the Internet, phone, email and fax. Stakeholders were able to access materials conveniently through the project Web site or through alternative formats upon request.

Soliciting quality input throughout the duration of the stakeholder outreach was crucial to the planning process. Accessibility and continuity of the information was also key to the success of the project. Therefore, each stakeholder was encouraged to continue their involvement in the project beyond their initial contact by participating in the focus group discussions, workshops, interviews and periodically visiting the project Web site to view announcements and news and also to share comments and ideas on past, present and future deliverables.

1.3.1 Web Site and Survey

The project web site (www.itsatlantic.com) provides a focal point where information and ideas can be exchanged between stakeholders, the project team and the steering committee. Exhibit 1.4 below outlines the site map for the project Web site.

Exhibit 1.4 – Project Web Site



The purpose of project Web site was twofold:

1. To provide Internet access to information about ITS in general and the ITS Strategic Plan. This gave stakeholders the necessary background for the project and ITS in general.

2. To provide a web based survey instrument, which allowed stakeholders to conveniently fill out the survey.

The web site incorporated information that described ITS and the Strategic Plan project in terms of:

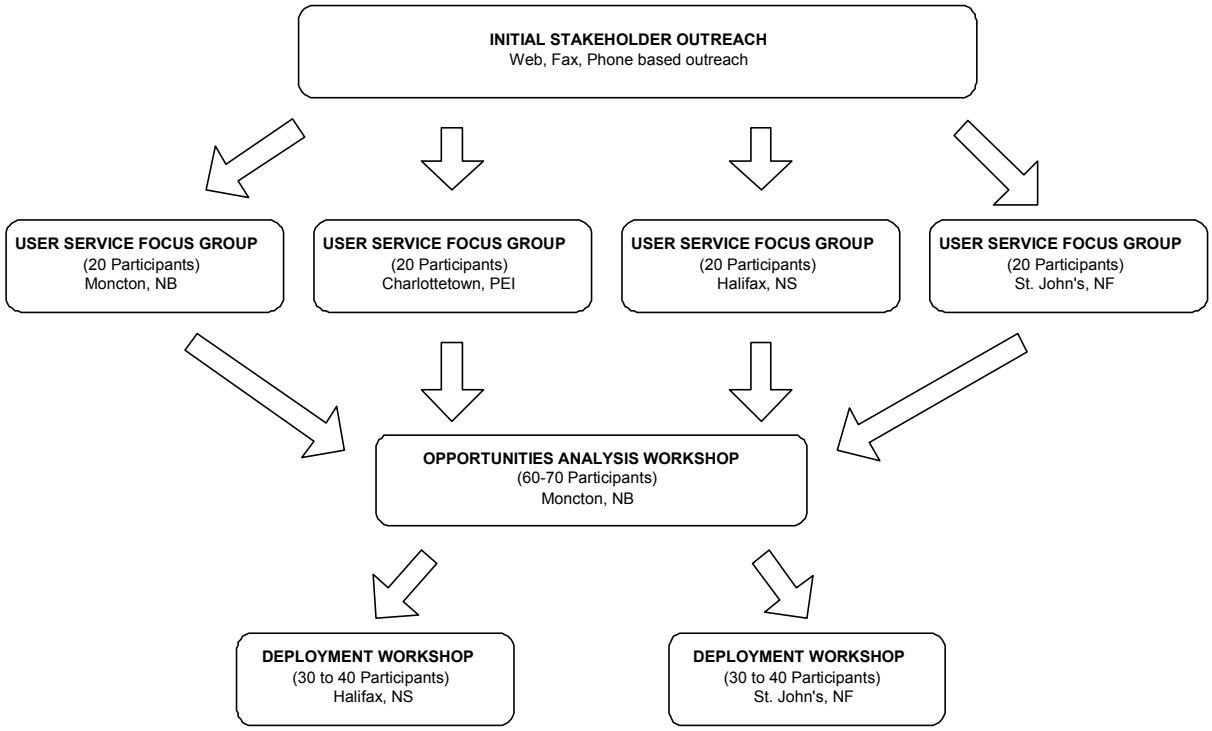
- What is ITS?
- How can you benefit from ITS?
- What is the Atlantic Provinces Regional ITS Strategic Plan? (i.e., overall scope, schedule, outputs, and downstream work, contact information).
- Atlantic Region ITS success stories.
- How can you help?

The Initial Outreach/Survey was targeted to all stakeholders outlined in Section 1.2. Prior to the Initial Outreach/Survey, the project Web site was established thus enabling all stakeholders to conveniently access project information on the Internet. For stakeholders that had no Internet access, the materials were provided via fax or mail. The initial outreach involved contacting each stakeholder either by email, phone or fax. Our experience has shown that voice contact by telephone is critical to achieving a high response rate for the survey, and we undertook these calls. Stakeholders were introduced to the project and encouraged to participate either through the Web based survey, the focus group discussions or the workshops.

1.3.2 Focus Groups and Workshops

Following the completion of the initial consultation outreach (questionnaire), a series of focus groups followed by workshops were held. Exhibit 1.5 illustrates the locations and anticipated audiences for the focus groups and workshops.

Exhibit 1.5 – Outreach Workflow



The User Service focus groups were intended to validate the vision developed using the results of the initial stakeholder outreach and to provide a prioritization of User Services as input to the User Service Plan (refer to Section 2). In order to assure representation from a cross section of interests from each province in the Atlantic Region, a focus group was undertaken in each province. The target audience consisted of approximately 20 to 25 stakeholders for each session, facilitated by two representatives from the consultant team.

The sessions included a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis. The objective of the SWOT analysis is to set the context for strategy development. The exercise was broken down into two activities: a brainstorming session and an analysis session. During the brainstorming session participants focused on ITS needs and ITS user bundles. During the Analysis session, participants identified SWOT for each User Service bundle, considering core competencies and life cycle issues. Based on the results of SWOT, participants developed a list of strategic objectives for the ITS strategy development and identified candidate "early winner" projects for further analysis.

The User Services focus groups represented the key forum of collecting information from stakeholders, and brought together similar stakeholders. The session was structured and facilitated using a "workbook" that guides the stakeholders in providing the information relating to their mandate, modes, needs, and inventory, as discussed in the previous sections. The results of the focus group are discussed later in this document (Section 2.1).

Three stakeholder workshops were held through the course of the study. These workshops provided stakeholder input in the development of key project deliverables. Each workshop was coordinated, facilitated and documented by IBI Group. The background materials (brochure and workbooks) were provided in print form at each workshop. Two representatives facilitated the workshop, with the project team expert advisors participating as well.

The following outlines the workshop activities in more detail, with particular attention to anticipated participants and arrangements.

Nearing the completion of the Step 3 task, an opportunities analysis workshop was convened in Moncton, New Brunswick. The intent of the workshop was to introduce stakeholder input in identifying and rationalizing potential roles and partnership arrangements among the stakeholder community. The workshop was structured around exercises aimed at opening a constructive dialogue with stakeholders and identifying initiatives for the ITS vision. These exercises included:

- Breakout groups to provide an assessment of the candidate User Services in terms of key beneficiaries, delivery participants, availability of technologies, operations and maintenance considerations, and known barriers to implementation; and

- Breakout groups to provide a detailed assessment of candidate early winner projects including development cycle, target milestones, and potential stakeholder roles.

The results of the opportunities workshops are discussed in Section 3.1 of this document.

Nearing the completion of the study, all stakeholders were invited to attend one of two deployment workshops. Following the first deployment workshop in Halifax, a second deployment workshop was held in St. John's, building on the results of first workshop. The goal of the two workshops was to provide stakeholder input in defining and prioritizing deployment activities as input to the Deployment Program (refer to Section 5).

1.4 WEB SURVEY RESULTS

The web survey was undertaken in October/November 2001. Once the website was fully developed and approved by the Steering Committee, the Consultant Team undertook e-mail and telephone contact to all

stakeholders to direct them to the site and complete the survey. Of the two hundred stakeholders contacted, a total of 60 surveys were completed. The body of respondents is largely consistent with the group of stakeholders that attended the four User Service focus groups in early November 2001. The complete web survey results are included as Appendix B.

The responses to the survey questions are grouped as follows:

- Questions applicable to all stakeholders;
- Questions specific to the owner/operator category;
- Questions specific to the suppliers and service provider categories; and
- Questions specific to the researchers and special interest group categories.

1.4.1 All Stakeholders

Stakeholders were asked to indicate their areas of activity, without limitation to any one category. The owner/operator category, which includes regulators and municipal/regional agencies, was the predominant area of activity, with 60% of the responses. The supplier and service provider activity captured 24% of responses, followed by researchers, special interest groups and other at 15%.

The agencies were asked to categorize the relevance of their work to ITS, yielding a relatively even distribution among interested parties, a direct operations role or a non-operations involvement.

Each agency was asked to characterize their primary mandate. Public sector respondents typically indicated mission statements, reflecting socio-economic goals. Responses with an owner/operator perspective reflected a customer service focus and a mandate to manage transportation infrastructure. There was significant private sector representation, which was reflected through product and service development and marketing mandates.

Each respondent was asked to indicate the key external agencies they deal with in carrying out their mandate. The range of responses encompassed all types of stakeholders within the region. The responses reflected a wide array of federal and provincial government funding agencies, as well as the role of municipal economic development organizations. Some of the private sector suppliers/service provider industry participants reflected international markets through references such as the U.S. Aerospace and Defence Industry.

All stakeholders were asked to identify their perception of the institutional, legal and technical barriers to development of the ITS industry in Atlantic Canada. The majority of the responses in this area were from owner/operators, citing the following key barriers:

- The inability to raise project financing;
- The lack of interagency coordination and interoperability;
- The lack of technical standards to support that interoperability; or

- Various provincial and federal acts of legislation which inhibit seamless transportation in the region, such as the lack of harmonization in Provincial commercial vehicle regulations.

All stakeholders were asked to indicate which of the eight User Service bundles they considered to be most relevant to their areas of activity. Each of the stakeholder groups responded with a consistent profile, characterized as follows:

- The traveller information services and associated warehousing bundle were most prevalent, reflecting the need to better integrate existing information sources and package that information for use by travellers and carriers.

- Traffic management, public transportation, electronic payment and commercial vehicle operations were consistently prevalent, reflecting the specific interests of the relevant stakeholders.

- Emergency management services was relatively under-weighted in comparison to the level of attention directed in this area during the course of the focus groups, perhaps reflecting a lack of understanding of what is incorporated under this bundle.

- Conversely, vehicle safety and control seemed relatively over-weighted, again perhaps reflecting a lack of a clear understanding of what is involved in this bundle, capturing mobile data terminal type applications which might fall under the commercial vehicle or public transportation areas.

1.4.2 Owner/Operator

Each owner/operator agency was asked to indicate User Service bundles wherein the agency is currently using ITS applications or may have a future interest. The responses reflected a very even distribution among the eight User Service bundles in terms of where applications are currently being used and where future interest may lie. A detailed review of the responses indicate that some respondents took some liberties in terms of defining current activities that fall within the ITS User Service bundles. Specifically, some of the current activities in traveller information services may in fact reflect more static information delivery campaigns versus real-time interactive services. Similarly, the respondents interpretation of vehicle safety and control systems may be too broad.

Over 60% of respondents indicated they are active in ITS deployment/operations. Of those active in ITS, over 75% of the respondents indicated satisfaction with the performance of existing ITS applications. Many agencies recognize that they are currently only dealing with the initial phases of a longer term staged implementation plan which will hopefully yield ultimate benefits of system-wide deployment. The results reflected that 70% of the respondents are seeking partnership opportunities with other public or private agencies.

With respect to the benefits of ITS, the results indicated an even distribution of priority among customer satisfaction, improved operating efficiencies, and improved safety. There was marginally less emphasis on increased revenues (as this would not be relevant to some operations) and reduction of pollution (as this is more readily associated with large urban areas).

1.4.3 Supplier and Service Providers

While the sample size for the supplier and service provider category was relatively small, the following observations are offered:

- There is an even distribution among the eight User Service bundles with regards to current agency involvement and areas of interest.
- Surprisingly, over 50% of the respondents indicated that they are not seeking partnerships to expand their business opportunities.
- All of the ITS areas of benefit were considered equally important with the exception of the reduced emphasis on reduction of pollution.

1.4.4 Research and Special Interest Group

Once again, the distribution of interest in the eight User Service bundles was very even, perhaps reflecting an over-weighting in the vehicle safety and control area. Past areas of experience for the research community reflect areas of emphasis such as Advanced Road Weather Information System (ARWIS), Commercial Vehicle Operations (CVO), and electronic payment.

The experience with research and special interest groups indicates some positive aspects associated with partnering, reflecting the academic community working with private sector consultants and suppliers, other academic institutions, and various levels of government. Many of the respondents indicated that they are looking to activities such as this study to help promote the awareness of ITS opportunities, and the importance of promoting partnerships to help develop the ITS industry in Atlantic Canada.

Most respondents indicated that they did not feel that the current education system was well suited to meeting the anticipated future staffing needs of the ITS industry. The comments indicated a need to specifically identify what those industry requirements might be with the intent of targeting programs accordingly.

2. USER SERVICES PLAN

The second step of the Atlantic Canada ITS Strategic Study was to develop a User Services Plan. This section of the report details the development of this plan, and is subdivided into four distinct but interrelated activities. Provided below is a brief description of each sub-section:

- **Needs Assessment (Section 2.1)** – It was important to develop an understanding of the current state of the transportation systems in the Atlantic Provinces, and organize the needs. Through input received at the stakeholder workshops and the web-survey, current transportation issues, problems, opportunities and gaps were identified. Section 2.0 provides a summary of the needs formulated around this information.

- **The Vision (Section 2.2)** – The development of a "vision" for ITS deployment in Atlantic Canada is an integral part of the planning process and assisted in shaping the regional ITS Strategic Plan.

- **User Service Assessment (Section 2.3)** – The needs identified in Section 2.1 were mapped to the User Services defined in the *Canadian Architecture for Intelligent Transportation Systems*. Each User Service was assessed against a number of criteria including its ability to address the identified needs. Also included in this section is a preliminary examination of the potential **"early winner"** projects identified in the initial focus group workshops convened in each Province.

- **Performance Criteria** (**Section 2.4**) – A set of performance criteria was established, and mapped against the primary User Services identified in the preceding section.

2.1 NEEDS ASSESSMENT

The objective of the Needs Assessment was to develop an understanding of the current state of the Atlantic Provinces transportation system, and describe and organize the needs into a consistent framework. This ensured that current issues, concerns, problems and gaps were identified and addressed on a consistent basis.

The input to the needs assessment included project team and steering committee input, the web-based survey, and the results of the four User Services focus groups.

In early November 2001, four user needs focus groups were conducted, as outlined in Exhibit 2.1.

Exhibit 2.1 – User Needs Focus Groups

Date	Location	Attendees
November 5, 2001	Moncton	25
November 6, 2001	Charlottetown	12
November 7, 2001	Halifax	14
November 8, 2001	St. John's	19

Each of the one-day sessions included:

- An introductory session to provide an overview of the draft ITS vision, the Canadian ITS Architecture, and description of the 35 User Services;
- A workshop session to validate the draft strengths, weaknesses, opportunities, and threats (SWOT) analysis for each of the eight User Service bundles;
- A User Service prioritization exercise;
- A breakout session to develop strategies and candidate projects for each of the key User Service bundles; and
- Closing presentations from participants for each of the key User Service bundles.

Appendix C provides a detailed summary report for the focus group sessions, including the agenda and attendance listing. The following sections provide a high level overview of the results, which helped to shape the development of the Step 2 User Service Plan.

2.1.1 Focus Group Attendance

As a general comment, the four sessions attracted a diverse range of stakeholders who actively participated in the sessions. The Moncton session included a particularly broad range, namely three levels of government, private sector owner/operators, tourism, academia, telecommunications, RCMP, and strong representation from the commercial carriers. Key areas of discussion centred around the needs and applicable user services for commercial vehicle operations and traveller information.

The Charlottetown session provided good input on bus operations, emergency services, and small business perspectives. The discussion in this focus group centred on needs associated with community transit, and co-ordinated emergency response to incidents.

The Halifax session was characterized by a high level of awareness and experience with ITS applications. Key stakeholder groups represented included intermodal operations, transit, electronic payment and trucking. Many of the participants at the Halifax focus group have experience with ITS deployment. Key areas of discussion centred on electronic payment, traffic management, and intermodal goods movement.

The attendance at the St. John's focus group reflected more of a public sector weighting with representation from three levels of government and from telecommunications service providers. Key areas of discussion included commercial vehicle operations, and rural incident management.

2.1.2 SWOT Analysis

The review of the SWOT analysis exercise was very helpful in prompting stakeholders to think about the existing characteristics of the region (i.e. strengths and weaknesses), as well as identifying future considerations (i.e. opportunities and threats). Substantial edits/additions were undertaken to the SWOT analysis forms included in the User Service Plan. Some particular areas included identification of existing ITS applications and plans for deployment, which are reflected in strengths and opportunities. Many of

the comments on threats are centred on the lack of ITS awareness and the associated inability to secure funding. Many of the comments on future opportunities focussed upon integration and interoperability among agencies.

2.1.3 User Services and Early Winners

The participants identified the User Services most relevant to their needs and areas of interest, utilized worksheets to analyze these User Services in the context of the Atlantic Region, and identified potential early winner projects for further consideration under this study. A detailed list of the priority User Services and associated candidate products is included in Appendix D and further discussed in Section 2.3.

Based upon the input solicited through the project team and steering committee input, the web-based survey, and the focus groups, a number of current and future transportation needs were established. Exhibit 2.2 includes a summary of the identified needs. For each of these needs, a summary page has been prepared to provide a synopsis of the following:

- Description;
- Related trends;
- Priority;
- Potential stakeholders;
- Associated User Services; and
- Prospectus.

Accordingly, the following pages include the summary sheets for each identified need. A review of these profiles underscores some key themes for the Atlantic Provinces. These themes include priorities involving the efficient movement of goods on-road, at terminals and across borders, optimized response to rural traffic incidents, optimized management of the infrastructure, and the provision of a seamless, accessible transportation network for travellers. In order to achieve these priorities, there is a series of needs focussing on improved real-time data collection, such as road weather conditions, improved inter-agency coordination and information exchange and improved interactive interfaces with travellers and carriers.

Exhibit 2.2 – Identified Transportation Needs

Need	Description
1	Expedited Border-Crossing Inspection and Clearance for Commercial Vehicles
2	Reduce Rural Road Collisions Through Early Detection of Adverse Conditions
3	Reduce the Incidence, Severity and Cost to the Community of Road Collisions
4	Improved Safety in Road Work Zones
5	Enhanced Management of Winter Maintenance Operations
6	Expedited Weight, Credential, and Safety Checks for Commercial Vehicles

Need	Description
7	Road Emergency Notification and Information System for Rural Areas
8	Improved Ferry Services, Particularly Nova Scotia – Newfoundland
9	Provide Travel Incentives and Traveller Information to Promote Tourism in Atlantic Canada
10	Enhanced Safety and Security for Travellers and for Transportation Operators and Facilities
11	Enhanced Ability to Detect, Verify, and Respond to Incidents on Major Roadways
12	Enhanced Tracking and Real-Time Management of Containers and Other Goods at Intermodal Terminals
13	Real Time Transit Service Monitoring and Public Information
14	Improve Management of Fleet Transportation Services
15	Real-Time Management of Parking Operations

EXISTING NEED

- The border-crossing process for commercial vehicles potentially involves a complex set of checks and inspections related to customs, immigration, safety, agriculture/food/drug and environmental regulations. Up to 6 paper documents may need to be presented and checked at the border.
- A delay study at the St Stephen / Calais border crossing showed that between 70 and 95% of all commercial vehicles crossing the border are subject to delay. Delays typically range between 2 and 30 minutes with occasional delays greater than 30 minutes. In the case of St Stephen, resulting delays to other traffic can cause queuing through the downtown area.
- There are 16 border crossings between New Brunswick and Maine and an international ferry crossing between Nova Scotia and Maine.
- ITS facilities being considered for a new border-crossing facility at St Stephen, NB / Calais, ME include weigh-in-motion (WIM) scales, transponder readers, safety information systems, International Trade Data Systems (ITDS), and truck driver information kiosks.
- There is an existing need to improve border security and enhance safety at border crossings.

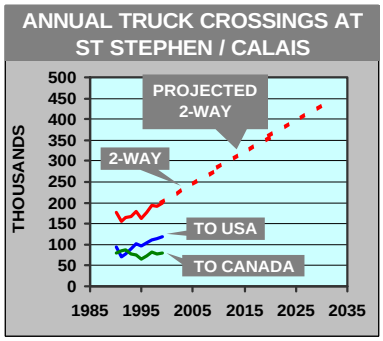
Existing manual customs and related inspection and clearance can lead to …

Queuing and delay for all border-crossers, which can result in…

Frustration, and increased costs of business and administration.

TRENDS

- The three busiest border crossings to the USA are at St Stephen, Milltown, and Woodstock NB. Average daily truck volumes (2-way) at these locations are 302, 243 and 500 respectively. Crossing at these locations represent 2/3 of the southbound cross-border truck trips for the Atlantic Provinces.
- Two-way truck traffic at the New Brunswick / Maine border is expected to more than double by 2030 (3.8% per year uncompounded).
- Canada and the US signed The Canada-US Smart Border Declaration (December 12, 2001) which refers to initiatives that would use ITS to improve security at international border crossings.



PRIORITY OF NEED

- This is a high priority need. Construction of a new bridge and border crossing facility at St Stephen / Calais is currently being pursued. Enhanced clearance processing could provide interim relief until the new crossing is in place and would maximize the efficiency of the new facility if implemented at start-up.
- Increased border security in the context of anti-terrorist initiatives will likely increase inspection requirements and the need for enhanced efficiency.

The key border crossings are at St Stephen, Milltown, and Woodstock, New Brunswick.

Need #1

Expedited border-crossing inspection and clearance for commercial vehicles.

Currently, six different documents have to be completed and sent with the trucker, who presents these documents at the US border, at which point the paper documents are matched up with the electronic documents sent to the border by the shipper. This is another good argument for speeding up the adoption of suitable ITS technologies.

STAKEHOLDERS:

- Canada Customs and Revenue, U.S. Customs
- Provinces, State of Maine
- Carriers and shippers
- Other border traffic

USER SERVICE:

- Commercial Vehicle Electronic Clearance
- Automated Dynamic Warning and Enforcement

PROSPECTUS:

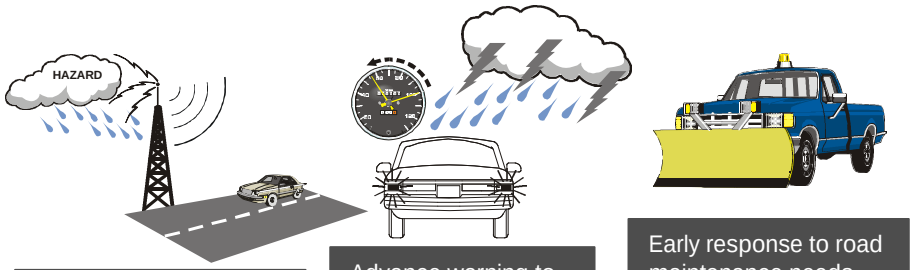
- All indications point to a need for greater efficiency to accommodate increased demand for commercial vehicle border-crossings and enhanced inspection requirements without increased delay and cost.

PRIORITY OF NEED:

ATLANTIC PROVINCES INTELLIGENT TRANSPORTATION SYSTEMS
STRATEGIC PLANNING STUDY

EXISTING NEED

- Hazardous road conditions coupled with adverse weather conditions in the form of floods, winter storms, forest fires and heavy fog can have a crippling effect on Atlantic Canada road travel.
- Opportunities to maintain safe road conditions prior to, during or immediately following an adverse change in driving conditions would reduce the effect of the potentially hazardous conditions.
- Opportunities to advise motorists in advance of their approach to the hazardous area would alert them and instill more cautious driving or avoidance of the area.
- There are approximately 64,000 kilometres of highway in the Atlantic Region



Early detection of hazard or adverse condition

Advance warning to motorists would reduce collision potential

Early response to road maintenance needs would improve driving conditions

TRENDS

- A proposal for a National Road Weather Information System (RWIS) has been approved by 9 provinces (Quebec has agreed in principal) and is now before the Federal government (Transport Canada & Environment Canada).
- A new state-of-the-art Dopplar Radar system has been installed across Canada (completed in 2001)
  - 5 of the Dopplar Radar sites are in Atlantic Canada with near real time single site and composite images available on the Web.
- Nova Scotia recently signed a 3 year supply and install contract for 18 ARWIS sites (6 sites a year for 3 years).
- Prince Edward Island has a total of 4 RWIS stations to support its winter maintenance program.
- The new Fredericton / Moncton Highway will have 6 ARWIS sites along it to support the winter maintenance activities this winter

Number of ARWIS sites in 2001

PRIORITY OF NEED

- This is a high priority need. With the prevalence of severe weather and the extensive use of rural roads, road safety should be enhanced as opportunities for this are identified.

ALL RURAL ROADS IN ATLANTIC CANADA

Need #2

Reduce rural road collisions through early detection of adverse conditions.

Early detection of hazardous road conditions, advance warning to motorists and response by road maintenance staff are means of improving road safety.

STAKEHOLDERS:

- All road users
- Road agencies
- Emergency services

USER SERVICES:

- Traveller Information
- Environmental Conditions Management
- Operations and Maintenance
- Automated Dynamic Warning and Enforcement
- Emergency Vehicle Management
- Weather and Environmental Data Management
- Incident Management
- Emergency Notification and Personal Security
- Disaster Response and Management

PROSPECTUS:

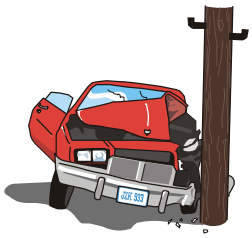
- Increasing use of existing rural roads, increasing vehicle speeds and limited improvements to road infra-structure highlight the importance of road safety improvements.

PRIORITY OF NEED:

ATLANTIC PROVINCES INTELLIGENT TRANSPORTATION SYSTEMS
STRATEGIC PLANNING STUDY

EXISTING NEED

- Potential issues for priority action are: speeding; fatigue; seatbelt use; road design; quality and condition; drivers in high risk; age groups; motorcycle, bicycle and pedestrian safety; heavy vehicle collisions; drinking & driving; drugs and driving and occupant protection.
- Transport Canada 's Road Safety Vision 2001 goal is to have the safest road in the world however Canada is ranked ninth in the number of road user fatalities per 10,000 registered vehicles.
- Reduction of fatal motor vehicle collisions is specifically targeted by all Provinces, including both rural and urbanized areas.
- Possible opportunities to address include:
  - On-board applications (eg. Driver monitoring)
  - Infrastructure applications (eg. Red-light cameras)



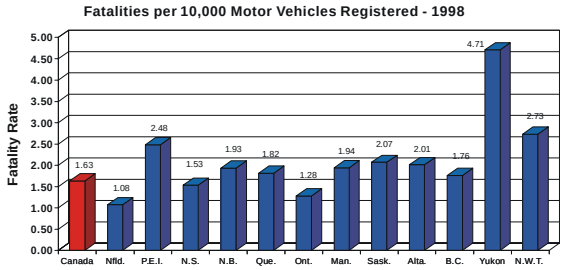
Road safety continues to be a high priority

Efforts are made to reduce impacts of road collisions

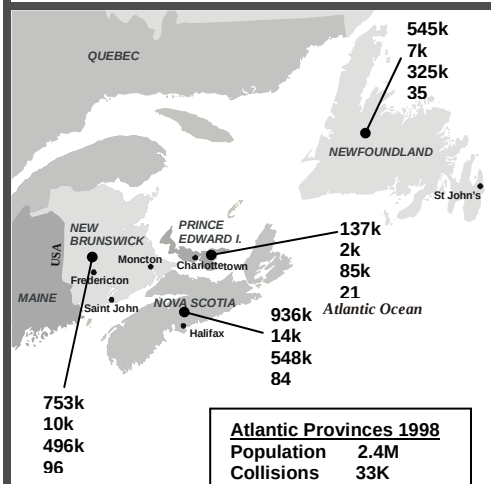
Outcomes of vehicle collisions are not at an acceptable level

TRENDS

- Road collisions account for over 90% of all transportation related deaths.
- Cost of road collisions in 1998 to Canadian economy was $10.5 Billion.



- The fatality rate in auto collisions in 3 of the 4 Atlantic Provinces exceeded the average rate for Canada in 1999.



Atlantic Provinces 1998

Population	2.4M
Collisions	33K
Vehicles	1.5M
Fatalities	236

PRIORITY OF NEED

- This is a high priority need. The risks of road use continue to decline and continuing effort should be placed on achieving further declines.

ALL ROADS IN ATLANTIC CANADA ARE INCLUDED

Need #3

Reduce the incidence, severity and cost to the community of road collisions.

Road related collisions cost the community billions of dollars, pain and suffering and is a top priority to all of us.

STAKEHOLDERS:

- All government agencies
- Emergencies agencies
- All commercial sectors
- The communities of Atlantic Canada and beyond
- Health Services

USER SERVICES:

- Traffic Control
- Traveller Information
- Incident Management
- Environmental Conditions Management
- Operations and Maintenance
- Automated Dynamic Warning and Enforcement
- Emergency Vehicle Management
- Emergency Notification and Personal Security
- Disaster Response and Management
-

PROSPECTUS:

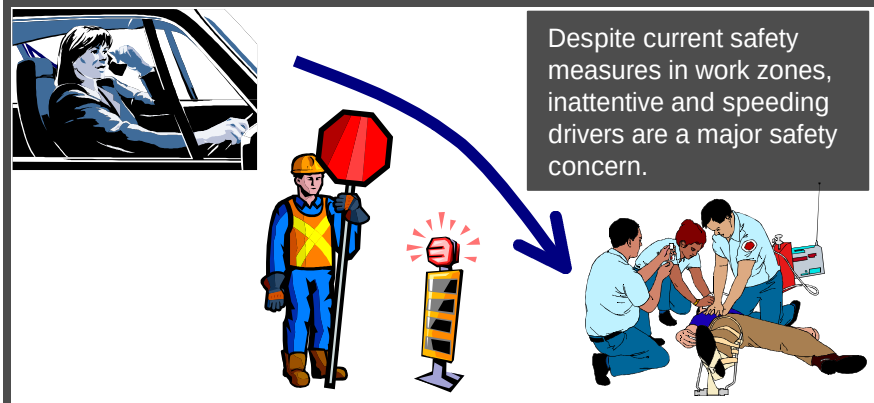
- Over the past 10 years to 1998, traffic deaths have decreased by more than 29%, while drivers licensed have increased 20%.

PRIORITY OF NEED:

ATLANTIC PROVINCES INTELLIGENT TRANSPORTATION SYSTEMS
STRATEGIC PLANNING STUDY

EXISTING NEED

- Work zones associated with road construction often involve lane reductions, speed reductions, or other modifications to driving conditions.
- Inadequate advance warning, driver inattention, possibly due to cell-phone use or other in-vehicle distractions, or unresponsiveness with respect to work-zone driving conditions represent a substantial safety risk to both road users and construction personnel. Driving too fast, following too close, and the resulting need for sudden stops and speed changes are key factors in many work-zone collisions.
- Although enforcement is a major consideration, enhanced visibility/audibility and clarity of advisory messaging, in combination with improved traffic control and enforcement in advance of and within work-zones would play a significant role in improving work-zone safety.
- Improving the level of information available to the driver concerning traffic conditions within the work zone could reduce frustration and help increase compliance with reduced speed limits. Another possibility is feedback to drivers on their actual speeds.



Despite current safety measures in work zones, inattentive and speeding drivers are a major safety concern.

TRENDS

Based on US data:

- The number of people killed in highway work zones is at an all-time high.
- Between 1995 and 1999, motorists accounted for 84 percent of work zone fatalities. However, fatality rates for highway workers are twice that of other types of construction.
- Aging road infrastructure means increased maintenance and rehabilitation activity.
- Trend is to crash trucks, attenuators, advance warning and more comprehensive strategies for delineation and lane closures.

PRIORITY OF NEED

- This is a high priority need.
- Safety is a high-priority concern.

Primarily relevant to work zones on higher-speed highways but also of relevance in urban situations.

Need #4

Improved safety in road work zones.

Road sign written in a child's hand… "Please slow down, my daddy works here."

Most work-zone collisions occur because of driver inattention and speeding. Three top things are visibility, visibility, visibility.

STAKEHOLDERS:

- Provincial and municipal transportation agencies
- Travelling public
- Construction contractors

USER SERVICES:

- Operations and Maintenance
- Traveller Information
- Automated Dynamic Warning and Enforcement

PROSPECTUS:

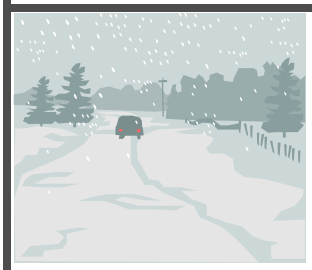
- Improving driver awareness through provision of work-zone status and traffic control information would help to mitigate the congestion and safety impacts associated with roadway construction, maintenance and rehabilitation work.

PRIORITY OF NEED:

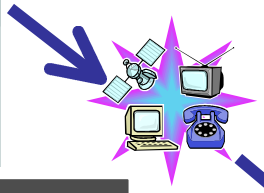
ATLANTIC PROVINCES INTELLIGENT TRANSPORTATION SYSTEMS
STRATEGIC PLANNING STUDY

EXISTING NEED

- Variable and changeable weather conditions across a dispersed road system in Atlantic Canada means that the planning and dispatching of winter maintenance operations is a difficult task.
- Today's winter maintenance operations rely on dispatcher/operator experience and limited information on weather and road surface conditions in attempting to keep roads clear and safe within limited resources.
- Lack of real-time information on micro-climatic variations leads to a requirement for a conservative approach to salting, sanding, or plowing operations, meaning that some critical areas may not receive timely attention while other, less critical areas may be over-maintained.
- Improved information on weather and road surface conditions could allow more precisely targeted maintenance. Safer roads, more timely maintenance, and a reduction in salt use and cost to achieve the same or higher levels of maintenance effectiveness are possible with improved decision support and technological advances in maintenance methods.



Real-time information on road surface and micro-climatic conditions ….



….could mean increased safety and reduced salt use.

TRENDS

- The trend in winter maintenance is towards better management of resources and improved methods.
- Environment Canada has indicated that they will declare road salt to be toxic to the environment. Effective salt management will therefore be a priority item.
- Advanced road weather information systems can provide early warning of winter storms and allow maintenance personnel to pre-treat roads, thus preventing snow from binding to the pavement and reducing salt use by at least 20%.

PRIORITY OF NEED

- This is a high priority need.
- The Trans-Canada Highway is seen as a high priority need due to traffic volume and its role in support of trade and commerce.

Relevant to all roads and highways, both urban and rural.

Need #5

Enhanced management of winter maintenance operations.

More precisely targeted winter maintenance activity means safer roads and reduced maintenance costs.

STAKEHOLDERS:

- Provincial and municipal transportation agencies
- Travelling public
- Road contractors

USER SERVICE:

- Environmental Conditions Management
- Operations and Maintenance
- Weather and Environmental Data Management

PROSPECTUS:

- The availability of more comprehensive weather and road surface information would improve road safety and facilitate more effective use of increasingly constrained maintenance resources.

PRIORITY OF NEED:

LOW HIGH

EXISTING NEED

- Existing weigh stations are off-line and do not permit high-speed truck passes, resulting in delay to truckers and potential for queuing onto the highway and attendant ramp and mainline safety problems. The absence of information sharing may mean that some trucks may be weighed more than once per trip while others may not be weighed at all.
- Existing safety inspections (driver and vehicle condition and safe loading) are accomplished manually and cannot take advantage of information sharing among inspectors and jurisdictions (such as the SAFER system). Compliant carriers with good safety records may be subject to unnecessary delay while the relatively small percentage of carriers with poor safety records may not be adequately inspected. When weigh stations close temporarily due to congestion and delay, commercial vehicle traffic is not adequately inspected.
- Document checks (driver's license, hours of service log, trip inspection reports, certificate of dangerous goods handling, vehicle operating authority, registration and insurance) are accomplished manually and without information sharing that could significantly reduce inspection time and paperwork.

Need #6
Expedited weight, credential, and safety checks for commercial vehicles.

Lack of electronic pre-clearance at weigh/inspection stations…

…causes excess delay and cost.

STAKEHOLDERS:

- Provincial transportation departments
- Carriers and shippers
- Public Safety Departments

USER SERVICE:

- Commercial Vehicle Electronic Clearance

TRENDS

- Commercial Vehicle Operations (CVO) are becoming a subject of attention across Canada.
- A CVO study is being carried out for British Columbia involving major routes and border crossings with the objective of including weigh-in motion, tolling, truck safety and inspection clearance on one transponder.
- Transport Canada has a study underway for Canadian standardization of electronic collection and information transfer.
- Major border crossings such as the Peace Bridge (Ontario, Canada – New York , USA) are using their own transponders for truck preclearance and tolling.

PROSPECTUS:

- Electronic clearance processes may be more efficient than increased physical capacity of weigh stations in the face of increasing commercial vehicle traffic.

PRIORITY OF NEED

- This is a medium-to-high priority. There is potential for significant enhancement to the procedures for weighing commercial vehicles and for inspection in relation to truck safety and credentials. The resulting time savings, combined with more effective and efficient inspection and regulation suggests the benefits of early implementation.

PRIORITY OF NEED:

There are 18 weigh stations within the Atlantic Provinces.

ATLANTIC PROVINCES INTELLIGENT TRANSPORTATION SYSTEMS
STRATEGIC PLANNING STUDY

EXISTING NEED

- There are several aspects to this need for improved emergency notification and information.
- Drivers may be involved in a collision, unconscious, and unable to notify emergency services, provide their location, and describe their situation, delaying effective response.
- Motorists may be stranded by a breakdown or uncertain of their personal security but unable to pinpoint their location for a response team.
- National Highway Traffic Safety (US) data yields the average response times below.

	URBAN	RURAL
Crash to notification	3.9 min	8.2 min
Notification to response	6.2 min	11.4 min
Response arrival to hospital	25.5 min	36.1 min

These average times mask potentially much higher notification and response times associated with remote areas.

- The elapsed time between a collision and arrival of a response team may mean the difference between life and death.

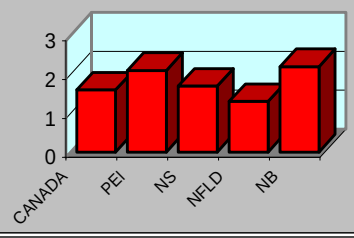
Motorists may be involved in a collision and unable to notify emergency services or stranded and unable to pinpoint their location…

… possibly leading to delays in emergency response and/or the wrong response.

TRENDS

- The fatality rate in auto collisions in 3 of the 4 Atlantic Provinces exceeded the average rate for Canada in 1999. In 1998 2 of the 4 Atlantic Provinces exceeded the average Canadian fatality rate.
- Typically, the number of collision fatalities on rural roads exceeds that on urban roads by almost 2 to 1.
- Annual fatalities have been declining across Canada although one fatality is one too many.

FATALITIES PER 10,000 VEHICLES REGISTERED (1999)



PRIORITY OF NEED

- This is a medium-to-high priority since there is potential to save lives by reducing emergency notification and response times associated with traffic collisions. The potential to improve traveler security or respond more quickly to stranded motorists would help offset the difficulties associated with traveling on remote, rural roads.

This need is most relevant to rural roads. Much of the road system in the Atlantic Provinces is outside urban areas and many parts of the road system may be considered remote.

Need #7
Road emergency notification and information system for rural areas.

The first hour after a crash is the most crucial in a severely injured persons outcome. This has been referred to as the 'Golden Hour'.

STAKEHOLDERS:

- Rural residents and drivers
- Emergency services (police, fire, ambulance, etc)
- Hospitals and other caregivers

USER SERVICE:

- Traffic Control
- Emergency Notification and Personal Security
- Disaster Response and Management

PROSPECTUS:

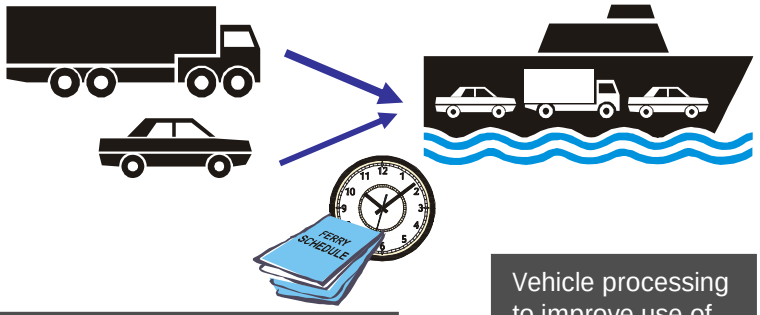
- Although the number of fatal vehicular collisions annually has been declining steadily across Canada, there is potential to save lives across Canada

PRIORITY OF NEED:

LOW HIGH

EXISTING NEED

- Capacity problems, rates and schedules, and service quality issues are areas of concern in regards to Gulf Ferry service.
- Some Atlantic Communities rely heavily on ferry service as their primary access to points outside the community.
- Trucking industry is concerned that there are increasing numbers of commercial units and tractor-trailer lengths have increased from 45-48 Feet to 53 Feet.
- Gulf Ferry capacity constraints may delay trucks 1-2 days during peak tourism season.
- Newfoundland requires a guaranteed level of stability for its Ferry service.

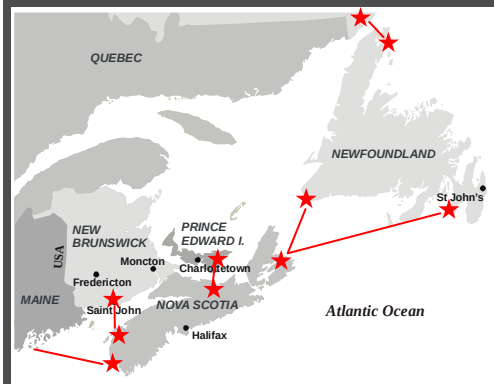


Need for advance information regarding routes, schedules, space availability, and reservations

Vehicle processing to improve use of available capacity and faster loading

TRENDS

- In July and August 1998 Marine Atlantic operated at full capacity in 186 of 265 crossings of the two Gulf Superferries.
- There is a growing trend towards web-based and centralized bookings and/or reservations.
- Improved ferry technologies including jet hovercrafts are available, although costly.



MAJOR FERRY SERVICES

PRIORITY OF NEED

- This is a medium priority need. The highest need relates to access to / from Newfoundland since other areas have mainland access.
- Gulf Ferry service is critical to the economy of Newfoundland.

Need #8
Improved ferry services, particularly Nova Scotia - Newfoundland.

Limited ferry capacities and manual processes of vehicle processing have a significant bearing on the attractiveness of ferry travel.

STAKEHOLDERS:

- Road Users
- Communities of Atlantic Canada
- Carriers / Shippers
- Ferry services operators
- Tourism industry
- Business Community
- Canada Customs and Revenue Agency

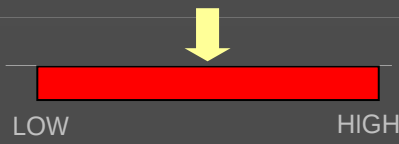
USER SERVICES:

- Traffic Control
- Traveller Information
- Traveller Services and Reservations
- Electronic Payment Services
- Commercial Vehicle Electronic Clearance

PROSPECTUS:

- Atlantic Canada requires efficient and capacity – optimizing ferry services, particularly to Newfoundland to accommodate growth in demands and to ease road demands.

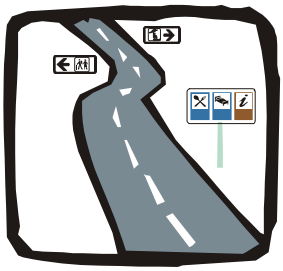
PRIORITY OF NEED:



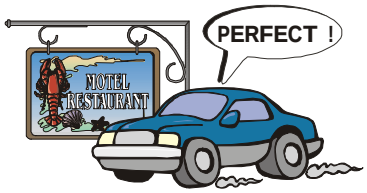
ATLANTIC PROVINCES INTELLIGENT TRANSPORTATION SYSTEMS
STRATEGIC PLANNING STUDY

EXISTING NEED

- Visitors who are unfamiliar with Atlantic Canada require information about attractions, accommodation, restaurants, directions, route guidance and many other services.
- Travelers en-route are not able to access information regarding all potential destinations, other than those advertised in tourist books and brochures and at tourist offices (subject to seasonal and daily hours)
- Businesses that derive potential livelihood from tourism require advertising through one or more media, at significant costs.
- Tourism was identified among the top 3 growth sectors for Atlantic Canada, building on the strength of the region.



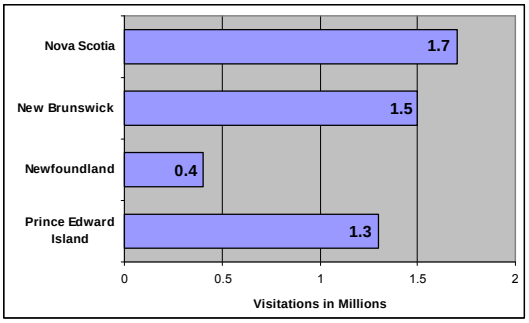
Need to inform unfamiliar visitors



Advertising benefits tourists and local businesses

TRENDS

- 3.5 million non-resident visitations to Atlantic Canada in 1996 and an increase of 40% by 1999 to 4.9 million.
- PEI increase was 60% between 1996-1999.



PRIORITY OF NEED

- This is a medium priority need. The need of tourists to seek information in a convenient manner is important to them and critical to support businesses in the tourism industry.

TOURIST DESTINATIONS INCLUDE ALL OF ATLANTIC CANADA

Need #9

Provide travel incentives and traveller information to promote tourism in Atlantic Canada.

Visitors in Atlantic Canada want a convenient means of searching for attractions, accommodations, food services and many other destinations.

STAKEHOLDERS:

- Tourists
- Chambers of Commerce
- Provincial Departments of Tourism
- Canadian Automobile Association

USER SERVICES:

- Traveller Information
- Traveller Services and Reservations

PROSPECTUS:

- Growth in Atlantic Canada tourism will continue and accelerate with improvements to information dissemination.

PRIORITY OF NEED:

LOW HIGH

ATLANTIC PROVINCES INTELLIGENT TRANSPORTATION SYSTEMS
STRATEGIC PLANNING STUDY

EXISTING NEED

- Personal safety and security issues are receiving much greater attention both in terms of media reporting and in initiatives to address these issues.
- One key aspect involves the on-board security and safety of passengers travelling on public transport services (buses, school buses, taxis, trains, ferries). Related to this is safety and security at terminals (bus-stops, parking lots, ferry terminals, airports, etc). This need primarily relates to surveillance and monitoring and emergency notification and response functions.
- Recent terrorist activity suggests that the security of the facilities themselves is also an issue requiring action. This would include the safety and security of the operators (bus drivers, taxi drivers, etc)
- Another perspective is that of the safety of non-vehicular users of the road system – pedestrians and cyclists, including those with perceptual or physical limitations. This need might involve surveillance, detection, and passive or active warning and advisory functions.

Need #10

Enhanced safety and security for travellers and for transportation operators and facilities.

Increasing need for and emphasis on traveler, operator and facility safety and security necessitates new approaches.

STAKEHOLDERS:

- Operators of public transportation facilities and services
- Province, municipalities
- The traveling public

USER SERVICES:

- Emergency Notification and Personal Security
- Disaster Response and Management

TRENDS

- Use of closed circuit television monitoring, panic alarms for facilities, personnel and users. (e.g. taxis, transit, parking facilities.)

PROSPECTUS:

- Increased emphasis on personal safety and security and increased potential for terrorist and criminal activity affecting travellers suggests an increased need for surveillance, alarm, and protection systems.

PRIORITY OF NEED

- This is a medium priority need.
- There is a renewed emphasis on the safety and security aspects of this need that demand attention in the short term.

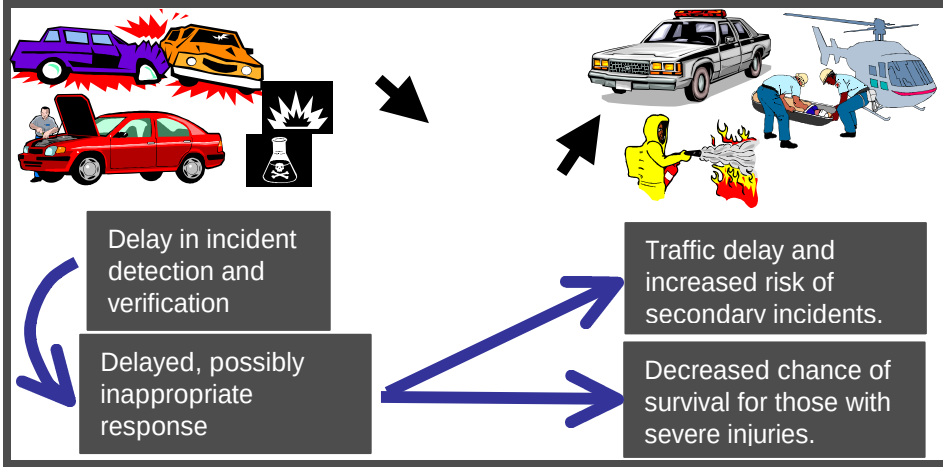
PRIORITY OF NEED:

This need applies widely to public transportation, ferry, parking, pedestrian and cycling routes and terminal facilities.

ATLANTIC PROVINCES INTELLIGENT TRANSPORTATION SYSTEMS
STRATEGIC PLANNING STUDY

EXISTING NEED

- Incidents on major roadways generate a multi-faceted need that includes enhanced incident detection and verification, coordinated response and reduced response times, and coordinated management of the incident site and of information provided to motorists..
- The first need is for quick detection of an incident and verification of its nature and location. The proliferation of cellular phone use has created an informal incident detection system but this must be considered supplementary to a more formalized system of detection and verification.
- The second need is for rapid deployment of a response appropriate to the incident, requiring a coordinated management and communication system. The first hour after a collision is a critical factor in the survival of severely injured collision victims. The presence of hazardous materials requires more specialized response capabilities.
- The third need is for effective management of the incident site, including restoring normal operation as soon as possible consistent with medical and police requirements. This reduces the risk of secondary incidents. Coordinated with site management is the provision of information to motorists, advising them of possible delays, alternative routes, etc.



TRENDS

- Improved incident detection and response capabilities are saving lives on highways. Trend is towards mayday systems for rural ITS. This may use a combination of cell phone, GPS, telematics and 911.
- One estimate has the cost of congestion related to incidents across the USA pegged at approximately $75 billion for 2005.

PRIORITY OF NEED

- This is a medium priority need. Emergency services already exist and provide acceptable response within the existing context.

This need is most relevant to major roadways in both urban and rural areas.

Need #11

Enhanced ability to detect, verify, and respond to incidents on major roadways.

STAKEHOLDERS:

- Provinces, municipalities
- Emergency services
- Road users

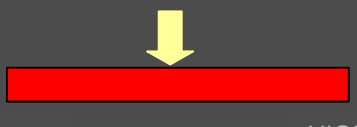
USER SERVICES:

- Incident management
- Emergency Vehicle Management
- Disaster Response and Management

PROSPECTUS:

- Increased emphasis on safety and the staggering cost of incident-related congestion suggest a definite need for enhanced incident detection, response, and management.

PRIORITY OF NEED:



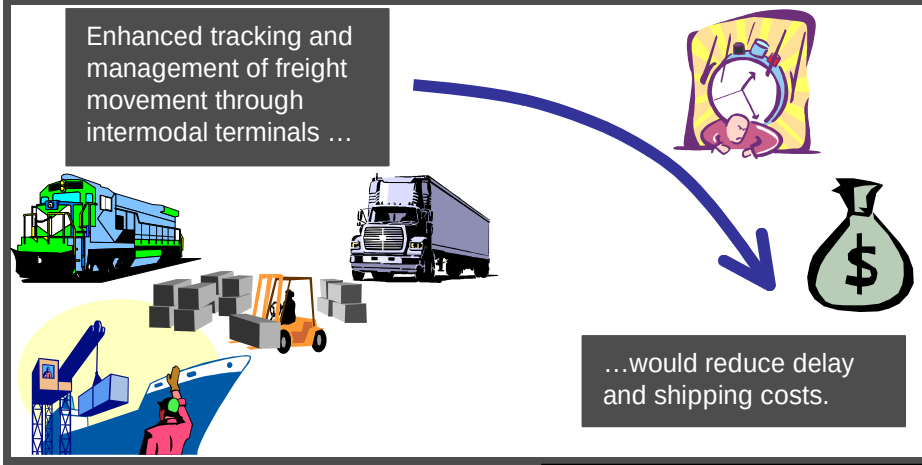
EXISTING NEED

- Enhanced tracking and management of the movement and storage of containers and other forms of cargo within intermodal terminals would facilitate inspection, loading, and shipping. In turn, delay and delivery costs would be reduced.
- To remain competitive among North American Atlantic seaboard facilities and make optimum use of existing physical infrastructure and capacity, the efficiency of handling and administering intermodal cargo movements should be enhanced.

Need #12

Enhanced tracking and real-time management of containers and other goods at intermodal terminals.

Enhanced tracking and management of freight movement through intermodal terminals …



…would reduce delay and shipping costs.

STAKEHOLDERS:

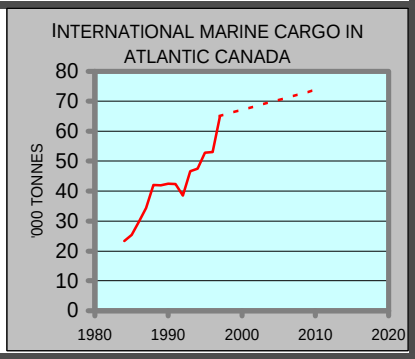
- Canada Customs and Revenue, U.S. Customs
- Provinces, State of Maine
- Carriers and shippers

USER SERVICE:

- Information Warehousing
- Intermodal Freight Management

TRENDS

- International and domestic marine cargo loaded and unloaded in Atlantic Canada are expected to grow at 0.85% and 2.03% per year respectively, an overall average of 1.04%.
- The container component of intermodal cargo handling is expected to grow at 4.0% annually.
- Financial considerations (fees) may result in transfer of operations from smaller to larger ports, increasing demand at these locations.



PROSPECTUS:

- Increased demand for freight movement through intermodal terminals will require more efficient handling to ensure continued competitiveness.

PRIORITY OF NEED

- This is a medium priority need.
- Questions surrounding the ability of New York/New Jersey to be the port of choice for the northeast and Midwest USA in the short-to-medium term suggest that operations at Halifax be enhanced to maintain competitiveness.
- The Port of Halifax is expected to reach capacity by approximately 2002-2003.

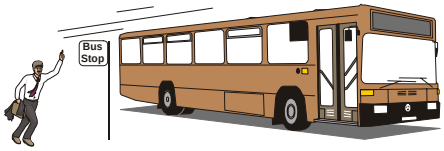
Key intermodal terminals are located at Halifax, Saint John, and Moncton.

PRIORITY OF NEED:

LOW HIGH

EXISTING NEED

- There are trends of decreasing ridership, reduced Provincial incentives for expansion, lack of interagency / system integration and reduced funding.
- Success in public in transit is through:
  - Integration of operations (ie. good connections, coordinated timetables, passenger information, service frequency).
  - Efficient passenger transfers (ie. short walk distances).
- New intelligent technologies are the only means of providing integration.
- Operational transitioning to new technologies is challenging (eg. from tokens and paper tickets to electronic ticketing).
- Various public transport services are operating completely independently and should work towards a seamless service in terms of consistent information, schedules, vehicle and mode transfers, etc.

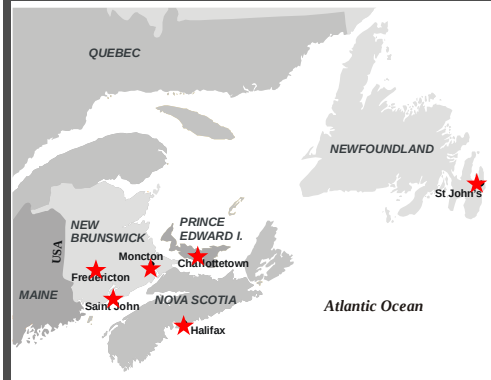


Transit schedules are often not enough

Passengers require accurate information and reliable services

TRENDS

- Transit ridership changes 1999-2000.
  - Fredericton, NB 703,420 → 755,494 +7.4%
  - Halifax, NS 11,998,985 → 12,509,661 +4.3%
  - Saint John, NB 2,494,574 → 2,491,001 -0.1%
  - Saint John's, NF 3,252,865 → 3,176,982 -2.3%
  - Canadian average → +3.4%



PRIORITY OF NEED

- This is a medium priority need. The current transit operations should continue to introduce service improvements to retain or increase ridership.

KEY PUBLIC TRANSIT OPERATIONS

Need #13

Real time transit service monitoring and public information.

Effects of transit service delays, overloads and incidents should be mitigated quickly and passengers notified.

STAKEHOLDERS:

- Transit Patrons
- Transit Agencies
- CUTA

USER SERVICES:

- Traveller Information
- Public Transport Management
- Electronic Payment Services

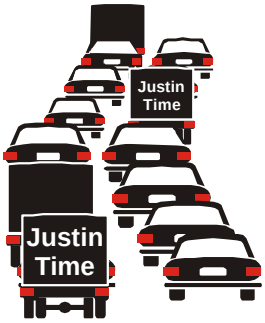
PROSPECTUS:

- The use of new technology in public transit continues to increase attractiveness of transit in urban areas.

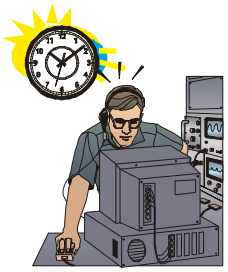
PRIORITY OF NEED:

EXISTING NEED

- Challenges of providing transportation services are increasing due to an ever-changing marketplace
  - Increasing customer demand for convenience and service reliability
  - Increasing competitiveness for similar services in the local, national and international marketplace
  - Delivery timeframes or windows are expanding beyond 8 to 5
  - Understanding where fleet vehicles are and where they've been is critical to manage a transportation service
- There is a precedent for developing these systems, including:
  - AVLS in Halifax for passenger bus fleets
  - ITS fleet messenger systems for trucks



Reliability of service is critical and difficult to achieve



Knowing location of fleet vehicles can trigger decisions

Customers demand satisfactory service

TRENDS

- Fleet management is becoming more focused on the "strategy" of service delivery and optimization of that service and is moving to real time deliveries.
- Transportation companies are creating business plans that apply available technologies to provide quality customer service.
- Technologically astute customer base is demanding a higher level of convenience.
- World marketplace is already advancing in transportation services and Atlantic Canada wants to remain competitive.
- Four out of the top 20 Canadian trucking companies (in term of No. of employees) have headquarters in Atlantic Canada.
- Gross revenue of for-hire truck carriers in the Atlantic Region exceed $1 Billion annually.

PRIORITY OF NEED

- This is a medium priority need. The existing situation may lead to inefficiencies; slow response / delivery times and unreliable services.

FLEET MANAGEMENT IS AN ISSUE THROUGHOUT ATLANTIC CANADA

Need #14
Improve management of fleet transportation services.

Efficiency and viability of freight and transit fleets depend on vehicle tracking, routing, scheduling, dispatch communications and traffic regulations.

STAKEHOLDERS:

- Trucking industry
- Emergency services
- Public Works Department
- Taxi companies

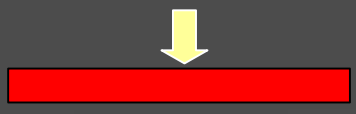
USER SERVICES:

- Public Transport Management
- Commercial Vehicle Electronic Clearance
- Commercial Fleet Management

PROSPECTUS:

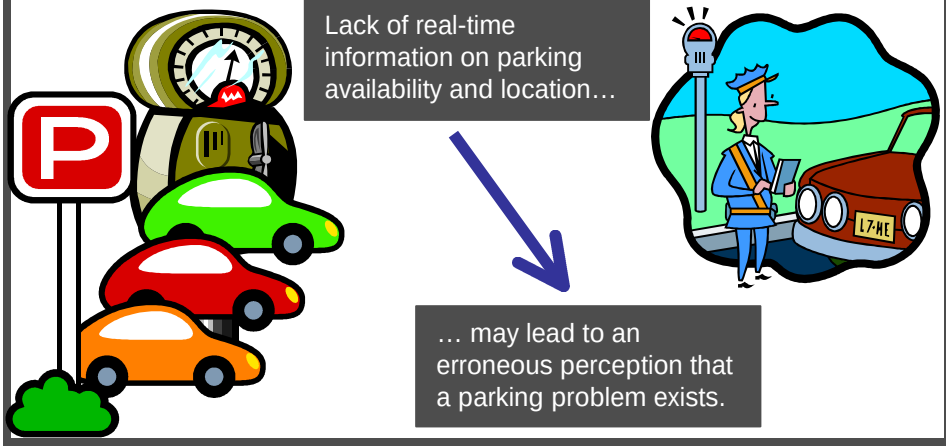
- Transportation services must continue to provide improvement to satisfy customer expectations.

PRIORITY OF NEED:



EXISTING NEED

- Inability to provide information on the availability and location of parking spaces (wayfinding) may prevent full utilization of parking assets. The need for more effective parking management is most relevant to parking in conjunction with major events, and shopping and tourist destinations, where parking demand may be accommodated at a variety of locations. However, this need may also exist with respect to other major generators such as institutions (eg. universities) and transportation terminals (airports, ferry terminals etc.)
- Habitual parking situations, such as employee parking at places of work would not typically exhibit this type of problem.
- Drivers trying to find one of the last 5% of parking spots available may experience frustration and perceive a parking problem despite the fact that not all parking spaces may be occupied. Furthermore, driving around (trolling) in search of a parking space contributes to traffic congestion and excess vehicle emissions.
- Perceived lack of parking may reduce the attractiveness of shopping and tourist destinations.



TRENDS

- Examples of major events include the Vikings events at L'Anse aux Meadows.
- There may only be parking issues with respect to events / festivals, to be considered on a case by case basis.

PRIORITY OF NEED

- This is a low-to-medium priority need as the number of potential applications in the Atlantic Region is limited.
- Specific situations may warrant a higher priority depending upon circumstances.

Relevant to major events, shopping areas, tourist attractions, and other major traffic generators.

Need #15
Real-time management of parking operations.

Inability to locate available parking spots may reduce the attractiveness of the region's retail and tourism trade.

STAKEHOLDERS:

- Municipalities
- Parking operators
- Travelling public

USER SERVICE:

- Traveller Services and Reservations
- Traveller Information
- Electronic Payment Services

PROSPECTUS:

- As urban space becomes increasingly constrained and parking resources must be pooled to accommodate larger demands, efficient management of parking assets assumes greater importance.

PRIORITY OF NEED:

2.2 VISION

It is important to capture the user needs of the region in a common "ITS Vision" which stakeholders can identify with, and work towards. The vision becomes an integral part of the planning process, helping to shape the regional ITS Strategic Plan. The Needs Assessment developed profiles of fifteen "needs" of the Atlantic Provinces. The next challenge was to translate these various "needs" into a vision.

A "vision" can consist of one short statement or paragraph. Conversely, it can be a more extensive document, providing **goals**, objectives, and a series of "views" from different perspectives. This section begins with "a vision for the future". It leads to a summary of typical ITS goals, followed by a series of "views":

- The **"User Views"** present "a day in the life" in the Atlantic Provinces, demonstrating how the users will benefit from the functions of the different surface transportation services;
- The **"Business View"** approaches the ITS strategy from the perspective of the different roles of the stakeholders;
- The **"Procurement View"** suggests the potential contracting, partnering and funding options for deploying ITS; and
- Finally, the **"Process View"** describes how the plan can evolve and change as new technologies, User Services and systems are developed.

2.2.1 A Vision for the Future

Over the coming twenty years, technology performs a key role in improving the performance of transportation systems in the Atlantic Region. People and goods move seamlessly throughout the region. Information technology is a driving force behind how people get to work, do business, and sell and transport goods. The role of the public transportation right-of-way has expanded to include a telecommunications backbone making "e-solutions" for mobility and commerce possible in Atlantic Provinces.

Commerce will thrive in Atlantic Provinces. Commercial vehicles will be able to pay tolls and tariffs electronically at all New Brunswick - Maine border crossings. Similarly, all vehicles will be able to pay tolls electronically. The same technology will be available to pay parking fees and pay for access to recreational areas. Private sector retailers will choose to take advantage of the technology to accept payment at drive-through facilities. Electronic payment will also be a boon to public transit travel. "Smart cards" can be used to move seamlessly from one transit system to another.

All across the Atlantic Provinces, road and weather information systems will collect real-time data on road and weather conditions. The information will be made available to travellers through advance warning systems, and traveller information systems. It will also be used by road maintenance crews to efficiently maintain the road conditions at a safe level.

Despite the widespread deployment of safety systems, incidents will still occur, but in far fewer numbers. When an incident does occur, emergency services will automatically be contacted regarding the location of the incident. Emergency vehicle drivers will be able to select the fastest route to the incident site, based upon real-time travel information, and dynamic route guidance in the vehicle. If the incident involves a spillage of hazardous material, a message will be sent electronically to emergency management centres providing details on the type of material. The traffic management systems will implement special plans to clear the route of traffic.

To improve public safety, public agencies will have opened the traffic management systems and the public right-of-way for the installation of electronic enforcement systems, with the main emphasis on reducing incidents. If, for example, the system detects that a red light violation is about to occur, the traffic signal timings are instantly adjusted to avoid a collision.

Drivers of passenger vehicles can travel their route confident that the large commercial vehicles in their midst are driving safely. The commercial vehicles have the same vehicle and driver monitoring systems. In addition, electronic roadside inspection points check the condition of all commercial vehicles on major road facilities. They perform weigh-in-motion, and receive an electronic report from the commercial vehicle's operating system on the status of key systems.

A greater emphasis is placed on safety and security, and systems that enhance vehicle safety and traveller security. Vehicle safety systems are used to sense all potential dangers. If a vehicle system is on the verge of failure, the driver is warned immediately. Tools are provided to assist drivers in navigating their route. Further, if the driver has placed the vehicle in a potentially dangerous situation, the vehicle safety systems recognize the danger and take the necessary corrective action in a fast and efficient manner. The transit vehicles will be equipped with vehicle and driver monitoring systems. In addition, transit passengers have their own personal safety devices if they feel threatened as pedestrians, or while using the transit systems.

Time spent travelling between places of business will no longer be considered to be wasted time. To begin with, personalized traveller information services will provide information on the best route, and the estimated travel time. These services will be possible through the complete availability of traffic data. Travellers will be able to communicate with their places of business, make hotel reservations, and receive personalized news reports. For example, travellers will have advance information regarding routes, schedules, space availability, and reservations for the ferry services.

Tourists will be able to access information on the transportation network, and advertisements for tourist attractions.

ITS will provide enhanced tracking and real-time management of containers and other goods at intermodal terminals. This will increase the security and efficiency of the intermodal terminals in Halifax, Saint John, and Moncton.

The public transit systems will be managed using sophisticated vehicle monitoring systems. They will be connected to the traffic management centres to aid to the prediction of travel times. They will be connected to adjacent transit systems to maintain efficient route connections. Transit riders will be able to determine precisely when the next transit vehicle will arrive through kiosks or portable devices. The improved service helps promote public transit as a viable alternative for commuters and recreational travellers. These types of services will be available in most of the large and mid-sized municipalities in Atlantic Provinces.

Parking management systems provide real-time information to travellers relating to the location of parking lots, and the availability of parking spaces. This is particularly important during the staging of special events.

Providing "intelligent" solutions to transportation problems allows for an investment in the economies of the Atlantic Provinces. The opportunity, provided by the public sector, to access traffic data and the public right-of-way and implement systems creates an environment for the private sector to thrive. Atlantic Provinces-based transportation equipment suppliers will provide the infrastructure for developing Atlantic Provinces systems. Information technology and systems developed in Atlantic Provinces' high technology centres will be adopted by the transportation industry. The exposure gained from successful projects in Atlantic Provinces will help them export their technology to other provinces, and other parts of the world.

The implementation of these sophisticated systems is possible because transportation professionals in the Atlantic Provinces participated in extensive ITS training programs to learn about the technology, implementation strategies, and experience gained in other jurisdictions.

2.2.2 ITS Goals

In order to translate the vision into a strategy, it was important to establish goals, and ultimately, clearly defined objectives. Traditional ITS goals applicable to the Atlantic Region include:

1. Improve safety for the traveling public and commercial vehicles.

2. Minimize delays and congestion in the transportation network to reduce delay costs and boost economic activity and development.

3. Manage travel demand in order to use the transportation network more effectively.

4. Provide fast and coordinated responses to incidents and other emergencies.

5. Improve data collection, management, and sharing to provide users with relevant timely information, and help agencies better manage their operations and infrastructure.

6. Improve interagency coordination and cooperation in order to develop solutions that cross geographic and institutional boundaries.

7. Improve the economic prosperity of a region.

These goals are, in some cases, inter-related and will be achieved through a combination of resources. First, there are the four cornerstones that create a composite of transportation in ITS, namely the travellers, vehicles, wayside and centres. These ITS cornerstones are further described below in Section 2.2.3. Then there are the different roles of participants. The strategies will be implemented through different methods and different processes. The remaining sections provide a series of "views" from each of these perspectives.

2.2.3 Users Views

ITS is an industry that works with both the motor vehicle and the road network. The evolution of the motor vehicle has always been a function of the private sector while the public sector has always been charged with the development of the transportation network, to support the motor vehicle and other modes of transportation. Today, public agencies are predominantly in an "operate, maintain and enhance" role as the rate of transportation network expansion has declined. In many cases, expansion of the road network is being left to the private sector.

We are entering a new phase in the evolution of the vehicle, as we enter the era of the "intelligent" vehicle. The demands resulting from development of the intelligent vehicle create the need for the road right-of-way and the road network to respond through the implementation of ITS.

The broad vision for ITS development in Atlantic Provinces incorporates both the public and private sector roles in ITS as applied to the four cornerstones that create a composite of transportation: travellers, vehicles, wayside and centres. The communications backbone is used to link these components. The ITS cornerstones and the communications backbone form the "physical architecture" to which the ITS vision is applied.

Travellers: "Travellers" include commuters, commercial vehicle operators and tourists. They have an interest in personal mobility, safety, and comfort.

Vehicles: Unless they are on foot, travellers move from location to location using some form of vehicle. "Vehicles" include bicycles, motorcycles, automobiles, trucks, buses, trains, streetcars, and ferries. These types of vehicles serve as private vehicles, public transit vehicles, commercial vehicles, maintenance vehicles, and emergency vehicles.

Wayside: The travellers move on foot or in vehicles from location to location along public rights-of-way. These public rights-of-way consist of roads, rail lines, sidewalks, structures, and traffic control and monitoring devices. Traffic control and monitoring devices are installed and operated in the "wayside".

Centres: Centres play a key role in collecting and disseminating information between travellers, vehicles and the wayside to deliver "intelligent transportation systems". This information is collected and disseminated through a variety of communication devices.

2.2.4 Business View

In developing the ITS strategy, it was important to establish the roles of the stakeholders in the Atlantic Region. These roles are distinctly different, and the role of the stakeholder is dependent on the specific strategy or project. There are four "profiles" to describe the alternative roles. The four "profiles" are:

- Observer;
- Facilitator;
- Participant; and
- Manager.

These alternative roles are described in the following sections:

Observer

In this role, the stakeholder serves solely in a "monitoring" function. ITS progress is dictated by the objectives of the other private sector and/or other public sector agencies.

Facilitator

In this case, ITS progress is led by other private and other public sector objectives. However, the stakeholder has control over some type of "barrier" to the implementation, and has the power to assist in removing the barrier. The private sector or public sector agencies identify barriers to be addressed and the stakeholder responds. The barriers would include: access to data, access to property, access to financial resources, and policies and regulations.

Participant

In this case, the other private sector or other public sector agencies identify their objectives. Where it impacts on the stakeholder's mandate, the stakeholder serves as a facilitator. However, in this scenario, the stakeholder also actively participates in the project, since it provides a significant benefit to the stakeholder.

Manager

Under this scenario, the stakeholder's mandate is directly affected by ITS progress. In this case, the stakeholder identifies all the objectives, and chooses the projects, partners, and funding mechanisms.

It should be noted that the four roles are not mutually exclusive, and that the progression from Observer through to Manager reflects an expanding role.

2.2.5 Procurement View

The first step in the procurement view was to establish who will be the primary and secondary beneficiaries of an ITS application. Exhibit 2.3 provides a perspective. It is logical to assume that the agency absorbing the "costs" would be responsible for procuring the application.

Exhibit 2.3 – ITS Applications – Typical Beneficiaries

ITS Application	Beneficiary		Costs
	Primary	Secondary	
Advance Traffic Management Systems	Public Individuals Private Sector Agencies	Public Sector Agencies	Public Sector Agencies
Advanced Traveller Information System	Public Individuals Private Sector Agencies		Public Individuals Private Sector Agencies
Electronic Toll Collection	Private Sector Agencies Public Individuals	Public Sector Agencies	Private Sector Agencies Public Individuals
Commercial Vehicle Operations	Private Sector Agencies	Public Individuals Public Sector Agencies	Private Sector Agencies
Advanced Public Transport Services	Public Individuals Public Sector Agencies		Public Sector Agencies

There are a variety of procurement strategies to be assessed. They include public agency procurement, public-private partnership, and public-public partnership. Exhibit 2.4 includes examples of the different procurement processes for applications at the national, regional, and local levels.

Exhibit 2.4 – Examples of Procurement Processes

Type of Partnership	National	Regional	Local
Public-Private Partnership	E-Commerce in the Canadian Trucking Industry	RWIS for Snow Plows in Southern Ontario	EDIport
Public-Public Partnership	Canadian Multi-Application Smartcard Initiative Canadian National ITS Architecture	Centre-to-Centre ITS for Toronto ITS Strategic Plan for Atlantic Canada	AVL for Transit Vehicles, St. John's

2.2.6 Process View

The vision sets the stage for the strategy development. Goals will be set, and a series of specific objectives will be identified. The Strategic Plan will then progress to develop strategies and specific projects. Roles will be defined for the stakeholders, and an implementation plan will be developed and executed.

Notwithstanding, a strategic plan cannot be a static document. Many of the strategies and projects will take years to execute. In the meantime, new User Services will be identified, and new technologies will be developed. The plan will need to evolve and change to reflect these developments.

The cornerstone of the Strategic Plan is a straightforward process that flows logically from goals and objectives, through the identification of strategies and roles, and then to implementation plans. If the Strategic Plan process is easy to follow, then it will be easy to incorporate a new User Service, or a new technology, into the plan. Conversely, a user will be able to determine that a new development does not fall within the ITS Strategic Plan.

When a new technology or potential User Service is identified, it will first be assessed to determine if it contributes to the ITS goals. The next step will be to determine if it can directly contribute to meeting a specific objective. If the new development "passes" these tests, then it can be integrated into the Strategic Plan.

2.3 USER SERVICE ASSESSMENT

With the transportation needs that characterize Atlantic Canada identified and an "ITS Vision" developed to help shape the Strategic Plan, the next step was to map the user needs to the User Services that can best service Atlantic Canada. The starting point for this process was the master list of ITS User Services. These services were reviewed and discussed with the stakeholder community in the Atlantic Region in order to develop a shortlist of the most applicable User Services. In doing so, stakeholders considered whether a given User Service addresses their needs. Stakeholders and the project team considered what functions are characteristic of a given need, and in turn how a given User Service improves upon that functionality.

The following sections provide an overview of the User Service "toolbox", the identification of the high priority User Services, with those User Services mapped to the needs identified in Section 2.1. Each User Service has been subjected to a detailed analysis to assess the ability to meet the stated needs and the practicality for implementation. As part of this exercise, some candidate "early winner" projects have been identified in association with some of the User Services.

2.3.1 User Service 'Tools'

It is useful to compare the selection of ITS applications to the process of selecting 'tools' from a 'toolbox'. The 'toolbox' can be taken to be the *Canadian Architecture for Intelligent Transportation Systems*. The 'tools' are the User Services and User Sub-Services that are identified to define the Architecture. These tools can be used independently or in combination to address the transportation needs of Atlantic Canada.

The User Services of the Canadian ITS Architecture are organized into 8 User Service bundles. Within these bundles, there are 35 User Services and 90 User Sub-Services included in the toolbox. A complete definition of each User Service and associated sub-services is available on the Architecture CD, or at www.its-sti.gc.ca.

2.3.2 Identification of Higher Priority User Services

In consideration of the input from the Needs Assessment, the ITS Vision, and the four User Service focus groups, the following User Services were identified as having the higher priority within the Atlantic Region:

1.1	Traveller Information
1.4	Traveller Services and Reservation
2.1	Traffic Control
2.2	Incident Management
2.4	Environmental Conditions Monitoring
2.5	Operations and Maintenance
2.6	Automated Warning and Enforcement
3.1	Public Transport Management

4.1	Toll Roads, Parking and Transit
5.1	Commercial Vehicle Electronic Clearance
5.5	Intermodal Freight Management
5.6	Commercial Fleet Management
6.1	Emergency Notification and Personal Safety
6.3	Disaster Response Management
6.4	Emergency Vehicle Management
8.1	Weather and Environmental Data Management.

Definitions for the 16 User Services are presented in Appendix R and focus on key themes most relevant to the Atlantic Region, namely goods movement, rural incident response, road weather information, and seamless accessible surface transportation for travellers on a region-wide scale. It is important to recognize that within these User Services there may be some sub-services that are not as relevant as others, and this will be assessed under Section 4.3 of the project. Similarly, this listing is not intended to be exclusive, and sub-services from other User Service areas could emerge as being relevant over time. While any of these User Services can exist independently, there are several logical synergies among the shortlist. For example, Environmental Conditions Monitoring directly relates to Weather and Environmental Data Management, which in turn supports a range of other services such as Traveller Information, and Commercial Fleet Management.

2.3.3 Mapping the User Services to Needs

The following summary table (Exhibit 2.5) maps the identified needs against the User Services and sub-services. Essentially, the table is a visual summary indicating the User Services that have the potential to address the identified needs and would be most useful as elements of an ITS strategy.

Exhibit 2.5 – Mapping User Services to Needs

IDENTIFIED NEED ➔ RELEVANT USER SERVICES AND SUB-SERVICES ⬇	1 Expedited border crossing inspection and clearance for commercial vehicles	2 Reduce rural road collisions through early detection of adverse conditions	3 Reduce the incidence, severity, and cost to the community of road collisions.	4 Improved safety at work zones on roadways (smart work zones).	5 Improved effectiveness and efficiency of roadway winter maintenance operations.	6 Expedited weight, credential, and safety checks for commercial vehicles.	7 Road emergency notification and information system for rural areas.	8 Improved ferry services.	9 Provide travel incentives and traveller information to promote tourism.	10 Enhanced safety and security for travellers and for transportation operators and facilities.	11 Enhanced ability to detect, verify, and respond to incidents on major roadways.	12 Enhanced tracking and real-time mgmt of containers & other goods at intermodal terminals.	13 Real-time transit service monitoring and public information.	14 Improved management of fleet transportation services.	15 Real-time management of parking operations.
1.1 TRAVELLER INFORMATION															
1.1.1 Broadcast Traveller Information	✓	✓	✓	✓				✓	✓				✓		✓
1.1.2 Interactive Traveller Information	✓	✓						✓	✓				✓		
1.4 TRAVELLER SERVICES AND RESERVATIONS															
1.4.2 Services Purchases and Reservations	✓							✓	✓						
1.4.4 Regional Parking Management									✓	✓					✓
2.1 TRAFFIC CONTROL															
2.1.1 Network Flow Monitoring			✓	✓				✓							
2.1.2 Surface Street Control	✓	✓	✓				✓	✓							
2.1.5 Traffic Information Dissemination			✓							✓	✓				
2.2 INCIDENT MANAGEMENT															
2.2.1 Incident Management Coordination		✓	✓	✓							✓				
2.4 ENVIRONMENTAL CONDITIONS MANAGEMENT															
2.4.1 Roadway Environmental Sensing		✓	✓		✓										
2.4.3 Road Weather Information System		✓			✓										
2.4.4 Vehicle-based Sensing					✓										
2.5 OPERATIONS AND MAINTENANCE															
2.5.1 Infrastructure Maintenance Management		✓			✓										
2.5.2 Smart Work Zones		✓	✓	✓						✓					
2.6 AUTOMATED DYNAMIC WARNING AND ENFORCEMENT															
2.6.1 Dynamic Roadway Warning		✓	✓	✓						✓					

Exhibit 2.5 – Mapping User Services to Needs

IDENTIFIED NEED ➔ / RELEVANT USER SERVICES AND SUB-SERVICES ⬇	1 Expedited border crossing inspection and clearance for commercial vehicles	2 Reduce rural road collisions through early detection of adverse conditions	3 Reduce the incidence, severity, and cost to the community of road collisions.	4 Improved safety at work zones on roadways (smart work zones).	5 Improved effectiveness and efficiency of roadway winter maintenance operations.	6 Expedited weight, credential, and safety checks for commercial vehicles.	7 Road emergency notification and information system for rural areas.	8 Improved ferry services.	9 Provide travel incentives and traveller information to promote tourism.	10 Enhanced safety and security for travellers and for transportation operators and facilities.	11 Enhanced ability to detect, verify, and respond to incidents on major roadways.	12 Enhanced tracking and real-time mgmt of containers & other goods at intermodal terminals.	13 Real-time transit service monitoring and public information.	14 Improved management of fleet transportation services.	15 Real-time management of parking operations.
3.1 PUBLIC TRANSPORT MANAGEMENT															
3.1.1 Transit Vehicle Tracking										✓			✓	✓	
3.1.2 Transit Fixed-route Operations													✓	✓	
3.1.3 Passenger and Fare Management													✓	✓	
4.1 ELECTRONIC PAYMENT SERVICES															
4.1.1 Electronic Toll Collection								✓						✓	
4.1.2 Electronic Parking Payment								✓							✓
4.1.3 Transit Services Payment													✓		
4.1.4 Traveller Services Payment								✓	✓						
5.1 COMMERCIAL VEHICLE ELECTRONIC CLEARANCE															
5.1.1 Electronic Clearance	✓					✓		✓				✓		✓	
5.1.2 International Border Crossing Clearance	✓					✓						✓		✓	
5.1.3 Weigh-in-Motion (WIM)	✓					✓						✓		✓	
5.5 INTERMODAL FREIGHT MANAGEMENT															
5.5.1 Freight In-Transit Monitoring						✓						✓		✓	
5.5.2 Intermodal Interface Management						✓						✓		✓	
5.6 COMMERCIAL FLEET MANAGEMENT															
5.6.1 Fleet Administration	✓												✓	✓	
5.6.2 Freight Administration	✓												✓	✓	
6.1 EMERGENCY NOTIFICATION AND PERSONAL SECURITY															
6.1.1 Personal Security		✓					✓			✓	✓				
6.1.2 MAYDAY Support			✓				✓			✓	✓				

Exhibit 2.5 – Mapping User Services to Needs

IDENTIFIED NEED ➔ / RELEVANT USER SERVICES AND SUB-SERVICES ⬇	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Expedited border crossing inspection and clearance for commercial vehicles	Reduce rural road collisions through early detection of adverse conditions	Reduce the incidence, severity, and cost to the community of road collisions.	Improved safety at work zones on roadways (smart work zones).	Improved effectiveness and efficiency of roadway winter maintenance operations.	Expedited weight, credential, and safety checks for commercial vehicles.	Road emergency notification and information system for rural areas.	Improved ferry services.	Provide travel incentives and traveller information to promote tourism.	Enhanced safety and security for travellers and for transportation operators and facilities.	Enhanced ability to detect, verify, and respond to incidents on major roadways.	Enhanced tracking and real-time mgmt of containers & other goods at intermodal terminals.	Real-time transit service monitoring and public information.	Improved management of fleet transportation services.	Real-time management of parking operations.
6.3 DISASTER RESPONSE AND MANAGEMENT															
6.3.1 Disaster Command and Control		✓	✓				✓			✓	✓				
6.3.2 Disaster Information Dissemination		✓	✓				✓			✓	✓				
6.4 EMERGENCY VEHICLE MANAGEMENT															
6.4.1 Emergency Response Management		✓	✓				✓			✓	✓				
6.4.2 Emergency Vehicle Routing			✓				✓			✓	✓				
8.1 WEATHER AND ENVIRONMENTAL DATA MANAGEMENT															
8.1.1 Roadway and Weather Data Fusion	✓	✓	✓		✓										
8.1.2 Environmental Information Dissemination		✓	✓		✓										

2.3.4 User Service Analysis

Each candidate User Service has been analyzed against a set of criteria in consultation with the stakeholder community. The User Service analysis criteria are an aggregation and elaboration of those established in previous ITS Strategic Planning studies in Canada and abroad. A brief description of these criteria is provided as follows:

- **Ability to Address Need** – Does a widely recognized need currently exist and can the facilities/services included in the User Service be deployed to address these priorities?

- **Compatibility with Vision** – Does the User Service correspond with the fundamentals of the Atlantic Provinces ITS Vision as outlined in Section 3.0?

- **Potential Benefit** – Which of the User Services will be of the most benefit in terms of magnitude, payback period, and potential beneficiaries?

- **Practicality** – Can the User Service be ready in the time and are potential users and beneficiaries positioned to make use of the service?

- **Availability of Champion(s)** – Are there individuals, groups or agencies willing to spearhead the planning/implementation to move the initiative along?

- **Risk Management** – Are there risks involved and can they be overcome and managed in the implementation time frame?

- **Capability of Integration** – Can the ITS service be easily integrated into mainstream transportation and management activities within the Atlantic Provinces? Can the User Service be integrated across modes, jurisdictions and geographic areas?

A set of "User Service Assessment" summaries is included in Appendix D for the higher priority/ more relevant User Services. A review of the User Service assessments yields the following observations:

- Most of the User Services are characterized by a high degree of compatibility with the vision and the stated needs, stemming from a readily identifiable and proven set of benefits.

- Most of the User Services under consideration employ proven applications and hence can be considered practical for implementation in the Atlantic Region. However, some User Services, such as Automated Warning and Enforcement are characterized by significant implementation hurdles to overcome, such as legislative changes, and are considered less practical for near term implementation.

- Many of the User Services, such as Traveller Services and Reservations, involve a broad range of stakeholders on a region-wide scale. This presents challenges in terms of identifying appropriate champions to secure funding and lead a deployment and operations effort.

- Virtually all of the User Services under consideration offer some level of capability to integrate and exchange information with other companion User Services. In many cases, enabling standards to support this integration exist or are under development.

2.3.5 Early Winners

One means of examining the merits of a given User Service is to assess the validity of an early winner, or pilot project undertaking. Such undertakings can serve as a microcosm of a broader deployment, and test the abilities to bring together project partners in resolving barriers to implementation, and demonstrate the effectiveness of the application. The User Service focus groups held in each Atlantic Province included an activity where participants were invited to develop strategies, focusing on "early winner" projects that could be implemented fairly quickly and easily, and promote ITS implementation.

The following is a summary of the criteria for which the participants were asked to address for each early winner project:

- **Meets perceived need** – The project meets a perceived need and addresses a higher priority issue;

- **Consensus support** – The initiative has received a level of consensus among stakeholders that it is a worthwhile project to pursue;
- **Minimal technological barriers** – Has a low risk of being held-up or defeated by a technological barrier;
- **Minimal institutional barriers** – Has a low risk of being held-up or defeated by a institutional barrier;
- **Business case** – Can be implemented at a reasonable cost and provide obvious and real benefits to a large stakeholder group;
- **Attracts champions** – Will catch the attention of potential champions among legislators, business leaders, the public and the media; and
- **Contributes to ITS profile/Vital to mainline strategy** – Showcases ITS as a viable component of the mainline transportation strategy.

Exhibit 2.6 is a summary of the potential early winner projects identified by the participants. Appendix E includes summary sheets, which assess each candidate project against the stated criteria.

The identified early winner projects provide a solid starting point for implementation planning, and these projects are carried forward for further analysis under subsequent steps of the project. The candidate early winner projects represent interests expressed by the stakeholders at the user needs focus groups and reflect the various needs for each area.

Exhibit 2.6 – Candidate "Early Winner" Projects

Project Name	Province
Incident Management	New Brunswick
Electronic Payment	New Brunswick
Commercial Vehicle Administrative Process	New Brunswick
Province-wide Weigh-In-Motion Program	Newfoundland and Labrador
Interactive Traveller Information	Newfoundland and Labrador
Red Light Camera Pilot Project	Newfoundland and Labrador
Implementation of Transportation Smart Card	Newfoundland and Labrador
Signal Pre-Emption for Priority Areas	Newfoundland and Labrador
Traffic Responsive Signal System	Newfoundland and Labrador
En-Route Transit Information	Nova Scotia
Public Travel Security	Nova Scotia
Transit Traffic Light Pre-Emption/Priority	Nova Scotia
Consolidation of "Just-in-time" Information Gathering and Dissemination for all Modes of Transportation	Nova Scotia
Initiate Intermodal Network	Nova Scotia
Electronic Payment	Nova Scotia
Centralized Traveller Information System	Nova Scotia
Public Transport Services – Optimize Fleet GPS	Prince Edward Island

Exhibit 2.6 – Candidate "Early Winner" Projects (cont'd)	
Project Name	**Province**
Incident Management	Prince Edward Island
Environmental Conditions Monitoring	Prince Edward Island
Adaptive Traffic Signal System	Prince Edward Island
Emergency Vehicle Management	Prince Edward Island
Electronic Payment Services	Prince Edward Island
Demand Responsive Transit	Prince Edward Island
Traveller Information System	Prince Edward Island

2.4 PERFORMANCE CRITERIA

Performance evaluation is an integral component of the deployment of ITS initiatives. The foundation of any performance evaluation is the development of a useful and practical set of performance criteria. These criteria are to be used in the selection process to estimate the extent to which candidate User Services will meet the identified needs and subsequently in the evaluation of the effectiveness of the implemented initiatives.

The performance criteria included both qualitative and quantitative measures, which are generally obtainable and provide an overall measure of success:

- **Transportation Efficiency** – performance measures reflecting a reduction in travel/delivery times, improved reliability of travel time scheduling, a reduction in vehicle delays and the consequential reduction in vehicle emissions;

- **Safety** – A measure of the frequency/severity of collisions and the associated response times should a collision or incident occur;

- **User Satisfaction** – A determination of "customer satisfaction", where the road users are the customers in the system;

- **Reduction in Public Fund Expenditures** – A criteria to determine if the overall benefit of the initiative outweighs the costs of implementation, for the public sector(s); and/or

- **Economic Development** – A measure of the financial effect on the tourism industry.

Exhibit 2.7 includes a summary of the performance criteria for each of the User Services and associated needs. It was intended that the identified performance criteria relevant to a given User Service be carried forward and used to rationalize and assess any given project activities associated with that User Service. Section 5.3.2 presents a more detailed analysis of performance criteria and includes a list of the criteria selected for the recommended deployment projects.

Exhibit 2.7 – Broad Level Performance Criteria For Planning Assessment

USER SERVICES↓	PERFORMANCE CRITERIA→ / REFERENCE TO RELATED NEEDS↓	Reduction in Delay	Reduction in Fuel Used	Reduction in Pollutant Emissions	Increase in Schedule Reliability	Reduction in Collisions	Reduction in Response Time	Reduction in Duration of Incident	Level of User Acceptance/Satisfaction	Increase in Tourism-Related Revenue	Reduction in Public Cost	Improvement in Quality of Life
1.1 TRAVELLER INFORMATION	1, 2, 3, 4, 8, 9, 13, 15	●	●	●	●	●			●		●	●
1.4 TRAVELLER SERVICES AND RESERVATIONS	1, 8, 9, 10, 15								●	●		●
2.1 TRAFFIC CONTROL	1, 2, 3, 4, 7, 8, 10, 11	●	●	●		●	●				●	●
2.2 INCIDENT MANAGEMENT	2, 3, 4, 11	●	●	●		●	●	●			●	●
2.4 ENVIRONMENTAL CONDITIONS MANAGEMENT	2, 3, 5	●	●	●	●	●	●				●	●
2.5 OPERATIONS AND MAINTENANCE	2, 3, 4, 5, 10				●	●					●	●
2.6 AUTOMATED DYNAMIC WARNING AND ENFORCEMENT	2, 3, 4, 10					●					●	●
3.1 PUBLIC TRANSPORT MANAGEMENT	10, 13, 14				●				●		●	●
4.1 ELECTRONIC PAYMENT SERVICES	8, 9, 13, 14, 15	●	●	●	●				●	●	●	●
5.1 COMMERCIAL VEHICLE ELECTRONIC CLEARANCE	1, 6, 8, 12, 14	●	●	●	●	●					●	●
5.5 INTERMODAL FREIGHT MANAGEMENT	6, 12, 14	●	●	●	●						●	●
5.6 COMMERCIAL FLEET MANAGEMENT	1, 13, 14	●	●	●	●						●	●
6.1 EMERGENCY NOTIFICATION AND PERSONAL SECURITY	2, 3, 7, 10, 11						●				●	●
6.3 DISASTER RESPONSE AND MANAGEMENT	2, 3, 7, 10, 11						●				●	●
6.4 EMERGENCY VEHICLE MANAGEMENT	2, 3, 7, 10, 11						●				●	●
8.1 WEATHER AND ENVIRONMENTAL DATA MANAGEMENT	1, 2, 3, 5	●	●	●	●	●	●				●	●

3. OPPORTUNITIES ANALYSIS

The Opportunities Analysis is intended to provide the basis for further ITS planning and design initiatives in Atlantic Canada and is also intended to guide investment decisions on ITS activities. Analysis included the development of an Operations Plan to identify ITS deployment, operations, and maintenance, and an identification of stakeholder roles to successfully apply the plan.

The types of opportunities that were deemed most applicable in the Atlantic Region, and that warrant development and sponsorship include:

- Improving the accessibility and efficiency of transportation through better integration of services and traveller information, and driver aids that include remote driver assistance using wireless communications;
- Making more efficient use of existing transportation infrastructure through providing timely incident management, congestion management and navigational aids;
- Reducing time and travel costs for individuals but more importantly, vehicle fleets, can make a difference in productivity; and
- Reducing the number and severity of vehicle collisions through in-vehicle and wayside means. Emergency services will also be made aware of incidents earlier which will reduce delays in getting help.

3.1 OPPORTUNITIES ANALYSIS WORKSHOP

On January 31, 2002 a full day workshop was held in Moncton to include all interested stakeholders. The workshop was attended by 65 people, including representation from the project team and a strong cross-section of stakeholder groups, drawing primarily from the focus group attendees. The session included:

- An overview of the study efforts to date including the results from the focus groups;
- Breakout groups to provide a detailed assessment of the attributes and barriers associated with the higher priority User Services;
- Presentations on past Atlantic ITS projects, and the Transport Canada ITS program;
- Breakout sessions to perform a detailed assessment of candidate early winner projects in each of the key User Service areas; and
- Presentation of the results by the workshop participants.

Appendix F includes a listing of participants, the workshop agenda and a summary report of the event.

3.1.1 Operations Plan

Each of the candidate User Services was subjected to a detailed evaluation in terms of:

- Key beneficiaries;
- Delivery participants;
- Availability of technologies;
- Operations and maintenance considerations; and
- Potential barriers.

The intent of the exercise was to involve the stakeholders in identifying the logical roles for relevant stakeholders in taking ownership in resolving implementation barriers for any given User Service area.

3.1.2 Early Winner Assessment

Participants were asked to perform a detailed analysis of candidate early winner projects in order to force the discussion of roles and responsibilities at a project-specific level. Each project was characterized in terms of the lifecycle development from concept through to implementation and management. The specific candidate projects are listed in the Appendix E summary memo.

The results from the opportunities analysis workshop are presented in the following sections, and provided input to the definition of the ITS program.

3.2 OPERATIONS PLAN AND INSTITUTIONAL ANALYSIS

The ITS Operations Plan and an Institutional Analysis for the Atlantic Region are both closely related and have a bearing on the opportunities to identify projects and associated delivery approaches.

The Operations Plan is a component of the Regional ITS Strategic Plan and incorporates the higher priority User Services that have been identified through the earlier processes of this study.

The ultimate goal of developing the Operations Plan was to identify individual projects that are anticipated to have the best chances for success in the region, based on a number of significant attributes. The Plan deals with aspects relating to the actual means of initiating projects (including an identification of financial means and proponent roles in the delivery), staging of delivery, and ongoing operations and maintenance of system components. It is through the review and analysis of these attributes that decisions are made with regard to the priority of implementing the User Services.

To provide an analytic approach in assessing the User Services and the potential projects that may emerge from them, a compilation of factors or criteria defined as Strategic Plan attributes were considered. These attributes highlight the most pertinent aspects of the User Services as they might be applied in Atlantic Canada, and are defined in the subsequent sections.

3.2.1 Strategic Plan Attributes

There are four pertinent aspects or attributes of the Strategic Plan that must be analyzed in order to make decisions regarding the initiation of projects and the stakeholders that should be involved in the implementation. The critical Strategic Plan attributes are:

- Key Beneficiaries;
- Delivery Participants;
- Availability of Technologies; and
- Operations and Maintenance Considerations of Services Provided.

The institutional analysis attributes are included under:

- Known Barriers to Implementation by Delivery Participants.

The following sub-sections describe the attributes in detail as they have been considered in the Opportunities Analysis.

Key Beneficiaries

There are several ways to categorize key beneficiaries. The approach selected for use in this application includes all potential beneficiaries of ITS implementation in eight categories. The first five, covering the stakeholder categories identified in Section 1.2, are:

- Owners/Operators/Regulators;
- Suppliers;
- Customers and Service Providers;
- Researchers; and
- Special Interest Groups.

The following additional definitions were added to supplement the above:

- **Travellers** – Perhaps the most important beneficiaries are travellers. These individuals look to roads agencies and service providers for up-to-date information regarding the availability and schedule of those transportation facilities and services that they are either intending to use shortly or immediately. This group requires access to information in a readily available format, in the vehicle, in the home or business. In addition, in cases where travellers require response, they rely on those same agencies and operators for quick and efficient response to reduce the extent of any emergency situation.

- **Enforcement Authorities –** The ability of enforcement authorities to provide security and safety in the context of transportation facilities is enhanced with ITS. Whether their jurisdiction involves Traffic Act infractions, import/export regulations, immigration/emigration policy adherence or ferry restrictions, ITS can provide them with an improved means of providing inspections, monitoring and surveillance in an efficient manner.

- **Emergency Service Providers –** In the event of emergencies, whether they are road-related or not, emergency providers rely on roads to access the site of the emergency. In the event of a non-road related emergency, emergency service providers can use electronic real time information to identify the most appropriate route to the emergency, based on congestion reporting or other road conditions reports. For road related emergencies, ITS can offer surveillance opportunities to assist emergency staff to assess the situation prior to responding.

Delivery Participants

ITS services are traditionally implemented by major public and private organizations. For the purposes of this application, the following participant groups were identified for consideration:

- **Federal Government –** The Federal Government has a role through financing and/or operation of the Trans-Canada Highway, the national highway system, the ports, airports and other transportation infrastructure. On the basis of their roles in these contexts, federal agencies and in particular Transport Canada, have a responsibility to enhance those areas of the transportation network that are within their jurisdiction.

- **Provincial Government –** The Provincial Government also has a major role in defining, funding and operating emergency services, including police and ambulance. The Departments of Transportation from the four provinces operate highway networks.

- **Municipal Government –** The municipalities operate road networks, traffic control systems, transit systems, parking and emergency services.

- **Non Profit/Advisory –** The non-profit sector needs to participate in developing appropriate institutional and technical support for the final ITS deployment plan for the region. Environmental groups can be important stakeholders in transportation, and play key roles in advocating transit-friendly, multi-modal transportation policies and programs. Professional bodies play a key role in information transfer, standards setting, education and training.

- **Private Sector –** They are identified as "customers" since they in most cases directly receive an ITS service for commercial purposes. In some cases, they are in the business of "information service provider" or value-added service provider, by repackaging ITS information and distributing it to the ultimate end user.

Availability of Technologies

Technologies that are potentially applicable in the Atlantic Region range from electronics and communications instrumentation in vehicles, to control centres, to consumer households, and to field instruments. For the purposes of this application, five groups of technologies were considered and these are described below. The five groups are defined in terms of the two-way communications that are established between entities. This includes the communications itself but also the terminal equipment (i.e. sensors) involved with the entire communications process. The links are described in detail in the ITS Architecture for Canada.

The technology groups are:

- **Centre to Wayside –** These components provide communications between operations centres and electronic equipment that are in the transportation networks of Atlantic Canada, primarily along the roads of the region but also at international border crossings and at terminals. These may include:

  - Data collection and monitoring devices;
  - Dynamic message signs;
  - Environmental monitoring devices;
  - Ramp metering;
  - Traffic signals;
  - Vehicle sensors; and
  - Video monitoring.

- **Centre-to-Centre –** As data is transmitted from an operator to another information user, it is considered to be centre-to-centre communications. Types of ITS operations that require this transmission type are:

  - Data archival;
  - Incident management;
  - Rail coordination;
  - Traffic management;
  - Transit management; and
  - Traveller information.

- **Centre to Vehicle/Traveller –** In the situations where information is conveyed directly between an ITS operations centre and a traveller, whether enroute or prior to travel, it is considered to be centre to vehicle / traveller. Examples of these communications are:

  - Mayday;
  - Transit vehicle communications; and
  - Traveller information.

- **Wayside to Vehicle –** Information is transmitted from the field equipment to a vehicle. This is considered to be wayside to vehicle communications. Examples of this type of interface include:

  - Electronic toll/fee collection; and
  - Signal priority.

- **Wayside to Wayside –** In specific situations, information is communicated between wayside environments. Examples of this is are Highway Rail Intersection (HRI) and “smart signs”.

Operations and Maintenance Considerations of Services Provided

As with any service that is implemented for transportation purposes, once it has been installed and operational, it must be operated and maintained on an ongoing basis. This role may involve individual focus on a full time basis, or intermittent observation of its operational status over the course of a long time period. In all cases with ITS equipment, operations and maintenance is required and must be considered in the matrix to identify ITS projects for pursuit. Consideration of skills that are inherent with the operations and maintenance must be brought into the assessment of whether an ITS technology can be readily introduced into any particular application in Atlantic Canada.

3.2.2 Institutional Analysis

As noted above, some of the key considerations in implementing ITS User Services are the potential barriers to that implementation. The barriers of a User Service, also described as issues that may slow or eliminate the potential for application, must therefore be identified early on so as to also identify any potential actions that could be triggered to overcome those barriers. The barriers presented in this section of the report are pertinent in Atlantic Canada; however, in order to develop a feasible and sufficiently detailed Operations Plan, local input was required to identify the specific barriers, and the specific potential solutions to overcome the barriers.

Known Barriers to Implementation by Delivery Participants

Decades of experience have led to a stable operating structure for government agencies responsible for building, maintaining, and operating transportation facilities. Each agency is responsible for specific roads and/or transit services. The responsible agencies are traditionally well versed in their respective tasks. Funding mechanisms are in place, experienced staff carry out projects, and long-term plans guide decision-making. To some extent each agency is capable of operating independently of other government departments responsible for transportation. This "stability" can sometimes represent a barrier in terms of a lack of flexibility to introduce innovative programs.

Conversely, a number of government agencies have experienced radical change over the past few years. Jurisdictions have been amalgamated, the roles of the agencies have been redefined, organizations have been restructured and down-sized, and the financial processes have changed. In these cases, the barrier can be "instability".

Deployment of ITS is a significant departure from "business as usual" for transportation agencies. Projects cut across all types of transportation facilities and raise a whole host of new implementation questions. Balancing ITS and "traditional" transportation investments becomes a challenge, as does finding the right personnel for the job. In fact, the multitude of "institutional issues" related to ITS planning and deployment are so significant that they often overshadow the technological challenges of a given project.

At their core, many ITS issues simply boil down to a lack of experience. In time, agencies will adapt to the needs associated with ITS, just as they adapted to major highway building programs, new transit systems, and other major developments. Now that transportation agencies throughout Canada (and the US) have close to 10 years of experience with widespread ITS deployment, many of the challenges and most promising solutions are becoming more apparent.

There are five groups of barriers that are anticipated to have a bearing on the success of implementing the Operations Plan. The groups are:

- Organizational Issues;
- Project Finance;
- Legal;
- User Acceptance; and
- Technical.

Each of these groups of barriers is described below:

- **Organizational Issues**

  Inter-Agency Coordination

  One of the most widely documented institutional issues is interagency coordination and communication. Many ITS projects, such as traffic management, rely on data from a number of transportation agencies. Projects must be designed with the needs of a wide array of users (travellers) and operating agencies in mind. In many cases, however, these agencies are not accustomed to working together closely and on a consistent basis. A primary example is coordination between provincial and municipal traffic engineering staff. Establishing interagency coordination and mechanisms for communications is both a serious challenge and crucial to project success.

  Intra-Agency Coordination

  Intra-agency coordination can also be a significant issue, especially in larger organizations. For example, it is not clear who would take responsibility for new and emerging roles/services such as commercial vehicle operations programs. For an example at the municipal level, the department of a municipality responsible for traffic signals might not interact very often, or very successfully, with the department responsible for transit operations.

  Partnerships

  Over the past several years there has been an increasing emphasis on the establishment of partnerships to enable various transportation industry stakeholders to jointly pursue common interests and objectives. Public-public partnerships can be used as a means of facilitating inter-agency co-operation. However, public sector agencies have traditionally been constrained in their ability to enter into partnerships.

  Changing Skill Sets

  Most transportation agencies have hired technical expertise to deal with traditional transportation tasks like road building and maintenance, transit operations, etc. Few agencies, however, have expertise in software design and procuring high-tech equipment. Also, the availability of information technology resources in the current market is an issue. ITS deployment necessitates that transportation agencies quickly acquire a broad set of high-technology skills, and that

transportation planners focus more on the needs of day-to-day operations rather than just capital improvement projects. The ongoing operations and maintenance of ITS application requires specialized in house and/or contracted resources including:

- specialists in traffic operations, with training in areas such as traffic engineering and traffic operations, coupled with competency in information systems.
- maintenance technicians qualified in the areas of field electronics, communications equipment, and information technology.

Customer Focus

Transportation agencies are under increasing pressure to accommodate the transportation needs of their communities with a new customer focus. There is increasing pressure to shift attitudes among transport authorities away from simply maintaining infrastructure, to managing the provision of transport services. Contributing to the customer focus is the realization that transportation agencies will not be able to build their way out of transportation problems such as congestion, and mitigating those problems often involves promoting a less "popular" means of travel. For these reasons, transportation agencies need to understand their customers and the acceptable solutions to transportation problems in their community.

- **Project Finance**

Capital and Ongoing Funding

All government agencies are facing constrained budgets, and each year the challenge of providing the same level of service becomes more and more difficult. In the conventional transportation funding model, ITS could represent an additional burden for government agencies. The very nature of ITS makes it necessary for agencies to change the way they see their "customers" also opens the door to new means of financing projects. In some cases government agencies know little about the financing opportunities that exist and are unaware of how to proceed with an innovative project finance plan. As an example opportunity, the Transport Canada ITS Partnerships Initiative provides funding as part of the ITS Plan for Canada. Other funding opportunities are identified in Section 6.3.4.

- **Legal**

Liability

A significant risk to both government agencies and commercial vendors is legal liability. Any new technology or process raises questions pertaining to how the user can expect to be protected and who is at fault if the system does not perform as expected. If a truck operator cannot get their permits and inspections processed because a computer system crashes, the trucker is at risk of losing revenue and customers and may seek to hold the government agency operator responsible.

Privacy

Another barrier to widespread adoption of certain technologies is privacy. Travellers may be concerned that traffic monitoring efforts may eventually lead to "Big Brother" tracking an individual's daily movements. The legal identification of vehicles through electronic license plates has long since been contemplated for a number of ITS applications but privacy concerns have posed a significant barrier. Commercial vehicle operators may be concerned that electronic access to data pertaining to permits, inspection records, etc., may lead to certain carriers being targeted for increased scrutiny by regulatory officials.

Intellectual Property

Many ITS projects involve a commercial vendor developing a customized computer and/or telecommunications package for a government agency. In some cases this project may be a public-private partnership, while in others it may be a conventional customer-vendor arrangement. The development of technologies and processes raises intellectual property issues. Vendors are accustomed to retaining the rights to whatever they develop, while a government agency may (often by law) expect to retain the rights to anything developed using taxpayer funding. While some governments have faced these issues before, typically transportation agencies have little experience in this area. Furthermore, the rapidly evolving communications and information technology industries make the issue far more complicated.

Procurement Practices

Public sector departments active in the ITS arena are typically limited in their flexibility with respect to procurement policies and mechanisms. In the interest of equitability, agencies are typically restricted to public tender and RFQ/RFP processes for procurement. For transport authorities, these processes are typically oriented towards hard engineering for infrastructure development and may not provide the flexibility for innovative multi-agency ITS applications. Agencies dealing with ITS need some degrees of flexibility and autonomy to pursue these innovative solutions while still maintaining and demonstrating open and fair procurement practices.

Policy and Legislation

Current government policy at all levels is unlikely to be broad enough to accommodate the intents and methods that ITS will require as it becomes sought for wider application in Atlantic Canada. Aspects that include public-private partnerships, guidelines and best practices to encourage use of ITS, intellectual property, privacy and the Traffic Acts of each province must be addressed in order that the application of new technologies can be implemented and within acceptable boundaries of use.

- **User Acceptance**

Technology Adaptation

The ability of the public to accept new technology applications and integrate these applications into their daily routines is a critical consideration for ITS deployment.

Public Perceptions

The public's perception of how a technology is being applied will influence the rate of acceptance. As information flows within the transportation sector become more automated, there is increasing public concern over the transfer of information.

- **Technical**

Standards and Architecture

ITS architecture and standards are crucial to ensuring that whatever technologies are deployed deliver the maximum benefits to the traveling public and government agencies. Many jurisdictions may already have components of incompatible systems in place and will be reluctant to agree to a standard that requires them to replace their existing equipment. Similarly, private sector vendors will lobby aggressively for those specifications that are closest to their existing products and capabilities.

Availability or Infiltration of Field Equipment

In addition to the compatibility aspects of ITS implementation, it is very important to stage ITS implementation to utilize technologies as they become available to the region. It may be suggested that a particular technology is expected to improve efficiencies significantly, once available. An example, although not necessary for Atlantic Region, is the infrared camera surveillance equipment that potentially can read the number of people in vehicles. This would be useful in High Occupancy Vehicle (HOV) enforcement. It is, however, not available yet as testing is still underway.

Potential Actions to Resolve Barriers

Although the list of potential barriers is long, these are not barriers experienced only in Atlantic Canada, and therefore Atlantic Canada can learn from the experiences elsewhere. Other jurisdictions can provide valuable input to how barriers were identified and then addressed in order to successfully implement an ITS project. Several types of actions are available to overcome barriers that are identified. Examples of these actions, as they have been applied elsewhere, are provided for consideration in addressing those that may arise in Atlantic Canada.

- **Financial Grants**

Establish grant programs to provide seed money for ITS. Government agencies may be reluctant to commit their own funds at first. Seed money can be very effective in expediting participation and consensus among a coalition of agencies.

- **Improved Electronic Communications**

  - Improve the communications backbone facilitating the rapid transfer of voice and data; and
  - Use of web-based tools.

- **Changes to Policies / Legislation**

  - Examine legislative requirements to facilitate public-private partnerships;
  - Provide policy framework and department autonomy to facilitate rapid response to public-private partnership opportunities;
  - Establish Task Force to identify/prioritize legal issues that require attention to facilitate ITS. Recommend legislation where necessary;
  - Establish guidelines and best practices to encourage responsible activity by government agencies and/or private vendors. Such documentation reduces the liability risk to both agencies and vendors;
  - Undertake outreach efforts to identify privacy concerns among commercial interest and traveling public;
  - Establish guidelines for dealing with intellectual property concerns in agreements with the private sector; and
  - Provide the flexibility and autonomy to pursue innovative initiatives while maintaining principals of equity and open procurement.

- **Introduction of Standards**

  - Develop Regional Architecture and the application of standards must be a primary objective of the Task Force; and
  - Participate in international standards development initiatives with the ISO and the US program with a view to representing specific Atlantic Canada needs and goals.

- **Improved Skill Sets**

  - Promote professional capacity building programs to introduce existing staff to skills necessary to support ITS;
  - Implement project teams made up of individuals with diverse skills. Facilitate exchanges of staff between different office and/or agencies; and
  - Work with Atlantic Canada universities and community colleges to promote programs that emphasize skills appropriate for ITS. Systems engineering is often a key need.

- **Privatization / Partnerships**

  - Develop organizational framework and hierarchy as a crucial first step toward building consensus and efficient division of tasks;
  - Improve communications amongst groups – establish a variety of means of disseminating information to coordinate activities such as a Task Force and region-wide website;
  - Implement a program of staff exchanges to promote communication between agencies and to make more efficient use of individuals with complementary skills;
  - Consider privatizing some functions. Use the private sector know-how in customer service to promote public sector goals such as increased cost-recovery; and
  - Bring private sector on-board early to encourage interest in ITS and learn what the private sector will expect/need from government agencies.

- **Public Education**

  - Undertake public relations campaign to allay concerns regarding privacy; and
  - Provide public education/awareness regarding system benefits and control of information.

3.2.3 User Services Assessments – Opportunities Analysis

The detailed User Service Assessments were structured to encompass the meanings and intents of Strategic Plan Attributes as described above. The assessments were initially provided by the consultant team. The material was then reviewed, edited and enhanced through a session in the Opportunities Workshop. The input of this "local" knowledge is a key contribution to identifying the regional Operations Plan projects, the specific barriers to overcome, and realistic timeframes for implementation.

The User Service Assessments include a "Rating" for each of the Strategic Plan attributes, followed by a recommended "Timeframe for Implementation".

The ratings consist of three categories:

- "Primary" indicates that the attribute is an important component in developing an implementation plan;

- "Secondary" indicates that the attribute is a significant component in developing the implementation plan; and

- "Not applicable" indicates that the attribute is not pertinent to developing the implementation plan.

Exhibit 3.1 – A Summary Matrix of the Strategic Plan Attributes, provides a broad assessment of the significance of each attribute for the sixteen higher priority User Services. Appendix G contains a series of User Service Assessments that provide greater detail.

The "Timeframe for Implementation" is divided into three timeframes: "Early winner", "Medium term", and "Longer term". The attributes that most affect the estimated timeframe are the "Known Barriers to Implementation by Delivery Participants". User Services with substantial barriers are more likely to require more time to overcome the barriers, and subsequently implement the service.

The sixteen User Services as assessed reflect several trends that are noteworthy:

- In all cases, the owners/operators are key beneficiaries, as are suppliers in many cases, and travellers in most cases;

- Delivery of most User Services includes the Provincial Governments and almost equally, Municipal Governments. The private sector is seen to be involved in most delivery activities;

- Technologies are generally available in Atlantic Canada, particularly Centre to Wayside and Wayside to Vehicle;

- The availability of the necessary skill sets to support ITS technologies in Atlantic Canada is a concern. Acceptable levels of skill sets are identified as being present for only three of the User Services; and

- With regard to barriers, the element most critical to implementing ITS of any type is funding availability. Interagency coordination is a significant issue since ITS requires cooperative effort in many applications. Legal hurdles are also present, particularly where road safety and electronic payment is involved.

Consideration of the barriers, and the means of resolution, is discussed further in Section 3.4.1.

Exhibit 3.1 – Summary Matrix of Strategic Plan Attributes

USER SERVICES / STRATEGIC PLAN ATTRIBUTES	1.1 TRAVELLER INFORMATION	1.4 TRAVELLER SERVICES AND RESERVATIONS	2.1 TRAFFIC CONTROL	2.2 INCIDENT MANAGEMENT	2.4 ENVIRONMENTAL CONDITIONS MANAGEMENT	2.5 OPERATIONS AND MAINTENANCE	2.6 AUTOMATED DYNAMIC WARNING AND ENFORCEMENT	3.1 PUBLIC TRANSPORT MANAGEMENT	4.1 ELECTRONIC PAYMENT SERVICES	5.1 COMMERCIAL VEHICLE ELECTRONIC CLEARANCE	5.5 INTERMODAL FREIGHT MANAGEMENT	5.6 COMMERCIAL FLEET MANAGEMENT	6.1 EMERGENCY NOTIFICATION AND PERSONAL SECURITY	6.3 DISASTER RESPONSE AND MANAGEMENT	6.4 EMERGENCY VEHICLE MANAGEMENT	8.1 WEATHER AND ENVIRONMENTAL DATA MANAGEMENT
KEY BENEFICIARIES																
OWNERS/OPERATORS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
SUPPLIERS	◐	◐	●	●	◐	●	●	●	○	●	●	●	●	●	◐	◐
CUSTOMERS AND SERVICE PROVIDERS	◐	◐	◐	●	◐	○	○	●	●	○	●	●	●	○	●	○
RESEARCHERS	◐	○	◐	◐	◐	◐	◐	●	○	○	◐	◐	○	○	◐	●
SPECIAL INTEREST GROUPS	◐	○	◐	◐	◐	◐	◐	●	○	○	○	○	○	○	◐	○
TRAVELLERS	●	●	●	●	●	●	●	●	●	●	○	○	●	●	●	●
ENFORCEMENT AUTHORITIES	◐	○	●	◐	◐	○	●	●	○	◐	○	◐	○	○	◐	○
EMERGENCY SERVICES PROVIDERS	◐	○	◐	◐	○	○	◐	○	○	○	◐	○	●	●	●	●
DELIVERY PARTICIPANTS																
FEDERAL GOVERNMENT	◐	◐	◐	◐	◐	●	◐	●	●	●	◐	◐	○	◐	◐	●
PROVINCIAL GOVERNMENT	●	●	●	●	●	●	●	●	◐	●	○	◐	●	●	●	●
MUNICIPAL GOVERNMENT	◐	○	●	●	●	●	●	●	●	○	◐	◐	●	●	●	●
NON PROFIT/ADVISORY	◐	○	○	○	○	○	○	◐	◐	○	○	○	○	○	○	○
PRIVATE SECTOR	●	●	●	◐	◐	○	●	●	●	●	●	●	●	○	○	●

● High Significance ◐ Medium Significance ○ Low Significance

USER SERVICES / STRATEGIC PLAN ATTRIBUTES	1.1 TRAVELLER INFORMATION	1.4 TRAVELLER SERVICES AND RESERVATIONS	2.1 TRAFFIC CONTROL	2.2 INCIDENT MANAGEMENT	2.4 ENVIRONMENTAL CONDITIONS MANAGEMENT	2.5 OPERATIONS AND MAINTENANCE	2.6 AUTOMATED DYNAMIC WARNING AND ENFORCEMENT	3.1 PUBLIC TRANSPORT MANAGEMENT	4.1 ELECTRONIC PAYMENT SERVICES	5.1 COMMERCIAL VEHICLE ELECTRONIC CLEARANCE	5.5 INTERMODAL FREIGHT MANAGEMENT	5.6 COMMERCIAL FLEET MANAGEMENT	6.1 EMERGENCY NOTIFICATION AND PERSONAL SECURITY	6.3 DISASTER RESPONSE AND MANAGEMENT	6.4 EMERGENCY VEHICLE MANAGEMENT	8.1 WEATHER AND ENVIRONMENTAL DATA MANAGEMENT
AVAILABILITY OF TECHNOLOGIES																
CENTRE TO WAYSIDE	●	○	●	●	●	○	○	●	●	●	○	●	○	●	●	●
CENTRE TO CENTRE	●	●	◐	◐	●	○	○	●	○	◐	○	●	○	●	●	●
CENTRE TO VEHICLE/TRAVELLER	●	●	○	◐	◐	○	◐	●	○	○	○	●	●	○	◐	○
WAYSIDE TO VEHICLE	●	○	●	●	◐	◐	●	●	●	●	●	●	○	●	●	○
WAYSIDE TO ROADSIDE	○	○	◐	○	○	○	○	○	○	○	○	○	○	○	○	○
OPERATIONS & MAINTENANCE CONSIDERATION OF SERVICES PROVIDED																
AVAILABLE SKILL SETS	◐	◐	●	◐	◐	◐	○	●	◐	◐	◐	◐	○	○	◐	●
KNOWN BARRIERS TO IMPLEMENTATION BY DELIVERY PARTICIPANTS																
ORGANIZATIONAL ISSUES Inter-agency coordination Intra-agency coordination Partnerships Changing skill sets Customer focus	●	●	●	●	●	◐	◐	●	●	●	○	◐	○	●	●	●
PROJECT FINANCE	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●

● High Significance ◐ Medium Significance ○ Low Significance

USER SERVICES / STRATEGIC PLAN ATTRIBUTES	1.1 TRAVELLER INFORMATION	1.4 TRAVELLER SERVICES AND RESERVATIONS	2.1 TRAFFIC CONTROL	2.2 INCIDENT MANAGEMENT	2.4 ENVIRONMENTAL CONDITIONS MANAGEMENT	2.5 OPERATIONS AND MAINTENANCE	2.6 AUTOMATED DYNAMIC WARNING AND ENFORCEMENT	3.1 PUBLIC TRANSPORT MANAGEMENT	4.1 ELECTRONIC PAYMENT SERVICES	5.1 COMMERCIAL VEHICLE ELECTRONIC CLEARANCE	5.5 INTERMODAL FREIGHT MANAGEMENT	5.6 COMMERCIAL FLEET MANAGEMENT	6.1 EMERGENCY NOTIFICATION AND PERSONAL SECURITY	6.3 DISASTER RESPONSE AND MANAGEMENT	6.4 EMERGENCY VEHICLE MANAGEMENT	8.1 WEATHER AND ENVIRONMENTAL DATA MANAGEMENT
LEGAL																
Liability																
Privacy																
Intellectual Property	◐	◐	●	◐	◐	◐	●	◐	●	◐	◐	○	○	○	○	●
Procurement Practices																
Policy/Legislation																
USER ACCEPTANCE																
Technology Adaptations	●	●	◐	◐	○	◐	●	●	◐	◐	◐	◐	●	◐	○	○
Public Perceptions																
TECHNICAL																
Standards and Architecture																
Availability of Enabling Technologies	◐	◐	●	◐	◐	●	○	◐	◐	◐	◐	◐	●	○	◐	◐
Availability or Infiltration of Field Equipment																
IMPLEMENTATION STAGING CANDIDATES																
EARLY WINNER (0-5 YRS)	√	√	√	√	√		√	√	√	√	√	√				√
MEDIUM TERM (5-10 YRS)						√							√	√	√	
LONGER TERM (> 10 YRS)																

● High Significance ◐ Medium Significance ○ Low Significance

3.3 PARTNERSHIP OPPORTUNITIES

Partnerships are becoming commonplace in ITS projects and initiatives throughout the world. Specifically, many ITS projects involve one or more of the following characteristics and/or aspects that lend themselves to partnering opportunities:

- Significant upfront and ongoing investment. Likewise, potential for significant benefits and revenue streams;
- Multiple mode impact and geographic coverage;
- Challenging operational transitions;
- Requirement of specialized skill sets;
- Coordination of several agencies and jurisdictions; and
- Multiple beneficiaries in terms of operations and "end users".

3.3.1 Benefits of Partnerships

It is important to examine opportunities for partnering and look to others for examples of their experiences. The U.S. National ITS Program states as one of its eight goals that government should "promote the innovative use of private resources". It also suggests that one of its eight strategies is in creating funding incentives.

As is well known, many of the U.S. ITS programs are funded through traditional transportation funding mechanisms such as the Highway Trust Fund and The Transportation Efficiency Act for the 21st Century (TEA-21). In Canada, this level of government participation is not currently available and it becomes more important to look at partnerships as practical opportunities to introduce ITS into the region.

In the Atlantic Region, ITS partnerships can provide various benefits and opportunities, some of which include the following:

- Improve the product/project provided to the end user;
- Finance projects and sharing funding;
- Improve efficiency of the project;
- Reduce/share risk and/or increase the return on investment;
- Take advantage of the strengths of different organization and increase communications and awareness regarding the project; and
- Complete the planning, design, implementation or operational/maintenance phases of a project.

3.3.2 Types of Partnerships

It became apparent through the Strengths Weaknesses Opportunities and Threats (SWOT) analysis, that there exist a number of opportunities, benefits and motives to form partnerships between various agencies, jurisdictions and private sector entities.

Exhibit 3.2 includes a summary of partnership examples that have been formed to obtain goals of various types of ITS related projects ranging from strategic planning and research projects, to maintenance and

operations of facilities. Section 3.3.3 provides a summary of the combined "lessons learned" from a number of these partnerships.

Exhibit 3.2 – Partnership Examples Summary

Project Type	Type of Partnership	Geographic Scope	Related User Services	Examples
Partnerships for ITS Planning and Coordination	Public-Public	Local and Regional	All	ITS Architecture for Canada Atlantic ITS Strategic Plan I-95 Corridor Coalition COATS – California Oregon Advanced Transportation System Statewide Plan for ATIS – Minnesota
ITS Research	Public-Public Public-Private	Local	All	University of Toronto Advanced Transportation Systems Testbed
Joint Use Call Centres	Public-Public Public-Private		2.1 – Traffic Control	City of Toronto and Ministry of Transportation of Ontario – Road information line
Traveller Information Systems	Public-Public Public-Private		1.1 – Traveller Information	Confederation Bridge Highway Advisory Radio Halifax Area Traveller Information Radio TRIP USA Texas DOT and TransGuide TravInfo (et al) – San Francisco Bay Area SmartTraveler – Boston
Fibre for Right-of-Way	Public-Private			Ministry of Transportation of Ontario New York State Thruway Authority
Centre-to-Centre	Public-Public	Local and Regional	2.1 – Traffic Control	Greater Toronto Area Silicon Valley
Toll Roadways	Public-Private	Regional	4.1 – Electronic Payment Services	Dulles Greenway Trip II Highway 407
Traffic Operations Centres	Public-Public	Local and Regional	2.1 – Traffic Control 2.2 – Incident Management 2.3 – Travel Demand Management	Minnesota (Arrowhead Region) - ARTIC City of Toronto Joint Operations Centre
Multi-Modal Operations	Public-Private	Regional		BC CVO
Adaptive Signal Control System	Public-Public	Local	2.1 – Traffic Control 5.0 – Commercial Vehicle Operations	Minneapolis, Minnesota – SCOOT

Exhibit 3.2 – Partnership Examples Summary

Project Type	Type of Partnership	Geographic Scope	Related User Services	Examples
Advanced Road Weather Information System	Public-Public Public-Private	Regional and National	2.4 – Environmental Conditions Management	MRDC – Fredericton-Moncton Highway New Brunswick Department of Transportation Nova Scotia Department of Transportation and Public Works
Emergency Vehicle Management	Public-Public	Local		RESCU – Toronto
Commercial Vehicle Clearance	Public-Private	Regional	5.2 – Commercial Vehicle Electronic Clearance	NORPASS
Border Crossing ITS Plan and Design	Public-Private	Local	4.1 – Electronic Payment Services 5.1 – Commercial Vehicle Electronic Clearance	ITBCS - New York-Ontario International Border Crossing AVION - ITS
Red-light Enforcement	Public-Public Public-Private	Local	2.6 – Automatic Dynamic Warning and Enforcement	Ontario municipalities
AVL/Operations and Maintenance			3.1 – Public Transport Management 2.5 – Operations and Maintenance	Pearson Airport Limousine Management GPS on managing maintenance vehicles
SmartCard Initiatives	Public-Private	Regional	4.1 – Electronic Payment Services 3.1 – Public Transport Management	City of Burlington-GO Transit Barrie Transit VISA Cashcard Guelph Transit Smart Card
Public Transport Management	Public-Private	Regional	3.1 – Public Transport Management 1.1 – Traveller Information	Summit Stage Transfer Centre – Colorado TravLink – Minnesota
Transit Priority	Public-Public	Regional	2.1 – Traffic Control	Toronto Transit Priority Projects for Streetcars
Advanced Parking Information Systems	Public-Public	Local	1.4 – Traveller Services and Reservations 1.1 – Traveller Information	City of St. Paul Boston

3.3.3 Lessons Learned

Some of the main "lessons learned" from ITS partnership activities indicate that partnerships:

- Induce regular meetings and communications between members which assists in the development of a standard approach, and facilitates increased awareness of projects;
- Promote value-added engineering enhancements;
- Address inter-jurisdictional barriers;
- Promote greater adherence to delivery schedule;
- Generate more-hands on involvement by owners and operators;
- Induce co-operation between organizations that generally are viewed as competing entities/companies;
- Facilitate the comprehension of other participants' perspectives;
- Result in the assembly of special skills and management personal; and
- Provide the ability to take advantage of the "economies of scale" through various means ranging from volume purchases of equipment, to sharing on-site construction offices.

The experience of many public sector agencies in pursuing partnerships suggests that significant efforts may be required to adapt procurement practices to accommodate partnership proposals. It is important that this effort be invested at the outset in order to avoid long lead times for individual proposals/projects.

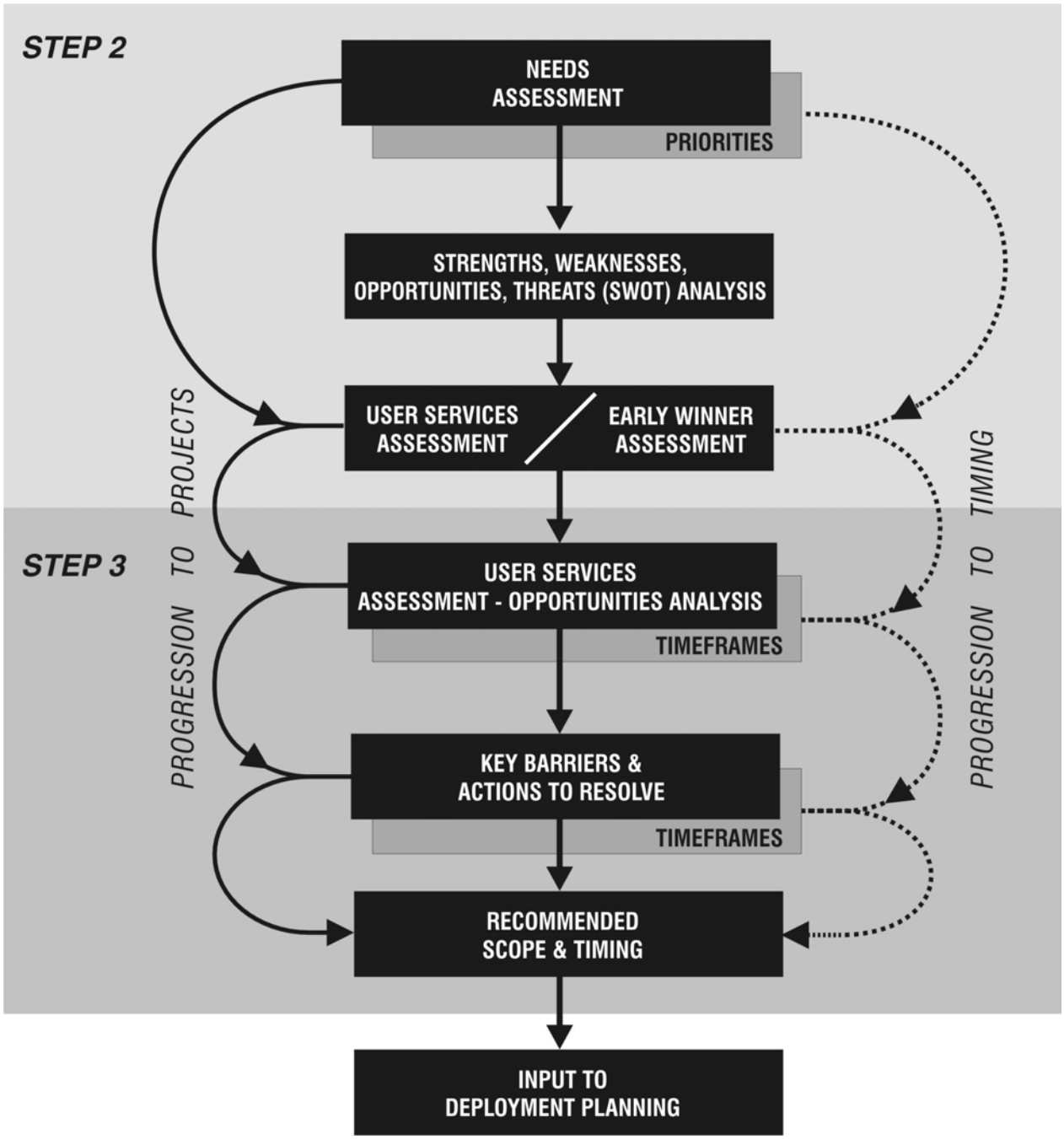
3.4 USER SERVICE REFINEMENT

The development of the Strategic Plan dealt with the needs, a vision, and the assessment and selection of higher priority User Services. The Opportunities Analysis dealt with the beneficiaries, delivery participants, availability of technologies, barriers, and actions to resolve barriers. The above processes are presented in Exhibit 3.3, reflecting the co-ordination and flow between these various steps and analyses. It is clear that ITS projects should be initiated on the basis of need and through application of the most appropriate User Services.

A refinement process was undertaken subsequent to the Operations Analysis to review all of the earlier analytical results, and to ensure consistency within them and that the selection of User Services is most appropriate. Similarly, the timing of implementation should be based on the priorities that have been established for each need and the timeframe assessments that have been completed. This refinement process took into consideration the User Services satisfying needs and the timeframes satisfying Priorities.

The refinement process confirmed that all sixteen User Services that had been identified through the study process were appropriate for implementation in Atlantic Canada and confirmed that the timeframes are consistent with the priorities that are attached to the transportation needs of the region. The potential timeframes also take into consideration the potential barriers and the opportunities to resolve those barriers.

Exhibit 3.3 – Refining the User Services



3.4.1 Resolving Barriers

In reviewing the key barriers to implementation, there are a number of common challenges to be addressed. Many of these challenges are not necessarily unique to the Atlantic Provinces, and in fact are shared by many regions in North America. These include:

- Lack of inter-agency co-ordination;
- Lack of start-up funding;
- Competitors must co-operate and co-ordinate to deliver a joint service;
- Protection of intellectual property;
- Requirement for expensive joint back-office to process data;
- Financing to obtain equipment is an issue for smaller commercial operators; and
- Concerns about privacy of employees.

The challenges that are more specific to the Atlantic Provinces include:

- Gaps in wireless service; and
- Large geographic areas, with low-density population may make it difficult to build a business case.

There were a number of actions identified to resolve the barriers. Some of the specific actions that applied to the Atlantic Provinces include:

- Continued regional coordination meetings among the Provinces, under the direction of the Atlantic Council of Premiers, and in coordination with other related forums, such as that for the harmonization of trucking regulations;
- Education of the purchasing agencies within the public sector owner/operators on the nature of the systems procurement process, and the distinguishing features relative to the conventional construction process;
- Pursuit of joint procurement by public agencies within the region in order to employ common equipment specifications, and take advantage of economies of scale;
- Identification and engagement of a champion(s) from the tourism industry associations and Provincial Ministries of Tourism in order to help realize opportunities with traveller information services;

- Continue to represent the four Atlantic Provinces and the related transportation stakeholders as a common voice in dealing with peer agencies such as Transport Canada, and the I-95 Corridor Coalition;

- Identification of lead agencies, or joint ventures among peer agencies in order to take the initiative on multi-party, back office applications, such as that required for data warehousing and potentially electronic payment;

- Advance the development and deployment of various applications, such as that related to border crossings and inter-modal terminals, through the scoping of pilot projects;

- Access opportunities to implement ITS applications related to commercial vehicle operations and border crossings under the Smart Borders Initiative.

Exhibit 3.4 provides a summary of this analysis. The potential actions that arise from Exhibit 3.4 were considered in the deployment program (refer to Section 5).

Exhibit 3.4 – User Service Assessments – Key Actions and Potential Timeframes

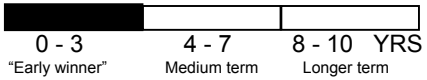
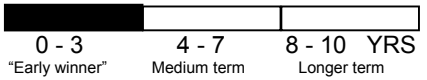
USER SERVICE	KEY BARRIERS	ACTIONS TO RESOLVE BARRIERS	POTENTIAL TIMEFRAME
1.1 Traveller Information The Traveller Information User Service provides travellers with information prior to their departure to assist them in making mode choices, travel time estimates, and route decisions. The sub-services of the Traveller Information User Service address four major functions, which are: (1) Available Services Information, (2) Current Situation Information, (3) Trip Planning Service, and (4) User Access. Information is integrated from various transportation modes and other information sources and is presented to the user for decision making.	• Lack of inter-agency co-ordination • Lack of start-up funding • Protection of intellectual property • No central pool for information • Gaps in wireless service	• Identification of a champion, possibly tourism would be appropriate to resolve issues • Start with pilot project in New Brunswick, intercepting travellers from Quebec and from the border crossings, then extend to other provinces • Link to 1.4 Traveller Services/Reservations	
1.4 Traveller Services / Reservations The Traveller Services Information User Service provides the traveller with access to "yellow pages" type information regarding a variety of travel-related services and facilities. The information will be accessible to the traveller in the home or office to support pre-trip planning and while enroute, either in the vehicle or at public facilities such as public transit terminals or highway rest stops.	• Competitors must co-operate and co-ordinate to deliver a joint service • Lack of start-up funding • Protection of intellectual property • No central pool for information • Gaps in wireless service	• Identification of a champion, possibly a provincial tourism agency would be appropriate to resolve issues • Start with a pilot project for one province • Link to 1.1 Traveller Information	

Exhibit 3.4 – User Service Assessments – Key Actions and Potential Timeframes

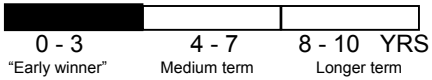
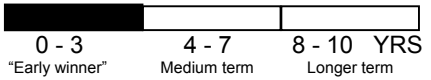
USER SERVICE	KEY BARRIERS	ACTIONS TO RESOLVE BARRIERS	POTENTIAL TIMEFRAME
2.1 Traffic Control The Traffic Control User Service manages the movement of traffic on streets and highways. It includes surface street controls such as traffic signal systems, adaptive traffic control systems and freeway control techniques such as ramp metering and lane control. Between the eight sub-services of the Traffic Control User Services, the following four functions are provided which are (1) Traffic Flow Optimization, (2) Traffic Surveillance, (3) Control Function, and (4) Provide Information.	• Equipment and system intensive, and therefore requires substantial funding • Debate over ownership of systems software • Procurement practices treating traffic control systems as a commodity can lead to problems • Pace of development of industry standards	• Educate purchasing agencies on the issues of installing these systems – importance of the best long-term investment, versus the short-term price • Municipalities can consider joint procurements to take advantage of economies of scale	
2.2 Incident Management The Incident Management User Service enhances existing capabilities to identify incidents, formulate response actions, and support initiation and ongoing co-ordination of those response actions. The single sub-service of the Incident Management User Service provides six major functions such as: (1) Scheduled Planned Incidents, (2) Identify Incidents, (3) Formulate Response Actions, (4) Support Co-ordinated Implementation of Response Actions, (5) Support Initialization of Response to Actions, and (6) Predict Hazardous Conditions.	• Lack of mechanisms available for inter-agency co-ordination • Lack of funding • Large geographic areas, with low density population make it difficult to build a business case • Lack of standards, and the issue of interoperability	• Raise awareness of the benefits of incident management • Pilot programs (e.g. Confederation Bridge) • Opportunities to link collision data and images to GIS-T	

Exhibit 3.4 – User Service Assessments – Key Actions and Potential Timeframes

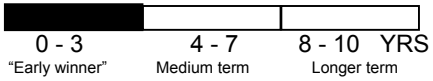
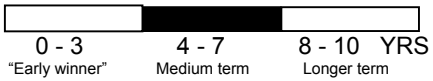
USER SERVICE	KEY BARRIERS	ACTIONS TO RESOLVE BARRIERS	POTENTIAL TIMEFRAME
2.4 Environmental Conditions Management The Environmental Conditions and Monitoring User Service provides government agencies with the capability to enhance their air quality control strategies. The function provides both wide area and Wayside emissions monitoring as well as Road Weather Systems and Services. Information is used by Traffic Demand Management in the Traffic Management Centre to mitigate pollution and may be provided to enforcement agencies to compel offenders to comply with standards. In addition, road weather information and forecasts provide inputs to other systems such as ATMS and ATIS to increase safety and efficiency.	• Lack of mechanisms available for inter-agency co-ordination • Lack of funding	• Build on federal effort to develop a nation-wide Road and Weather Information System network	
2.5 Operations and Maintenance The Operations and Maintenance User Service provides government agencies, as well as contractors with the resources to manage the operations and maintenance of vehicle fleet and equipment assets, and monitor and manage traffic flow around work zone areas.	• Introduction of sophisticated technology to operations and maintenance activities • Exposure to liability if systems fail • Can require substantial initial funding	• Implement as part of a greater strategy to form public/private partnerships to deliver operations and maintenance services	

Exhibit 3.4 – User Service Assessments – Key Actions and Potential Timeframes

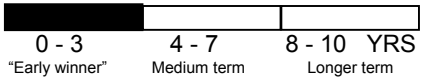
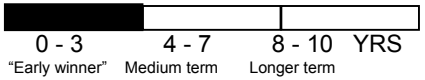
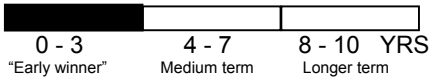
USER SERVICE	KEY BARRIERS	ACTIONS TO RESOLVE BARRIERS	POTENTIAL TIMEFRAME
2.6 Automated Dynamic Warning and Enforcement The Automated Dynamic Warning and Enforcement User Service provides systems which warn vehicles or motorists of imminent danger, and provide electronic enforcement of traffic control and regulations	• Systems are costly to implement, and require a back-office to process fines • Public may perceive electronic enforcement as primarily a revenue generation strategy • Legislation required to implement electronic enforcement • Privacy is an issue when using image recording equipment	• Municipalities can consider joint procurements to take advantage of economies of scale • Ability to offset cost with revenue generation	
3.1 Public Transport Management The Public Transport Management User Service applies advanced vehicle electronic systems to various public transportation modes and uses the data generated by these modes to improve service to the public. It includes operation of vehicles and facilities, planning and scheduling, and personnel management.	• Systems are costly to implement and operate – require a sound business case • May be privacy issues with transit employees	• Market importance of advances to maintain a modern alternative to the car • Financial potential for transit funding through gasoline tax	
4.1 Electronic Payment Services The Electronic Payment Services User Service allows travellers to pay for transportation services by electronic means. Between the four sub-services of the Electronic Payment User Services the following functionality is provided: (1) Electronic Toll Collection, (2) Electronic Fare Collection, (3) Electronic Parking Payment, and (4) Electronic Payment Services Integration. It may, as envisioned, also serve broad non-transportation functions and may be integrated with credit and debit cards in banking and other financial transactions.	• Requires one back office to process transactions • Substantial initial investment, including back office functions • Privacy • Intellectual property • Public required to change payment habits • Standards still evolving	• Government funding for start-up • Form partnerships with one party designated to operate the common back office	

Exhibit 3.4 – User Service Assessments – Key Actions and Potential Timeframes

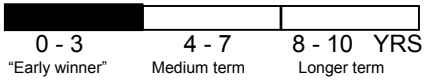
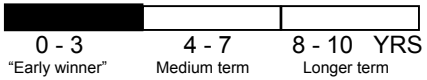
USER SERVICE	KEY BARRIERS	ACTIONS TO RESOLVE BARRIERS	POTENTIAL TIMEFRAME
5.1 Commercial Vehicle Electronic Clearance The Commercial Vehicle Electronic Clearance User Service consists of both domestic and international border electronic clearances. Domestic electronic clearance allows commercial vehicles to continue past inspection stations without stopping. International border clearance allows vehicles to bypass international border checkpoints without stopping, or at least with expedited checks. As a vehicle approaches an inspection station or checkpoint, vehicle to Wayside communications take place that identify the vehicle and make available to authorities the necessary data about credentials, vehicle weight, safety status, cargo, and occupants. Enforcement personnel can then select potentially unsafe vehicles for inspection and allow safe and legal vehicles to bypass the inspection station/checkpoint.	• For international border, requires co-operation and information sharing between U.S. and Canadian agencies • Legislative restrictions on data exchange • Driver/operators may have privacy concerns • Financing to obtain equipment is an issue for smaller commercial operators	• Pilot projects provide opportunity to visit operation/policy issues • Increased interest in security measures might lead to greater support for initiatives	
5.5 Intermodal Freight Management The intermodal freight management User Service provides systems which will monitor the status of freight-in-transit and at freight terminals	• Legislative restrictions on data exchange • Driver/operators may have privacy concerns • Financing to obtain equipment is an issue for smaller commercial operators	• Choose one intermodal terminal for pilot project	

Exhibit 3.4 – User Service Assessments – Key Actions and Potential Timeframes

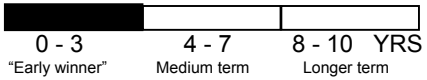
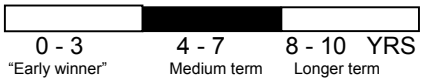
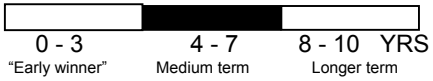
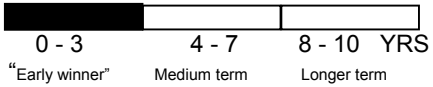
USER SERVICE	KEY BARRIERS	ACTIONS TO RESOLVE BARRIERS	POTENTIAL TIMEFRAME
5.6 Commercial Fleet Management The Commercial Fleet Management User Service provides real-time communications for vehicle location, dispatching and tracking between commercial vehicle drivers, dispatchers, and intermodal transportation providers, thereby reducing delays for drivers and providing commercial drivers and dispatchers with real-time routing information in response to congestion or incidents. Commercial fleet management includes the management of taxi fleets.	• Financing is an issue for smaller operators • Incomplete wireless communications coverage	• Retain third party to implement.	
6.1 Emergency Notification and Personal Security The Emergency Notification And Personal Security User Service provides the capability for the user to manually initiate a distress signal for incidents like mechanical breakdown or non-injury collisions. An automated system would help mitigate the consequences of a serious collision by automatically sending information regarding the location, nature and severity of the collision to an emergency services dispatcher and/or to hospital and emergency room personnel.	• Public willingness to pay for service • Requires installation of equipment in vehicles	• Introduce legislation to make the service mandatory	
6.3 Disaster Response and Management The Disaster Response and Management User Service co-ordinates disaster response strategies from a virtual control centre, and disseminates information to agencies and individuals on traffic conditions, diversion routes etc.	• Information sharing, and control at the scene • Before Sept. 11/01, disasters considered rare, and therefore disaster planning had lower priority	• Educate agencies responsible for disaster response planning – role that ITS can play	

Exhibit 3.4 – User Service Assessments – Key Actions and Potential Timeframes

USER SERVICE	KEY BARRIERS	ACTIONS TO RESOLVE BARRIERS	POTENTIAL TIMEFRAME
6.4 Emergency Vehicle Management The Emergency Vehicle Management Service User Service is oriented towards reducing the time from the receipt of notification of an incident by an emergency services dispatcher, and the arrival of emergency vehicles on the scene. It includes emergency vehicle fleet management, route guidance to the incident scene or a suitable hospital, and pre-emption of traffic signals on an emergency vehicle's route to receive more green displays	• Require extensive field equipment, both on the wayside, and on emergency vehicles • Interoperability of systems	• Promote as a potential strategy to deal with stress on emergency services budgets • Regional meetings	
8.1 Weather and Environmental Data Management The Weather and Environmental Data Management User Service provides system wide gathering, fusion, and dissemination of information on roadway weather conditions and forecasts.	• Ownership of data • Coverage in rural areas may be financially difficult to justify given low traffic volumes.	• Start with pilot project involving public/public partnership, or public/private partnership	

3.4.2 Recommended Scope and Timing

Through a process of reviewing and refining the User Service Plan and the associated analyses, a comparison was made of the User Services identified for consideration. Exhibit 3.5 summarizes the several stages of analysis. It is on the basis of this overall summary of ratings that decisions were made to recommend timing for deployment of the User Services.

With regard to timeframes, nine Early Winners were identified. The decision to focus on a limited number of Early Winners is strategic from a number of perspectives. Initiating too many projects will dilute the ability of regional stakeholders to focus on the deployment issues that need to be addressed including financing, partnerships, skills and legal aspects. If attention is focused on a few projects then the chances for success increase. The successes of the first few projects will be examined critically by Government and the communities involved. They are therefore most important in the region. For the purposes of diversification, only one project has been selected from each User Service bundle (i.e. Traveller Information Services, Emergency Management Services). The exceptions are in *2.0 Traffic Management Services,* and *5.0 Commercial Vehicle Operations,* where two User Services were selected for early application. This selection of nine User Services overall will blanket the region with a diverse sample of projects.

The User Services identified for Early Winners deployment included:

- 1.1 Traveller Information;
- 2.1 Traffic Control;
- 2.4 Environmental Conditions Management;
- 3.1 Public Transport Management;
- 4.1 Electronic Payment;
- 5.1 Commercial Vehicle Electronic Clearance;
- 5.5 Intermodal Freight Management;
- 6.4 Emergency Vehicle Management; and
- 8.1 Weather and Environmental Data Management

These User Services represent projects that are sufficiently challenging to initiate and support within the region but less challenging than others. The *Environmental Conditions Management* and *Weather and Environmental Data Management* areas of pursuit (i.e. RWIS) are integrated and should be pursued jointly. It is acknowledged that border security is a very prevalent issue in today's environment, as evidenced in the earlier Needs Assessment (i.e. Expedited border crossing inspection and clearance for commercial vehicles). It is anticipated that security issues would be incorporated in *5.1 Commercial Vehicle Electronic Clearance,* and *5.5 Intermodal Freight Management.*

The Opportunities Analysis resulted in nine User Services that were considered "early winners" (implementation in zero to three years), and seven User Services that should be considered for the "medium term" (implementation in four to seven years). The following is a summary rationale for delaying implementation of seven of the higher priority User Services.

Traveller Services and Reservations (1.4)

Traveller Services and Reservations is very closely linked to *1.1 Traveller Information*. It is suggested that the focus be on developing a Traveller Information pilot project, and then build upon successes by expanding the system to include Traveller Services and Reservations.

Incident Management (2.2)

Although there is interest in the benefits of implementing this User Service, a specific "early winner" has not been identified by the stakeholders.

Operations and Maintenance (2.5)

This area is undergoing significant change, with the trend toward outsourcing by government agencies. The User Service requires substantial start-up funding, and the introduction of sophisticated technology to operations and maintenance activities. Equipment operators would require significant training to fully make use of the systems. Therefore, the systems must be justified based on a sound business case, and used to their full potential once implemented. These represent significant barriers to overcome before systems are implemented.

Automated Dynamic Warning and Enforcement (2.6)

Two potential "early winners" were identified, but upon closer examination, significant barriers were identified.

The first potential project focused on a rural application to provide dynamic warning to reduce collisions between vehicles and wildlife. However, the approach included the development of new technology, which would likely take considerable time and resources.

The second potential project focused on the automated enforcement in urban areas through the implementation of Red Light Cameras. A substantial barrier is the necessary changes to the legislation in the individual provinces to permit automated enforcement. This process would likely take a significant amount of time.

Commercial Fleet Management (5.6)

The large carriers already have systems under development, or in place. For further implementation, a champion is required to represent and organize the smaller operators, or to implement a system at a specific transportation hub such as an airport.

Emergency Notification and Personal Security (6.1)

This User Service is heavily reliant on public acceptance. Most systems are vehicle based, and fairly expensive. They must be acquired at the time that a vehicle is acquired, or acquired using an after-market service. The slow acceptance rate will delay widespread implementation.

Disaster Response and Management (6.3)

The implementation of this User Service may be accelerated as a result of the events of September 11, 2001. However, many hurdles must be overcome to achieve a greater level of co-operation and co-ordination between agencies, and to develop the scope and components of disaster response and management plans, before the ITS strategies are implemented.

The recommended timeframes will be taken into account during the development of the deployment plan.

Exhibit 3.5 – Confirmation Of User Services For Deployment

USER SERVICES	STEP 2			STEP 3		
	PRIORITY (NEEDS ASSESSMENT AND SWOT ANALYSIS)	USER SERVICES ASSESSMENT RATING	EARLY WINNER ASSESSMENT (FOCUS GROUPS)	USER SERVICES ASSESSMENT – OPPORTUNITIES ANALYSIS RATING	USER SERVICES ASSESSMENT – KEY BARRIERS & ACTIONS TO RESOLVE	RECOMMENDED TIMEFRAMES
1.1 TRAVELLER INFORMATION	MED/HIGH	HIGH	VERY GOOD	EARLY WINNER	SOME BARRIERS BUT GOOD ACTION PLAN – EARLY WINNER	EARLY WINNER
1.4 TRAVELLER SERVICES/RESERVATIONS	MED	MED/HIGH	VERY GOOD	EARLY WINNER	SOME BARRIERS BUT GOOD ACTION PLAN – EARLY WINNER	MEDIUM TERM
2.1 TRAFFIC CONTROL	MED/HIGH	HIGH	GOOD/VERY GOOD	EARLY WINNER	FEW BARRIERS AND GOOD ACTION PLAN – EARLY WINNER	EARLY WINNER
2.2 INCIDENT MANAGEMENT	MED/HIGH	MED	VERY GOOD	EARLY WINNER	SOME BARRIERS AND FAIRLY GENERAL ACTION PLAN – MEDIUM TERM	MEDIUM TERM
2.4 ENVIRONMENTAL CONDITIONS MANAGEMENT	HIGH	HIGH	VERY GOOD	EARLY WINNER	FEW BARRIERS AND FAIR ACTION PLAN – EARLY WINNER	EARLY WINNER
2.5 OPERATIONS AND MAINTENANCE	HIGH	MED		MEDIUM TERM	SEVERAL BARRIERS AND FAIRLY GENERAL ACTION PLAN – MEDIUM TERM	MEDIUM TERM
2.6 AUTOMATED DYNAMIC WARNING AND ENFORCEMENT	HIGH	MED/HIGH	EXCELLENT	EARLY WINNER	SEVERAL BARRIERS AND PRODUCT DEVELOPMENT REQUIRED – MEDIUM TERM	MEDIUM TERM
3.1 PUBLIC TRANSPORT MANAGEMENT	MED	HIGH	VERY GOOD	EARLY WINNER	SOME BARRIERS AND STRONG ACTION PLAN – EARLY WINNER	EARLY WINNER

Exhibit 3.5 – Confirmation Of User Services For Deployment

USER SERVICES	STEP 2			STEP 3		
	PRIORITY (NEEDS ASSESSMENT AND SWOT ANALYSIS)	USER SERVICES ASSESSMENT RATING	EARLY WINNER ASSESSMENT (FOCUS GROUPS)	USER SERVICES ASSESSMENT – OPPORTUNITIES ANALYSIS RATING	USER SERVICES ASSESSMENT – KEY BARRIERS & ACTIONS TO RESOLVE	RECOMMENDED TIMEFRAMES
4.1 ELECTRONIC PAYMENT SERVICES	LOW/MED	HIGH	VERY GOOD	EARLY WINNER	SOME BARRIERS AND FAIR ACTION PLAN – MEDIUM TERM	EARLY WINNER
5.1 COMMERCIAL VEHICLE ELECTRONIC CLEARANCE	MED	HIGH	EXCELLENT	EARLY WINNER	SOME BARRIERS AND GOOD ACTION PLAN – EARLY WINNER	EARLY WINNER
5.5 INTERMODAL FREIGHT MANAGEMENT	MED		VERY GOOD	EARLY WINNER	SEVERAL BARRIERS AND GOOD ACTION PLAN – EARLY WINNER	EARLY WINNER
5.6 COMMERCIAL FLEET MANAGEMENT	MED	HIGH	VERY GOOD	EARLY WINNER	SEVERAL BARRIERS AND REQUIRES PRIVATE SECTOR INITIATIVE – MEDIUM TERM	MEDIUM TERM, BUT LED BY PRIVATE SECTOR
6.1 EMERGENCY NOTIFICATION AND PERSONAL SECURITY	MED/HIGH	MED	-	MEDIUM TERM	-	MEDIUM TERM
6.3 DISASTER RESPONSE AND MANAGEMENT	MED/HIGH	MED	-	MEDIUM TERM	BARRIERS NOT WELL KNOWN AND FAIRLY GENERAL ACTION PLAN – MEDIUM TERM	MEDIUM TERM
6.4 EMERGENCY VEHICLE MANAGEMENT	MED/HIGH	MED/HIGH	GOOD	MEDIUM TERM	SOME BARRIERS AND FAIR ACTION PLAN – MEDIUM TERM	EARLY WINNER
8.1 WEATHER AND ENVIRONMENTAL DATA MANAGEMENT	HIGH	MED/HIGH	-	EARLY WINNER	FEW BARRIERS AND FAIR ACTION PLAN	EARLY WINNER

4. ITS PROGRAM FRAMEWORK

The refined User Service Plan identified a number of User Services that are expected to meet the ITS needs of Atlantic Canada. The ITS Program reflects the functional requirements for each of these User Services, as tailored to the needs of the region. This section applies the ITS Architecture for Canada to assist in the definition of an ITS Program for Atlantic Canada. It does so by:

- Defining the functional requirements related to the User Services that are specifically relevant to Atlantic Canada;
- Identifying the enabling technologies that address these functional requirements; and
- Defining the User Sub-Services and applications that employ these technologies.

User Services define ITS in terms of broad categories of services. The ITS Architecture for Canada defines User Services in terms of what they are supposed to accomplish for the end-user. A broad range of users is considered, including the travelling public as well as many different types of system operators. The application of the concept of User Services facilitates the identification of high level services that will be provided to address identified problems and needs.

The ITS Architecture for Canada further sub-divides User Services into User Sub-Services. These were developed to more fully define the range of possible services provided. In addition, these User Sub-Services can be mapped directly to Market Packages, i.e. the system delivery components intended to meet the identified needs.

The descriptions provided for the User Services and Sub-Services in this document are substantially taken from those provided in the ITS Architecture for Canada, but have been edited to reflect the priorities, needs and context for Atlantic Canada.

It is anticipated that a given stakeholder within the Atlantic Region will have an interest in a specific User Service or set of related User Services, such as the CVO bundle. This section serves as a reference tool to enable the stakeholder, or project participants, to source high-level statements of functionality, ITS Architecture references, and key enabling technologies for the User Services that are of particular interest.

The remainder of the ITS Program Definition has been subdivided into the following interrelated activities. Provided below is a brief description of each component:

- **Functional Requirements (Section 4.1)** – This section outlines the functional requirements for each of the ITS User Services previously identified as important to the Atlantic Region.
- **Enabling Technologies (Section 4.2)** – This section summarizes a variety of practical technologies that can be combined to deliver the functionality as outlined in Section 2. The current state of maturity for each of these technologies is identified, as well as local availability of these products.
- **User Sub-Services (Section 4.3)** – This section provides further refinement of the User Services with reference to the applicable Market Packages.

To assist in the interpretation of the technical terminology contained in this document, a Glossary of Terms is provided in the appendices.

A more detailed discussion regarding the enabling technologies identified in Section 4.2 is provided as Appendix H.

4.1 FUNCTIONAL REQUIREMENTS

The Canadian ITS Architecture identifies thirty-five User Services. These User Services document what ITS should accomplish to fulfill user needs. A broad range of users must be considered, including the travelling public as well as many different types of system operators. User Services definitions assist in project planning exercises by establishing the high level services that will be provided to address identified problems and needs.

The refined User Service Plan identified a total of sixteen User Services of relevance to Atlantic Canada. The following sections outline the intended functionality for each of these "candidate User Services". The functionality for each User Service is defined according to the following headings (where applicable):

- Surveillance;
- Data processing;
- Control;
- Traveller interface;
- Navigation;
- In-vehicle sensors; and
- Communications.

4.1.1 Traveller Information (User Service 1.1)

The Traveller Information User Service provides travellers with information to assist them in making mode choices and route decisions. Information is integrated from various transportation modes and other information sources and is presented to the traveller, pre-trip or en-route, for decision-making. The following functional areas are required in support of this User Service.

- Surveillance – Traveller Information shall provide for the collection of traffic conditions, road conditions, event/incident advisories, general public transportation, toll and parking information, and air quality and weather information.
- Data Processing – Traveller Information shall collect surveillance data from a variety of sources and integrate into a common database (i.e. data fusion). Algorithms validate data to estimate in near real-time current traffic conditions, road conditions, transit services, ride share/ride match, parking management, and pricing information for dissemination to the public.
- Traveller Interface – Traveller Information shall support both interactive and broadcast capabilities to access information prior to a trip or en-route. Information is conveyed using a variety of media that includes text, voice, advisory, map display and video.

- Communications – Wide area coverage is required for en-route traveller information. Broadcast and two-way (interactive) en-route traveller information is transmitted over low bandwidth wireless communication systems. Broadcast and two-way (interactive) pre-trip traveller information is transmitted over higher bandwidth wireline communication systems to support feature-rich traveller interfaces (e.g. interactive map display).

4.1.2 Traveller Services and Reservation (User Service 1.4)

The Traveller Services and Reservation User Service provides the traveller with access to "yellow pages" type information regarding a variety of travel-related services and facilities. The information is accessible to the traveller in the home or office to support pre-trip planning and while en-route, either in the vehicle or at public facilities such as public transit terminals or highway rest stops. The following functional areas are required in support of this User Service:

- Surveillance – Traveller Services and Reservation shall provide for the collection of information as defined under 1.1 Traveller Information supplemented with access to yellow pages, services purchases and reservation services.

- Data Processing – Traveller Services and Reservation shall integrate Traveller Information, with "yellow pages" directories, and services/accommodations booking/purchases into a consolidated reference system.

- Traveller Interface – The Traveller Services and Reservation User Service shall provide an interactive interface to access information prior to a trip or en-route. Traveller Services and Reservation shall provide an interactive interface for yellow pages directory access, services purchases, reservation services, and status information on parking facilities.

- Communications – Two-way (interactive) pre-trip traveller information is transmitted over higher bandwidth wireline communication systems to support feature-rich traveller interfaces. Interactive en-route traveller information is transmitted over lower bandwidth wireless communication systems.

4.1.3 Traffic Control (User Service 2.1)

The Traffic Control User Service manages the movement of traffic on streets and highways. It includes surface street controls such as traffic signal systems, adaptive traffic control systems and freeway control techniques such as ramp metering and lane control.

- Surveillance – Traffic Control shall provide for the collection of traffic conditions, and road conditions data using road condition sensors, environmental sensors and other surveillance equipment such as video monitoring.

- Data Processing – Traffic Control shall provide data processing for:

  – Fixed device communication;

  – Data pre-processing and validation; and

  - Processing algorithms for monitoring traffic environmental and road conditions, identification and verification of incidents, and local surface street control and/or arterial traffic management.

- Control Strategies - Traffic Control shall provide control strategies to support daily operations and incident management (refer to 2.2 Incident Management) and shall include:

  - Surface street control;

  - Highway control; and

  - Regional traffic control.

- Traveller Interface – Traffic Control shall support the dissemination of traffic information to drivers and vehicles using roadway equipment, and dissemination of information to users and Information Service Providers (ISP) for distribution to a wider audience for either en-route, or pre-trip planning purposes (refer to 1.1 Traveller Information).

- Communications – A range of two-way wireline and wireless communications systems may be used to support the various devices employed under this User Service. Low bandwidth two-way communications systems are used for communications between the control centre and field devices. High bandwidth communication systems are required for the transmission of video. High-speed networks are required for digital data and video transmission between control centres.

4.1.4 Incident Management (User Service 2.2)

The Incident Management User Service enhances traffic monitoring and control capabilities to identify incidents, formulate response actions, and support initiation and ongoing co-ordination of those response actions.

- Surveillance – Incident Management shall use the surveillance equipment deployed under the Traffic Control User Service for the collection of traffic conditions, and road conditions using road condition sensors, environmental sensors and other surveillance equipment. Call centres will provide incident detection capabilities in rural areas, and supplemental information for incident detection on instrumented roadways.

- Data Processing – Incident Management shall use the incident detection capabilities included in the Traffic Control User Service for incident detection. Automated processes shall be employed to initiate and manage response to the incident site.

- Control Strategies - Incident Management shall manage both scheduled and unscheduled incidents so that the impact to the transportation network and traveller safety is minimized. The incident response may include co-ordination with emergency management, traffic control strategy modifications and dissemination of information to affected users.

- Traveller Interface – Incident Management shall:

- Provide regional co-ordination with other traffic management and emergency management centres, weather service entities, and event promoters;
- Disseminate traffic information to drivers and vehicles using roadway equipment; and
- Disseminate information to users and the ISP for distribution to a wider audience for either en-route, or pre-trip planning purposes.

- Communications – A range of two-way wireline and wireless communications systems may be used to support the various devices employed for this User Service. Low bandwidth two-way communications systems are used for communications between the control centre and field devices. High bandwidth communication systems are required for the transmission of video. High-speed networks are required for digital data and video transmission between control centres and the emergency management system. Wireless communications systems are required in rural areas for incident detection and response.

4.1.5 Environmental Conditions Monitoring (User Service 2.4)

The Environmental Conditions and Monitoring User Service provides for the collection and processing of road weather information to optimize winter maintenance. In addition, road weather information and forecasts provide inputs to other services such as Traffic Management and Traveller Information to increase safety and efficiency.

- Surveillance – Environmental Conditions Monitoring shall utilize fixed sensor stations on and about the roadway, to provide information on road and weather conditions. Road condition information may include pavement moisture content and temperature. Weather condition information may include precipitation, temperature, wind direction and speed and the presence of fog. Additional environmental hazards may be monitored along site-specific routes or locations, prone to these hazards such as mudslides or fire (smoke).

- Data Processing – Environmental Conditions Monitoring shall analyze environmental data to detect and forecast environmental hazards, which can be used to more effectively deploy road maintenance resources, issue general traveller advisories, improve emergency management and response, and support location specific warnings to drivers. Environmental data may be obtained from system surveillance equipment, the national meteorological services and aviation services (refer to 8.1 Weather and Environmental Data Management).

- Control Strategies –Environmental Conditions Monitoring shall increase the efficiency of plowing operations and the application of anti and de-icing materials through the prediction of weather conditions and the monitoring of roadway conditions.

- Traveller Interface – Environmental Conditions Monitoring shall disseminate information regarding environmental hazards through connections with traffic management systems, traveller information systems and information services providers. Environmental Conditions Monitoring shall use in-vehicle signing to inform maintenance vehicle operators of detected road and weather conditions. In-vehicle signing may use audio, visual and tactile interface technologies.

- In-Vehicle Sensors – Environmental Conditions Monitoring shall use sensors located on the maintenance vehicles to monitor and report the application of anti- and de-icing materials.

- Communications – Low bandwidth two-way wireline and wireless communication is required between field devices and the traffic management centre. Two-way wide area wireless communications system may be used to communicate with maintenance vehicles.

4.1.6 Operations and Maintenance (User Service 2.5)

The Operations and Maintenance User Service provides road authorities, as well as contractors with the resources to manage the operations and maintenance of vehicle fleet and equipment assets, and monitor and manage traffic flow around work zone areas.

- Surveillance – Operations and Maintenance shall:

  – Use road weather information as collected under the Environmental Conditions Monitoring User Service;

  – Monitor maintenance vehicle (e.g. snowplows and sand/salt trucks) location, vehicle status, and the output of sensors (such as environmental or road surface sensors), which are mounted on the vehicle; and

  – Use roadside sensors to monitor traffic in the vicinity of the work zone.

- Data processing – Operations and Maintenance shall process maintenance resource requests with the other available current and archived information (refer to Environmental Conditions Monitoring) to dynamically provide optimized maintenance assignments.

- Control Strategies – Operations and Maintenance shall use roadside elements to control traffic in the vicinity of the work zone.

- Traveller Interface – Operations and Maintenance shall provide the ability for the maintenance and construction driver to exchange information with the operation centre.

- Communications – Low bandwidth two-way wireline and wireless communication is required between field devices and the traffic management centre. Two-way wide area wireless communications system may be used to communicate with maintenance vehicles.

4.1.7 Automated Warning and Enforcement (User Service 2.6)

The Automated Dynamic Warning and Enforcement User Service provides systems that warn vehicles or motorists of imminent danger, and provide electronic enforcement of traffic control and regulations.

- Surveillance – Automated Warning and Enforcement shall monitor vehicles, roadway weather conditions, road surface conditions, traffic conditions, and obstacles or wildlife in the roadway.

- Data Processing – Automated Warning and Enforcement shall process:

  - Surveillance data for driver notification of dangerous conditions (i.e. wildlife on roadway); and

  - Vehicle and traffic signal display status for enforcement purposes (i.e. red light camera).

- Control Strategies – Automated Warning and Enforcement shall dynamically vary speed limits in response to roadway conditions and enforce roadway traffic signals and speed limits.

- Traveller Interface – Automated Warning and Enforcement shall disseminate warning information to the roadway user using dynamic message signs.

- Communications – A range of two-way wireline and wireless communications systems may be used to support the various devices employed under this User Service. Often, surveillance data can be processed remotely at the roadside, reducing communications requirements.

4.1.8 Public Transport Management (User Service 3.1)

The Public Transport Management User Service applies tracking and communications functions to various public transportation modes to improve service to the public. It includes operation of vehicles and facilities, planning and scheduling, and personnel management.

- Surveillance – Public Transport Management shall track the transit vehicle position.

- Data Processing – Public Transport Management shall:

  - Process vehicle location information to update the transit schedule for dissemination to patrons, and adjust transit vehicle operations to maintain schedule compliance;

  - Process and store data as necessary for electronic payment (refer to Electronic Payment Services);

  - Monitor the status of transit vehicle critical systems for transit maintenance activities; and

  - Coordinate with multiple transit and traffic agencies to improve service coordination.

- Control Strategies – Public Transport Management shall provide local co-ordination between the transit vehicle and the individual intersection for signal priority. Real time operations adjustments can be implemented to optimize service.

- Traveller Interface – Public Transport Management shall make real-time schedule information available via the Traveller Information User Service (refer to 2.1 of this document – Traveller Information) for dissemination.

- In-Vehicle Sensors – Public Transport Management shall provide the capability to monitor transit vehicle positioning, critical system status, passenger loading, and allow for electronic fare payment.

- Communications – Two-way low bandwidth wireless communications between the transit vehicle and transit management system is used for relaying vehicle position, and system status. Control measures (signal priority) are typically implemented using low bandwidth wireless roadside communication systems. Some information, such as vehicle maintenance data can be batch downloaded using short range communications.

4.1.9 Electronic Payment Services (User Service 4.1)

The Electronic Payment Services User Service allows travellers to pay for transportation services by electronic means. It may also serve broad non-transportation functions and may be integrated with credit and debit cards in banking and other financial transactions.

- Surveillance – Electronic Payment Services shall provide transportation operators with the ability to detect and process violators.

- Data Processing – Electronic Payment Services shall:

  – Provide toll operators with the ability to locally or centrally process transactions electronically;

  – Provides electronic processing of parking fees;

  – Allows for the fare payments onboard transit vehicles using electronic means; and

  – Processing includes account reconciliation using pre-paid or credit accounts.

- In-Vehicle Sensors – Electronic Payment Services shall use short-range communications with in-vehicle equipment for electronic toll collection and parking payment. Electronic Payment Services shall use transit in-vehicle systems to allow transit fare payment.

- Communications – Dedicated short-range communication between the roadway equipment and the vehicle is required. Dedicated high bandwidth two-way network communications between the toll collection equipment, transportation authorities and the financial infrastructure is required to support fee collection and processing.

4.1.10 Commercial Vehicle Electronic Clearance (User Service 5.1)

The Commercial Vehicle Electronic Clearance User Service consists of both domestic and international border electronic clearances. Domestic electronic clearance allows commercial vehicles to continue past inspection stations without stopping. International border clearance allows vehicles to bypass international border checkpoints without stopping, or at least expedited checks. As a vehicle approaches an inspection station or checkpoint, vehicle to roadside communications take place that identify the vehicle and make available to authorities the necessary data about credentials, vehicle weight, safety status, cargo, and occupants. Enforcement personnel can then select potentially unsafe vehicles for inspection and allow safe and legal vehicles to bypass the inspection station/checkpoint.

- Surveillance – Commercial Vehicle Electronic Clearance shall provide automated clearance at roadside check facilities. The roadside check facility will be equipped with sensors to

identify and weigh vehicles. Vehicle and cargo status monitoring capabilities are secondary technologies enabling this ITS application.

- Data Processing – Commercial Vehicle Electronic Clearance shall use surveillance data to retrieve snapshots of critical carriers, vehicle, and driver data. When making the "Pass/Need to Stop" determination, vehicle/carrier safety information, vehicle credentials, driver credentials, driver status, and vehicle weight information shall be checked.

- Control Strategies – Commercial Vehicle Electronic Clearance shall include equipment needed to signal "Pull-in for Safety Inspection".

- Traveller Interface – Commercial Vehicle Electronic Clearance shall provide messaging to drivers approaching the inspection station/checkpoint using roadside display or in-vehicle signalling.

- In-Vehicle Sensors – Commercial Vehicle Electronic Clearance shall use a range of on-board sensor technologies that monitor vehicle condition, performance and safety.

- Communications – Low bandwidth two-way communications systems are used to allow a compliant vehicle/driver/carrier to pass roadside facilities at highway speeds.

4.1.11 Intermodal Freight Management (User Service 5.5)

The Intermodal Freight Management User Service provides systems that will monitor the status of freight in-transit and at freight terminals.

- Surveillance – Intermodal Freight Management shall track and monitor intermodal containers and intermodal freight systems anywhere in the transportation system.

- Data Processing – Intermodal Freight Management shall support the monitoring of the container and its contents during the entire pickup-transport-drop-off period. This includes determining the location of a container regardless of transportation mode, and if appropriate monitors measured parameters of the container contents (e.g. temperature, shock and vibration, etc.)

- Traveller Interface – Intermodal Freight Management shall provide tracking and monitoring information to freight customers, fleet managers, and logistics service providers.

- Communications – Short-range two-way wireless communication systems are used between the container and the terminal and customs agencies.

4.1.12 Commercial Fleet Management (User Service 5.6)

The Commercial Fleet Management User Service provides real-time communications for vehicle location, dispatching and tracking between commercial vehicle drivers, dispatchers, and intermodal transportation providers, thereby reducing delays for drivers and providing commercial drivers and dispatchers with real-time routing information in response to congestion or incidents.

- Surveillance – Commercial Fleet Management shall monitor vehicle location, onboard vehicle sensors (e.g. fuel gauge), cargo and cargo condition (e.g. temperature). Information on traffic and weather conditions shall be obtained from ISP's.

- Data Processing – Commercial Fleet Management shall provide:

  – The vehicle with dispatch instructions and can process and respond to requests for assistance;

  – Real-time information to clients on cargo status; and

  – Support vehicle (tractor and trailer) maintenance by recording vehicle mileage and repairs.

- Traveller Interface – Commercial Fleet Management shall provide real-time communication between the driver and the dispatcher/operator.

- In-Vehicle Sensor – Commercial Fleet Management shall use an in-vehicle processor to interface to its sensors (e.g. GPS receiver) and to the communications data link.

- Navigation and Guidance – Optimized routing instructions shall be conveyed to the commercial vehicle based upon current traffic and weather conditions.

- Communications – This User Service uses area-wide low bandwidth wireless communications to communicate with vehicle en-route.

4.1.13 Emergency Notification and Personal Safety (User Service 6.1)

The Emergency Notification And Personal Security User Service provides the capability for the user to manually initiate a distress signal for incidents like mechanical breakdown or non-injury collisions. An automated system would help mitigate the consequences of a serious collision by automatically sending information regarding the location, nature and severity of the collision to an emergency services dispatcher and/or to hospital and emergency room personnel.

- Surveillance – Emergency Notification and Personal Safety shall receive a request for emergency assistance from a user (driver, non-driver, and pedestrian) and locate the user.

- Data Processing – Emergency Notification and Personal Safety shall locate the user and initiate an appropriate response based on information obtained.

- Control Strategies – Emergency Notification and Personal Safety shall stop stolen vehicles at the request of the user.

- Traveller Interface – Emergency Notification and Personal Safety shall provide the capability to manually initiate a distress signal, and automatically initiate a distress signal if the user is incapacitated.

- In-Vehicle Sensors – Emergency Notification and Personal Safety shall automatically initiate a request for assistance based on information obtained from in-vehicle sensors and vehicle positioning applications.

- Communications – Area-wide low-bandwidth wireless communications is required with voice communications as an option.

4.1.14 Disaster Response and Management (User Service 6.3)

The Disaster Response and Management User Service co-ordinates disaster response strategies from a virtual control centre, and disseminates information to agencies and individuals on traffic conditions, diversion routes etc.

- Surveillance – Disaster Response and Management shall collect information from the transportation agencies, to help monitor the disaster and the status of the response.

- Data Processing – Disaster Response and Management shall:

  – Coordinate the roadway transportation management centres with the overall command authority that is leading the disaster response;

  – Co-ordinate emergency management and maintenance management fleets and activities;

  – Coordinate transit assets to support evacuation; and

  – Exchange information with traffic management centres to control roadway usage.

- Traveller Interface – Disaster Response and Management shall disseminate evacuation guidance to travellers via traffic management ISP's (refer to 1.1 Traveller Information).

- Communications – High-bandwidth wireline communication networks are required between traffic management centres for coordinated disaster response.

4.1.15 Emergency Vehicle Management (User Service 6.4)

The Emergency Vehicle Management Service User Service is oriented towards reducing the time from the receipt of notification of an incident by an emergency services dispatcher, and the arrival of emergency vehicles on the scene. It includes emergency vehicle fleet management, route guidance to the incident scene or a suitable hospital, and pre-emption of traffic signals on an emergency vehicle's route to receive more green displays.

- Surveillance – Emergency Vehicle Management shall provide for tracking the location of emergency vehicles. Real-time traffic conditions for emergency routes are obtained from the ISP.

- Data Processing – Emergency Vehicle Management shall:

  – Enable safe and rapid deployment of appropriate resources to an emergency;

  - Co-ordinate the emergency response between agencies;
  - Select the preferred route for the emergency vehicle;
  - Track the progress of emergency vehicles to the emergency scene; and
  - Re-route the emergency vehicle based on roadway conditions.

- Control Strategies – Emergency Vehicle Management shall interact with the traffic signal control system to provide pre-emption to the emergency vehicle along its selected route. Alternatively, the emergency vehicle would be equipped with dedicated short-range communications for local signal pre-emption.
- Navigation and Guidance – Emergency Vehicle Management shall reroute the emergency vehicle depending on roadway conditions.
- Communications – Area-wide low-bandwidth wireless two-way communications between the emergency vehicle and the emergency management system is required for vehicle tracking and guidance.

4.1.16 Weather and Environmental Data Management (User Service 8.1)

The Weather and Environmental Data Management User Service provides system-wide gathering, fusion, and dissemination of information on roadway weather conditions and forecasts.

- Surveillance – Weather and Environmental Data Management shall use roadside sensor systems and weather sensors mounted on maintenance vehicles to collect roadway environmental data, while the national meteorological services provides the basic weather data and modeling functions.
- Data Processing – Weather and Environmental Data Management shall aggregate data from multiple sources and produce a consolidated data source. This data shall be combined with weather predictions for modeling purposes to predict roadway conditions (refer to Environmental Conditions Monitoring).
- Communications – High-bandwidth wireline communications networks are required between centres.

4.2 ENABLING TECHNOLOGIES

The candidate ITS User Services employ many technologies, each with unique performance, cost and maturity characteristics. Many of these technologies are commercially available and would expose the implementing authority to little technical risk in the near term. The most problematic technology implications exist where a required ITS function is not presently supported by any cost-effective, commercially available technology. In a few instances, required technologies may not exist or may be too costly and/or unreliable for commercial application. ITS services that are dependent on such technologies require further research and development before a commercially viable product will be available.

This section identifies and describes the technologies associated with each User Service, defines the maturity of the particular technology, and briefly discusses its local availability in Atlantic Canada.

4.2.1 Technology Requirement Relationships

Exhibit 4.1 identifies functional groups of technologies and relates each of them to the candidate ITS User Services. Each column in the table represents a general technology area that is required to deploy ITS services. The technology requirements for each ITS Service are presented in the body of the table using the following icons:

■: The opaque (black) squares denote a basic relationship between the candidate ITS User Service and the technology area. This assignment indicates that the technology area is fundamental to the ITS service.

❑: The transparent (white) squares denote a secondary relationship between the candidate ITS User Service and the technology area. This assignment indicates that the technology would allow a partially implemented ITS Service to be fully implemented, or a basic definition of the service expanded to a broader one. Use of this technology area is desirable but not necessarily required for candidate ITS User Service implementation.

The candidate ITS User Services are ultimately at a very coarse resolution level for the purposes of this technology assessment. However, this will suffice to identify the areas that are likely to be deployable as near term services (by 2010) and which are likely to be long term services (after 2010).

Exhibit 4.1 – Technology Areas Associated with the Priority User Services for Atlantic Canada

Atlantic ITS Services	Surveillance										Data Processing	Control			Traveler I/F			Navigation	In-Vehicle Sensors	Communications				
	Traffic	Vehicle Status	Environment	Vehicle Monitoring	Driver Monitoring	Cargo Monitoring	Obstacle Ranging	Lane Tracking	Security	Location Determination		Signals	Signs	Vehicle	Driver	Traveler	Operator			Extended Range 2-Way	DSRC	Vehicle-Vehicle	Broadcast	Fixed Wireline
1.1 Traveller Information	■		❑							❑	■				■	■	■	❑		■			■	■
1.4 Traveller Services and Reservation										❑	■				■	■	■	❑		■				■
2.1 Traffic Control	■		❑	❑						❑	■	■	■				■			❑	❑			■
2.2 Incident Management	■			■						■	■	■	■				■			■				■
2.4 Environmental Conditions Monitoring		■	■	❑							■		❑		❑		■		❑	❑				■
2.5 Operations and Maintenance	❑		■	■	❑					■	■	❑	❑	❑	❑		❑		❑	■				
2.6 Automated Warning and Enforcement	■		■								■	■	■											
3.1 Public Transport Management				❑	❑					■	■				❑	❑	■		❑	■	❑			
4.1 Electronic Payment Services									■	❑	■									❑	■			■
5.1 Commercial Veh Electronic Clearance		❑		❑		❑			❑		■	■	■		■		■	❑	❑	❑	■			■
5.5 Intermodal Freight Mgt.				❑		■			■	■	■				■		■			■	■			
5.6 Commercial Fleet Mgt				■					❑	■	■				■		■		❑	■	■			❑
6.1 Emergency Notification and Personal Safety		❑								■	■				■	■	■			■				■
6.3 Disaster Response and Management									■		■									❑				■
6.4 Emergency Vehicle Management				❑					■	■	■				■		■	❑	❑	■	❑			■
8.1 Weather and Environmental Data Mgt			■								■												❑	■

4.2.2 Technology Areas

This section includes a discussion of the functional groups introduced in Section 4.1 (i.e. surveillance, data processing, control, traveller interface, navigation, in-vehicle sensors, and communications) in terms of sub-groups or 'technology areas'. Exhibit 4.2 summarizes the technology areas that have been analyzed within each of the candidate ITS User Services and the relative maturity of that particular technology. A more detailed description of each technology is included within Appendix H.

The maturity assignments are defined as follows (referring to the year 2010 as the end of the "near term" deployment window):

- **Mature:** Current commercially available technology supports the identified ITS requirements in this area. Deployment of the candidate ITS Services is not predicated on further research and development of these technologies. *Candidate ITS Services with dependencies only on these mature technologies should be deployable prior to 2010 with low risk.*

- **Mature with rapid innovation:** Current commercially available technology supports the identified ITS requirements. The area is one of rapid technology growth that indicates that the basic support provided by current technologies will likely be superseded within the period to 2010. While further research and development is not required to support ITS, future deployment may benefit from technology enhancements that should not be precluded by excessive rigidity in the architecture or deployment definitions. *Candidate ITS Services with dependencies only on this class of technologies should be deployable prior to 2010 with low performance risk and medium cost risk, based on obsolescence.*

- **Mixed:** This technology area is required to satisfy a range of ITS requirements including some that are not supported by current technology. Useful services may be deployed using currently available technologies; however, satisfying all ITS Service requirements will require additional research and development to bolster the identified deficiencies. Where this assignment is made, the associated description in highlights the specific areas where technology advancement is required. *Candidate ITS Services with dependencies only on these "mixed" technologies may not be deployable prior to 2010 without significant technical risk.*

- **Immature:** Additional research and development is required before technologies in this area can be cost-effectively and reliably applied to support the candidate ITS Services. In some cases, potentially suitable technologies have been applied in defence and/or aerospace applications, but not in commercial transportation applications. Additional research and development is still required in these areas to address the unique mass production, safety, and cost issues associated with larger commercial markets. *Candidate ITS Services with dependencies only on these immature technologies may not be deployable prior to 2010 under any risk scenario.*

Exhibit 4.2 takes the summary one step further by identifying the local market availability of the technology in terms of the presence of relevant suppliers and service providers. This technology

assessment will suffice to identify areas that are likely to be deployable in Atlantic Canada as near term services (by 2010) and which are likely to be long term services (after 2010).

The identification of a technology area as immature is not the same as an absolute prediction that deployments will not occur without significant further research. There are numerous examples where relatively immature technologies have been applied in successful products, depending on the customer's needs and expectations. Where the need is great enough, creative providers will find other approaches that can be used for interim deployments. For example, technologies that automate vehicle occupant sensing for the purposes of determining compliance with HOV requirements are in their infancy. However, special rules and manned surveillance stations with high speed cameras are currently being used in several locations to support vehicle occupant sensing.

Although the relationship is not absolute, the deployment timing for the dependent candidate ITS Services will be influenced by the timing of the required technology advancements. Unfortunately, accurately forecasting technology development timing is extremely difficult. This timing is dependent upon the current status of the required technology and the quantity and productivity of the research that will be performed in the area.

Exhibit 4.2 – Enabling Technologies Summary

Technology Area	Technology	Description	Maturity	Availability		
				Local	Central and Western Canada	North America
1. Surveillance Section						
Traffic Table B.1 (Appendix B)	Loop Mats	generate an electromagnetic field designed for temporary use				X
	Pressure Plates	detect axles thru electrical contact			X	
	Magnetometer	measure change in Earth magnetic field				X
	Inductive loop	wireline buried in pavement		X		
	Magnetic Probes	measures change in Earth magnetic field			X	
	Sensing Cable	technology limited to detect axles			X	
	Video Imaging	uses the visible light and near infrared bandwidths to sensor traffic parameters			X	
	Radar	2 types: Doppler radar - unable to measure presence; and True presence microwave - detects volume, presence and calculates speeds			X	
	Laser	technology is sensitive to mounting height and position and noise				X
	Ultrasonic Sensing	transmit and receive an acoustic wave that is analyzed to determine vehicle volume				X
	Automatic Vehicle Identification	may be used to provide road link travel time data between antennae for freeway and arterial networks			X	
Vehicle Status Table B.2	Vehicle Classification	sensors which determine individual characteristics of passing vehicles (e.g. vehicle length, weight, no. of axles, lane position, speed)			X	
	Vehicle Emissions	enforcement application technologies that monitor emissions, passenger counts and operational status for specific vehicles are less mature			X	
Environment Table B.3	Environmental Sensors	technologies which monitors local climate (temperature, humidity, precipitation, wind, pollution) and road surface status (dry, wet, ice, snow)		X		
Vehicle Monitoring Table B.4	CCTV Cameras	provides visual surveillance and confirmation of incidents, may be used to detect incidents, and to monitor environmental conditions, supports vehicle classification and enforcement		X		
Driver Monitoring Table B.5	Driver Monitoring Sensors	technologies which monitor driver condition by monitoring driving characteristics and/or other psycho-physiological symptoms associated with impaired performance				X
Cargo Monitoring Table B.6	Cargo Monitoring Sensors	technologies which monitor various indicators of cargo status such as load distribution, temperature, acceleration, pressure			X	

Technology Area	Technology	Description	Maturity	Availability		
				Local	Central and Western Canada	North America
Obstacle Ranging Table B.7	Obstacle Ranging Sensors	technologies which detect and characterize potential obstacles (other vehicles, people, road debris) in a vehicle's vicinity				X
Lane Tracking Table B.7	Lane Tracking Sensors	technologies on board which monitor the position of the vehicle with respect to travel lane				X
Security Table B.8	Security Sensors	technologies which provide surveillance of and restrict access to secure public areas such as card readers, CCTV		X		
Location Determination Table B.9	GPS	technologies which determine absolute position		X		
2. Data Processing Section						
Algorithms Table B.10	custom software packages for automatic incident detection, real-time signal optimization, route optimization, traffic simulation	e.g. McMaster algorithm, SCOOT (Split Cycle Offset Optimization Technique), INTEGRATION, TRANSYT-7F			X	
3. Control Section 4.2.6						
Information Management Table B.10	Regional traffic control	encompasses the communications links and integrated control strategies to enable integrated interjurisdictional traffic control			X	
	Incident Management Systems	manages both predicted and unexpected incidents to impact to safety is minimized			X	
Signals Table B.11	UTC Systems	Traffic signal control, limited ATMS abilities		X		
Signs Table B.12	Light Emitting Diode	uses pixels comprised of clusters of hi-intensity LEDs			X	
	Liquid Crystal Displays	insufficient contrast ratios and operating temperature restrictions limit outdoor use				
	Hybrid	includes fibre/flip, LED/flip: each disk has a small opening to expose the end of an illuminated fibre strand			X	
	Rotating Drum	No. of messages displayed depends on no. of drums and no. of sides of its drums		X		
Vehicle Table B.13	Vehicle Control Sensors	technologies will emerge on the market as a collection of discrete market driven features (e.g. adaptive cruise control)				X
4. Traveller Interface Section						
Driver Table B.14	Driver Interface	Audio, visual and tactile interface technologies appropriate for interaction with drivers during vehicle operation (e.g. console LED, LCD, heads-up displays and synthesized speech)				X
Traveller Table B.15	Traveler Interface	Same technologies as for D/I with varied constraints, extreme portability requirements restrict interface options			X	

Technology Area	Technology	Description	Maturity	Availability		
				Local	Central and Western Canada	North America
Operator Table B.16	Operator Interface	Same as for T/I			X	
5. Navigation Section						
Navigation Table B.17	Route Selection and Guidance	can be either autonomous or dynamic				X
6. In-Vehicle Sensors Section						
In-Vehicle Table B.18	In-Vehicle Sensors	The range of on-board sensor technologies which monitor vehicle condition (e.g. engine, brake, tire and suspension status) and performance (e.g. speed, braking)				X
7. Communications Section						
Extended Range 2-Way Table B.19	PCS	analog cellular and digital PCS services offered in Canada		X		
	Enhanced Specialized Mobile Radio (ESMR)	form of high mobility telephony and dispatch service		X		
	Microwave	uses a no. of microwave radios, low cost, high bandwidth alternative to a fibre network build			X	
DSRC Table B.20	Dedicated Short Range Communications	wireless devices capable of transferring data at a high rate between mobile and/or stationary devices but are limited to a short-range			X	
Vehicle-Vehicle Table B.21	Vehicle to vehicle Communications	short-range wireless communications used to exchange information between vehicles in close proximity for applications such as intersection collision avoidance and vehicle platooning				X
Broadcast Table B.22	Broadcast Communication	highway advisory radio, licensed AM or FM frequency, DAB is a wireless audio and data transmission system developed for point to multipoint data broadcast applications			X	
Fixed Wireline Table B.23	Fixed Wireline Communications	SONET is a multiplexing industry standard for fibre optic transmission system ATM is a packetization standard which facilitates the transfer of data in cells or packets of a fixed size				X

4.3 USER SUB-SERVICES

The ITS Architecture for Canada identifies User Sub-Services to further refine the context for each of the User Services. The ITS Architecture for Canada provides 90 User Sub-Services for its 35 User Services. The Atlantic Provinces Regional ITS Strategic Planning Study has identified sixteen priority ITS User Services of relevance to Atlantic Canada in response to the identified existing and anticipated user needs. Specifically, the Step 2 "User Service Plan" section mapped user needs to User Sub-Services and the relevant constituent Sub-Services.

Exhibit 4.3 includes a summary of the User Sub-Services that have been identified for each of the candidate ITS User Services and a rating for the relative relevancy and maturity of the particular User Sub-Service to Atlantic Canada. A total of thirty-six User Sub-Services were identified as relevant to Atlantic Canada.

The relevancy rating assignments were based on the potential of a particular User Sub-Service to:

- Meet multiple user needs (as defined in the Step 2 "User Service Plan"); and/or
- Meet the needs of a particularly high-priority user need.

The relevancy rating assignments are defined as follows:

● **Highly Relevant:** Meets multiple user needs and/or high priority user needs.

◐ **Moderately Relevant:** Meets some user needs and/or user needs of a lesser priority.

○ **Less Relevant:** Does not directly address user needs. Has a low priority for implementation in Atlantic Canada.

Exhibit 4.3 – User Sub-Service Readiness for Deployment

User Sub-Services	Relevancy to Atlantic Canada	Maturity of Application
1.1 Traveller Information		
1.1.1 Broadcast Traveller Information	●	●
1.1.2 Interactive Traveller Information	●	◔
1.1.3 Real-Time Ridesharing Information	○	◔
1.4 Traveller Services and Reservations		
1.4.1 Traveller Yellow Pages	◐	◐
1.4.2 Services Purchases and Reservations	◐	◔
1.4.3 Parking Facility Management	◐	◐
1.4.4 Regional Parking Management	◐	◐
2.1 Traffic Control		
2.1.1 Network Flow Monitoring	◐	◔
2.1.2 Surface Street Control	●	●
2.1.3 Highway Control	◐	●
2.1.4 Regional Traffic Control	○	●
2.1.5 Traffic Information Dissemination	●	◔
2.1.6 Virtual TMC	○	◐
2.1.7 Probe-based Flow Monitoring	○	◔
2.1.8 Traffic Estimation and Prediction	○	◔

Exhibit 4.3 – User Sub-Service Readiness for Deployment

User Sub-Services	Relevancy to Atlantic Canada	Maturity of Application
2.2 Incident Management		
2.2.1 Incident Management Coordination	●	◔
2.2.2 Incident Prediction System	○	◔
2.4 Environmental Conditions Management		
2.4.1 Roadway Environmental Sensing	◐	●
2.4.2 Emissions Management	○	◐
2.4.3 Road Weather Information System	◐	●
2.4.4 Vehicle-based Sensing	◐	●
2.5 Operations and Maintenance		
2.5.1 Infrastructure Maintenance Management	◐	●
2.5.2 Smart Work Zone	●	●
2.6 Automated Dynamic Warning and Enforcement		
2.6.1 Dynamic Roadway Warning	●	◔
2.6.2 Variable Speed Limit and Enforcement	○	●
2.6.3 Signal Enforcement	◐	●
3.1 Public Transport Management		
3.1.1 Transit Vehicle Tracking	●	●
3.1.2 Transit Fixed-route Operations	◐	●
3.1.3 Passenger and Fare Management	◐	●
3.1.4 Transit Maintenance	◐	●
3.1.5 Multi-Modal Coordination	○	◐
3.1.6 Multi-modal Connection Protection	○	◐
4.1 Electronic Payment Services		
4.1.1 Electronic Toll Collection	●	●
4.1.2 Electronic Parking Payment	◐	◔
4.1.3 Transit Services Payment	◐	●
4.1.4 Traveller Services Payment	●	●
5.1 Commercial Vehicle Electronic Clearance		
5.1.1 Electronic Clearance	●	◔

Exhibit 4.3 – User Sub-Service Readiness for Deployment

User Sub-Services	Relevancy to Atlantic Canada	Maturity of Application
5.1.2 International Border Crossing Clearance	●	◐
5.1.3 Weigh-in-Motion (WIM)	●	◐
5.5 Intermodal Freight Management		
5.5.1 Freight In-Transit Monitoring	●	◐
5.5.2 Intermodal Interface Management	●	◐
5.6 Commercial Fleet Management		
5.6.1 Fleet Administration	●	◔
5.6.2 Freight Administration	●	◔
5.6.3 CVO Fleet Management	●	●
6.1 Emergency Notification and Personal Security		
6.1.1 Personal Security	●	◔
6.1.2 MAYDAY Support	●	◐
6.3 Disaster Response and Management		
6.3.1 Disaster Command and Control	●	◐
6.3.2 Disaster Information Dissemination	●	◔
6.4 Emergency Vehicle Management		
6.4.1 Emergency Response Management	●	◔
6.4.2 Emergency Vehicle Routing	●	●
8.1 Weather and Environmental Data Management		
8.1.1 Roadway and Weather Data Fusion	●	●
8.1.2 Environmental Information Dissemination	●	●
8.1.3 Roadway Meso and Micro Prediction	○	◐

4.3.1 Outline of Relevant User Sub-Services

This section provides brief descriptions for the User Sub-Services identified as 'highly relevant' in the previous section. These descriptions are substantially taken from those provided in the ITS Architecture for Canada, but have been tailored (where appropriate) to reflect the priorities, needs and context for Atlantic Canada.

This section feeds into the subsequent section covering the 'Deployment Planning' for the Strategic Plan. The aim of this section is to identify practical implementation scenarios for each of the above-noted User Sub-Services. Consequently, the Market Package(s) within the ITS Architecture for Canada that are associated with these User Sub-Services have been identified.

Traveller Information (User Service 1.1)

Broadcast Traveller Information (User Sub-Service 1.1.1)

This User Sub-Service provides the user with a basic set of ATIS services; its objective is early notification. It involves the collection of traffic conditions, road conditions, advisories, general public transportation, toll, ferry, border crossing and parking status information, incident information, air quality and weather information, and the near real time dissemination of this information over a wide area through existing infrastructures and low cost user equipment. The successful deployment of this User Sub-Service relies on the availability of real-time traveller information from roadway instrumentation, probe vehicles, or other sources.

This User Sub-Service is related to the *Broadcast Traveller Information Market Package* within the ITS Architecture for Canada.

Interactive Traveller Information (User Sub-Service 1.1.2)

This User Sub-Service provides tailored information in response to a traveller request. Both real-time interactive request/response systems and information systems are supported, that "push" a tailored stream of information to the traveller based on a submitted profile. The traveller can obtain current information regarding traffic conditions, road, weather and sea conditions, transit services, ride share/ride match, parking management, ferry status and/or scheduling, border crossing delays, and pricing information. A range of two-way wide-area wireless and wireline communications systems may be used to support the required digital communications between traveller and the information service provider. A variety of interactive devices may be used by the traveller to access information prior to a trip or en-route to include phone, kiosk, Personal Digital Assistant, personal computer, and a variety of in-vehicle devices. Successful deployment of this User Sub-Service relies on availability of real-time transportation data from roadway instrumentation, probe vehicles, parking managers, transit providers, traffic management authorities, Marine Atlantic or other means.

This User Sub-Service is related to the *Interactive Traveller Information Market Package* within the ITS Architecture for Canada.

Traffic Control (User Service 2.1)

Surface Street Control (User Sub-Service 2.1.2)

This User Sub-Service provides the central control and monitoring equipment, communication links, and the signal control equipment that support local surface street control and/or arterial traffic management. A range of traffic signal control systems are represented by this User Sub-Service ranging from static pre-timed control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. Additionally, general advisory and traffic control information can be provided to the driver while en-route. This User Sub-Service is generally an intra-jurisdictional sub-service that does not rely on real-time communications between separate control systems to achieve area-wide traffic signal co-ordination. Systems that achieve co-ordination across jurisdictions by using a common time base or other strategies that do not require real time co-ordination would be represented by this sub-service. This User Sub-Service is consistent with typical urban traffic signal control systems.

This User Sub-Service is related to the *Surface Street Control Market Package* within the ITS Architecture for Canada.

Traffic Information Dissemination (User Sub-Service 2.1.5)

This User Sub-Service allows traffic information to be disseminated to drivers and vehicles using roadway equipment such as dynamic message signs or highway advisory radio. This User Sub-Service provides a tool that can be used to notify drivers of incidents. Careful placement of the roadway equipment provides the information at points in the network where the drivers have recourse and can tailor their routes to account for the new information. This User Sub-Service also covers the equipment and interfaces that provide traffic information from a traffic management centre to the media (e.g. via a direct tie-in between a traffic management centre and radio or television station computer systems), transit management centre, emergency management centre, and information service provider.

This User Sub-Service is related to the *Traffic Information Dissemination Market Package* within the ITS Architecture for Canada.

Incident Management (User Service 2.2)

2.2.1 Incident Management Coordination (User Sub-Service 2.2.1)

This User Sub-Service manages both scheduled and unscheduled incidents so that the impact to the transportation network and traveller safety is minimised. Requisite incident detection capabilities are included in the highway control User Sub-Service. The regional co-ordination with other traffic management (e.g. municipal and regional traffic and transit authorities, ferry operators, etc.), and emergency management centres, weather service entities, and event promoters is supported by this User Sub-Service. Information from these diverse sources are collected and correlated by this User Sub-Service to detect and verify incidents and implement an appropriate response. This User Sub-Service provides Traffic Management Subsystem and Maintenance Management Subsystem equipment that supports traffic operations/maintenance personnel in developing an appropriate response in co-ordination with emergency management and other incident response personnel to confirmed incidents. The response may include traffic control strategy modifications and dissemination of information to affected travellers using the Traffic Information Dissemination market package. The same equipment assists the operator by monitoring incident status as the response unfolds. The co-ordination with emergency management might be through a CAD system or through other communication with emergency field personnel. Co-ordination between traffic and maintenance operations is also included and also includes assets such as tow trucks.

This User Sub-Service is related to the *Incident Risk Prediction System Market Package* within the ITS Architecture for Canada.

Operations and Maintenance (User Service 2.5)

Smart Work Zone (User Sub-Service 2.5.2)

This User Sub-Service includes systems that gather, store, and disseminate information relating to work zones. The roadside elements of the User Sub-Service can monitor and control traffic in the vicinity of the work zone. The central element of this User Sub-Service can participate in incident management by

initiating incident notification, or by participating in incident response. It can advise drivers of work zone status (either directly at the roadside or through an interface with the Information Service Provider or Traffic Management Subsystems.). The central systems can manage and track construction and maintenance activities while co-ordinating with other Subsystems (such as traffic management). It can schedule and manage the location and usage of maintenance assets (such as portable dynamic message signs). These information systems are used by roadway maintenance personnel, roadway construction personnel, and other work crew personnel assigned to highway construction and maintenance to rapidly correct deficiencies that are noted through its advanced surveillance capabilities. This improves the quality and accuracy of information available to Travellers regarding closures and other roadway construction and maintenance activities, and improves safety for workers within the work zone.

This User Sub-Service is related to the *Smart Work Zones Market Package* within the ITS Architecture for Canada.

Automated Dynamic Warning and Enforcement (User Service 2.6)

Dynamic Roadway Warning (User Sub-Service 2.6.1)

This User Sub-Service supports the dynamic presentation of warning information to drivers. Warnings may be generated in response to roadway weather conditions, road surface conditions, traffic conditions, obstacles or animals in the roadway, and any other transient events that can be sensed. Warnings may also be generated that recognise the limitations of a given vehicle for the geometry of the roadway, (e.g. rollover risk for tall vehicles). This User Sub-Service differs from "Traffic Information Dissemination" in that it is possible for all processing to occur remotely at the roadside, making this capability autonomous for remote application. It also expands the capabilities of Traffic Information Dissemination User Sub-Service by focusing on non-traffic roadway issues. This User Sub-Service would be of particular benefit to the rural areas of Atlantic Canada.

This User Sub-Service is related to the *Dynamic Roadway Warning Market Package* within the ITS Architecture for Canada.

Public Transport Management (User Service 3.1)

Transit Vehicle Tracking (User Sub-Service 3.1.1)

This User Sub-Service provides for an Automated Vehicle Location System to track the transit vehicle's real time schedule adherence and updates the transit system's schedule in real-time. Vehicle position may be determined either by the vehicle (e.g., through GPS) and relayed to the infrastructure or may be determined directly by the communications infrastructure. A 2-way wireless communication link with the Transit Management Subsystem is used for relaying vehicle position and control measures. Fixed route transit systems may also employ beacons along the route to enable position determination and facilitate communications with each vehicle at fixed intervals. The Transit Management Subsystem processes this information, updates the transit schedule and makes real-time schedule information available to the Information Service Provider Subsystem via a wireline link.

This User Sub-Service is related to the *Transit Vehicle Tracking Market Package* within the ITS Architecture for Canada.

Electronic Payment Services (User Service 4.1)

Electronic Toll Collection (User Sub-Service 4.1.1)

This User Sub-Service provides toll operators with the ability to locally or centrally collect tolls electronically and detect and process violators. Variations in the fees that are collected enable implementation of demand management strategies. Dedicated short-range communication between the roadway equipment and the vehicle is required as well as wireline interfaces between the toll collection equipment and transportation authorities and the financial infrastructure that supports fee collection. Vehicle tags of toll violators are read and electronically posted to vehicle owners. Standards, inter-agency co-ordination, and financial clearinghouse capabilities enable regional and ultimately national interoperability for these services. The population of toll tags and roadside readers that these systems utilize can also be used to collect road use statistics for highway authorities. This data can be collected as a natural by-product of the toll collection process or collected by separate readers that are dedicated to probe data collection.

This User Sub-Service is related to the *Electronic Toll Collection Market Package* within the ITS Architecture for Canada.

Traveller Services Payment (User Sub-Service 4.1.4)

This User Sub-Service enhances the Interactive Traveller Information User Sub-Service by making infrastructure-provided yellow pages and reservation services available to the user. The same basic user equipment is included. This User Sub-Service provides multiple ways to access information either while en-route using wide-area wireless communications or pre-trip via wireline connections.

This User Sub-Service is related to the *Traveller Services Payment and Reservation Market Package* within the ITS Architecture for Canada.

Commercial Vehicle Electronic Clearance (User Service 5.1)

Electronic Clearance (User Sub-Service 5.1.1)

This User Sub-Service will be of particular relevance to the main border crossing facilities within New Brunswick. It provides for automated clearance at roadside check facilities. The roadside check facility communicates with the Commercial Vehicle Administration Subsystem over wireline to retrieve infrastructure snapshots of critical carrier, vehicle, and driver data to be used to sort passing vehicles. This User Sub-Service allows a compliant driver/vehicle/carrier to pass roadside facilities at highway speeds using transponders and dedicated short-range communications to the roadside. The roadside check facility may be equipped with AVI, weighing sensors, transponder read/write devices, and computer workstation processing hardware, software, and databases.

This User Sub-Service is related to the *Electronic Clearance Market Package* within the ITS Architecture for Canada.

International Border Crossing Clearance (User Sub-Service 5.1.2)

Important for the Atlantic Provinces because of the numerous border facilities to the U.S., this User Sub-Service provides for automated clearance specific to international border crossings. This sub-service augments the electronic clearance sub-service by allowing interface with customs related functions and permitting NAFTA required entry and exit from Canada and the U.S.

This User Sub-Service is related to the *International Border Crossing Clearance Market Package* within the ITS Architecture for Canada.

Weigh-in-Motion (WIM) (User Sub-Service 5.1.3)

This User Sub-Service provides for high speed weigh-in-motion with or without AVI capabilities. If the equipment is fixed, then it is characterized as an addition to the electronic clearance and would work in conjunction with the AVI and AVC equipment in place.

This User Sub-Service is related to the *Weigh-In-Motion (WIM) Market Package* within the ITS Architecture for Canada.

Intermodal Freight Management (User Service 5.5)

Freight In-Transit Monitoring (User Sub-Service 5.5.1)

This User Sub-Service covers the ability to track and monitor intermodal containers and intermodal freight shipments anywhere in the transportation system. This information is provided to freight customers, fleet managers, and logistics service providers. This User Sub-Service supports the monitoring of the container and its contents during the entire pickup-transport-drop-off period.

This User Sub-Service is related to the *Freight In-Transit Monitoring Market Package* within the ITS Architecture for Canada.

Intermodal Interface Management (User Sub-Service 5.5.2)

This User Sub-Service supports the operation of the roadway aspects of an intermodal terminal. The "terminal" may represent the transfer point between roadway and one or more other modes of container transport (rail, air or water), and may be an actual terminal facility or a private intermodal transfer facility. The key capabilities include the ability to identify and control vehicle traffic entering and departing the facility, guide vehicles to loading and unloading points, maintain site security and monitor container integrity, provide an interface to Customs as appropriate, and acknowledge container pickup and drop-off. In addition, the sub-service allows data exchange between different terminals of the same mode or different modes. Other capabilities include the ability to track container locations within the facility and to manage any other required assets, like truck chassis. This User Sub-Service may be deployed in conjunction with user the Weigh-in-Motion and Roadside CVO Safety User Sub-Services to provide truck weight and safety assessments for vehicles prior to departing the facility.

This User Sub-Service is related to the *Freight Terminal Management Market Package* within the ITS Architecture for Canada.

Commercial Fleet Management (User Service 5.6)

Fleet Administration (User Sub-Service 5.6.1)

This User Sub-Service keeps track of vehicle location, itineraries, and fuel usage at the Fleet and Freight Management Subsystem using a cell based or satellite data link and the pre-existing wireless infrastructure. The vehicle has a processor to interface to its sensor (e.g., fuel gauge) and to the cellular data link. The Fleet and Freight Management Subsystem can provide the vehicle with dispatch instructions, and can process and respond to requests for assistance and general information from the vehicle via the cellular data link. The User Sub-Service also provides the Fleet Manager with connectivity to intermodal transportation providers using the existing wireline infrastructure.

This User Sub-Service is related to the *Fleet Administration Market Package* within the ITS Architecture for Canada.

Freight Administration (User Sub-Service 5.6.2)

This User Sub-Service tracks cargo and its status. This information is communicated with the Fleet and Freight Management Subsystem via the existing wireless infrastructure. Interconnections are provided to intermodal shippers and intermodal freight terminals for tracking the cargo from source to destination.

This User Sub-Service is related to the *Freight Administration Market Package* within the ITS Architecture for Canada.

CVO Fleet Maintenance (User Sub-Service 5.6.1)

This User Sub-Service supports maintenance of CVO fleet vehicles through close interface with on-board monitoring equipment and AVLS capabilities with in the Fleet and Freight Management Subsystem. Records of vehicle mileage, repairs, and safety violations are maintained to assure safe vehicles on the highway.

This User Sub-Service is related to the CVO Fleet Maintenance Market Package.

Emergency Notification and Personal Security (User Service 6.1)

Personal Security (User Sub-Service 6.1.1)

This User Sub-Service allows the user (driver, non-driver, and pedestrian) to initiate a request for emergency assistance and enables the Emergency Management Subsystem to locate the user and determine the appropriate response. The Emergency Management Subsystem may be operated by the public sector or by a private sector provider. The request from the traveller needing assistance may be manually initiated or automated and linked to vehicle sensors. The data is sent to the Emergency Management Subsystem using wide area wireless communications with voice as an option. Providing user location implies either a location technology within the user device or location determination within the communications infrastructure.

This User Sub-Service is related to the *Personal Security and MAYDAY Support Market Package* within the ITS Architecture for Canada.

MAYDAY Support (User Sub-Service 6.1.2)

This User Sub-Service allows the user (driver, non-driver, and pedestrian) to initiate a request for emergency assistance and enables the Emergency Management Subsystem to locate the user and determine the appropriate response. The Sub-Service allows user to inform regarding the stolen vehicles and enables the Emergency Management Subsystem to detect and stop such vehicles. The Emergency Management Subsystem may be operated by the public sector or by a private sector provider. The request from the traveller needing assistance may be manually initiated or automated and linked to vehicle sensors. The data is sent to the Emergency Management Subsystem using wide area wireless communications with voice as an option. Providing user location implies either a location technology within the user device or location determination within the communications infrastructure.

This User Sub-Service is related to the *Personal Security and MAYDAY Support Market* within the ITS Architecture for Canada. Package.

Disaster Response and Management (User Service 6.3)

Disaster Command and Control (User Sub-Service 6.3.1)

This User Sub-Service supports the co-ordinated response to large-scale disasters. Examples can include natural disasters like hurricanes, blizzards, earthquakes, and floods or man-made disasters like explosions, chemical spills, terrorism, or air crashes. The User Sub-Service supports co-ordination of the roadway transportation management centres with the overall command authority that is leading the disaster response. This includes co-ordination of emergency management and maintenance management fleets and activities, the use of transit assets to support evacuation and the exchange of information with traffic management to control roadway usage.

This User Sub-Service is related to the *Disaster Command and Control Market Package* within the ITS Architecture for Canada.

Disaster Information Dissemination (User Sub-Service 6.3.2)

This User Sub-Service supports the dissemination of disaster related information from a central co-ordinating point. Disasters are considered to be large-scale events that affect regions and may require province-level or even national-level response. The information that is disseminated can include evacuation guidance to travellers via traffic management and information service providers. Information can also include specific disaster response status for the operational needs of various transportation and emergency management agencies. This User Sub-Service also supports the capability for the disaster-co-ordinating agency to collect information from the transportation agencies, to help monitor the disaster and the status of the response.

This User Sub-Service is related to the *Disaster Information Dissemination Market Package* within the ITS Architecture for Canada.

Emergency Vehicle Management (User Service 6.4)

Emergency Response Management (User Sub-Service 6.4.1)

This User Sub-Service provides the computer-aided dispatch systems, emergency vehicle equipment, and wireless communications that enable safe and rapid deployment of appropriate resources to an emergency. Co-ordination between Emergency Management Subsystems supports emergency notification and co-ordinated response between agencies. Existing wide area wireless communications would be utilized between the Emergency Management Subsystem and an Emergency Vehicle to enable an incident command system to be established and supported at the emergency location. The Emergency Management Subsystem would include hardware and software for tracking the emergency vehicles. Public safety, traffic management, maintenance management and many other allied agencies may each participate in the co-ordinated response managed by this sub-service.

This User Sub-Service is related to the *Emergency Response Management Market Package* within the ITS Architecture for Canada.

Emergency Vehicle Routing (User Sub-Service 6.4.2)

This User Sub-Service supports dynamic routing of emergency vehicles and co-ordination with the Traffic Management Subsystem for special priority on the selected route(s). The Information Service Provider Subsystem supports routing for the emergency fleet based on real-time traffic conditions and the emergency routes assigned to other responding vehicles. In this User Sub-Service, the Information Service Provider Subsystem would typically be integrated with the Emergency Management Subsystem in a public safety communications centre. The Emergency Vehicle would also optionally be equipped with dedicated short-range communications for local signal pre-emption.

This User Sub-Service is related to the *Emergency Vehicle Routing Market Package* within the ITS Architecture for Canada.

Weather and Environmental Data Management (User Service 8.1)

Roadway and Weather Data Fusion (User Sub-Service 8.1.1)

This User Sub-Service supports the fusion of roadway environmental data with general weather forecasts and observations. Roadside sensor systems, or sensor systems mounted on maintenance vehicles collect roadway environmental data while the national meteorological service provides the basic weather data and modelling functions.

This User Sub-Service is related to the *Roadway and Weather Data Fusion Market Package* within the ITS Architecture for Canada.

Environmental Information Dissemination (User Sub-Service 8.1.2)

This User Sub-Service supports the dissemination of roadway and weather data to centres which can utilize it as part of their operations, or to the Information Service Providers who can provide the information to travellers.

This User Sub-Service is related to the *Environmental Information Dissemination Market Package* within the ITS Architecture for Canada.

5. ITS DEPLOYMENT PROGRAM

The Deployment Program definition establishes the strategic projects for short, medium and long term deployment, the implementation schedule, and an Action Plan for ongoing monitoring through implementation and subsequent performance evaluation. The following is a summary of these aspects.

5.1 STRATEGIC PROJECTS

5.1.1 Development of Strategic Project Short-List

Drawing from the information gathered, the stakeholder input/discussions and the analysis undertaken in Tasks 1 through 4, a short list of strategic projects was developed and reflected:

- Identified "early winners";
- Additional priority projects that meet the needs and vision;
- Projects that may:
  - Expand the use of technology;
  - Receive positive reaction from all sectors and stimulate other projects in the Atlantic Region;
  - Involve Atlantic companies/services; and/or
  - Stimulate economic growth.

Initially the stakeholder group identified twenty-six strategic projects, which have been refined through the stakeholder consultation process outlined below.

5.1.2 Stakeholder Input

The stakeholder group was reconvened in Halifax on April 25th, 2002 and in St. John's on May 15th, 2002 to undertake a Deployment Planning workshop. A detailed agenda and list of participants is included in Appendix I. The workshops included a(n):

- Introductory session which provided an overview of the study status and prepared the participants to provide input on the deployment plan;
- Presentation of the "project profile" summaries for the short-list of strategic ITS projects; and
- Opportunity to provide input relating to the strategic projects and their characteristics.

Individuals directly related to the project and others in the area of expertise reviewed the strategic projects in detail. To facilitate the review process, one-page "project profiles" were prepared for each project.

As a result of the input received through these workshops, a number of changes were made to the project list and the content of individual profiles. Specifically, some of the traveller information and commercial vehicle projects were combined. In both these circumstances, all agreed that the nature, scope and intent of these projects were sufficient to warrant their combination.

In June 2002, the project profiles were revised to reflect the comments received by the stakeholder group and the Project Steering Committee (PSC). The updated project profiles were distributed by e-mail to the stakeholders present at the Deployment Planning workshops, the PSC and the ITS Working Group for a final review and comment. This series of reviews was undertaken to ensure that comments were received and incorporated as the participants and PSC envisioned.

Exhibit 5.1 is a summary of the final list of the twenty-two projects to be included in the Plan. Each project was given a reference number based upon their primary User Service.

Exhibit 5.1 – Final Project List

Project Reference	Project Name
TI-1	Atlantic Provinces Advanced Traveller and Tourist Information System
TM-1	Atlantic Provinces ARWIS Expansion
TM-2	Wildlife Detection in Atlantic Canada, Scoping Study and Pilot Project
TM-3	Implementation of Fixed Automated Spray Technology (FAST) for Bridge De-icing
TM-4	Red Light Camera Pilot Project
TM-5	Portable Changeable Message Sign (PCMS) for Work Zones
TM-6	Smart Snowplow Expansion
TM-7	Bridge Incident Management Scoping Study
PT-1	Urban Transit Real-Time Information Service
PT-2	Community Transit Fleet Management
EP-1	Parking Electronic Payment and Monitoring
EP-2	Atlantic Canada Transaction Tag
EP-3	Smart Card Pilot Project
CV-1	Integrated Intermodal Information System
CV-2	Atlantic Trade Corridor Border Security and Electronic Inspection
CV-3	Atlantic Canada Electronic Permitting for Oversized and Overweight Vehicles
CV-4	Port Operational Information Extranet
CV-5	Port Container Security

Exhibit 5.1 – Final Project List	
Project Reference	**Project Name**
CV-6	Airport Groundside Transportation Management
CV-7	Commercial Fleet Management Program
EM-1	Wireless Network Expansion
EM-2	Atlantic Provinces Disaster Response Plan Scoping Study
Notes: TI – Traveller Information PT- Public Transport CV- Commercial Vehicle	 TM – Traffic Management EP – Electronic Payment EM – Emergency Management

5.1.3 Project Profiles

A one-page "project profile" was developed for each of the short-listed strategic projects to provide a brief summary of the details of the project. A summary template was developed to allow for easy consumption and review by the stakeholders and others by providing a common format and a consistent level of detail for all projects.

The project profile summaries include:

- **Project Title and Reference Number**
- **Project Description** – A brief description of the project highlighting the principle components and a direct reference to one or more needs from Task 1 that are being addressed by the initiative;
- **Benefits** – The nature of the anticipated benefits and the key beneficiaries;
- **Barriers** – Identification of any known barriers to implementation including organizational, financial, legal, user acceptance or technical impediments;
- **Project Logistics** – A description of the related ITS and other on-going projects external to the Plan, the technologies required to implement the initiative and the required resources (funding);
- **Participants** – Categorization of participants into lead and supporting participants as a function of there expected involvement in the project;
- **ITS Definitions** – Identification of the components of the ITS architecture that are applicable to the project, including User Services, User Sub-services and Market Packages;
- **Evaluation** – A description of the measures of effectiveness and the methodologies to evaluate the relative success of the project; and

- **Implementation Time Frame** – The implementation time frame including an estimation of the start date.

Project profiles for the finalized list of strategic projects are included in the following pages.

Project No. TI-1

Atlantic Provinces Advanced Traveller and Tourist Information System

PROPOSED PROJECT PROSPECTUS

Project Description

The first stage of the project would consist of a pilot system in New Brunswick, providing traveller information and tourist reservation systems. The project would incrementally be expanded to include other services and regions through the course of the project. The system would gather, fuse and disseminate traffic and weather data to provide travellers with information prior to their departure, and would assist them in making reservations at local facilities. A key to the delivery of comprehensive, consolidated, and accurate traveller information is the implementation of an information warehouse. The establishment of the data warehouse would be undertaken through cooperation with the remaining Atlantic Provinces.

Need #8: Improved ferry services, particularly Nova Scotia – Newfoundland
Need #9: Provide travel incentives and traveller information to promote tourism in Atlantic Canada

Benefits

- Travellers will be able to access one service to find information on traffic and weather conditions, construction sites and bridge closures
- The consolidation of the data will make gaps in data more apparent, and encourage system expansion.
- The project will include an information warehouse that will house data required to support and assess other initiatives.

Barriers

Organizational and Funding Issues:
- Inter-agency co-operation
- Identification of a host operator
- Funding structure and availability

Technical
- Geographic gaps in available data
- Lack of common data/information sharing structure, i.e. lack of national standards

Logistics

Directly Related Projects:
- EM-1 – Wireless Network Expansion
- EP-1 – Saint John Parking Commission Parking Electronic Payment/Monitoring
- CV-4 – Port of Halifax Operational Information Extranet
- CV-6 - Halifax Airport Groundside Transportation Management

Technologies:
- Traveller information website and other information dissemination services

Estimated Resources:
- Pilot project deployment and support ($400,000 to $700,000)
- Design and implementation of information warehouse ($500,000 to $700,000)

Participants

Lead Participants: New Brunswick Department of Transportation and New Brunswick Tourism.

Supporting Participants:

- Three remaining provincial departments and large municipalities
- Maine Department of Transportation and Transport Quebec
- Environment Canada and ACOA
- Canadian Customs and Revenue Agency and U.S. Customs
- Internet service providers, toll authorities and telecommunications services
- Nova Scotia Tourism

ITS Definition

User Service: 1.1 Traveller Information, 1.4 Traveller Services and Reservations, 8.1 Weather and Environmental Data Management, 8.2 Archived Data Management
User Sub-Services: 1.1.1, 1.4.1, 1.4.2, 8.1.1

Market Packages: AD1, AD2, AD3, ATISI, ATMS06, ATIS7

Evaluation

The primary evaluation criteria for the project would be the:

- Number of travellers using the system
- Growth in tourism industry participants in the system
- Stability of the system
- Interest in expansion generated by the pilot project.
- The information warehouse will be evaluated based on the quality and scope of the data

Target Start: Spring 2003

2003	2004	2005	2006	2007	2008

Project No. TM-1

Atlantic Provinces ARWIS Expansion

PROPOSED PROJECT PROSPECTUS

Project Description

ARWIS technologies are currently being used to verify local weather conditions, forecast snow control planning and evaluate response actions, increase weather forecast accuracy, and provide traveler information. This initiative would review opportunities to improve ARWIS coverage throughout the Atlantic Provinces, improve information exchange to Environment Canada and provide road weather information to road maintenance personnel.

Need #2: Reduce rural road accidents through early detection and treatment of adverse conditions
Need #5: Improved effectiveness and efficiency of roadway winter maintenance operations

Benefits

This project would contribute to improvement in road conditions during and after winter storm events along with a reduction in roadway collisions and liability exposure. Further improvements in the effectiveness and efficiency of roadway winter maintenance operations should also be realized. ARWIS would help justify and document the use of road salt in support of Environment Canada's initiatives relating to salt being declared as harmful to the environment.

Barriers

Both Federal and Provincial governments would have to provide capital and on going operational funding. Municipal and private groups would also be looked to for operational funding. Inter-agency and Public/Private partnerships would have to be forged. Local expertise in ARWIS planning, installation and maintenance would have to be developed. The expanded system would have to be integrated with multiple existing ARWIS systems.

Liability issues relating to data dissemination.

Logistics

Directly Related Projects:
- Need commitment from Environment Canada for ongoing ARWIS polling, forecasting and Web Server operation.
- Planning on a regional (Atlantic) scale to achieve good coverage and integration of new with existing sites without overlap.
- TM-6 – Smart Snowplow Expansion

Technologies:
- ARWIS site equipment compatible with existing information dissemination system

Estimated Resources:
- 5 sites - $400,000 and 10 sites - $750,000

ITS Definition

User Services: 2.4 Environmental Conditions Management.
User Sub-services: 2.4.1 Roadway Environmental Sensing; 2.4.3 Road Weather Information System
Market Package(s): ATMS18 Road Weather Information System, ATMS20 Roadway Environmental Sensing

Participants

Environment Canada | Environnement Canada

Lead Participants: The four Provincial DOTs providing the ARWIS sites and Environment Canada.

Supporting Participants:
- Municipalities
- Private road agencies
- Winter maintenance contractors
- ARWIS suppliers
- Information service providers
- Trucking industry

Evaluation

Agencies should monitor before/after collision data and maintenance expenditures. The Atlantic Provinces can expect to see:
- An improvement in highway safety through a reduction in roadway collisions and liability exposure;
- Further improvements in the effectiveness and efficiency of roadway winter maintenance operations;
- Improved justification and documentation of Road Salt use (supporting Environment Canada's initiatives relating to Salt being declared as harmful to the environment).

Target Start: Summer 2004

2003	2004	2005	2006	2007	2008

Project No. TM-2

Wildlife Detection in Atlantic Canada Scoping Study and Pilot Project

PROPOSED PROJECT PROSPECTUS

Project Description

This two-phase project would commence with a scoping study to assess potential collision reduction methods/technologies and identify high wildlife conflict sections of roadway. This exercise would be followed by a pilot installation on high risk rural section of roadway including an assessment of the effectiveness of the chosen system in reducing collisions. Further applications in other Atlantic Provinces would be a follow-on project.

Need #3: Reduce the incidence, severity, and cost to the community of road collisions.

Benefits

The average vehicle damage costs resulting from deer-vehicle collisions is $2,000, with moose-vehicle collisions far exceeding this value. Annually, there are approximately 250 moose-vehicle collisions in New Brunswick. In addition to the property damage, costs associated with personal injury, collision investigation and removal of dead or maimed animals may result.

Technologies are available which have the potential to reduce the frequency and/or severity of deer/moose-vehicle collisions, thus improving highway safety.

Barriers

- Collision data availability for the identification of suitable pilot test sites
- Lack of power and communication infrastructure in some remote areas
- Public education regarding the system to ensure user acceptance
- An extended data collection period would be required to ensure statistical validity and to test for behavioural adaptation of the deer/moose

Logistics

Directly Related Projects:
- None

Technologies:
- Infra-red or microwave detection
- Audible warning and/or active warning signs
- Communications infrastructure

Estimated Resources:
- First stage - determination of the best available technology and suitable high risk sites ($20,000 to $30,000)
- The pilot project will include construction, maintenance and monitoring of the system on three two-kilometre road sections. In addition, an evaluation of the collision reduction will be undertaken. ($70,000 – $90,000 based on other agency costs)

Participants

Lead Participants: New Brunswick Department of Transportation and New Brunswick Natural Resources and Energy.

Supporting Participants:
- University of New Brunswick through “in-kind” research and analysis services in both Phases of the study
- New Brunswick Department of Public Safety
- Co-operation with police services will be an important component of the study
- Maritime Roads Development Corporation
- Other Atlantic Provinces

ITS Definition

User Service: 2.6 Automatic Dynamic Warning and Enforcement
Sub-Service: 2.6.1 Dynamic Roadway Warning
Market Packages: ATMS26 Dynamic Roadway Warning

Evaluation

The primary criteria for the project would be the:

- Reduction in deer/moose-vehicle collisions
- Public perception regarding reliability and usefulness of system
- Cost-benefit analysis of pilot test technology versus “do nothing” and other conventional methods such as fencing

Target Start: Spring 2003

2003	2004	2005	2006	2007	2008

Project No. TM-3

Implementation of Fixed Automated Spray Technology (FAST) for Bridge De-icing

PROPOSED PROJECT PROSPECTUS

Project Description

This project would see the installation of a Fixed Automated Spray Technology (FAST) system on the existing A. Murray MacKay Bridge (Hwy. 111) between Halifax and Dartmouth in Nova Scotia. The operation of the system would be coordinated with existing winter maintenance agencies to improve the conditions on the bridge during and after winter storm events. The project would make use of non-chloride spray chemicals to reduce corrosion and chloride loading in the surrounding environment.

Need #5: Improved effectiveness and efficiency of roadway winter maintenance operations

Benefits

This project would contribute improvement in bridge conditions during and after winter storm events along with a reduction in roadway collisions and liability exposure. Improvements in the effectiveness and efficiency of the winter maintenance operations on the bridge should also be realized. FAST would also reduce corrosion and chloride loading in the surrounding environment including the structure.

Barriers

This project faces a number of challenges including capital and on-going operational funding. Local expertise in FAST design, installation and maintenance would have to be developed.

Logistics

Directly Related Projects:
- None

Technologies:
- Automated detection and spray systems

Estimated Resources:
- $1,000,000 - $1,250,000

Participants

Lead Participant: Halifax-Dartmouth Bridge Commission

Supporting Participants:
- Halifax Regional Municipality
- Suppliers of FAST equipment and chemicals
- Local winter maintenance contractors and agencies

Evaluation

This single site FAST pilot project would be evaluated in three areas:

- Reduction in roadway collisions and liability exposure
- Improvements in the effectiveness and efficiency of the winter maintenance operations on the bridge
- Reduction in bridge corrosion and chloride loading in the surrounding environment

ITS Definition

User Services: 2.4 Environmental Conditions Management
Sub-services: 2.4.1 Roadway Environmental Sensing.
Market Package(s): ATMS20 Roadway Environmental Sensing

Target Start: Summer 2003

2003	2004	2005	2006	2007	2008

Project No. TM-4

Red Light Camera Pilot Project

PROPOSED PROJECT PROSPECTUS

Project Description

The objective of this pilot project is to implement Red Light Cameras (RLC) at study locations and evaluate the effectiveness of the cameras in terms of reducing the occurrence of red light running. The City of St. John's is identified as the prospective showcase deployment for this technology. The purpose of the evaluation is to add to the body of data currently available on this topic, and determine whether further deployment is warranted within the Atlantic Provinces.

Need #3: Reduce the incidence, severity and cost to the community of road collisions

Benefits

- Several jurisdictions have reported that RLC reduce the occurrence of red light running, and hence the potential for collisions
- RLC provide an automated enforcement tool that provides "around-the-clock" enforcement
- Potentially self-funding
- Societal benefits to insurance claims, health care, emergency services, etc.

Barriers

Legal:
- Revisions to existing legislation, or additional legislation may be required to use RLC for enforcement purposes

User Acceptance:
- Public perception and acceptance of automated enforcement systems to date has been mixed

Logistics

Directly Related Projects:
- Develop and enact legislation for RLC enforcement

Technologies
- Off-the-shelf RLC (wet film for prosecution purposes)
- Vehicle detectors – typically inductive loops

Estimated Resources:
- Approximately $100,000 per site for camera and installation
- Ongoing costs to maintain equipment retrieve and process film, generate offense notices and prosecute offences
- Alternate business model is to lease equipment from vendors

Participants

Lead Participant: City of St. John's Transportation

Support Participants:
- Provincial government level to enact legislation for RLC enforcement
- Police services

ITS Definition

User Services: 2.6 Automated Dynamic Warning and Enforcement
User Sub-Services: 2.6.3 Signal Enforcement
Market Packages: ATMS28 Signal Enforcement

Evaluation

The main emphasis of the evaluation is to determine the effectiveness of RLC. Measuring the effectiveness of RLC may consider:
- A comparison in the occurrence of red light running before and after the cameras were implemented (i.e. reduction in potential for collisions)
- A comparison of the performance (in terms of cost and effectiveness) of RLC versus traditional police enforcement techniques

Target Start: Spring 2003

2003	2004	2005	2006	2007	2008

Project No. TM-5

Portable Changeable Message Sign (PCMS) for Work Zones

PROPOSED PROJECT PROSPECTUS

Project Description

This project involves the installation of PCMS for a large-scale construction project to test their ability to aid the traveling public, and enhance safety to the traveling public and field personnel. Ideally, the construction project would have a series of stages, requiring several lane closure strategies. The various lane closures would provide a comprehensive assessment of the effectiveness of PCMS.

Need #4: Improved safety in road work zones

Benefits

- Increased safety for traveling public and construction personnel is the primary benefit of these systems
- Reduce work zone congestion by providing updated information to the traveling public
- Improve public's perception of work zone management

Barriers

The effectiveness of the PCMS would be governed, largely by the Contractor's ability to use the PCMS (i.e. implement the appropriate message for the roadway conditions). Detailed training is required to ensure the Contractor is knowledgeable on the use of the PCMS. Throughout the project, the Province of New Brunswick would need to closely monitor the use of the PCMS to ensure its correct operation. Funding availability may also be a barrier.

Logistics

Directly Related Projects:
- None

Technology
- Typically trailer mounted full matrix LED PCMS

Estimated Resources:
- Approximate $45,000 to $55,000 per sign.
- Four to eight PCMS units would be required for a large scale construction project.

Participants

Lead Participant: The New Brunswick Department of Transportation will lead the implementation of this project in conjunction with the University of New Brunswick and Maritime Road Development Corporation (MRDC).

Supporting Participants:
- Police Services will be required to evaluate the use of the PCMS
- Contractor responsible for the construction project is required to ensure the correct use of the PCMS

ITS Definition

User Services: 1.1 Traveller Information, 2.5 Operations and Maintenance, 2.6 Automated Dynamic Warning and Enforcement
User Sub-Services: 1.1.1 Broadcast Traveller Information, 2.5.2 Smart Work Zones, 2.6.1 Dynamic Roadway Warning
Market Packages: ATIS1 Broadcast Traveller Information, ATMS25 Smart Work Zones, ATMS26 Dynamic Roadway Warning

Evaluation

Aspects of the evaluation may include:
- Reduction in vehicle speeds through the work zone
- Survey of motorists to determine driver satisfaction
- Ease of PCMS use from the contractors perspective

Results of the evaluation would lead to the development of standards for using PCMS in work zones.

Target Start: Summer 2003

2003	2004	2005	2006	2007	2008

Project No. TM-6

Smart Snowplow Expansion

PROPOSED PROJECT PROSPECTUS

Project Description

This project expands on already operating services in the Atlantic Region on the Fredericton-Moncton Highway, in the Halifax Regional Municipality and other municipalities. The relevant aspect is in making efficient use of available funding required for winter road maintenance. Expansion would be well suited to a snowplowing operation in the vicinity of other smart snowplows to ease requirements for maintenance staff supporting the new technologies.

Need #2: Reducing rural road accidents through early detection of adverse conditions
Need #5: Enhance management of winter maintenance operations

Benefits

The use of smart salt application results in:

- Increased road safety
- Reduced winter maintenance cost
- Reduced impact to environment by better regulating salt usage
- Quicker response times to changing weather conditions or fleet problems
- Resulted in reductions of salt use by 10-30%

Other benefits relate to legal claims/liability associated with collision claims.

Barriers

Recent use of this technology should reflect significant benefits however issues may include:

- Funding that will be additional to current road maintenance needs
- Require training for maintenance of on-board equipment
- Require operational guidelines

Logistics

Directly Related Projects::

- TM-1 – Atlantic Provinces ARWIS Expansion

Technologies:

- Infrared sensors on snowplows
- Communications between trucks and operations center / AVL
- Mobile computers for salt spreading
- Sensors (speed, air & pavement temp.)

Estimated Resources::

- District cost is vehicle equipment ($15,000 per 140 lane kilometers) + control center equipment ($25,000) and GIS mapping

Participants

Lead Participant: Halifax Regional Municipality

Supporting Participants:

- Nova Scotia Department of Transportation and Public Works
- New Brunswick Department of Transportation
- City of St. John's Transportation
- Newfoundland Works, Services and Transportation

Evaluation

The expanded use of technology to reduce rural accidents could be evaluated through:

- Review of collision rates
- Review of salt usage

ITS Definition

User Service: 2.4 Environmental Conditions Management
Sub-services: Vehicle Based Sensing
Market Package(s): ATMS18 Road Weather Information System, ATMS20 Roadway Environmental Sensing, ATMS22 Environmental information Dissemination

Target Start: Spring 2003

2003	2004	2005	2006	2007	2008

Project No. TM-7

Bridge Incident Management Scoping Study

PROPOSED PROJECT PROSPECTUS

Project Description

With over 90,000 vehicle trips per day, the safe and efficient movement of traffic on the Macdonald and MacKay bridges must be maintained. Reducing the time to detect, assess and respond to unplanned events on the bridges would greatly improve the emergency response time and the time required to clear the incident.

A scoping study to determine costs and benefits of providing video (CCTV) coverage, variable message signs (VMS) on the approaches, and non-intrusive detection and motorist/bicycle call boxes at key locations along on the bridges.

Need #3 – Reduce the incidence, severity and cost to community of road collisions
Need #11 – Enhance ability to detect, verify and respond to incidents on major roadways

Benefits

The system would provide faster response to incidents, allowing appropriate resources to be directed to the scene. This ability has the potential to:

- Ensure effective use of emergency services
- Reduce driver and goods movement delay
- Reduce driver frustration and vehicle emissions

Barriers

- It is a challenge to quantify measures of effectiveness relating to non-recurrent congestion and unplanned incidents
- The project would require substantial input and support from participating agencies
- Estimation of the benefits would require the application of time saving approximations from other transportation systems

Logistics

Directly Related Projects:
- None

Technologies:
- Communications backbone, Variable message signs (VMS), CCTV

Estimated Resources:
- Identification of camera, detection, communication and video display hardware, operations and maintenance, and staff requirements ($50,000)
- Benefits will be determined by estimating existing frequency and nature of incidents, societal impact of incidents on the bridges and potential benefits of system ($30,000)

Participants

Lead Participants: Halifax-Dartmouth Bridge Commission

Supporting Participants:
- Halifax Regional Municipality
- Emergency service providers
- Nova Scotia Department of Transportation and Public Works

ITS Definition

User Service: 2.2 Incident Management
User Sub-Service: 2.2.1 Incident Management Coordination
Market Package: ATMS01 Traffic Network Flow Monitoring

Evaluation

The evaluation would include a benefit-cost analysis of the system implementation and operations versus its anticipated benefits. An analysis period of 15 to 20 years would be used and reflects the functional life of the primary components

The benefits of the system would be estimated values based on a comparison of existing incident techniques and benefits realized from systems in other jurisdictions

Target Start: Spring 2003

2003	2004	2005	2006	2007	2008

Project No. PT-1

Urban Transit Real-Time Information Service

PROPOSED PROJECT PROSPECTUS

Project Description

The use of new technology in public transit continues to increase attractiveness of transit in urban areas. This project will build on the existing Halifax Transit Automatic Vehicle Location (AVL) system, by adding a real-time information service for transit patrons. The service could be provided in cooperation with existing broadcast media traveller information services.

Need #13: Real time transit service monitoring and public information.

Benefits

The main benefit to implementing a real-time information service is increasing customer satisfaction, which in turn should increase ridership.

Barriers

- Integrating the real-time information system with the existing AVL system is the foremost barrier to deployment for this project
- Other barriers include map integration and funding

Logistics

Directly Related Projects:
- None

Technologies
- A variety of delivery mechanisms for providing real-time traveller information may be used (i.e. kiosks, Internet, phone, etc.)

Estimated Resources:
- $250,000 for enhanced customer contact services
- $250,000 to $500,000 for initial deployment of kiosks/passenger information displays

Participants

Lead Participant: Halifax Transit

Supporting Participants:
- Other transit agencies that have implemented real-time information services

ITS Definition

User Services: 1.1 Traveller Information, 3.1 Public Transport Management
User Sub-Services: 1.1.3 Real Time Ride Sharing Information, 3.1.1 Transit Vehicle Tracking
Market Packages: ATIS8 Ride Matching, APTS1 Transit Vehicle Tracking

Evaluation

Conduct a survey to assess patron satisfaction with the real-time information service, and assess users perception of system performance. Survey results should be cross-referenced with actual system performance to emphasis areas for operational improvements.

Target Start: Spring 2004

2003	2004	2005	2006	2007	2008

Project No. PT-2

Community Transit Fleet Management

PROPOSED PROJECT PROSPECTUS

Project Description

In Prince Edward Island, there is a need to co-ordinate local transit, inter-city, and inter-provincial transit operations. The purpose of this project would be to determine how ITS can assist in the integration and management of public and private bussing operations. The project could ultimately include the use of an integrated transit vehicle scheduling and tracking system. A first task would be a feasibility study to determine the scope of an integrated service, and the tools to be implemented. The second step would be to implement the integrated service.

Need #13: Real time transit service monitoring and public information
Need #14: Improve management of fleet transportation services

Benefits

An integrated system would lead to an expanded, more efficient local, inter-city, and inter-provincial transit operations. It would be of particular benefit to transit-captive transit patrons. Other benefits relate to security/safety of operators/users and reduced emissions through increased ridership.

Barriers

Organizational Issues:
- Ability of public sector to form partnership with private sector operators – competing objectives.

Technical:
- Compatibility of vehicles to serve a variety of uses

Logistics

Directly Related Projects:
- None

Technologies:
- Fleet GPS and an integrated web-based service request system

Estimated Resources:
- $80,000 including the development of a business model. Implementation costs will be determined through the development of the business case

Participants

Lead Participant: PEI Department of Transportation and Public Works

Supporting Participants:
- Municipalities
- School boards
- Trius tours
- Taxi services, shuttle buses and other private carriers

Evaluation

The primary criteria for the project would be the:

- Increase in transit ridership
- Greater efficiency in fleet management.

ITS Definition

User Service: 3.1 Public Transport Management, 3.3 Demand Responsive Management
User Sub-Services: 3.1.1 Transit Vehicle Tracking, 3.3.1 Demand Responsible Transit
Market Packages: APTS1 Transit Vehicle Tracking, APTS3 Demand Responsive Transit

Target Start: Summer 2003

2003	2004	2005	2006	2007	2008

Project No. EP-1

Parking Electronic Payment and Monitoring

PROPOSED PROJECT PROSPECTUS

Project Description

This project would see the implementation of a pre-paid toll collection card/tag systems at the Saint John's primary parking facilities and the creation of a "back office" to administer the accounting and monitoring activities.

The Saint John Parking Commission currently operates 750 on-street parking spaces and off-street facilities totaling 3,600 parking spaces. Current payment methods include cash, credit card and tokens.

Need #15: Real-time management of parking operations

Benefits

- Reduce token collection and distribution activities/resources
- Reduces congestion and safety issues at entrances to parking facilities
- Permit detailed monitoring of parking occupancy.
- Ability to be expanded into other applications/services

Barriers

- Significant upfront costs are associated with implementation of the new system and the associated public education and awareness programs
- Compatibility with and expandability to other systems in the City and Region; standards are still evolving
- Maintaining ability to use tokens during the transition period would require multiple payment platforms during this time

Logistics

Directly Related Projects:
TI-1 – Atlantic Provinces Advanced Traveller and Tourist Information System

Technologies:
- Transaction tags/transponders
- Short-range communications to local facilities
- Information dissemination equipment
- Back office equipment

Estimated Resources:
- Assess available technologies including other systems that are currently used in the City/Region and establish a preferred system/vendor ($20,000)
- Determine which facilities should be equipped with payment and monitoring system ($30,000)
- Implement system – a follow-up stage once the feasibility has been resolved

ITS Definition

User Service: 4.1 Electronic Payment
Sub-Services: 4.1.2 Electronic Parking Payment
Market Packages: ATMS16 Electronic Parking Payment and Parking Facility Management

Participants

Lead Participant - Saint John Parking Authority

Supporting participants:
- Retail operators and other public and private sector partners considering electronic payment opportunities

Evaluation

Evaluation measures should include:
- Entry/exit times at parking facilities
- Staff requirements to process payments
- Proliferation of use

In addition, a user survey could be undertaken to determine the qualitative benefits relating to convenience of the electronic payment.

Target Start: Summer 2004

2003	2004	2005	2006	2007	2008

Project No. EP-2

Atlantic Canada Transaction Tag

PROPOSED PROJECT PROSPECTUS

Project Description

The first stage of the project would be to expand the tag population by inviting other partners/applications, such as tolls, parking, ferry service, and retail services.

The second stage would be to review opportunities to integrate back office functions.

Need #8: Improve ferry services
Need #15: Real-time management of parking operations

Benefits

- Operators share costs of "back office" transaction management
- Customers (commercial vehicle and private vehicle operators) only need to carry one electronic tag

Barriers

Organizational Issues:
- Identification of which agency would host the back office

Technical Issues:
- Interoperability and security of systems
- Confidence in system by retailers and customers
- Potential for future initiatives by financial institution to make system redundant by creating a new/more wide spread technology or application

Logistics

Directly Related Project:
- None

Technologies:
- Transaction tags/transponders
- Short-range communications to local facilities
- Information dissemination equipment
- Back office equipment

Estimated Resources:
- TBD

Participants

Lead Participants: Saint John Harbour Bridge, Confederation Bridge and Halifax-Dartmouth Bridge Commission

Supporting Participants:
- Highway 104 Corporation
- Financial institutions
- Ferry operators
- Retail operators and parking garages

Evaluation

The primary criteria for the project would be the:

- Establishment of a common back office
- Lower operating costs through the common back office
- Growth in transaction tag usage

ITS Definition

User Service: 4.1 Electronic Payment Services
Sub-Services: 4.1.1 Electronic Toll Collection, 4.1.2 Electronic Parking Payment, 4.1.4 Traveller Services Payment
Market Packages: ATMS10 Electronic Toll Collection, ATMS16 Electronic Parking Payment

Target Start: Spring 2003

2003	2004	2005	2006	2007	2008

Project No. EP-3

Smart Card Pilot Project

PROPOSED PROJECT PROSPECTUS

Project Description

The objective of this project is to deploy within St. John's, a multi-application smart card for use by Metrobus, City of St. John's, Memorial University, Aliant, colleges, high schools, banks and potentially other businesses and agencies. This project would involve three steps:

- An initial evaluation to identify public agencies for project participation, and an assessment of smart card technologies, particularly the City's Parkcard
- Deployment – procurement and installation of equipment and distribution of smart cards
- Project evaluation and potential expansion to other public agencies

Need #14: Improve management of fleet transportation services

Benefits

The following are the main advantages of smart cards over debit, credit cards, and cash:

- Improve user satisfaction through high speed transactions
- Reduction in operating costs
- Card holder privacy
- Capacity to store data

Barriers

Organizational issues:

- Back office/reconciliation issues
- Institutional challenges between agencies
- Concerns about privacy and security

Technical:

- Status of standards for technology
- Lack of physical infrastructure to support smart card system

Project Finance

- Uncertainty about the business case of introducing a smart card system

Logistics

Directly Related Projects:

- None

Technologies:

- Multi-application smart card

Estimated Resources:

- Varies depending on number of agencies involved, customer base, cost to customer for smart card, etc.

Participants

Lead Participants – Metrobus and City of St. John's Transportation

Supporting Participants:

- Memorial University
- Telecommunications services (Aliant, Rogers and AT&T)
- Other additional public and private agencies within St. John's

Evaluation

Following the smart card implementation, a survey of customers would be conducted to assess the user-acceptance of the smart card. Smart card expansion to other public agencies would be contingent upon factors such as successful customer uptake of smart cards, reduction in operating costs and resolution of financial transaction security issues.

ITS Definition

User Services: 3.1 Public Transport Management, 4.1 Electronic Payment
User Sub-Services: 3.1.3 Passenger and Fare Management, 4.1.3 Transit Services Payment
Market Packages: APTS6 Transit Maintenance, APTS4 Passenger and Fare Management

Target Start: Spring 2003

2003	2004	2005	2006	2007	2008

Project No. CV-1

Integrated Intermodal Information System

PROPOSED PROJECT PROSPECTUS

Project Description

This pilot project provides pre-clearance to commercial vehicles throughout the Province, which translates into eliminating stops for those vehicles.

The location for the weigh-in-motion (WIM) device would be at the Oceanex terminal in the Port of St. John's.

No WIM technologies are in use in Newfoundland and this new feature would improve operations at this world-class container depot. Project could be expanded to other key locations such as Port-aux-Basques.

Need #6: Expedited weight, credential and safety checks for commercial vehicles

Benefits

The pilot project would permit:
- Higher-speed truck passes
- Reduced queuing and delays
- Efficient weighing of vehicles
- Improved extent of information gathering

Other benefits include:
- Time savings/increased capacity
- Environmental benefits

Barriers

The primary barriers include:
- Availability of funding
- Determining the method of operation
- Protecting privacy of commercial information
- Integrating with technologies currently in use
- Coordination of stakeholders

Logistics

Directly Related Projects:
- None

Technologies:
- Pressure sensors (3 options)
- Transponders/roadside readers
- Communications

Estimated Resources:
- $15-80,000 per station (varies by option)
- Annual life cycle cost <$15,000 per station
- Enforcement staff at weigh station

Participants

Lead participants: Province of Newfoundland and Labrador Government Services and Lands, Motor Registration Division.

Supporting Participants:
- St. John's Port Authority
- Oceanex (shipping company) and trucking companies

ITS Definition

User Service: 5.1 Commercial Vehicle Electronic Clearance
Sub-services: 5.1.1 Electronic Clearance, 5.1.3 Weigh-in-Motion.
Market Package(s): CVO3 Electronic Clearance, CVO6 Weigh-in-Motion, CVO11 Freight In-Transit Monitoring

Evaluation

The pilot project is expected to result in efficiencies in the vehicle monitoring process, with peripheral effects such as less delays, less queuing, less wear on weigh station equipment. Evaluation should measure:
- Estimated saved time
- Willingness to pay for bypassing

A survey of users would provide useful input in terms of operational usefulness. An example is http://www.itsdocs.fhwa.dot.gov/jpodocs/repts_te/56701!.pdf

Target Start: Summer 2003

2003	2004	2005	2006	2007	2008

Project No. CV-2

Atlantic Trade Corridor Border Security and Electronic Inspection

PROPOSED PROJECT PROSPECTUS

Project Description

This initiative acts upon bilateral declarations aimed at improving the movement of goods between the Atlantic Provinces and the Northeastern US. Projects address resolutions put forth under the Smart Border Declaration of December, 2001 and declarations resulting from the August 2002 Conference of New England Governors and Eastern Canadian Premiers as follows:

- Resolution 27-1, Concerning the Standing Committee on Trade and Globalization
- Resolution 27-9, Concerning Security and Trade Between Canada and the United States

Projects build upon existing initiatives including Operation Safe Commerce, various I-95 Corridor Projects, and Customs programs including the Free and Secure Trade (FAST) program, and the NEXUS frequent traveller pre-clearance program. Key components of the Atlantic Trade Corridor initiative include:

- Preferred carrier programs employing electronic clearance for commercial vehicles at inspection stations and borders
- Application of advanced security screening technologies at borders
- Frequent traveller pre-clearance program to improve access at crossings, such as Campobello Island to the mainland

Need #1: Expedited border crossing inspection and clearance for commercial vehicles
Need #6: Expedited weight, credential, and safety checks for commercial vehicles

Benefits

- Easy access to motor carrier's safety and risk ratings, roadside inspection history and collision records improving enforcement efficiency and reduced wait times
- Quick access to electronic safety information required by insurers and shippers
- Compliance means reduced carrier down-time
- Improved surveillance of border crossing area and ability to utilize portable x-ray technologies to scan suspicious vehicles at customs/in the queue

Barriers

- Motor carrier participation / enrolment
- Funding
- Lack of existing infrastructure (e.g. pre-clearance at weigh stations)
- Legislation
- Lack of Canadian standardization for electronic collection and information transfer
- Cooperation of US and Canadian governments and custom agencies

Logistics

Directly Related Projects:

- St. Stephen - Calais new crossing development
- Technical Feasibility for CVO Network In Canada by Transport Canada (completion by Winter 2002)
- Benefit / Cost Study for Electronic Clearance and Roadside Inspection (ECRI) for Canada by Transport Canada (Fall 2002)
- CV-5 – Port of Halifax Container Security

Technologies:

- Wayside to Vehicle communications (e.g. transponders, tag readers, DSRC)
- Weigh-In-Motion, CCTV and vehicle detection
- Electronic security screening technologies

Estimated Resources:

- $850,000 per station
- $2.1 million for border crossing and security measures

Participants

Lead Participants: New Brunswick Departments of Transportation and Public Safety, US Customs, Canadian Customs and Revenue Agency

Supporting Participants:

- Federal and provincial governments, State of Maine, enforcement agencies and Transport Canada
- Commercial vehicle carriers and shippers
- ACOA
- Council of Atlantic Premiers
- Other Provincial Authorities as system expands
- I-95 Corridor Coalition

ITS Definition

User Services: 5.1 Commercial Vehicle Electronic Clearance
Sub-services: 5.1.1 Electronic Clearance, 5.1.2 International Border Crossing Clearance
Market Package(s): CVO3 Electronic Clearance

Evaluation

This pilot project would have the following evaluation parameters:

- Efficiency benefit (as measured in terms of % travel delay reduction)
- Safety benefit (as measured in terms of % accident reduction)
- Productivity benefit (as measured in terms of % cost reduction)
- Carrier satisfaction
- Evaluation of this pilot project would consist of the level of security obtained by the service provided and recommendations for improvements

Target Start: Spring 2003

2003	2004	2005	2006	2007	2008

Project No. CV-3

Atlantic Canada Electronic Permitting for Oversized and Overweight Vehicles

PROPOSED PROJECT PROSPECTUS

Project Description

Electronic permitting of Oversized and Overweight Commercial Vehicles would reduce congestion and air pollution by providing fast and accurate route and clearance checking and any bridge analysis approvals. Use of non-permitted oversized / overweight vehicles would lead to asset (roads/bridges) damages.

This initiative is identified under the Atlantic Provinces Harmonized Trucking Strategy. Expansion to all the Atlantic Provinces would follow a pilot project in New Brunswick.

Need #6: Expedited weight, credential and safety checks for commercial vehicles

Benefits

The electronic permitting would allow Atlantic transportation authorities' personnel to issue permits based on bridge ratings, vertical clearances, congestion, and construction work zones.

Barriers

This project would require comprehensive planning to resolve issues such as developing a new common process of issuing permits that coordinates with the Atlantic transportation authorities, police, trucking companies.

Logistics

Directly Related Projects:
- Harmonized Trucking Strategy

Technologies:
- Standard for electronic data interchange and automated vehicle identification
- Cell phone / 2-way radio
- On-board highway patrol vehicle computers

Estimated Resources:
- Cost of $300,000 to $500,000

Participants

New Nouveau Brunswick

Lead participant: New Brunswick Department of Transportation

Supporting Participants:
- Other Atlantic Provinces Departments of Transportation, Public Safety, and Government Services and Lands
- Service New Brunswick
- RCMP
- Technology manufacturers
- Transmission services (on behalf of motor carriers)
- Commercial vehicle carriers and shippers.
- Industry Canada and ACOA

ITS Definition

User Service: 5.1 Commercial Vehicle Electronic Clearance
Sub-services: 5.1.1 Electronic Clearance
Market Package(s): CVO03 Electronic Clearance

Evaluation

This project should generate efficiencies in the permit issuance process, making freight activity more efficient and reducing related congestion and energy consumption. Evaluation should measure:
- Time savings
- Related reductions in energy use
- Improvements to staff efficiency

Target Start: Spring 2003

2003	2004	2005	2006	2007	2008

Project No. CV-4

Port Operational Information Extranet

PROPOSED PROJECT PROSPECTUS

Project Description

Provide a single point of contact to facilitate the collection and exchange of operational information pertinent to the efficient movement of goods through the Port of Halifax.

Need #12 – Enhanced tracking and real-time management of containers and other goods at intermodal terminals
Need #14 – Improved management of fleet transportation services

Benefits

- Mitigate congestion/delays for motor carriers accessing the Port
- Reduced emissions
- Improved operational efficiency for ports, terminals and motor carriers
- Provide shippers better information to plan logistics of shipments

Barriers

- Multiple stakeholders involved
- Ability of small carriers to participate
- Incorporate wireless coverage for messaging
- Lack of standards for information exchange

Logistics

Directly Related Projects:
- Atlantic Provinces Advance Traveler and Tourist Information System (TI-1)

Technologies:
- Secure web site.
- CCTV
- Instant messaging
- Wireless device on-board

Estimated Resources:
- Start-up funding of $250,000

Participants

Lead Participant: Halifax Port Authority and the two Halifax container terminals.

Supporting Participants:
- Halifax Regional Municipality
- Halifax-Dartmouth Bridge Commission
- Motor carriers and shippers

Evaluation

The project is expected to result in reductions in delays and emissions. Specific measures would include:
- Travel times/wait times
- Volume of web site hits
- Volume of messages
- Number of subscribers to secure website

ITS Definition

User Services: 5.5 Intermodal Freight Management
User Sub-Services: 5.5.1 Freight In-Transit Monitoring; 5.5.2 Intermodal Interface Management
Market Packages: CVO11 Freight In-Transit Monitoring, CVO12 Freight Terminal Management

Target Start: Summer 2003

2003	2004	2005	2006	2007	2008

Project No. CV-5

Port Container Security

PROPOSED PROJECT PROSPECTUS

Project Description

Pilot project to demonstrate the application of electronic cargo seals for inbound containers destined for the United States, as part of the Smart Border Initiative.

Need #1 – Expedited border crossing inspection and clearance for commercial vehicles
Need #6 – Expedited weight, credential and safety checks for commercial vehicles
Need #10 – Enhanced safety and security for travelers and for transportation operators and facilities
Need #12 – Enhanced tracking and real-time management of containers and other goods at intermodal terminals
Need #14 – Improved management of fleet transportation services

Benefits

- Improved security
- Reduced delays at intermodal terminals and border crossings
- Improved operational efficiency

Barriers

- Multiple stakeholders involved
- Lack of accepted international standards
- Need a champion
- Requires legislative and policy changes
- Liability and jurisdictional issues

Logistics

Directly Related Projects:
- CV-2 – New Brunswick Border Crossing Security and Electronic Clearance

Technologies:
- Electronic seals
- GPS tracking

Estimated Resources:
- TBD

Participants

Lead Participant: Ediport Atlantic and Halifax Port Authority

Supporting Participants:
- Transport Canada
- Smart Border Declaration stakeholders
- Canadian Customs and Revenue Agency
- U.S. Customs

ITS Definition

User Services: 5.1 Intermodal Freight Management, 5.5 Intermodal Freight Management, 5.6 Commercial Fleet Management
User Sub-Services: 5.1.2 International Border Crossing Clearance, 5.5.1 Freight-In Transit Monitoring, 5.6.2 Freight Administration
Market Packages: CVO2 Freight Administration, CVO3 Electronic Clearance, CVO5 International Border Crossing Clearance, CVO11 Freight In-Transit Monitoring

Evaluation

The success of this project would be measured through:
- Better location tracking
- Provision of tamper-proof security
- Improved throughput times

Target Start: Summer 2004

2003	2004	2005	2006	2007	2008

Project No. CV-6

Airport Groundside Transportation Management

PROPOSED PROJECT PROSPECTUS

Project Description

Optimize coordination of groundside transportation connections to Halifax International Airport, incorporating commercial bus services and taxi services, and tourism information.

Need #9 – Provide travel incentives and traveller information to promote tourism.
Need #14 – Improved management of fleet transportation services

Benefits

- Improved efficiency for bus operators
- Reduced delays
- Improved service for travelers

Barriers

- Identification of champion agency
- Funding model

Logistics

Directly Related Projects:
- Atlantic Provinces Advanced Traveller Information System (TI-1)

Technologies:
- Internet/kiosk
- Dedicated short-range communications

Estimated Resources:
- TBD

Participants

Lead Participant: Halifax International Airport.

Supporting Participants:
- Tourism industry
- Bus operators
- Taxi and limousine services

Evaluation

- Reduced delay times
- Improved customer service for travellers

ITS Definition

User Services: 1.1 Traveller Information, 5.6 Commercial Fleet Management
User Sub-Services: 1.1.2 Interactive Traveller Information, 5.6.1 Fleet Administration
Market Packages: ATIS2 Interactive Traveller Information, CVO1 Fleet Administration

Target Start: Spring 2004

2003	2004	2005	2006	2007	2008

Project No. CV-7

Commercial Fleet Management Program

PROPOSED PROJECT PROSPECTUS

Project Description

Consistent with the ITS America CVO Technical Committee initiative and the Commercial Vehicle Information Systems and Networks (CVISN), there is a push to introduce interoperable ITS/CVO systems throughout North America. This concept study would explore those opportunities to enable electronic information exchange among stakeholders and consider an incremental progression to result in improving roadside CVO, efficiency and safety.

Need #11: Improve management of fleet transportation services

Benefits

Major benefits of Commercial Vehicle Operations (CVO) that include fleet management are:

- Improving highway safety
- Streamlining administrative processes
- Reducing congestion costs
- Ensuring regulatory compliance
- Preserving investment in highway infrastructure

Barriers

Issues that must be considered in pursuing a fleet management program include:

- Lack of stakeholder buy-in (unknown benefits)
- Lack of technical standards
- Lack of adequate funding
- Failure to manage internal/external expectations
- Ability of vendors to deliver services in appropriate timeframes

Logistics

Directly Related Projects:

- Development of standards (Project underway by Transport Canada
- Harmonized Trucking Strategy

Technologies:

- Transponders
- Roadside communications
- Data Warehousing
- Weight-in-Motion
- Vehicle Classification

Estimated Resources:

- TBD

Participants

Lead Participants: Commercial vehicle industry and provincial carrier enforcement agencies.

Supporting Participants:

- Trucking Associations
- Province of Quebec Commercial Vehicle Operations Program
- E-Z Pass System

ITS Definition

User Service: 5.6 Commercial Fleet Management
Sub-services: 5.6.1 Fleet Administration; 5.6.2 Freight Administration; 5.6.3 CVO Fleet Maintenance.
Market Package(s): CVO01 Fleet Administration, CVO02 Freight Administration, CVO09 CVO Fleet Maintenance

Evaluation

As a concept study, evaluation would focus on the benefits and feasibility that are anticipated with implementation of simulations, prototypes, operational tests and pilots.

A survey of stakeholders would provide useful input to applications that most benefit the industry and government involvement.

Target Start: Spring 2003

2003	2004	2005	2006	2007	2008

Project No. EM-1

Wireless Network Expansion

PROPOSED PROJECT PROSPECTUS

Project Description

Develop program to encourage wireless network providers to expand cellular network coverage to include rural highway routes.
The project would consist of:

- Understanding private sector network expansion plans
- Investigating ITS needs in greater depth
- Identifying methods to encourage expansion

Need #7 – Road emergency notification and information system for rural areas
Need #11 – Enhanced ability to detect, verify, and respond to incidents on major roadways

Benefits

- Improved incident response time
- Improved effectiveness of response/clearance
- Reduced impact to society
- Represents an enabling technology for other ITS initiatives
- Improved safety and security on the roadways in the coverage areas

Barriers

- Cost of additional cell site deployment
- Requirement for business case
- Justification of business case in rural and remote areas

Logistics

Directly Related Projects

- All projects requiring wireless communications

Technologies:

- Proven telecommunications technologies
- Emergency wireless E911 technologies

Estimated Resources:

- Requires the addition of cell sites to expand wireless network coverage beyond urbanized areas and major highway routes
- Approximate costs of $25,000-$100,000 per cell site

Participants

Lead Participants: Telecommunications service providers including Aliant and Rogers AT&T

Supporting Participants:

- Provincial governments
- Municipal governments

Evaluation

This project is expected to reduce rural incident response and clearance times. Performance measures include:

- Incident detection, response, and clearance times
- Transportation-related 911 calls processed

ITS Definition

User Services: 6.1 Emergency Notification and Personal Security
User Sub-Services: 6.1.1 Personal Security
Market Packages: EM3 Personal Security and MAYDAY Support

Target Start: Spring 2003

2003	2004	2005	2006	2007	2008

Project No. EM-2

Atlantic Provinces Disaster Response Plan Scoping Study

PROPOSED PROJECT PROSPECTUS

Project Description

Each province currently has an Emergency Measures Organization, which prepares and provides support to mitigate the effects of natural and man-made disasters.

This scoping study would review the existing disaster response strategies and determine opportunities for ITS to support responses to natural and man-made disasters. Transportation and monitoring needs would be mapped against existing capabilities to determine where ITS initiatives could bridge any deficiencies.

Need #2 – Reduce rural road collisions through early detection of adverse conditions
Need #3 – Reduce the incidence, severity and cost to community of road collisions
Need #7 – Road emergency notification and information system for rural areas

Benefits

- Obtain a better knowledge of emergency capabilities and limitations that exist with current systems/infrastructure
- Establish an understanding of required needs and potential ITS solutions
- Educate Provincial Emergency Measures Organizations regarding the potential for ITS applications to support their plans

Barriers

- The project would require substantial input from many operating authorities, agencies, jurisdictions, emergency services, etc.
- By nature, disasters are random events and planning for such variability will be a challenge
- Lack of agreed-upon incident management procedures

Logistics

Directly Related Projects:
- None

Technologies:
- All monitoring, communications and information dissemination technologies

Estimated Resources:
- Scoping Study - $85,000 - $95,000

Participants

Lead Participant: Provincial Emergency Measures Offices (EMO) and New Brunswick Department of Public Safety

Supporting Participants:
- Provincial Transportation Departments
- Emergency Services
- Transport Canada Security and Emergency Preparedness

Evaluation

Evaluation is to be determined through the course of the study.

ITS Definition

User Service: 6.3 Disaster Response and Management
Sub-Services: 6.3.1Disaster Command and Control and 6.3.2 Disaster Information Dissemination
Market Packages: EM1 Emergency Response Management and EM4 Disaster Command and Control

Target Start: Spring 2003					
2003	2004	2005	2006	2007	2008

5.2 DEPLOYMENT PLAN

5.2.1 Deployment Schedule and Phasing

In order to better guide the implementation, allow for evaluation of progress, and permit proper allocation of financial resources, the deployment schedules for the various projects have been sub-divided into major phases, as applicable, including the following categories:

- Planning, legislation and research activities;
- Design of the system or infrastructure;
- Procurement of the required technologies and pilot project installation; and/or
- Full deployment or construction of the project.

Included in Exhibit 5.2 – Implementation Plan, is a summary of the estimated project implementation time frames. The proposed timeframes have been reviewed with stakeholders at the workshop, but are subject to further refinement and definition though the project development process. It is the responsibility of the lead participants to take the initiative to draw upon the information as provided through the Strategic Planning process, and assemble the appropriate rationalization and coordination of resources as required to undertake the projects. The deployment details and project phases of each project are outlined below.

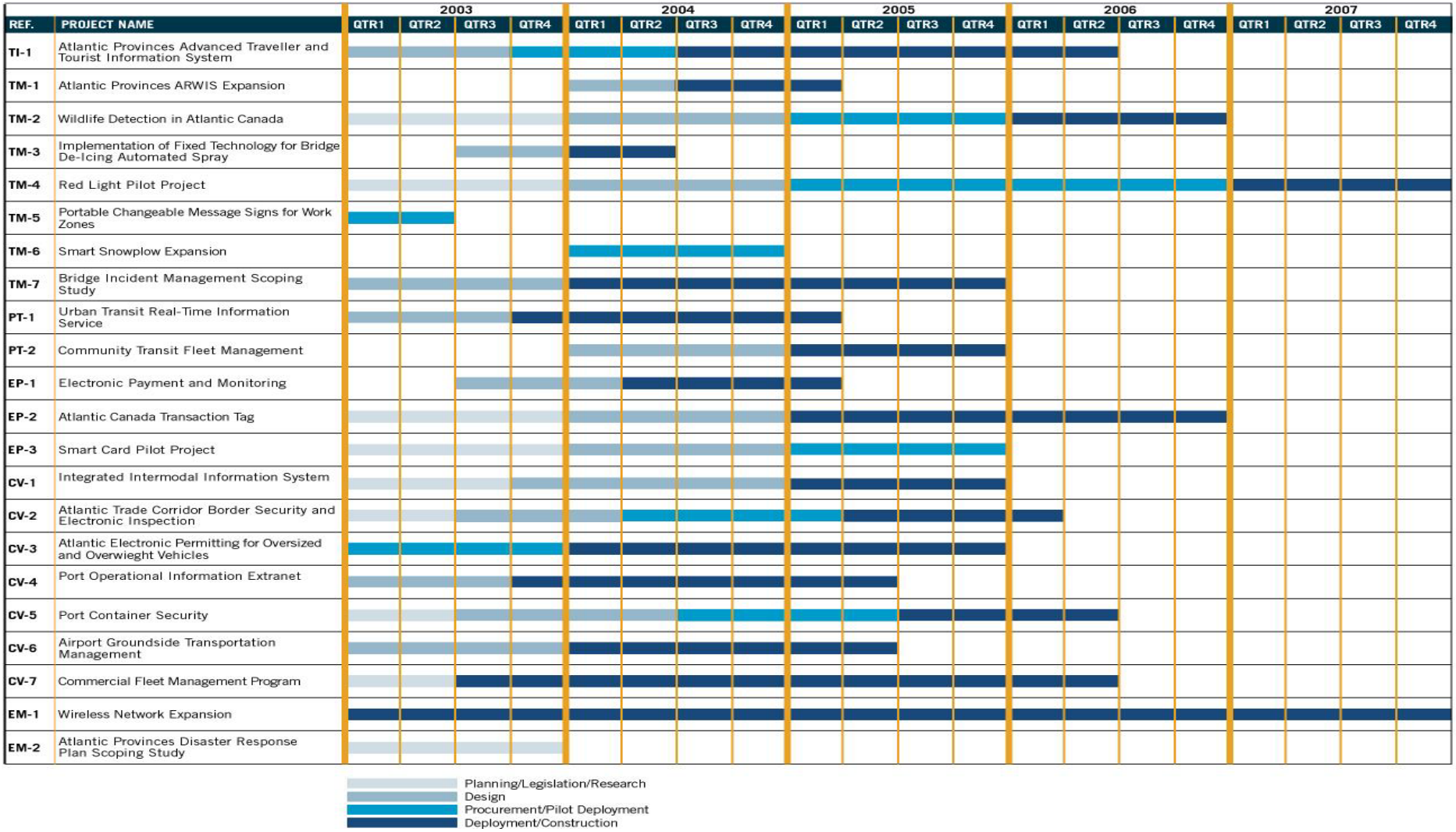
TI-1 Atlantic Provinces Advanced Traveller and Tourist Information System

The traveller information project represents a high priority in the region and as such has a start date of 2003. The first stage in the project is a planning component to determine the required functionality of the project and the associated traffic and traveller information needs. Following this stage, a pilot project would be deployed in New Brunswick. It is anticipated that together, these two projects will require eighteen months to complete. In conjunction with the above two aspects of the study, the data structure and storage, as well as the functionality of the data warehouse can be determined by the participating jurisdictions. Region-wide deployment of the data warehouse and traveller information system would follow on the completion of the pilot project and the planning for the warehouse. It is estimated that full deployment will take two years to complete.

TM-1 Atlantic Provinces ARWIS Expansion

The Provinces currently have a network of functioning ARWIS sites and have participated in national programs with Environment Canada to review technology, communications and reporting structures. Research efforts associated with available technologies have not been included in the project. In order to secure the necessary funding, a 2004 start date has been identified. A six-month design component has been incorporated into the deployment plan to provide for an opportunity to review the existing ARWIS coverage, coverage needs and site selection/design. Subsequent to this activity it is estimated that the installation of the sites will require nine months.

Exhibit 5.2 – Implementation Plan



TM-2 Wildlife Detection in Atlantic Canada, Scoping Study and Pilot Project

The pilot project will be twofold. Firstly, research will need to be conducted to identify the best available detection/warning technologies and the high vehicle-animal collision locations in New Brunswick. Starting in January of 2003, a twelve-month timeframe is estimated for these tasks.

The second stage of the project is expected to be completed in a twenty-four month period and will include the site design, the pilot test installation and project assessment. Further expansion to other sites will be based on the success of the pilot project.

TM-3 Implementation of Fixed Automated Spray Technology (FAST) for Bridge De-icing

This safety project includes design and implementation phases. The design phase will include a review of the available technologies and the design of the spray system for given the characteristics of the bridge. These tasks would be followed up by the installation of the system. The project is likely to proceed commencing mid-2003 and will require approximately six months for each of the two stages.

TM-4 Red Light Camera Pilot Project

The Province of Newfoundland does not currently have legislation for the use of red light cameras (RLCs) for enforcement. Legislation is currently being pursued by the City of St. John's. Twelve months have been allocated to the completion of this process, and the enactment of local by-laws.

The design phase includes two components. Firstly, an assessment of the red light camera violations in the City is required to determine high collision/infraction locations and the road user safety implications. Secondly, the equipment specifications and site designs will need to determined. The completion of the latter will, in some part, overlap with the procurement phase. Together, these two components will have an approximate duration of twelve months.

The procurement and pilot project stage will include the preparation and execution of a competitive tender, the installation of red light cameras at the high violation sites, an assessment of their impact on safety and the financial implications of installing, operating and maintaining the system. A minimum of twenty-four months will be required to complete these activities.

Should the safety benefits of the RLCs outweigh the costs associated with their operations, a twelve-month period has been allocated for the expansion of the RLC coverage.

TM-5 Portable Changeable Message Sign (PCMS) for Work Zones

PCMS technologies are relatively well developed and therefore the activities of this project relate to procurement and installation the signs at large construction projects. In order to use this technology in the 2003 roadway construction season, a six-month procurement schedule has been identified to begin in January of 2003.

TM-6 Smart Snowplow Expansion

Smart snowplows are already in use in the Atlantic Region along the Fredericton-Moncton Highway and in the City of Halifax. This project would include the procurement of additional units to expand the fleet

and coverage area. A procurement timeframe of twelve months during 2004 is estimated. The latter start date reflects the time required to secure funding for the project.

TM-7 Bridge Incident Management Scoping Study

The study would commence in 2003 and the timeframe is estimated to be twelve months. As the project is a scoping study, it represents a planning task and is shown in the deployment schedule as such. The decision to undertake a pilot installation or full deployment of an incident management system would be determined based on the findings of this study.

PT-1 Urban Transit Real-Time Information Service

The design of the system and its components would be undertaken in 2003 and is estimated to be completed in nine months. Implementation of the system would include improved customer contact services followed by an initial deployment of kiosks and/or passenger information displays. These components are anticipated to be completed in approximately 18 months and would follow the design phase.

PT-2 Community Transit Fleet Management

The first stage of this proposed project is a feasibility study to review the integration of the public and private transit service provisions in PEI. As this study represented a medium level priority, a project commencement of 2004 was established. The duration of the feasibility study is estimated to be twelve months followed by a twelve month period for implementation of the resulting system.

EP-1 Parking Electronic Payment and Monitoring

A design component of approximately nine months is planned to begin mid 2003. This component would assess the available technologies and the need and justification for the installation of the system at the City's parking facilities. This stage would be followed by an implementation phase of approximately twelve months.

EP-2 Atlantic Canada Transaction Tag

The two components of the project relate to the expansion of existing tag population/applications to other users and venues, and an assessment of the opportunities to integrate the back office functions of the participating entities. The first component of the study can begin in 2003 and will continue for approximately 12 months. The need, justification and design of a common back office will be reviewed subsequent to the initial stage. The duration of this phase will be a function on the number of agencies and participants established through the expansion efforts.

EP-3 Smart Card Pilot Project

The smart card pilot project consists of two stages and is planned to commence at the beginning of 2003. The first stage is a planning component to establish the participating agencies/service providers. The second stage is the design and pilot deployment stage to review available technologies, their application and relative benefits over the existing systems. The planning and pilot deployment stages are expected to

expend approximately twelve and twenty four months, respectively. Opportunities to expand the card usage through out the region would follow from the results of the pilot deployment.

CV-1 Integrated Intermodal Information System

The project is anticipated to begin with a nine month planning stage in 2003. This stage will focus on engaging stakeholders such as Oceanex, the port authorities, carriers, etc. The design of field sites and data processing requirements will be undertaken in the fifteen months following the initial planning assignment. Deployment of the system at the Oceanex and other key locations would be undertaken over an estimated twelve-month period.

CV-2 Atlantic Trade Corridor Border Security and Electronic Inspection

Given the high priority need relating to enforcement and security at the international and provincial border crossings, a start date of January 2003 have been indicated. The combined planning and design phase of approximately fifteen months has been identified to engage the many stakeholders, and to design the site and data processing requirements. Implementation of a pilot system and full deployment are planned consecutively for two twelve-month periods subsequent to the initial stage of the project. These study timelines may be fast-tracked based on the recent priorities placed on security and through the use of existing programs such as NEXUS.

CV-3 Atlantic Canada Electronic Permitting for Oversized and Overweight Vehicles

The Province of New Brunswick in conjunction with other supporting participants is currently pursuing this initiative and is presently addressing institutional issues. A pilot deployment is anticipated in 2003 with the potential for further expansion or region wide deployment in 2004.

CV-4 Port Operational Information Extranet

This two-phase project is anticipated to begin in 2003. A conceptual design for the system has already been developed and a nine month design phase will be required to complete the design of the information system. The second phase will continue for approximately 18 months and include the deployment and assessment of the pilot installation.

CV-5 Port Container Security

The three and half year schedule for this project reflects the number of stakeholders and the security issues that will be consider in all aspects of this project. The project initiation is anticipated in 2003. The sequential phases and their estimated duration are as follows:

- Planning of the system and its operations through consultation with enforcement agencies and users – six months;
- Design of the tracking and recording system – twelve months;
- Pilot project deployment – twelve months; and
- Implementation of the security system – twelve months.

Given the high priority that has been recently placed on cross-border security, there may be opportunities to "fast-track" a pilot deployment.

CV-6 Airport Groundside Transportation Management

It is anticipated that approximately twelve months will be required to consult with the various stakeholders and undertake the design of the information management system. With the completion of the design in 2003, implementation would follow in the subsequent 18 months.

CV-7 Commercial Fleet Management Program

A project spearheaded by the commercial trucking industry, the first phase would include the planning of the operational and management needs of the system. It is expected that the implementation and expansion of the system would occur over the next 36 months following the planning stage.

EM-1 Wireless Network Expansion

The major telecommunications service providers in the Atlantic Region are planning expansion to their wireless networks in 2003. Accordingly, project timeframe has been identified as an on-going effort commencing in 2003.

Wireless networks and technologies are well established in the Atlantic Provinces' urban areas. The purpose of this study is to assist in building the business case for wireless network expansion by identifying ITS benefits on an area-by-area basis, e.g., emergency management, traveller information, etc. Business case development is part of the telecommunications service providers' core business. For these two reasons, the project profile does not include a formal planning or a design stage.

EM-2 Atlantic Provinces Disaster Response Plan Scoping Study

The nature of this study is to review opportunities to dovetail ITS technologies and infrastructure with the existing and planned Provincial emergency management activities/plans. The study represents the groundwork and planning for future initiatives and thus has been identified as a planning exercise. Given the scope of the project and the number of organizations to be consulted with, it is anticipated that a twelve month time frame will be required for completion.

5.2.2 Project Participants and Available Resources

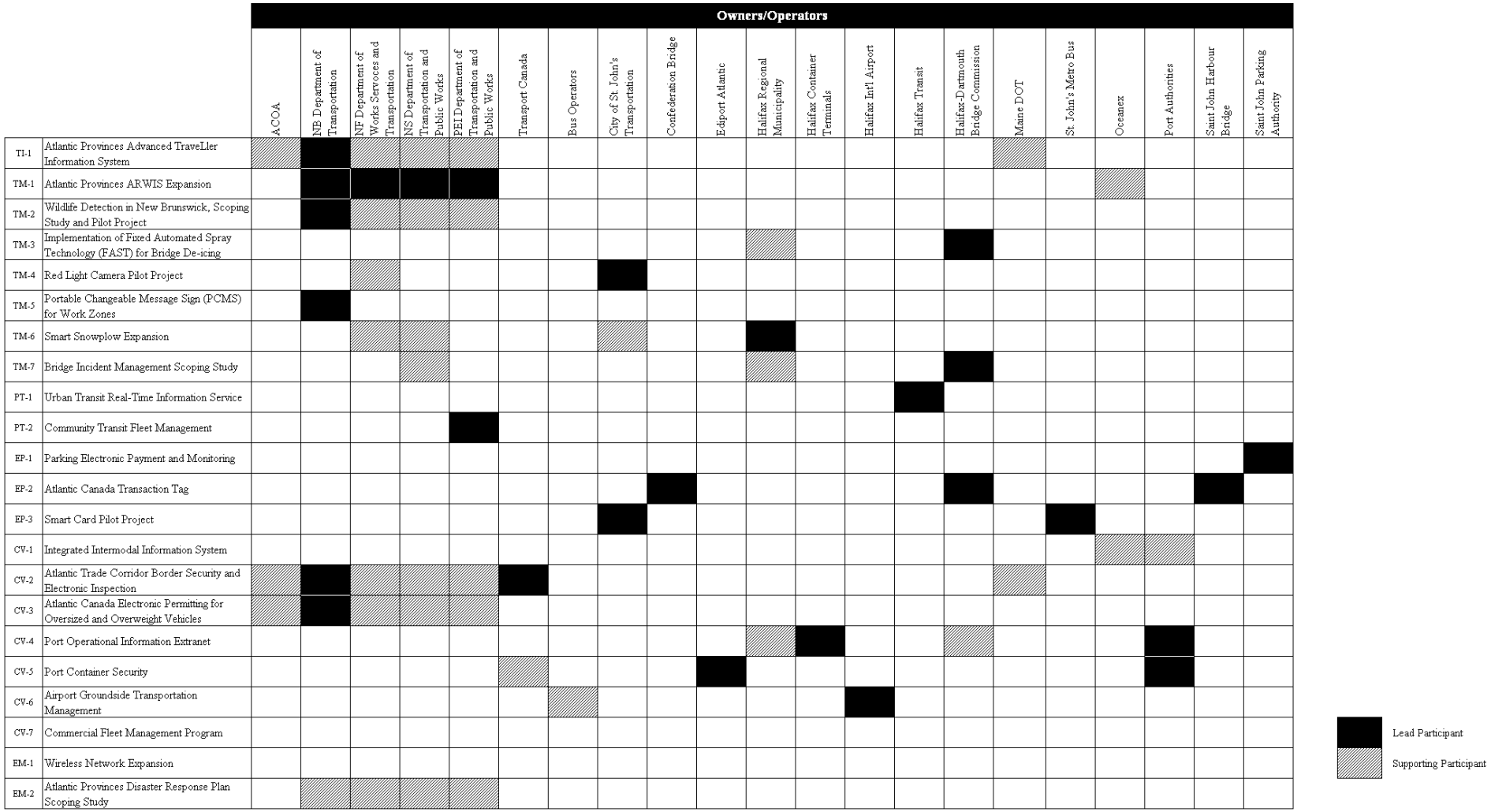
The implementation of strategic projects can become hindered if considerable resources are required from key stakeholders through their participation as lead or supporting entities in a number of initiatives. Recognizing that lead and supporting agency staff resources are essential in the initiation, management and/or undertaking of the strategic projects, a high level review of the project commitments for each major agency or group was carried out.

The lead and supporting participants were categorized based on the general groupings outlined in Section 3 – the Opportunities Analysis, which cover the key beneficiaries and delivery participants of the Strategic Plan.

A matrix was created, which tracks projects on one axis versus the stakeholders on the other axis. The list of stakeholders is not meant to be exhaustive, but to include the major players that have the potential to be involved the planning and deployment activities for a number of projects. To better understand their commitments, in each case the participation was identified as a lead or supporting role in the project. Included in Exhibit 5.3 is a summary of the projects mapped against the intended lead and supporting agency obligations, with the following groups identified:

- Owner/operators;
- Customer service providers;
- Researchers, enforcement authorities, emergency service providers; and
- Other agencies, jurisdictions or departments.

Exhibit 5.3 – Agency / Jurisdiction Project Commitments



		Customer Service Providers														Researchers		Enforcement Agencies			
		ARWIS suppliers	Atlantic Provinces Trucking Association	Commercial Vehicle carriers and shippers	E-Z Pass System	Ferry Operators	Financial Inst	Information Service Providers	Retail operators and parking garages	Suppliers of FAST equipment and chemicals	Taxi services; shuttle buses and other private carriers	Technology Manufacturers	Telecommunications Services (Aliant, Rogers AT&T)	Transmission services (on behalf of motor carriers)	Winter maintenance contractors	Memorial University	University of New Brunswick	Canada Customs and Revenue Agency	Other Police Services	RCMP	US Customs
TI-1	Atlantic Provinces Advanced TraveLler Information System							▨					▨								
TM-1	Atlantic Provinces ARWIS Expansion	▨		▨				▨							▨						
TM-2	Wildlife Detection in New Brunswick, Scoping Study and Pilot Project																▨		▨		
TM-3	Implementation of Fixed Automated Spray Technology (FAST) for Bridge De-icing									▨					▨						
TM-4	Red Light Camera Pilot Project																		▨		
TM-5	Portable Changeable Message Sign (PCMS) for Work Zones																■		▨		
TM-6	Smart Snowplow Expansion																				
TM-7	Bridge Incident Management Scoping Study																				
PT-1	Urban Transit Real-Time Information Service																				
PT-2	Community Transit Fleet Management										▨										
EP-1	Parking Electronic Payment and Monitoring								▨												
EP-2	Atlantic Canada Transaction Tag					▨	▨		▨												
EP-3	Smart Card Pilot Project												▨			▨					
CV-1	Integrated Intermodal Information System		▨																		
CV-2	Atlantic Trade Corridor Border Security and Electronic Inspection			▨														▨			▨
CV-3	Atlantic Canada Electronic Permitting for Oversized and Overweight Vehicles			▨								▨		▨						▨	
CV-4	Port Operational Information Extranet			▨															▨		
CV-5	Port Container Security																	▨			▨
CV-6	Airport Groundside Transportation Management																				
CV-7	Commercial Fleet Management Program		▨	■	▨																
EM-1	Wireless Network Expansion												■								
EM-2	Atlantic Provinces Disaster Response Plan Scoping Study																				

■ Lead Participant
▨ Supporting Participant

		Emergency Service Providers				**Other Participants**														
		Emergency service providers	NB Dept of Public Safety	Provincial Emergency Management Offices (EMO)	Transport Canada Security and Emergency Preparedness	Council of Atlantic Premiers	Environment Canada	Industry Canada	NB Natural Resources and Energy	NB Dept of Public Safety	NB Other Departments	NB Tourism	NF Dept of Industry, Trade, Rural Development	NF Other Departments	NS Other Departments	NS Tourism	Service NS and Municipal Relations	PEI Other Departments	Quebec CVO Program	Transport Quebec
TI-1	Atlantic Provinces Advanced TraveLler Information System						S					L				S				
TM-1	Atlantic Provinces ARWIS Expansion						L													
TM-2	Wildlife Detection in New Brunswick, Scoping Study and Pilot Project								L											
TM-3	Implementation of Fixed Automated Spray Technology (FAST) for Bridge De-icing																			
TM-4	Red Light Camera Pilot Project																			
TM-5	Portable Changeable Message Sign (PCMS) for Work Zones																			
TM-6	Smart Snowplow Expansion																			
TM-7	Bridge Incident Management Scoping Study	S																		
PT-1	Urban Transit Real-Time Information Service																			
PT-2	Community Transit Fleet Management																			
EP-1	Parking Electronic Payment and Monitoring																			
EP-2	Atlantic Canada Transaction Tag																			
EP-3	Smart Card Pilot Project																			
CV-1	Integrated Intermodal Information System												L	S						
CV-2	Atlantic Trade Corridor Border Security and Electronic Inspection		L			S					S						S			
CV-3	Atlantic Canada Electronic Permitting for Oversized and Overweight Vehicles		L					S			S			S	S		S	S		
CV-4	Port Operational Information Extranet																			
CV-5	Port Container Security																			
CV-6	Airport Groundside Transportation Management																			
CV-7	Commercial Fleet Management Program																		S	
EM-1	Wireless Network Expansion										S			S	S			S		
EM-2	Atlantic Provinces Disaster Response Plan Scoping Study	S		L	S					L										

L = Lead Participant
S = Supporting Participant

Based on a review of the planned roles, the following are concluded:

- The owner/operator of a system is generally identified as having a lead role in the project;
- The four provincial transportation departments represent the largest presence of lead roles, being implicated for some involvement in six to eight of the strategic projects
- The Newfoundland Department of Works, Services and Transportation is planned to provide a lead role in one project and a supporting role in seven others. The lead role, namely the Atlantic Provinces ARWIS Expansion (TM-1)), is in cooperation with other Provincial counterparts. In addition, these projects will make demands on separate divisions of the Department.
- The Nova Scotia Department of Transportation and Public Works has been identified as a lead participant in one project and a supporting participant in seven others. The lead role is in conjunction with the other Provincial counterparts for the projects identified for the Newfoundland Department of Works, Services and Transportation.
- The Prince Edward Island Department of Transportation and Public Works is identified in two lead roles and five supporting participant roles. In to the Atlantic-wide initiative identified above, their lead is identified in the Community Transit Fleet Management project (PT-2). The PEI Department of Transportation and Public Works will need to consider their level of involvement in these projects and the timing of each, with a view of resolving any resource limitations.
- The New Brunswick Department of Transportation is identified in seven project roles including six as lead participants in projects all starting in early 2003. Although these lead roles span a number of divisions within the department, New Brunswick DOT staff resources may not be able to provide this level of effort given their other commitments. A review of staff requirements and resources will need to be undertaken to identify any deficiencies.
- Police services are identified for participation in four projects and in all cases in supporting roles. This level of involvement reflects the prevalence of safety related and enforcement activities inherent to many of the projects;
- With the prevalence of CVO related strategic projects, commercial vehicle carriers and shippers are included as participants in five projects. Their role is generally a supporting participant with the exception of their lead in the Commercial Fleet Management Program project;
- Halifax-Dartmouth Bridge Commission is involved in four projects with lead roles in three of the projects. The three lead projects relate to an incident management system, the Atlantic Canada transaction tag and a fixed automated spray technology system for the bridge. Given the nature and timing of these projects, demands on staff resources do not appear to be a barrier.

- The Halifax Regional Municipality is involved in four projects including a lead role in the Smart Snowplow Expansion (TM-6) project. These projects will be spread over a number of departments and as such do not appear to represent a critical loading.

- City of St. John's is identified as a lead participant in the Red Light Camera Pilot Project (TM-4) and the Smart Card Pilot Project (EP-3). Given that these two projects would involve separate divisions, namely the traffic and transit divisions, a lead role for both these projects should be manageable. A supporting role is also anticipated in the Smart Snowplow Expansion (TM-6) initiative.

- The Saint John Parking Authority is identified as the lead agency for the Parking Electronic Payment and Monitoring Project (EP-1).

- The Atlantic Canada Opportunities Agency (ACOA) is identified in three projects, all of which include a supporting role.

5.3 DEVELOP ACTION PLAN FOR ONGOING EVALUATION

5.3.1 Strategic Program Management

The goal of the Action Plan for Ongoing Evaluation is to design a framework for the stewardship of the overall Atlantic Provinces Regional ITS Strategic Plan.

The specific tasks include:

- Project tracking process;

- Provide a resource group to make suggestions if a project is encountering difficulties; and

- Disseminate information on the ITS activities to stakeholders in the Atlantic Region.

The tools to be used to oversee the Action Plan:

- Establishment of a permanent Atlantic Provinces ITS Steering Committee;

- Maintenance of the ITS roundtable; and

- On-Going engagement of stakeholders.

Establishment of Atlantic Provinces ITS Steering Committee

In order to maintain momentum and focus on the implementation of the Strategic Plan, it is extremely important to establish a permanent Atlantic Provinces ITS Steering Committee. The committee should consist of, as a minimum, representatives of:

- New Brunswick Department of Transportation;

- Nova Scotia Department of Transportation & Public Works;
- Prince Edward Island Department of Transportation & Public Works;
- Newfoundland & Labrador Department of Works, Services & Transportation;
- Transport Canada;
- Atlantic Canada Opportunities Agency; and
- A representative of the academic/research community in Atlantic Canada.

The government members of the Steering Committee will share information on:

- Changes to regional institutional, legislative and technical barriers;
- Projected effects of policy and regulatory changes on the performance of the existing transportation infrastructure;
- Opportunities for ITS to address existing challenges in maximizing the efficiency of the existing infrastructure;
- Environmental, economic and social policies that can contribute to the development of the ITS infrastructure in the region.

The academic/research member of the Steering Committee will provide input on:

- Opportunities to promote and apply ITS research in the Atlantic Provinces;
- Opportunities for partnerships and the role of research centres of excellence in developing and implementing "early winner" ITS deployments.

Maintenance of the ITS Roundtable

Another important facet of the action plan is the maintenance of the ITS Roundtable which was established as part of Step 6 of the study. It is recommended that the ITS Steering Committee conduct a conference call once every 6 months to discuss the implementation of the plan, industry developments.

The original roundtable group convened for the study included approximately 17 individuals, with 4 members from each of New Brunswick, PEI, and Newfoundland, and 5 from Nova Scotia. Public sector participants were six in number while the private sector had 8 members. One individual represented the academic sector and the "other" category consisted of 1 representative each from an authority and a commission.

Before the initial meeting with the ITS Roundtable, the ITS Steering Committee should meet and discuss the membership. The membership should be adjusted to reflect demonstrated interest and contribution to the roundtable discussions, and the level of ITS and ITS-related activity of the participants.

Ongoing Engagement of Stakeholders

It is important to continue the dialogue initiated through this project. Mechanisms include hosting of the 2003 ITS Canada meeting in Fredericton, generation of a regional architecture and the maintenance of ITS Atlantic web-site. The latter two opportunities are further detailed in the following paragraphs.

Regional ITS Architecture

Success in ITS planning is predicated upon effective coordination between organizations, at both an institutional and technical level. As previously noted, the ITS Architecture for Canada provides a common framework for deployment and integration of ITS. However it is unlikely that any single area, province, or even region would plan to implement the entire architecture. Therefore, the ITS Architecture for Canada can be tailored to local needs, producing what is referred to as a regional ITS architecture. A regional ITS architecture identifies the functions, organizations, and information flows that are relevant to the area, as well as those that are planned for the future. As well, regional architectures can provide different institutional views. This provides stakeholders customized views from their perspective, allowing them to identify opportunities for integration and co-operation.

The development of a regional ITS architecture for the Atlantic Provinces would be facilitated greatly by the results of this Strategic Plan development, as well as from the fact that active representatives of the stakeholder community have already been identified and brought together as part of the project.

It should be noted that the real success of a regional ITS architecture effort hinges on effective use of the architecture once it is developed. A regional ITS architecture is an important tool for use in transportation planning and project implementation. As indicated, it can identify opportunities for making ITS investments in a more cost-effective fashion. This step is where the benefits are realized.

Atlantic ITS Website

The Atlantic ITS Website is established and has a profile. It can be used to post announcements concerning staff changes, new projects, relevant events, and project progress reports. A permanent host, and website administrator will need to be established.

Action Plan Structure

The proposed frequency of the ongoing monitoring and maintenance of the Plan is outlined in Exhibit 5.4.

Exhibit 5.4 – Action Plan Activities

Action Plan Activity	Frequency	Tasks
Steering Committee	4 times per year	• Meet via conference call • Discuss events which impact, or potentially impact the ITS Strategic Plan • Review overall Strategic Plan schedule • Review project status reports

Exhibit 5.4 – Action Plan Activities		
Action Plan Activity	**Frequency**	**Tasks**
Roundtable	2 times per year	• Steering Committee to meet with Roundtable 2 times per year, in conjunction with regular steering committee meeting
Website	4 times per year	• Website to be updated 4 times per year, following each Steering Committee meeting • Website to report on key topics of discussion, and project status reports
Project Status Reports	One per year	• Project Managers requested to complete and submit annual status reports, using the standard template

5.3.2 Strategic Project Evaluation

It is envisioned that the Atlantic Provinces ITS Strategic Plan be evaluated through collection of relevant "before" data, annual reviews of project progress, and a formal five-year update. The three components are outlined below:

Collection of "Before" Data

In Step 2 of the Plan, general performance criteria were identified for each User Service for future evaluation purposes. These criteria were carried forward and mapped against the strategic projects to provide a basis to determine data collection needs, specifically, the "before" data requirements. Included in Exhibit 5.5, is a summary of the applicable performance criteria, by project. Also included in Exhibit 5.5, is a summary of the data that should be collected prior to the project initiation/implementation, to permit the assessment of the benefits.

.

Exhibit 5.5 – General Performance Criteria and Before Data Collection Requirements

Project	Step 2 – Performance Criteria											Before Data to be Collected	Candidate for Online Monitoring
	Reduction in Delay	Reduction in Fuel Used	Reduction in Pollutant Emissions	Increase in Schedule Reliability	Reduction in Collisions	Reduction in Response Time	Reduction in Duration of Incident	Level of User Acceptance/Satisfaction	Increase in Tourism-Related Revenue	Reduction in Public Cost	Improvement in Quality of Life		
Atlantic Provinces Advanced Traveller Information System	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆	• Annual business revenue related to tourism • Number of "hits" on existing traveller information web sites (e.g. www.newbrunswick.world.web.com) • Number of ferry trips per year and associated passenger volume	✓ ✓
Atlantic Provinces ARWIS Expansion	◆	◆	◆	◆	◆	◆				◆	◆	• Number and rate of (total and fatal) collisions • Number and rate of (total and fatal) collisions per registered vehicle, where weather and/or road surface was a contributing factor • Percentage of drivers that have access to information prior to trip • Coverage area per winter maintenance vehicle • Current annual budget spent by jurisdictions collecting data on road and weather conditions • Current annual budget spent by jurisdictions on road surface maintenance related to weather conditions	✓
Wildlife Detection in New Brunswick, Scoping Study and Pilot Project					◆					◆	◆	• Number and rate of (total and fatal) wildlife-vehicle collisions	
Implementation of Fixed Automated Spray Technology (FAST) for Bridge De-icing	◆	◆	◆	◆	◆	◆				◆	◆	• Number of roadway (total and fatal) collisions • Rate of road collisions per registered vehicle passing bridge, where weather and/or road surface was a contributing factor • Assessment of current state of bridge with regards to corrosion and chloride loading in the surrounding environment	

Exhibit 5.5 – General Performance Criteria and Before Data Collection Requirements

Project	Step 2 – Performance Criteria											Before Data to be Collected	Candidate for Online Monitoring
	Reduction in Delay	Reduction in Fuel Used	Reduction in Pollutant Emissions	Increase in Schedule Reliability	Reduction in Collisions	Reduction in Response Time	Reduction in Duration of Incident	Level of User Acceptance/Satisfaction	Increase in Tourism-Related Revenue	Reduction in Public Cost	Improvement in Quality of Life		
Red Light Camera Pilot Project					◆					◆	◆	• Cost of traditional enforcement techniques (i.e. operating cost before implementation) • Number and rate of (total and fatal) collisions at candidate intersections, and at "control" intersections	
Portable Changeable Message Sign (PCMS) for Work Zones	◆	◆	◆	◆	◆	◆		◆		◆	◆	• Average vehicle speed in work zone • Number and rate of (total and fatal) collisions in a work zone • Average delay per vehicle incurred in work zones	✓
Smart Snowplow Expansion	◆	◆	◆	◆	◆	◆				◆	◆	• Number and rate of (total and fatal) collisions where presence of snow on roads was a contributing factor • Number and rate of (total and fatal) collisions per registered vehicle, where weather and/or road surface was a contributing factor • Current annual amount of salt used to de-ice roads, by jurisdiction • Current annual budget spent by jurisdictions on road surface maintenance related to weather conditions	✓
Bridge Incident Management Scoping Study	◆	◆	◆		◆	◆	◆			◆	◆	• Number and rate of (total and fatal) collisions • Average response time between apparent time of incident and arrival of appropriate response team • Number of false alarms • Average time between time of incident and reopening of road • Number of secondary incidents • Average time lost to delay	✓ ✓
Urban Transit Real-Time Information Service	◆	◆	◆	◆	◆			◆		◆	◆	• Annual ridership, by route • User attitudes survey	✓

Exhibit 5.5 – General Performance Criteria and Before Data Collection Requirements

Project	Step 2 – Performance Criteria											Before Data to be Collected	Candidate for Online Monitoring
	Reduction in Delay	Reduction in Fuel Used	Reduction in Pollutant Emissions	Increase in Schedule Reliability	Reduction in Collisions	Reduction in Response Time	Reduction in Duration of Incident	Level of User Acceptance/Satisfaction	Increase in Tourism-Related Revenue	Reduction in Public Cost	Improvement in Quality of Life		
Community Transit Fleet Management				◆				◆		◆	◆	• Annual ridership for existing services • User attitudes survey • Percentage of on-time end-station arrivals	✓ ✓
Parking Electronic Payment and Monitoring	◆	◆	◆	◆				◆	◆	◆	◆	• Human resources to administer existing system • Parking lot/space utilization • Average queue time to enter parking lot • User attitudes survey	 ✓
Atlantic Canada Transaction Tag	◆	◆	◆	◆				◆	◆	◆	◆	• Total operating costs with segregated “back offices” • Size of current tag population • Number of tag holders already using proposed partners/applications (i.e. tolls, parking, ferry service and retail services) • Parking lot/space utilization	 ✓ ✓ ✓
Smart Card Pilot Project								◆		◆	◆	• Annual ridership for existing services • Current revenue processing of costs	✓ ✓
Integrated Information System (WIM)	◆	◆	◆	◆	◆					◆	◆	• Number of vehicles that could participate in the WIM system • Average delay per commercial vehicle weighed/inspected • Percentage of commercial vehicles either known to be safe (carrier has good safety record) or checked at least once during a given trip • Number and rate of (total and fatal) collisions involving commercial vehicles • Number and rate of (total and fatal) collisions involving commercial vehicles with safety defects	✓

Exhibit 5.5 – General Performance Criteria and Before Data Collection Requirements

Project	Step 2 – Performance Criteria											Before Data to be Collected	Candidate for Online Monitoring
	Reduction in Delay	Reduction in Fuel Used	Reduction in Pollutant Emissions	Increase in Schedule Reliability	Reduction in Collisions	Reduction in Response Time	Reduction in Duration of Incident	Level of User Acceptance/Satisfaction	Increase in Tourism-Related Revenue	Reduction in Public Cost	Improvement in Quality of Life		
Atlantic Trade Corridor Border Security and Electronic Inspection	◆	◆	◆	◆	◆					◆	◆	• Average delay per vehicle • Average processing time per vehicle • Annual operating costs of border crossing inspection processes	✓ ✓
Atlantic Electronic Permitting for Oversized and Overweight Vehicles	◆	◆	◆	◆	◆					◆	◆	• Average delay per commercial vehicle during permit issuing process • Number and rate of (total and fatal) collisions involving oversized and overweight commercial vehicles • Estimated cost of asset (road/bridges) damage incurred due to oversized/overweight vehicles • Operating costs (including human resources requirements) to issue permits	✓
Port Operational Information Extranet	◆	◆	◆	◆						◆	◆	• Average wait time • Ratio of containers in-terminal to containers docked • Percentage of on-time deliveries • Current methods of information collection and dissemination, and resources required to perform this service • User attitudes survey	✓ ✓ ✓

Exhibit 5.5 – General Performance Criteria and Before Data Collection Requirements

Project	Step 2 – Performance Criteria											Before Data to be Collected	Candidate for Online Monitoring
	Reduction in Delay	Reduction in Fuel Used	Reduction in Pollutant Emissions	Increase in Schedule Reliability	Reduction in Collisions	Reduction in Response Time	Reduction in Duration of Incident	Level of User Acceptance/Satisfaction	Increase in Tourism-Related Revenue	Reduction in Public Cost	Improvement in Quality of Life		
Port Container Security	◆	◆	◆	◆	◆					◆	◆	• Percentage of containers tampered with • Percentage of on-time deliveries • Average waiting time to process at intermodal terminal and border crossing • Average processing time per container • Current resources required to perform this service	 ✓ ✓ ✓
Airport Groundside Transportation Management	◆	◆	◆	◆	◆			◆		◆	◆	• Annual number of customers by transportation mode • Average delay time per customer • User attitudes survey • Percentage of on-time arrivals/departures of bus and taxi services • Annual operating costs for groundside transportation service providers	✓ ✓ ✓
Commercial Fleet Management Program	◆	◆	◆	◆						◆	◆	• Average congestion costs and delay • Number and rate of (total and fatal) collisions involving commercial vehicles • Annual administrative operating costs • Human resources requirements to manage fleet services	
Wireless Network Expansion						◆				◆	◆	• Proportion of drivers able to initiate an emergency notification call • Number of transportation-related 911 calls • Number and rate of (total and fatal) collisions in rural areas • Average response time between apparent time of incident and arrival of appropriate response team • False alarm rate • Average time between time of incident and reopening of road • Number of secondary incidents	 ✓ ✓ ✓

Exhibit 5.5 – General Performance Criteria and Before Data Collection Requirements

Project	Step 2 – Performance Criteria											Before Data to be Collected	Candidate for Online Monitoring
	Reduction in Delay	Reduction in Fuel Used	Reduction in Pollutant Emissions	Increase in Schedule Reliability	Reduction in Collisions	Reduction in Response Time	Reduction in Duration of Incident	Level of User Acceptance/Satisfaction	Increase in Tourism-Related Revenue	Reduction in Public Cost	Improvement in Quality of Life		
Atlantic Provinces Disaster Response Plan Scoping Study						◆				◆	◆	• Current information dissemination processes – coverage, and anticipated time required to contact all members of the public • Percentage of drivers that have immediate, in-vehicle access to relevant information • Percentage of drivers that have access to relevant information prior to their trip • Proportion of drivers able to initiate an emergency notification call	

Annual Review

As the implementation plan is built upon a start date of 2003, it is recommended that a yearly review of project progress be undertaken to identify deviations from the original scope or time frames. To assist in the timely and consistent review of the project progress by each lead jurisdiction, a common template should be developed. Provided in Exhibit 5.6 below is the major components and the associated content that could be included in the template.

Exhibit 5.6 – Annual Project Progress Review
Sample Template

Item	Content
Project Name and Reference Number	Project name and reference number as identified in the ITS Strategic Plan
Activities completed to date	A brief outline of major tasks completed to date with reference to the deployment plan schedule. A revised schedule of project activities should be included, as applicable.
Changes in project scope, if any	As the projects proceed, it may be advantageous to revise the scope of the project to better suit the needs and opportunities presented. Any major changes in scope should be identified including the primary reasons for the change.
Technology advancements	Given the nature of the technologies required for many of the projects, it is anticipated that advancements in technology will occur over time and during the project implementation. Any progression in a technology field should be identified.
Evaluation of system, if applicable	Both qualitative and quantitative evaluation of the project should be provided.
Revised list of participants	If any changes have been made to the lead and supporting participants, the modifications should be identified and reasons provided.
Partnership opportunities	Identification of partnerships that have been developed for the project. Details regarding the nature and extent of and the motivation for the partnership should be provided for others to take into account.
Funding opportunities	All internal and external funding that has been obtained or earmarked for the project should be identified. "In-kind" services should be included in this summary.

Exhibit 5.6 – Annual Project Progress Review Sample Template	
Item	**Content**
Barriers	Any barriers encountered in the project implementation or completion should be identified including their impact on the project progress. Measures undertaken or to be considered to remove the barriers should be acknowledged.
Atlantic province companies/services	Where Atlantic based firms, companies and service providers have been involved in the implementation of the project; the entity's name and contribution/expertise should be acknowledged for consideration by others in the region. Contributions should be categorized, as applicable, to the planning, design, procurement, deployment, or construction phases in the project.
Lessons Learned	Provision of any lessons learned that may prove beneficial to other projects, jurisdictions or companies.

This evaluation form would be distributed to the lead participant(s) for each project in January of each year starting in January 2004. Electronic distribution of the evaluation form is recommended to permit timely response and the ability to forward the form if the responsible agency or individual has changed over the course of the project. The annual report will be compiled and distributed by the Steering Committee and posted to the website.

Plan Update (Five Year Review)

It is recommended that a five year review of the Plan be undertaken to ensure that the Plan is "evergreen" and reflects the region's current needs, opportunities and objects, as they relate to ITS services. As noted in Section 5.3.1, it is recommended that a Steering Committee be established for the ongoing monitoring and management of ITS deployment in the Atlantic Region. It is anticipated that the ITS Steering Committee would undertake a five year review of the plan, the scope of which would be determined at the time of its commissioning.

6. ECONOMIC DEVELOPMENT AND ACADEMIC/RESEARCH

6.1 INTRODUCTION

The Atlantic Provinces Regional Intelligent Transportation System Strategic Planning Study incorporates a designated stand-alone activity that specifically addresses the economic and industrial development potential for the Atlantic Provinces through increased participation in the ITS industry. This section represents the findings of the study pertaining to economic development and academic/research. The section summarizes past efforts in this area, the ITS industrial capabilities within the region, and an analysis of the market opportunities. The results from this effort are targeted at representatives from all sectors with an interest in furthering Atlantic Provinces participation in the rapidly developing international market for ITS.

Whereas ITS is a technical field, this section minimizes reference to technical terms. In cases where this isn't feasible, footnotes explaining the term are provided at the first occurrence. In addition, a Glossary of Terms is provided for reference in Appendix J.

6.1.1 Goals and Objectives

The overall goal of the Economic Development and Academic/Research analysis is to promote the development of an ITS industrial base in Atlantic Canada. The more specific objectives of the work include:

- Creating an awareness within Atlantic Canada industry and academia of ITS technologies and the potential markets which are being created by their deployment;
- Assessing the capacity and potential for Atlantic Canada firms to respond to ITS requirements within the region, but also beyond;
- Assessing the potential marketplace for ITS technologies within Atlantic Canada, as well as the opportunities which might exist for the region's ITS firms to develop and/or provide products for use in international markets;
- Preparing local industry and academic partners to respond to the requirements and tenders for the supply of ITS technologies within the Atlantic Region.

The Economic Development and Academic/Research analysis is distinct, but directly related to the overall Atlantic Region ITS Strategic Planning effort. Where the overall study aims to develop a strategic vision and plan for the deployment of ITS technologies in Atlantic Canada, the Economic Development and Academic/Research analysis is aimed directly at promoting the development of an industrial base within the region that can supply the technologies and personnel required for the deployment and ongoing support of ITS in Atlantic Canada and beyond.

In essence, the work plan addresses economic development issues and needs. Much of the information developed in the primary workstreams of the study have been used as input to analysis. Where the primary workstreams in the study aim at defining mainly demand-side issues, the emphasis in the Economic Development and Academic/Research analysis is on supply side challenges and opportunities.

6.1.2 The Underlying Philosophy

In developing the work plan, an approach was deliberately framed around four fundamental principles:

- The work must emphasize practical and cost-effective approaches and solutions to specific Atlantic Region needs. The environmental scan and opportunities analysis elements of the primary work plan are expected to provide critical inputs into the efforts in this respect. There is a need to develop a clear understanding of needs, limitations, and perceived opportunities before the ability of industry and academia to respond can be addressed.

- The approach stresses a two-stage need: the desire to move forward immediately with ITS deployment to some degree; and the recognition that the presence of such technologies will generate the need for an intellectual and industrial base to sustain it in the long term.

- Partnership opportunities between industry and academia are not only desirable, but are critical to the continuing success of any ITS deployment efforts. Academia's logical roles in research, education, and training precisely complement the traditional industrial roles of research, product development, and implementation. In addition, academia will ultimately have an important role to play in fostering the development of the intellectual capital that can sustain these efforts over the long term as noted in the point immediately above.

- Industry and academia will only buy into the Economic Development and Academic/Research analysis if they were involved in, and contributed substantively to it, throughout its execution. Analysis efforts included important components of consultation, networking, and showcasing, to help ensure that this happens. These were closely coordinated with the consultation efforts of the primary study workstream.

6.1.3 The Approach

Exhibit 6.1 provides an overview of the approach to the Economic Development and Academic/Research analysis.

The work plan was built around three areas of effort:

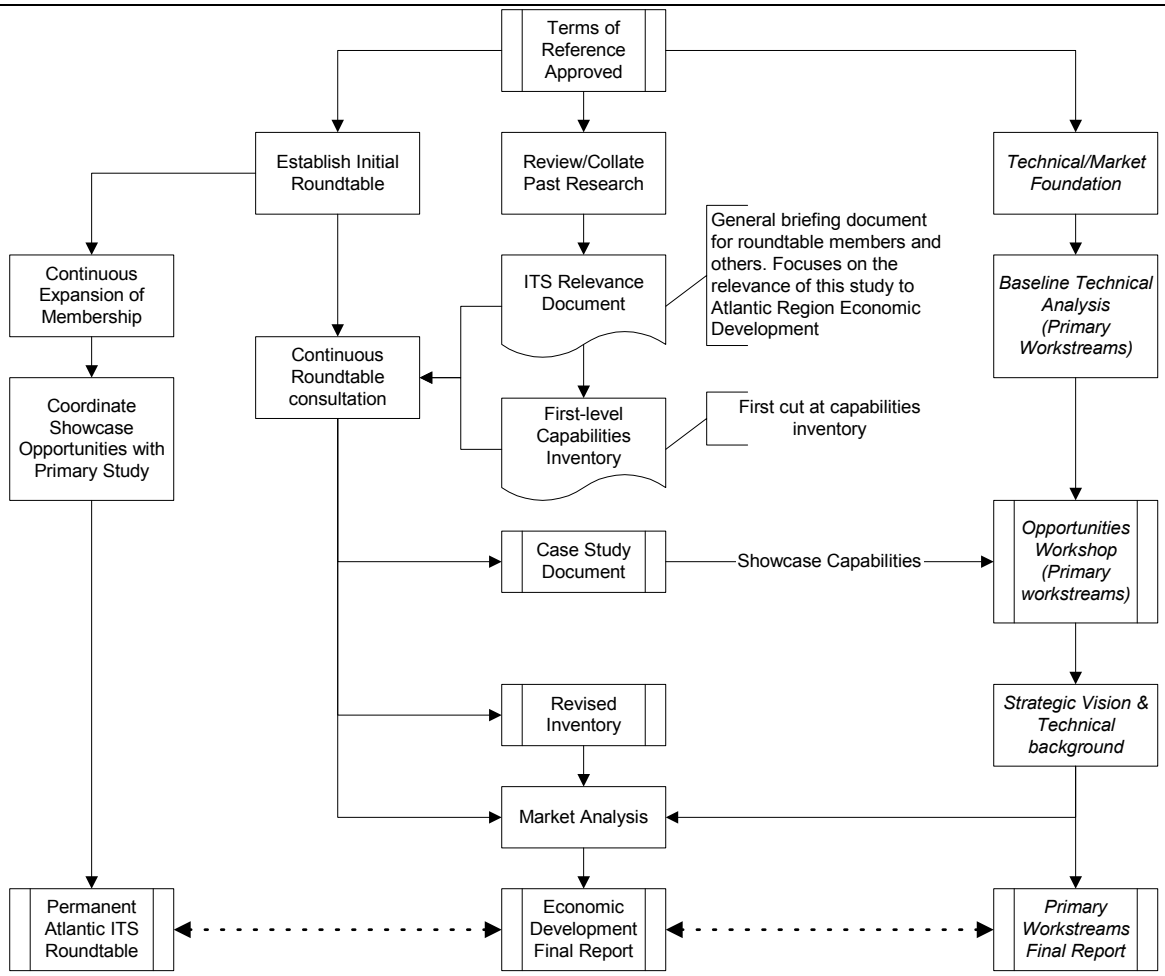
- Core deliverables;

- Consultative process;

- Integration with the overall study.

The core of the effort was dedicated to the actual development of the desired deliverables and focuses on an initial review of past work, consultations with industry and academia, a critical link to the outputs of the main strategic planning effort, and a sophisticated market and opportunities analysis.

Exhibit 6.1 – Overview of Approach



Note: Activities indicated in italics are associated with the Primary Study Activities (Steps 1 through 5)

An ITS Roundtable was established to serve as a consultative and review body for selected elements of the core work activities. The group included representation from industry, academic, and other stakeholders with primary interests and knowledge in ITS. It is through this representation that we begin to build the network of interested stakeholders that will be vital to supporting ITS activities in the long term. The ITS Atlantic website played a key role in terms of facilitating the communications among the ITS Roundtable throughout the course of the project, and conceivably will survive beyond the course of the project.

Finally, the effort addressed the need to continuously monitor and participate in the overall study workstream activities, so that information and contacts developed in the course of that work could be used as a basic input to the analysis efforts.

6.1.4 Deliverables

The following products/services were established for the Economic Development and Academic/Research analysis:

- The early creation of an Atlantic ITS Roundtable organization with a core initial membership from academia, the private sector, and government, together with ongoing management of and consultation with that group during the study period.

- An early "interim" ITS Capabilities/Inventory report.

- An early "ITS Relevance" document intended to provide an introductory-level discussion of the reasons for, and potential benefits flowing from the development of an ITS industrial base in Atlantic Canada. This document was used as an explanatory vehicle early in the consultative work.

- A Case Study document that was used as the basis for showcasing existing success stories and Atlantic Canada capabilities in ITS in Atlantic Canada. While the report was used primarily as an interim document for the showcasing activity, it also provided a foundation tool for marketing Atlantic Canada capabilities in ITS in the future.

- A final ITS Capabilities/Inventory report.

- Participation in the key Opportunities Workshop of the mainstream strategic planning activity.

- A Market Analysis report including an ITS Relevance Map and SWOT (Strengths, Weakness, Opportunities, and Threats) analysis.

- Through the Atlantic ITS Roundtable, facilitating the development of a proposal for the establishment of carefully focused ITS demonstration project to showcase Atlantic Canada capabilities nationally and internationally.

- A Final Report on the overall work of the analysis which includes a strategic plan component directed at the development an ITS Industrial Base in Atlantic Canada.

6.2 THE ITS ATLANTIC ROUNDTABLE

The creation of an Atlantic ITS Roundtable was one of the first priority steps in the Economic Development and Academic/Research workstream of the Atlantic ITS Strategic Planning effort. This organization assisted in efforts in information gathering, consultation and showcasing throughout the course of our work, and were an important participant in helping move this work forward. The group is expected to survive the completion of the strategic planning effort and provide ongoing guidance in the development of the Regional ITS base.

Appendix K lists the membership for the roundtable. Drawn from a variety of sources, including the overall stakeholder list, and the participants in the various Atlantic ITS Focus Groups, the group is

somewhat larger than originally anticipated. Consisting of 17 individuals, the membership represents all four Atlantic Provinces, with 3 members from each of PEI and Newfoundland, 5 from Nova Scotia, and 6 from New Brunswick. Public sector participants are 6 in number, while the private sector has 8 members. One individual represents the academic sector and the "other" category consists of 1 representative each from an authority and a commission. The basis for the selection of this proposed membership is outlined below.

6.2.1 Basis for Selection of the Committee

A number of criteria were used to select the proposed roundtable membership:

- knowledgeable and interested individuals;
- important that the membership represent all four Atlantic Provinces;
- good mix of public and private sector participants, as well as other potential ITS user groups.

Private sector members with relevant technological capabilities and experience were specifically recruited, and – because of the economic development focus of the work – as effort was made to ensure representation from economic development agencies (EDA) in most of our provinces. In structuring the committee, the overall study approach was carefully considered to ensure a structure compatible with the market analysis (Section 6).

6.2.2 Role of the Committee

Roundtable members provided input and documentation review throughout the course of undertaking this work. Meetings were convened via teleconference, and some members participated in the Strategic Plan workshops. The sheer size and diversity of the group was an impediment to meeting in person, and this perhaps contributed to a lack of identity and cohesion for the group.

6.3 PAST RESEARCH

The Atlantic Region ITS Strategic Planning effort aims to develop a strategic vision and plan for the deployment of ITS technologies. The Economic Development and Academic/Research analysis is aimed directly at promoting the development of an industrial base within the region that can supply the technologies and personnel required for the deployment and ongoing support of ITS in Atlantic Canada. This section provides a synthesis on the state of ITS pertaining to:

- ITS in Atlantic Canada in terms of the region's characteristics and strengths, industry involvement and academic involvement;
- Past efforts at developing the ITS industrial and academic capabilities in the region;
- World projections for the ITS market;
- Potential sources of funding for ITS projects.

6.3.1 ITS Experience in Atlantic Canada

6.3.1.1 Characteristics and Strengths of the Region

In general, Atlantic Canada consists of small population centres that are geographically dispersed. The Atlantic Canada transportation network consists of highways (66,644 km of two-lane equivalent roads under federal, provincial and municipal jurisdiction[1]), airports (7 major airports and 12 local/regional airports), marine ports, ferry systems and railways. Atlantic Canada has several modes of transportation access to the rest of Canada and the U.S. As in the rest of Canada, most of the Atlantic Provinces area would be classified as rural, with pockets of urban areas.

The Canadian ITS architecture (http://www.its-sti.gc.ca) provides a framework for implementing ITS projects and ensure compatibility of the products and services across jurisdictions and systems. Defined in the architecture are the functions of various components and the relation between them. Also identified are the standards needed to guarantee that the ITS components will operate in a consistent and predictable way.

Described in the architecture, the services provided by ITS can be divided into eight major categories referred to as "user service bundles". The bundles are subdivided into 35 user services*, which, in turn, are subdivided into 90 user sub-services. The user services and user sub-services provide increasing level of detail with regards to what the system will do from the perspective of the user, be it the travelling public or a system operator. "Market packages" identify groups of user sub-services that naturally relate to one another or are complimentary in nature.

In the Atlantic Provinces ITS Strategic Plan, 16 of 35 user services were identified as having a higher priority within the Atlantic Region based on the transportation system needs. These user services focused on emergency management, traveller information, traffic management, electronic payment, and commercial vehicle operations. The user services represented are not surprising given the characteristics of the region.

The Rural ITS Toolbox, recently published as part of U.S. Department of Transportation Rural Intelligent Transportation Systems (ITS) Program, identified seven Rural ITS Development Tracks defined in the Federal Highway Administration (FHWA) report Rural ITS User Needs[2]. Exhibit 6.2 illustrates that the user services identified under the Strategic Plan map well to the seven rural ITS development tracks.

Exhibit 6.2 – Comparison of Rural ITS Deployment Track with Priority User Services for Atlantic Canada

U.S. Rural ITS Development Track	Atlantic Priority User Services
Tourism and Travel Information	1.1 Traveller Information 1.4 Traveller Services and Reservation
Traffic Management	2.1 Traffic Control

* User services document what ITS should do from the user's perspective. A broad range of users are considered, including the traveling public as well as many different types of system operators. The concept of user services allows system or project definition to begin by establishing the high level services that will be provided to address identified problems and needs. Some examples of user services from the Canadian ITS Architecture are: Incident Management, En-Route Transit Information, Intermodal Freight Management, etc.

U.S. Rural ITS Development Track	Atlantic Priority User Services
	2.2 Incident Management
Surface Transportation and Weather	2.4 Environmental Conditions Monitoring 8.1 Weather and Environmental Data Management
Operations and Maintenance	2.5 Operations and Maintenance
Crash Prevention and Security	2.6 Automated Warning and Enforcement
Rural Transit and Mobility	3.1 Public Transport Management
Commercial Vehicle Operations	4.1 Toll Roads, Parking and Transit 5.1 Commercial Vehicle Electronic Clearance 5.5 Intermodal Freight Management 5.6 Commercial Fleet Management
Emergency Services	6.1 Emergency Notification and Personal Safety 6.3 Disaster Response and Management 6.4 Emergency Vehicle Management

Geographically, the Atlantic Provinces have significant linkages with the U.S. market. In a recent survey of Atlantic Provinces business, 12% of sales were generated by the U.S.[3]. The survey population includes primary, secondary and service business with the secondary and service, businesses each representing 48.5% of the respondents. This distribution of respondents is representative of the economic activity in the region. Given the close relationship to the U.S. Rural ITS Development Track, there is a potential for the Atlantic Provinces to showcase rural ITS applications in their respective provinces and transfer them to markets in the U.S. and the rest of Canada.

Exhibit 6.3 summarizes future ITS initiatives, along with ITS experience to date for the Atlantic Provinces. This demonstrates the starting point for the development of an ITS Industrial Base. This information was compiled from a recent presentation prepared by the Regional ITS Planning Team, which included Nancy Lynch, Assistant Director Transportation Policy Branch NB DoT; Tom Beckett, Director of Policy and Planning NF DoWST; Peter M. Adams, Operations Engineer, District Operations Division NS DoTPW; and Cathy Worth, Planning Engineer, PEI DoTPW. The presentation was part of the proceedings of the Regional ITS Conference in 2000, as arranged by the Atlantic Provinces Transportation Commission.

Exhibit 6.3 – Atlantic Provinces ITS Initiatives and Experience

ITS Application	Newfoundland	Prince Edward Island	Nova Scotia	New Brunswick
Examining				
Advanced Roadside Weather Information System (ARWIS)	✓			
International border crossing clearance				✓

ITS Application	Newfoundland	Prince Edward Island	Nova Scotia	New Brunswick
Electronic clearance				✓
Weigh-in-motion (WIM*)	✓		✓	✓
Advanced Traveller Information Services (ATIS)			✓	✓
Commercial Vehicle Operations (CVO)	✓		✓	✓
Archived Data Management			✓	
Experience to Date				
Road closure/restriction information system				✓
Winter road conditions				✓
Traffic monitoring system				✓
Bridge ice warning system				✓
GIS-T highway inventory system				✓
ARWIS		✓	✓	✓
Truck mounted Infra Red (IR) Temperature Sensors				✓
Weigh-In-Motion (WIM)			✓	
Vehicle counter/classifiers	✓	✓	✓	✓
Texas weather instrument stations (WebCAMS)			✓	
Coordinated traffic signal control	✓	✓	✓	✓
SCOOT*			✓	
Shadow Tolling				✓

Canada and the U.S. have recently signed the Smart Corridor Border Declaration[4]. The declaration is a 30-point action plan, to collaborate in identifying and addressing security risks while efficiently and effectively expediting the legitimate flow of people and goods back and forth across the Canada-U.S. border. The declaration specifically identifies ITS deployment "*in support of other initiatives to facilitate the secure movement of goods and people, such as transponder applications and electronic container seals".*

Some initiatives can be announced that do not necessarily promote ITS investment directly. However, those in the industry can recognize the significant role for ITS in the announcement. For example, as part

* WIM (Weigh-in-Motion) – WIM is a sensory technology that is capable of measuring the weight of a vehicle (typically used for Commercial Vehicle Operations) while in motion, thus saving the vehicle time and eliminating possible resulting congestion.

* SCOOT (Split Cycle Offset Optimization Technique) – SCOOT is a traffic control system that uses traffic adaptic control. Under traffic adaptive control, the system continuously monitors traffic flow and optimizes traffic signal operation based on an on-line traffic flow model.

of its Action Plan for Regional Co-operation released on November 8, 2001, the Council of Atlantic Premiers released the following statement regarding a Harmonized Trucking Strategy for the Atlantic trade corridor.

"The development and implementation of a harmonized trucking strategy for the Atlantic Region will facilitate the efficient movement of goods to and from the Atlantic Region. The strategy will: contribute to increased trade corridor efficiency; improve the capability of regional and local transportation systems; improve coordination among provincial agencies; and facilitate the application of information technologies to the Atlantic transportation system to ensure the evolution of an "intelligent" Atlantic trade corridor."

The Harmonized Trucking Strategy Scoping Study was completed in June 2002.

6.3.1.2 Industry Involvement

In a report prepared for the Atlantic Canada Opportunities Agency, 20 firms were identified as working in the "intelligent systems" industry within Atlantic Canada[5]. That is not to say that these firms are working directly in the ITS industry, but rather have developed products and/or skills that are transferable to the ITS industry. For example, systems initially developed for the region's petroleum and ocean industries sectors can conceivably be adapted for transportation purposes. Exhibit 6.4 identifies a sample of the 20 firms listed in the Atlantic Canada Opportunities Agency report, provides a brief profile on the firm and identifies those with ITS experience.

Exhibit 6.4 – Profile of Atlantic Province Intelligent Systems Firms

Firm	Profile	ITS Experience
Newfoundland		
Canpolar East	• Canpolar East develops automation technologies, specializing in vision and tactile sensor systems software.	
C-CORE	• C-CORE is an applied R&D corporation for the resource industry. Expertise includes robotics, control systems, industrial automation, computer vision and intelligent sensing.	
Prince Edward Island		
Baseline Business Geographics	• Baseline Business Geographics specializes in providing integrated desktop and Internet mapping solutions for a broad range of applications for government, agriculture, health care, telecommunications, and fisheries research.	✓
GeoNet Technologies Inc.	• GeoNet Technologies specializes in GIS* applications ranging from the generation and structuring of geographical data for land and water to jurisdiction-wide programs such as property mapping.	

* GIS (Geographic Information Systems) – GIS is a computer system capable of assembling, storing, manipulating, and displaying geographically referenced information, i.e. data identified according to their locations.

Firm	Profile	ITS Experience
Nova Scotia		
Aliant Inc.	• Aliant is a group of advanced technology companies with strengths in telecommunications, information technology, mobile satellite communications and emerging business.	✓
Metocean	• Metocean is a manufacturing and development company for state-of-the-art data acquisition and telemetry systems for severe environments.	
Siemac Ltd.	• Seimac develops technology to provide tracking and status reporting for containers, trucks, wildlife, moorings, buoys and valuable goods anywhere in the world.	✓
Satlantic	• Satlantic designs, manufactures and operates a wide range of precision sensors, time-critical surveillance systems and advanced information extraction tools.	
EDIPort Atlantic	• EDIPort enables participation by small and medium-sized firms in electronic data interchange and dispatch/delivery functions for the Port of Halifax.	✓
Nova Scotia CAD/CAM Centre	• Nova Scotia CAD/CAM Centre was established between the Province of Nova Scotia and Dalhousie University to develop, design and utilize CAD/CAM applications.	
IMP Group International	• IMP specializes in aircraft engineering and maintenance, avionics and aerospace components.	
New Brunswick		
Approach Navigation Systems Inc.	• ANS provides general meteorological systems to measure any array of environmental parameters, which range in size from single-parameter systems to highly complex multi-station environmental networks.	
Advanced Business Services Ltd.	• ABS is a business solutions provider specializing in the delivery of software solutions to private and public sector organizations.	
CARIS Universal Systems	• CARIS is a supplier of Geographic Information Systems (GIS) and Spatial Information Management (SIM) solutions.	
LearnStream Inc.	• LearnStream is a custom courseware design firm.	
Trip Data and Safety Management Inc.	• TDSM provides safety consulting to the trucking industry, as wells on-board trip recording systems.	
Maritime Road Development Corporation	• Maritime Road Development Corporation designs, constructs and operates the Fredericton-Moncton highway Project for the New Brunswick DoT.	✓
Advanced Monitoring Technologies	• Advanced Monitoring Technology develops and implements monitoring and control systems for industrial and commercial applications.	

In addition to the firms listed in the above exhibit, the roundtable identified engineering consulting firms within the region with ITS experience. Examples include:

- Vaughan International Consultants Ltd. (Nova Scotia);
- Jacques Whitford (Nova Scotia);
- Geoplan Consultants Ltd. (New Brunswick).

As Exhibit 6.4 indicates, the review includes many firms which do not have direct ITS experience yet could conceivably participate in the industry through the transfer of relevant enabling technologies from other applications. While these lateral transfers are theoretically possible, and do in practice occur, the barriers can be significant. Many of the firms noted are small firms focusing on very specialized technology applications, often in the marine environment. While enabling technologies such as GIS and GPS* may be applied, the differences in the market in moving to the surface transportation industry can be very pronounced, and in many cases there may not be any particular technological or market advantage for the given firm. These opportunities to access the ITS market will be explored in greater detail under the subsequent tasks.

6.3.1.3 Academic Involvement

A recent survey of Canadian universities and colleges by Forest Integration Group Limited[6] identified schools with ITS curricula and research programs. The survey found that post secondary training in the ITS field is offered at several institutions throughout Canada. However, limited courses are offered at these institutions and there is no standardized approach to course curriculum.

Out of the twelve universities and six colleges located in the Atlantic Provinces, seven Universities and two colleges were contacted by the Forest Integration Group. The University of New Brunswick was the sole post secondary institution providing undergraduate and graduate courses on ITS. Dr. Eric Hildebrand, a professor in the Department of Civil Engineering at the University of New Brunswick, is active in the area of Road Weather Information Systems (RWIS)^. The department is also active with the Canadian Transportation Research Forum (CTRF), which is a voluntary group comprised of members of academic (including other Atlantic Province universities), government and business communities that examines all areas of transportation management and policy.

The New Brunswick Community College – Dieppe offers a Logistics and Transportation Management Techniques Co-op program. This program is designed for middle management personnel in the fields of logistics and transportation.

Two "Networks of Centres of Excellence", named Intelligent Sensing for Innovative Structures (ISIS) and Institute for Robotics and Intelligent Systems (IRIS) have established linkages between industry and academic. Dalhousie University is an ISIS node for Atlantic Canada and the University of New

* GPS (Global Positioning System) – GPS is a system whereby a network of satellites is used to locate the longitude, latitude and altitude of the receiver. A minimum of three satellites must be in the scope of the receiver to function, with increasing accuracy as more satellites come into view.

^ RWIS (Road Weather Information Systems) - Monitors current road and weather conditions using a combination of weather service information and data collected from environmental sensors deployed on and about the roadway. The collected road weather information is monitored and analysed to detect and forecast environmental hazards. This information can be used to more effectively deploy road maintenance resources, issue general traveller advisories, improve emergency management and response, and support location specific warnings to drivers.

Brunswick has been involved with ISIS projects. Furthermore Memorial University is an IRIS partner and the University of Prince Edward Island has been involved in IRIS projects. While the industries participating in the Networks of Centres of Excellence are not directly working in the ITS arena, they were identified as industries with skill sets transferable to the ITS industry[7].

As is evident from the experience of Canadian Universities, there is benefit in linking centres into networks for collaboration and information sharing. This is particularly important in the face of the level of research and development expenditure that occurs through the universities and the National Laboratories in the United States. Through the National Laboratories such as Volpe and ITS Centres of Excellence, such as in Texas, millions of dollars of research monies are applied annually. To date, Canadian centres have not been active in linking into these U.S. to access these Networks of Centres of Excellence.

6.3.2 Past Efforts at Industrial Development

This section summarizes past studies and initiatives aimed at developing the industrial and academic capabilities within the region to support an ITS industry which will improve the economic competitiveness of the region. The literature reviewed provides both a national level scope from which we can draw an Atlantic perspective, or specifically for the Atlantic Provinces.

National Inventory of Intelligent Vehicle Highway Systems (IVHS) Programs and Related Activities in Canada[8]

This report developed an inventory of Canadian IVHS (ITS) programs completed, underway and planned. The objective was to use the national inventory to identify new research areas and document benefits from existing installations to foster the deployment of ITS. At the time of publication (December 31, 1994) Nova Scotia had 3 ITS projects either completed, active or planned in the areas of Advanced Traveller Information Systems (ATIS), Advanced Traffic Management Systems (ATMS) and Advanced Public Transportation Systems (APTS). The remaining Atlantic Provinces were not active in ITS at the time of publication. At the time, this represented 3 out of 167 projects within Canada.

The summary provided in Exhibit 6.3 demonstrates that ITS activity in Atlantic Canada has increased since this inventory was compiled.

Intelligent Transportation Systems in Canada: Current Priorities and Future Directions[9]

This paper identifies future directions for ITS development in Canada. Seven key action areas were identified, each with one or more action plan to develop Canadian capabilities in the field of ITS. These key actions include:

- Advocacy;
- Information dissemination;
- Enhancement of production factors;
- Promotion and fostering of industry;

- Research, Development & Deployment;
- Policy and decision making;
- Organizational coordinating structures.

Strategy for Developing an ITS Industrial Base in Canada[10]

This study was undertaken to facilitate the entry of Canadian companies into the ITS marketplace. An analysis of the Canadian ITS market revealed the following observations:

- Canada's world leading ITS companies are focused in CVO, electronic tolling, APTS and ATIS.
- Canada has world leading communication companies. Key communications technologies should be pursued and developed in support of ITS.
- Canada has strengths in key enabling technologies, including: GIS, displays, sensors, system integration and software, and positioning and navigation technologies.
- Canadian government is active in ITS at all levels. However, there is little coordination between jurisdictions, other than through ITS Canada.
- There is a need for a national-level government office to coordinate and work with Canadian ITS industries.
- The potential global ITS marketplace could reach U.S.$19 billion by 2001, U.S. $43 billion by 2006 and U.S. $66 billion by 2011. Canadian ITS industries could see global annual market sales of over U.S.$1.2 billion by 2001, U.S.$2.9 billion by 2006, and U.S.$4.7 billion by 2007.
- U.S. is a key market for Canadian ITS technology suppliers, with emerging industrialized countries in the Pacific Rim and Mexico/Latin America as a second major market.
- Lack of Canadian showcase projects limits Canadian industry offshore. Other countries have clearly demonstrated the need for government/industry partnerships for developing a strong ITS industrial base.

This work resulted in a series of recommendations for both the public sector and the private sector. Some recommendations, such as the establishment of a federal ITS office have been successfully applied. However it is noteworthy that a number of other key recommendations have not as of yet been acted upon. In particular, there has been little activity in developing partnerships among various levels of governments and the private sector to develop high profile showcase deployment projects, which have proved in the past to be very important for developing export markets, particularly in emerging markets.

ITS Universities and Colleges Output Study[11]

This project surveyed Canadian universities and colleges to identify schools with ITS curricula and research programs. In total 57 universities and colleges were contacted, with 41 responding to the survey. Results from the survey indicate that:

- Hotbeds for ITS training are emerging (e.g. Toronto and Montreal). Certain institutions have focused on aspects of ITS, such as safety or logistics likely due to research interest of senior department members.
- There is little consistency to the topics covered in programs covered at the various institutions either regionally or nationally.
- A governing body (i.e. ITS Canada) disseminating information regarding ITS research, training and deployment would help faculty on their own initiatives. An ITS Canada effort to develop interest in ITS in post-secondary institutions would be welcomed.
- Faculty interviewed did not have any sense of emerging demand for ITS professionals.

Study on ITS Applications within the Canadian Trucking Industry[12]

This report investigates the use of ITS in the motor carrier industry (CVO). The report provides an overview of ITS system and technologies applicable to the motor carrier industry, quantifies benefits to implementing CVO applications, assesses barriers to deployment, and estimates the potential for the industry if barriers are overcome. Main conclusions from the report applicable to this study include:

- Competition is driving the deployment of ITS-CVO applications, which is primarily limited to the large carriers.
- The roadside clearance network needs to be expanded in support of ITS-CVO/ATIS applications. Expansion of a roadside clearance system, and the addition of service functionalities would increase the enrolment of truckers.
- Future users will include the whole of the motor carrier industry, requiring participation from government regulatory agencies (e.g. provinces and the neighbouring states).

The experience of the North American market with large-scale corridor preclearance programs such as HELP, ADVANTAGE I-75/AVION, and NORPASS suggests that the level of subscription to these programs is not always met with expectations. This is an example where it is institutional considerations such as privacy concerns can become a significant barrier to widespread acceptance.

E-Commerce and the Canadian Trucking Industry[13]

The purpose of this study was to raise awareness of e-commerce and increase its adoption in the Canadian trucking industry. The study identifies barriers to e-commerce deployment as well as areas of future opportunity. The following briefly summarizes barrier to deployment:

- Customer readiness – the customer must be willing to adopt e-commerce as a method of doing business.

- Company preparedness – includes the knowledge of e-commerce, willingness of the industry and its ability to bear the cost of e-commerce, the readiness of the company's infrastructure, cooperation on e-commerce standards.

- Security issues –the security of both company and customer information is a concern. This is more of a perceived obstacle than a technical one.

Technology trends that may impact the trucking industry are:

- Wireless Web access;

- Speech recognition and natural language processing;

- Biometric identification;

- Electronic cash;

- Vehicle location and navigation technologies.

Much of the work under this program focuses on enabling the smaller scale, independent trucking organizations to access the electronic data interchange technologies employed by the larger organizations.

Intelligent Transportation Systems Economic Implications for Atlantic Canada[14]

A modest scan of Atlantic Canadian firms and research institutes developing intelligent systems was undertaken to assess the region's capabilities to compete on a world market. The objective is to assess the current state of the industry in order to identify factors required to develop the industrial capabilities within the region to support an ITS industry. Recommendations to further the development of the intelligent transportation systems industry in Atlantic Canada include:

- Federal and Provincial governments taking the lead public sector role in supporting Atlantic Canada ITS efforts.

- Establish an association similar to ITS Canada to interface between government and the ITS technology industry.

- Increased ITS awareness with the view of developing comprehensive deployment on a region-wide scale.

- Establish a forum for Atlantic Canada firms to showcase their expertise and gain insight on end-user requirements and solutions.

- Develop a test-bed in a specific area of ITS to develop expertise of Atlantic Canadian firms.

- Develop an ITS centre in Atlantic Canada to foster sharing and dissemination of information through cooperative research and development with firms, institutes and government.

Many of these recommendations are being acted upon and carried forward through the course of the ITS strategic planning exercise.

Report on Advancing Economic Cooperation in Atlantic Canada[15]

The purpose of this report was to survey industry and identify barriers to trade that restrict the movement of goods, services or persons within the region. The provinces were looking for feedback on the success of initiatives undertaken to date, which have proved successful for industry.

In a survey question respondents were asked to assess the importance of cooperation among provincial governments in improving the economic climate. Positive comments were received on the former Atlantic Provinces Telecommunication Council. The Atlantic Provinces Telecommunication Council along with government was instrumental in encouraging joint ventures among firms to develop the telecommunications industry within the Atlantic Provinces. This example may advance the roadmap for developing the ITS industry within the Atlantic Provinces.

Transport Canada – Deployment and Integration Plan (http://www.its-sti.gc.ca/en/its_deployment.htm**)**

The Government of Canada's Intelligent Transportation Systems (ITS) Plan sets out the federal government's strategy for stimulating the development and deployment of these systems across urban and rural Canada. The goals are to maximize the use and efficiency of existing infrastructure and meet future mobility needs more responsibly. The ITS Plan provides leadership and support to advance the application and compatibility of ITS technologies to make Canada's multimodal ground transportation system safe, integrated, efficient and sustainable. The Atlantic Provinces Strategic Planning Study and the St. John's Metrobus GPS project are part of this program. The ITS Plan outlines five pillars of activity:

1. Partnerships for knowledge – the essential building block;

2. Developing Canada's ITS architecture – a solid foundation;

3. A multimodal ITS research and development plan – fostering innovation;

4. Deployment and integration of ITS across Canada – moving forward;

5. Strengthening Canada's ITS industry – global leadership.

6.3.3 WORLD PROJECTIONS

The following is a small sample of market projects for the ITS industry from several resources. These projections reflect expectations of accelerated growth in spending as governments turn to ITS to help address transportation issues relating to safety, efficiency, and the environment.

- The following ITS market projections were described in the "ITS National Investment and Market Analysis"[16].

  - Over the next 20 years, the market for ITS products and services is expected to grow and cumulate to approximately $420 billion for the period, with the majority spent in developed markets (i.e. United States, Europe and the Pacific Rim).

  - Public infrastructure-driven markets in U.S. metropolitan areas are projected to exceed $80 billion cumulative over the next twenty years.

  - Private markets, including those for consumer and commercial driven ITS products and services, are estimated to exceed $340 billion cumulated over the next twenty years.

- The total U.S. consumer ITS market is expected to reach $27 billion (USD) by the year 2010[17].

- The total U.S. public led ITS market is expected to reach $35 billion (USD) and the total U.S. private sector ITS Market is expected to reach $318 billion (USD) by the year 2010[18].

- Technology market areas which are forecast to progress the most quickly are[19]:

  - Commercial vehicle operations in North America;

  - Advanced Traffic Management Services (ATMS) applications combined with Advanced Traveller Information Services (ATIS) in Japan;

  - ATMS applications oriented to traffic signal system adaptive control and coordination in Europe; and

  - Electronic toll collection.

The following are results from an Internet scan on world projects for the ITS industry.

- Transport Canada (http://www.its-sti.gc.ca/en/its_what_is_its.htm):

  - The annual world market for ITS is estimated to be $25 billion by 2001 and $90 billion by 2011.

  - The projected Canadian share of the global market is estimated at $1.2 billion by 2001 and $4.7 billion by 2011.

- A new analysis from Frost & Sullivan (http://transportation.frost.com/) states that the European market for intelligent transportation systems (ITS) comprising electronic toll collection systems (ETC), ATMS, and traffic information services (TIS) generated revenues of just under 1 billion Euros in 1997. Frost & Sullivan expects the market to more than double to 2.15 billion Euros by 2006.

- A recent U.S. Congress conference report earmarked $120 million (USD) for year 2002 ITS projects. Each state must match the Federal funding for their projects. The majority of the

money is designated to specific states for statewide use, without describing specific projects. However, Vermont has allocated $1.5 million (USD) of its total $2.25 million (USD) in Federal funds for rural ITS projects.

6.3.4 ITS Funding Sources

Exhibit 6.5 presents potential sources of ITS project funding. While there are some funding programs specifically targeted to ITS, many funding opportunities arise from programs where ITS can provide an enabling or supporting role. Examples include programs directed at infrastructure development, environmental sustainability and industrial development.

Exhibit 6.5 – Potential Sources for ITS Project Funding

Organization/Fund	Description
Transport Canada	
Strategic Highways Infrastructure Program (SHIP) (http://www.tc.gc.ca/SHIP/menu.htm)	• In Budget 2000 the federal government announced that up to $600 million would be spent from 2002 to 2006 on highway construction and national system integration initiatives.
ITS Deployment and Integration Plan **(**http://www.its-sti.gc.ca/en/its_deployment.htm**)**	• Program funds (through SHIP) cost-shared ITS initiatives as part of the ITS Plan for Canada (Deployment and integration of ITS across Canada).
Moving On Sustainable Transportation (MOST) Program (http://www.tc.gc.ca/EnvAffairs/MOST/)	The MOST Program will provide funding to help support projects that will: • provide Canadians with practical information and tools to better understand sustainable transportation issues; • encourage the creation of innovative ways to promote sustainable transportation; • achieve quantifiable environmental and sustainable-development benefits.
Urban Transportation Showcase Program (http://www.tc.gc.ca/programs/environment/urbantransportation/)	Transport Canada will work in partnership with provinces and municipalities, to establish a number of transportation "showcases" in selected cities, for demonstrating and evaluating a range of urban transportation strategies within a broad planning framework.

Organization/Fund	Description
Freight Efficiency and Technology Initiative (http://www.tc.gc.ca/programs/environment/freighttransportation/menu.htm)	The five-year initiative is designed to reduce the growth of greenhouse gas (GHG) emissions from the freight transportation. It consists of the following three components: • demonstrating and encouraging the uptake of innovative technologies and efficient best practices within the freight transportation sector through the Freight Sustainability Demonstration Program; • soliciting the freight transportation industry's participation in emissions reduction initiatives through voluntary performance agreements; and • increasing fuel efficiency and environmental training and awareness amongst freight operators and shippers.
Climate Change (http://www.tc.gc.ca/programs/environment/climatechange/menu.htm)	Transport Canada will continue to work with other federal departments, provincial transport departments, municipal governments and the broader transportation community to seek partnerships, and implement measures to reduce GHG emissions.
Ministry of Finance	
CCRA Refundable Tax Credits	The Canada Customs and Revenue Agency offers small and medium sized Canadian controlled businesses a refundable tax credit.
Canada Infrastructure Program	
Physical Infrastructure Program (http://www.tbs-sct.gc.ca/ino-bni/Main/main_e.asp)	In partnership with provincial, territorial and local governments, First Nations and the private sector, Infrastructure Canada will help to renew and build infrastructure in rural and urban municipalities across Canada.
Strategic Infrastructure Program	Strategic investments are applied to key areas such as: • water & waste water • roads & transit • recreational areas & tourism • information technology
Industry Canada	
Lean Logistics Technology Roadmap (http://www.infochain.org/roadmap/LRTM_en.html)	Through the Technology Roadmap process, companies in the logistics sector can lever their resources and work with academia and governments to look into the future, in order to try to determine both where their specific market is going and the critical technologies that will be required. The development of the Logistics Technology Roadmap (LTRM) is overseen by a Steering Committee comprising of various working groups tasked with examining different areas of importance in the logistics sector. Industry Canada is providing resources to facilitate the development of the LTRM.

Organization/Fund	Description
Environment Canada	
Green Fund Climate Change Action Fund (CCAF) (http://www.climatechange.gc.ca/english/actions/action_fund/index.shtml)	The Climate Change Action Fund (CCAF) was established in 1998 by the federal government to help Canada meet its commitments under the Kyoto Protocol to reduce greenhouse gas emissions. Operation of the CCAF is based on a number of principles: • building where possible on existing initiatives and mechanisms; • leveraging and cost-sharing with the provinces and the private sector; • concrete milestones and demonstrable results; and • a transparent process that engages all relevant federal departments and agencies and external stakeholders.
National Research Council	
Industrial Research Assistance Program (IRAP) (http://www.nrc.ca/irap/home.html)	IRAP's mandate is to stimulate wealth-creation for Canada through technological innovation. Our mission is to stimulate innovation in Canadian small and medium-sized enterprises (SMEs).
Transportation Association of Canada (TAC)	
(http://tac-atc.ca/)	TAC is a non-profit association of transportation stakeholders in government, private industry, and educational institutions. It is a neutral forum for gathering or exchanging ideas, information and knowledge in support of technical guidelines and best practices. In the past TAC has funded ITS projects that have Canada-wide installation potential (e.g. ARWIS).
Atlantic Canada Opportunities Agency (ACOA)	
Atlantic Innovation Fund (AIF) (http://www.acoa.ca/e/financial/aif/index.shtml)	The Atlantic Innovation Fund (AIF) finances research and development and related initiatives in the areas of natural and applied sciences, and social sciences and humanities linked explicitly to the development of technology-based products, processes or services or their commercialization. The AIF strives to strengthen the region's system of innovation.
Business Development Program (BDP) (http://www.acoa.ca/e/financial/business.shtml)	This ACOA program is designed to help small and medium sized enterprises from most business sectors to modernize their business. The program offers access to capital in the form of interest-free, unsecured, repayable contributions. Non-profit organizations providing support to the business community may also qualify. Eligible activities include business studies, capital investment, training, marketing, quality assurance, and not-for-profit activities that support business in the region.
Provincial Governments	
New Brunswick Innovation Fund	The soon to be created New Brunswick Innovation Fund will receive an initial endowment of $20 million from the province for new research and development and innovation investment for New Brunswick. Details to be unveiled in the upcoming months.
Provincial Tax Credit Programs	The provincial governments offer tax credits for research and development firms within each province.

Organization/Fund	Description
U.S. Department of Transportation Federal Highway Administration	
TEA-21 – Coordinated Border Infrastructure Program (http://www.fhwa.dot.gov/tea21/)	TEA-21 authorizes the Federal surface transportation programs for highways, highway safety, and transit for the 6-year period 1998-2003. $140 million (USD) has been earmarked for the 2003 Coordinated Border Infrastructure Program. A focus of this program is on international coordination of planning, programming and border operation with Canada and Mexico relating to expediting cross border vehicle and cargo movements.
PRECARN	
IRIS (http://www.precarn.ca/IRIS/IRISLOI/)	The Institute for Robotics and Intelligent Systems (IRIS) is one of the Networks of Centres of Excellence (http://www.nce.gc.ca/) and has been in existence since 1990. IRIS is currently preparing its final application for NCE funding to take it to March 31st, 2005.
T-GAP (http://www.precarn.ca/iris/t-gap_(new).cfm)	The IRIS Research Management Committee has allocated funds—referred to as the Technology-Gap Assistance Program (T-GAP)—to advance technologies that show commercial promise. The T-GAP Program is intended to support six-month projects with funding in the range of $40,000 to $60,000 per project.
Regional Alliance Program (http://www.precarn.ca/PRECARNResearchProgram/alliance.cfm)	Precarn's Alliance Program is aimed to foster the development of intelligent systems technologies in small and medium sized companies across Canada. Under the Alliance Program, Precarn will partner with a regional organization to help fund R&D projects. The Alliance Program is an important means of extending Precarn's reach into all regions of Canada.

6.3.5 SUMMARY

World projections for the ITS market are promising, but vary widely. Transport Canada estimates the annual world market for ITS to be $90 billion by 2011, and the Canadian share of this global market at $4.7 billion.

Atlantic Canada consists of small population centres that are geographically dispersed. Most of the Atlantic Provinces would be classified as rural, with pockets of urban areas. Atlantic Canada has several modes of transportation access to the rest of Canada and the U.S.

In the User Services Plan developed under the Strategic Plan, sixteen user services were identified as having a higher priority within the Atlantic Region. These user services map well to the seven rural ITS development tracks developed by the FHWA, which is not surprising given the characteristics of the region. The exception is the user services identified focusing on toll and commercial vehicle operations.

The Atlantic Provinces ITS initiatives and experience to date cut across several ITS user services, but tend to focus on rural applications and commercial vehicle operations. This work supports the sixteen user services identified in the Strategic Plan. A statement from the Council of Atlantic Premiers further reinforces the importance of commercial vehicle operations in the region.

A scan of Atlantic Canada firms working in the "intelligent systems" industry identified 20 firms that could potentially compete in the ITS market. These firms, primarily involved in related areas of information technology, could shift their business activity to include transportation applications, and transfer their knowledge and experience to develop and provide ITS solutions. While these lateral transfers are theoretically possible, the barriers can be significant. These opportunities to access the ITS market will be explored in greater detail under the subsequent sections.

Post secondary training in the ITS field (or a closely related field) is offered at the University of New Brunswick, New Brunswick Community College, Dalhousie University, Memorial University and the University of Prince Edward Island. The development of ITS curriculum at these institutions, as part of a national effort, would provide the necessary human resources to industry. Given the level of research and development expenditure that occurs through the universities and the national laboratories in the United States, there is benefit in linking centres into networks for collaboration and information sharing.

Past studies and initiatives undertaken to develop the industrial and academic capabilities to support an ITS industry were undertaken, most notably, by Transport Canada. These projects typically involved partnerships with other levels of government, as well as the private sector. Ongoing Transport Canada initiatives pave the way for potential funding sources for ITS projects within the region (i.e. ITS Deployment and Integration Plan, Urban Transportation Showcase Program).

To date, previous studies have evaluated the ITS industry in the Atlantic Provinces and in some cases have made recommendations to promote ITS. However, the studies have not provided a specific strategic approach to increase ITS deployment in the Atlantic Provinces. The intent of this Atlantic Provinces Regional ITS Strategic Planning Study is to develop the appropriate initiatives as part of a coordinated plan.

6.4 ITS CAPABILITIES INVENTORY

This section presents an inventory of the capabilities of businesses and academic institutions in the Atlantic Provinces with respect to the development, implementation, and export of Intelligent Transportation Systems (ITS) and related technology. The inventory represents a profile of the existing ITS industrial and research/academic presence in the region, with an indication of potential latent capabilities drawn from related industries. This information serves as input to the subsequent effort in case study analysis and showcasing regional ITS capabilities.

The objectives underlying the generation of this inventory include the following:

- To promote an understanding of the capabilities of regional businesses currently or potentially involved in ITS, both individually and as a group.

- To facilitate potential roles for resident businesses in the implementation of ITS within the Atlantic Region.

- To provide a guide to capabilities that will allow businesses to identify candidates for strategic alliances and other working relationships to assist them in achieving their corporate goals.

- To assist in identifying economic development opportunities with respect to the export of regional expertise and technology to growing national and international ITS markets.

6.4.1 What Businesses and Organizations are Included in This Inventory?

To be individually profiled in the inventory, the ITS Atlantic Roundtable agreed to include businesses that adhere to the following criteria:

- The products and/or services provided relate to the following groups of enabling technologies which represent core inputs to the development and implementation of ITS initiatives:
  - sensing, monitoring, surveillance, and data-logging systems, both on-board and infrastructure-based;
  - position determination, navigation, and routing technologies;
  - transportation control systems, including control hardware (signs, signals, etc.) and software (algorithms, intelligent software agents, etc.);
  - user interfaces for drivers, travellers, and transportation system operators;
  - electronic payment technologies related to transportation;
  - information communication, management, and analysis related to the above technology groups or to transportation in general; and,
  - consulting services, including the planning, evaluation, integration, and design of intelligent systems, as well as of transportation systems in a more general sense.

Many of these businesses also had communications and information technology components. It was not considered necessary that the business be involved directly in ITS at the present time; capabilities potentially transferable to ITS were also recognized. It is important to note that many of the technologies and capabilities required to implement those intelligent transportation systems now in existence around the world were adapted from other areas such as defence and aerospace. Other criteria include:

- The business is based in Atlantic Canada. This excluded a number of significant companies, such as AMEC and MacDonald Detweiler, who have branch offices in Atlantic Canada but are headquartered elsewhere, unless they are deemed to be significant contributors to ITS and economic development in the region.
- The business is export-oriented, focussed on accessing the North American and/or international markets.

Businesses not profiled individually but dealt with in more general terms in later sections of the report include communication system developers and service providers, companies dealing more generally with information technology, companies dealing principally with courseware and training, and companies primarily involved in sales, installation, and maintenance activities. Out of a group of companies

specializing in geomatics*, only a few were profiled, those having known experience with transportation-related applications. Academic institutions, technology associations, and public sector entities are also dealt with from a more general perspective.

It is acknowledged that this inventory is probably not exhaustive. Businesses are starting up, changing, or ceasing operations on an ongoing basis. However, it is believed to be quite comprehensive and illustrative of the range of capabilities resident in Atlantic Canada at the present time.

6.4.2 How the Capabilities Inventory was Created

An initial list of candidate businesses was generated from information provided by previous ITS inventory efforts, the study Roundtable, business associations, and information technology associations. This list was augmented through a review of Industry Canada's Strategis database of Canadian company capabilities and through the capabilities inventory recently developed for the defence and aerospace sectors in New Brunswick. A number of additional candidates were identified throughout the process during the course of discussions with the Steering Committee, ITS Working Group, and business representatives.

For each company, a sense of the business products and services was obtained through examination of the company profiles in the Strategis database and perusal of the individual business' websites. Each of the companies identified as a possible candidate was sent an e-mail outlining the purpose of the inventory and the information being sought as input to the profiles, and providing background information on ITS and the range of enabling technologies involved. It was intended that this information would assist individual businesses in assessing how their products or services might be relevant. Telephone contact was made with an appropriate representative of each candidate business. During the course of the discussion, the relevance of the company's goods and services to ITS was assessed and the information required for the profile was compiled. The majority of the interactions with the companies occurred in early 2002.

The company's affiliation with technology 'clusters' or industry associations and the nature and extent of their working relationships with other companies was also explored during the discussion. However, this information was not judged to be sufficiently complete in many cases or was of a proprietary nature and as such is discussed in general terms in the following sections rather than being included in the individual profiles.

6.4.3 An Assessment of ITS Capabilities in Atlantic Canada

6.4.3.1 Overview of the Profiled Companies

Exhibit 6.6 describes the types of services currently provided by the companies profiled in this inventory. For each firm, the primary office presence within the region is indicated; many firms have other office presence throughout the region.

Appendix L outlines the ITS capabilities of the profiled companies in the context of major categories of enabling technologies. The individual profiles are contained in Appendix M.

* Geomatics encompasses the science, technology and management of geographically referenced information, including its acquisition, storage, analysis, processing, display and dissemination.

Information available in the profiles includes:

- Contact information;
- The company's presence in Atlantic Canada and its principal business activities or roles;
- The products and services of the business that are directly related to or that are potentially adaptable to ITS; and
- The geographic distribution of the company's existing market.

There may be other companies with enabling technologies such as touch-screen kiosk applications which may be relevant within the ITS arena. It is important that this study effort provide the products to raise awareness and interest in ITS opportunities, and insight into the potential courses of action to access the market. Note that the list of companies is not necessarily exhaustive, and is not intended to exclude any firms.

Exhibit 6.6 – Summary of Current Products and Services of Profiled ITS-Capable Companies

Company	Principal Location	Description of Products/Services
Accesstec Inc.	NB	Integrated wireless parking information/enforcement systems.
ADI Group	NB	Transportation planning and engineering consulting services.
Advatek Systems Inc.	NB	RFID system for monitoring and tracking, weighing systems.
ALT Group Inc	NB	Wireless commercial vehicle fuel tax reporting system.
AMIRIX Systems Inc.	NS	Asset tracking system, custom embedded hardware and related software.
AnyWare Group Inc.	NB	Transponder/smart card-based billing system.
Approach Navigation Systems Inc.	NB	RWIS, aviation weather and navigation.
Atlantic Data Group	NS	Intelligent video surveillance systems.
Baseline Business Geographics Inc.	PE	GIS-based RF network planning, transportation routing/scheduling.
Beltek Systems Design Inc.	NB	Commercial vehicle route accounting, safety compliance monitoring.
Canpolar East Inc.	NF	Sensors including automobile occupant and crash sensors.
CARIS	NB	GIS/GPS-based tracking and routing systems.
C-CORE	NF	Remote sensing/surveillance systems.
Centre for Education & Research in Safety	NB	Programs to improve the safety behaviour of motorists, cyclists and pedestrians.
Compusult Limited	NF	Asset tracking systems.
Consolidated Technologies Ltd.	NF	Custom embedded data interfaces.
Delphi Systems	NS	ITS consulting (planning, evaluation, training).
DPL Group	NB	Asset tracking, remote data monitoring systems.
Engineering Technologies Canada Ltd.	PE	Intelligent sensors, custom microelectronics, consulting on user interfaces.
Enseignes Imperial Signs	NB	Electronic signs, message centres.
GeoNet Technologies Inc.	PE	GIS-based routing, 911-related civic addressing, off-line highway information.
Geoplan Consultants Inc.	NB	GIS-based 911-related civic addressing.
International Communications and Navigation Ltd.	NF	Marine navigation, security, surveillance, and tracking systems.
Intrignia Solutions Inc.	NF	Intelligent and automated mining and marine systems.
Jack McGraw Consulting Inc.	NS	Development and operation of radio services
J.J. Mackay Canada Limited	NS	Intelligent parking meters, enforcement, audit, smart-card capable

Company	Principal Location	Description of Products/Services
Kinek Ltd.	NB	Commercial delivery management and optimization.
Measurand Inc.	NB	Shape sensor alternative to accelerometers.
PEI Innovations Inc.	PE	Product handling/damage sensors and data-logging.
Pintér Consulting	NS	Modelling and optimization tools.
Satlantic Inc.	NS	Remote sensing/surveillance, data fusion and transmission, power management.
Seimac Limited	NS	Asset tracking, weather forecasting, telemetry, satcomm transmitters
SGE Group Inc.	NF	Advanced transportation management and information systems.
Spatial Decision Support Systems	PE	Bus routing and optimization.
SVG Consulting Inc.	NB	ITS consulting – policy, planning, evaluation, training.
Trip Data & Safety Management Inc.	NB	Commercial driver safety and vehicle status logging
Jacques Whitford Environment	NS	Infrastructure condition evaluation and management.
xwave	NS	Police mobile data support, emergency services dispatching, asset tracking, parking enforcement management, data fusion

The majority of companies contacted did not have direct experience with obvious ITS applications. This is not surprising since ITS implementation is in a state of relative infancy in Atlantic Canada. However, the range of capabilities with respect to technologies applicable or adaptable to ITS suggests a potential for greater involvement contingent upon suitable market opportunities, both domestic and international. Most of the firms contacted expressed a cautious interest in adapting their technology to ITS. No specific barriers to such technology transfers were noted, however, diversification of this nature, beyond existing core business activities, would invariably be contingent upon a sufficiently large market to make it financially and practically worthwhile. The availability of any necessary working relationships with complementary companies or organizations would be critical.

The companies profiled ranged from those specialized in a particular niche, such as specific types of sensors or specific software applications, to those who acted as systems integrators, assembling packages of hardware and software components into turnkey systems.

The following sections cover more specific aspects of the companies profiled, as well as documenting companies and organizations which, although not profiled, provide goods and services which would be supportive of ITS development and implementation in Atlantic Canada.

6.4.4 Core ITS Capability 'Clusters'

A review of the profiled companies indicates that most of them can be grouped into several functional clusters analogous to the categories of enabling technologies reflected in Appendix N. It is apparent that certain clusters directly relevant to ITS have a well-developed presence in Atlantic Canada, namely information technology, sensors and surveillance, and geomatics (including location determination and tracking). It is beyond the scope of this study to examine the reasons for the dominance of these particular clusters in the Atlantic Region, but the reasons likely include the following:

- Characteristics of local market location: for example, the sensor/surveillance cluster is oriented to the marine environment, likely in response to offshore oil, fishing, and shipping activities and requirements;

- The ability to operate at a distance from the broader market combined with quality of life considerations: for example, the information technology cluster including distance learning and training;

- Promotion and support from the provincial governments: for example, the information technology cluster;

- The availability of supporting functions such as centres of excellence, incubators/accelerators, and industry associations: again, for example, the information technology cluster;

- Working relationships with key academic institutions such as the University of New Brunswick which maintains targeted technology programs. The integrated research of the computer science and survey engineering faculties has led to the emergence of New Brunswick's excellence in geomatics.

The following discussion applies primarily to technology developed and, in some cases, produced by the companies under consideration. There is a broader base of ITS-applicable experience related to technology that is out-sourced with respect to manufacturing but integrated into turnkey systems by companies in Atlantic Canada.

Information Technology

The information technology clusters are formally represented through the IT associations in each province. Appendix N provides company listings for each provincial association. Through these formal associations, and the Information Technology Association of Canada (ITAC), the industry can represent itself to industry and government to achieve a number of objectives including promoting the profile and capabilities of the industry, and promoting information sharing and networking among members and potential customers. The IT sector has grown to be very broad, encompassing a range of applications. Within the sector, any given subset of organizations specializing in a particular area, such as asset management or supply chain management, may form ad hoc partnerships on a project-by-project basis in order to provide the complete software and hardware to deliver an application.

Many of the firms profiled develop their own software. In some cases this is marketed as a stand-alone product; in others it is integrated with hardware components (often out-sourced) to create turnkey systems. A wide range of information systems is represented among the products and services of the profiled companies. These include systems with potential ITS applicability related to asset tracking, fleet management and administration, parking management and enforcement, police support, weather forecasting, infrastructure condition monitoring and management, and data fusion. In addition to the companies actually profiled with software that is most closely related to ITS, there is a significant number of more generic software companies that could potentially offer software development support.

The IT cluster is very important when considering the development of the ITS industry within the region. Often the development of new software applications is the most readily accessible means for a new entrant to the ITS market. The typical model will involve a small start-up enterprise, often working in conjunction with an academic institution such as UNB, delivering a given project application which can subsequently be marketed elsewhere.

Sensors and Surveillance Systems

ITS applications are typically sensory intensive. In many cases, infrastructure based sensors and vehicle on-board sensors draw upon technologies developed from other industries. For example, optical character recognition technology used for automated license plate reading and toll road enforcement applications is drawn from the manufacturing process control industry.

A significant number of the profiled companies produce sensors and surveillance systems. One significant 'sub-cluster' involves oceanographic sensors, some of which have potential ITS applicability, particularly in the area of road weather information systems (RWIS). Other sensors range from those related to product handling, with potential applicability to cargo status monitoring, to those designed for occupant detection and safety systems activation in automobiles. Also represented are video-based surveillance systems which are potentially applicable to traffic surveillance and traveller security systems, and custom sensor micro-electronics. The related experience that many of these firms have accumulated with respect to telemetry, data fusion, data analysis, and power management is readily transferable to ITS.

Geomatics

The geomatics cluster is an area of strength for Atlantic industry and academia, well recognized beyond the borders of the region. The cluster incorporates a broad cross section of local start-up enterprises, presence of multi-national corporations, and linkages to targeted programs at academic institutions such as UNB and Memorial University Newfoundland (MUN). Much of the industrial focus is on marine applications for the resource industry, search and rescue, defence, etc.

This cluster includes companies that utilize geographic information systems (GIS) and global positioning systems (GPS) to provide positioning, tracking, routing, mapping, and other analytical services. There is a formal geomatics cluster, represented by the Champlain Institute, which includes nine geomatics companies located in New Brunswick, Nova Scotia, and Prince Edward Island. A few of these were profiled based on their previous experience with transportation-related applications. The MacDonnell Group, based in Halifax, also represents companies that provide services in the field of geomatics. Appendix O identifies the companies with these organizations.

There are also several companies, outside these more formal arrangements, that provide geomatics-related systems, primarily in the area of commercial fleet management and asset tracking. The experience represented by the companies in this cluster is potentially transferable to commercial vehicle and public transit fleet management, intermodal terminal operations, on-board navigation systems, emergency vehicle dispatching and routing, communications network planning, and rural mayday systems, to name a few.

6.4.4.1 Other ITS Capabilities

Outside of the obvious clusters described above, there are other areas of potential applicability to ITS represented by one or a few firms in each case.

General Transportation-Related Consulting Services

There are several firms in Atlantic Canada that provide transportation consulting services both related to ITS and of a more general nature related to policy, planning, evaluation, and operations. The experience of these companies would be valuable in conjunction with information technology or other companies

who may not have experience with respect to ITS and, more generally, transportation and transportation issues. These companies tend to serve a market more focused on the Atlantic Region, rather than international markets.

Electronic Payment Systems and Devices

Electronic payment systems developed by the profiled companies include smart-card or internet-based billing engines applicable to a variety of ITS applications including traveller reservations and payment for accommodations, events, ferry services and tolled roads and bridges. Also represented are 'intelligent' parking meters and pay-and-display systems that accept smart cards, can be programmed to implement different parking pricing strategies and in some cases offer wireless transmittal of payment and usage information. There are a number of possible enhancements to these systems that would increase their value from an ITS perspective but actual development and implementation would be dependent upon market opportunities.

Control Systems

Several companies have experience with control algorithms and one firm in particular produces variable message signs applicable to ITS. There have been successful examples in the region of the transfer of automated command and control technology from the marine environment to other applications, namely mining automation and process control.

User Interfaces

Only a limited selection of user interface technologies have been developed and are being produced in Atlantic Canada. Selected firms have experience in kiosks and touch screen displays for applications such as parking payment.

Multi-disciplinary Networks

In addition to the Champlain Institute and the MacDonnell Group, which are examples of "niche" clusters, the Northstar Network is an example of a formal, private-sector, multi-disciplinary cluster that facilitates access to its members and leverages their promotion initiatives. Companies belonging to this cluster represent a range of defence, aerospace, and marine capabilities potentially applicable to ITS. Appendix O identifies companies currently belonging to these clusters.

6.4.4.2 Clusters of Supporting Technologies and Services

Although companies and organizations in this category were not profiled individually, it is worthwhile noting the presence of a variety of core capabilities in the Atlantic Region that would be supportive of ITS implementation. Some of these can be considered as clusters as follows:

Courseware and e-learning

The Atlantic Region is internationally recognized for the development of core competencies in courseware and e-learning applications. These competencies can support a broad range of distance learning services for a range of applications. In New Brunswick alone, the industry has provided on-line training services

for over two million people, representing an investment of over $80 million. The bilingual capabilities of the industry have been a key asset.

Courseware and e-learning industrial strengths can provide a supporting role to the ITS industry. Specific areas of activity include:

- Driving simulators for passenger vehicles or specialty vehicles such as snow ploughs in order to analyze the human factors considerations associated with new technology applications.
- Operator training for various operations centre applications, including traffic management and incident management.
- Emergency services dispatch.
- Commercial fleet management/dispatch.
- Toll collection and revenue management.

Customer Contact Centres

There is a significant presence of customer contact centres in Atlantic Canada, providing voice and web based support services for many large multi-national corporations and public sector entities. New Brunswick and Nova Scotia have a particularly strong presence in this industry. Once again, the bilingual capability is seen as an asset for the industry. The supporting services, products and applications associated with this industry are a relevant supporting service for the ITS industry. With the ever increasing level of deployment particularly in the U.S. market, the focus of ITS applications is increasingly the management of real-time information. Examples include:

- Incident reporting/management;
- Regional traffic control;
- Advanced traveller information systems;
- Emergency services management;
- Fleet management.

Translation

A significant translation service industry cluster has emerged in New Brunswick. The industry extends beyond Canada's two official languages. This cluster is relevant to the ITS industry in order to support engineering services documentation, manuals, training documentation, and system user interfaces as North America's ITS industry expands into emerging markets, particularly Latin America.

Information Technology

As mentioned previously, there is a large number of information technology companies in Atlantic Canada that are not currently oriented to ITS-type applications. However, with the right working relationships, there is no reason why these more generic firms cannot play a role in ITS development.

Telecommunications

Some of the companies profiled include a communications component in their offerings, often through a working relationship with a communications service provider. There are a number of businesses dealing strictly with communications services and equipment that could contribute that component to a consortium assembling an ITS initiative.

6.4.4.3 Research/Academic Capabilities

Several of the profiled companies mentioned collaboration with Atlantic Region universities and colleges. There are a variety of technology-oriented programs at Atlantic Canada universities and colleges, with programs/activities which are either directly related to ITS, or incorporate technologies and applications transferable to the ITS industry.

University of New Brunswick

The University of New Brunswick (UNB) Department of Civil Engineering includes a transportation group established in 1967. The group presently incorporates a graduate studies research unit with a Masters and PhD program involving the participation of seven faculty members. There are typically up to ten full time and many part-time, graduate students. In addition, transportation undergrad courses are offered as part of the standard civil engineering program. Specific ITS elements within the curriculum include:

- Graduate Levels – Explicit course on ITS, and ITS components within the road safety engineering course.

- Undergrad Level – ITS components in the core introduction to transportation engineering, and within the final year elective on traffic engineering.

Other programs at UNB relevant to ITS include the Department of Geodessey and Geomatics, the Department of Computer Science, and the Department of Electrical and Computer Engineering.

The transportation group undertakes various ITS related research activities. The collision research team has worked for over twenty years with seven other universities across Canada and the Road Safety Directorate at Transport Canada in undertaking directed studies for specific types of collisions. The team is currently analyzing the impact of advanced safety technologies including side airbags, side curtains, and seat belt pre-tensioners. ITS related graduate student research projects have included:

- work zone speed control;

- heavy truck stability;

- micro simulation to optimize urban traffic control.

The transportation group has participated in a number of partnerships and networks including:

- Undergrad research projects funded by 3M Canada.
- The Economic Industrial Benefits Program with Maritime Road Development Corporation (MRDC).

New Brunswick Community College, Dieppe Campus

New Brunswick Community College (NBCC) offers a course in logistics and transportation management techniques. This is a three year program encompassing roughly forty students with a successful record of 100% placement in the freight and manufacturing industries. NBCC actively markets the program in order to recruit candidates to meet demand in the workplace. The program has a significant technology focus reflecting the impact of information technology on supply chain management and goods movement operations.

NBCC is currently seeking partners for a proposed program, the Transportation and Logistics Institute for the Atlantic Region. This program is envisaged as a separate bilingual entity linked to the college but able to readily work with private sector interests on research and development initiatives.

Memorial University, Newfoundland

The Memorial University, Newfoundland (MUN) Faculty of Engineering and Applied Sciences operates a number of technology oriented programs, focussed on the marine environment. Some of these programs would involve applications and technologies which are transferable to industrial automation and conceivably the ITS industry. Specifically, the Instrumentation Control and Automation Laboratory is involved in autonomous control for aircraft and marine vessels, primarily targeting the resource industry. Applications from this program have been transferred to other environments such as mining automation. The faculty is active in developing mechanisms for liaison with industry and collaborative research programs, such as the Ocean Research Centre.

Mount Saint Vincent University

The Psychology Department at Mount Saint Vincent University in Halifax has been actively involved in human factors applications in transportation. Activities have involved participation in ITS initiatives to facilitate traffic and pedestrian safety, traffic calming, and reduced impaired driving. Specific areas of research and publication have included advancements in pedestrian signal displays and signal phasing.

Dalhousie University

The Civil Engineering Department at Dalhousie University does address ITS in undergraduate transportation courses. A graduate course in ITS is being contemplated, and there has been some post-graduate activity in expert systems for ITS applications. As a member of the Consortium for ITS Training & Education (CITE), the Civil Engineering Department is able to offer some CITE courses to its students.

Recent faculty research has focused in the area of ITS architecture. A Ph.D. thesis in this field titled "Satellitic Automated Highway System: Visual Modelling of the Requirements Using Rational Rose and UML" had two main objectives:

- To provide the Intelligent Transportation System of Canada (ITSC) with a stable and flexible architecture based on object-oriented methodology; and

- To integrate the backup communication concept with the new ITSC architecture, which will enhance reliability and dependability of systems that will be developed based on the architecture.

Faculty in the Department of Electrical Engineering are active researchers in areas of communication – a key component of any ITS system.

Research Centres

There are a number of collaborative research centres in the Atlantic Region that provide research, development, and testing services to assist in the technological innovation process. Examples include the Research and Productivity Council (RPC), Concept + Inc. (Genieo), and the Electronic Commerce Centre (affiliated with the University of New Brunswick), all located in New Brunswick.

The National Research Council (NRC) is currently initiating the Institute for Information Technology (IIT) – Atlantic as part of its national ITT. This will initially involve the following four research facilities intended to support growing, locally-driven information technology clusters in Atlantic Canada:

- an Atlantic "hub" facility in Fredericton, New Brunswick;

- a facility in Moncton, New Brunswick, focusing on e-learning;

- a facility in Saint John, New Brunswick, focusing on customer behaviour in relation to e-business service delivery; and

- a facility in Sydney, Nova Scotia, focusing on wireless networking.

The initiation of these facilities is now underway. Other potential research topics have been and are continuing to be considered, including:

- voice recognition;

- security, trust and privacy related to e-business;

- decision support for e-business;

- multi-agent systems for e-business; and,

- voice interaction portal for mobile internet use.

6.4.4.4 Industry Support Services

The following organizations and institutions could also provide support to ITS implementation or the development of an ITS commercial and industrial base. This support might take the form of collaborative research, start-up support for new companies, or assisting in the formation of strategic alliances and other working relationships.

Incubator/Accelerator Companies

Incubator/accelerator companies, set up to provide business start-up facilities, training, mentoring, and related services, may be found throughout the Atlantic Region. Some also promote technology transfer from higher-level academic institutions.

These include:

- Centre of Excellence in Information Technology (New Brunswick)
- Incutech Brunswick Inc. (New Brunswick)
- Licensing Lab (New Brunswick)
- Miratech Inc. (New Brunswick)
- Crown of the Valley Development Corporation/Venture Centre (Newfoundland and Labrador)
- Excite Corporation/Exploits Centre for Information Technology Excellence (Newfoundland and Labrador)
- Genesis Centre (Memorial University of Newfoundland)
- InNOVAcorp/Technology Innovation Centre (Nova Scotia)
- Technology Enterprise Centre (Nova Scotia)
- TechPEI/Atlantic Technology Centre (Prince Edward Island)

Industry Associations

A number of public and private sector organizations, typically pursuing economic development objectives, facilitate collaboration among their members and promote the identity and interests of the information technology industry, an essential contributor to ITS initiatives.

These include:

- Premier's Roundtable on eNB and Innovation in New Brunswick

- Newfoundland & Labrador Association of Technology Industries (NATI)
- Canadian Centre for Marine Communications (CCMC) in Newfoundland and Labrador
- Information Technology Industry Alliance of Nova Scotia (ITANS)
- NovaKnowledge in Nova Scotia
- Information Technologies Association of Prince Edward Island (ITAP)
- Technology PEI (TechPEI) in Prince Edward Island

Several of these are affiliated with the Information Technology Association of Canada (ITAC). In addition, Business New Brunswick is involved in the formation of a new information technology association to replace a previous association, no longer in existence and has also launched a capabilities inventory for the aerospace and defence industries which may have applicability for ITS. It is worth noting again, in this context, that a significant part of the technology involved in existing ITS applications around the world evolved from defence and aerospace research and development.

Appendix N provides a list of information technology and related companies based on the membership lists for NATI, ITANS, ITAP, and Business New Brunswick and on other inputs received during the course of the study. Limited editing has been undertaken to remove public sector agencies and departments and companies obviously not ITS-related.

6.4.4.5 Company Roles – Niche-Oriented Businesses vs. Integrators

The profiled companies include niche-oriented companies that specialize in one or a small number of related software or hardware products which stand-alone or will be incorporated by other companies in more comprehensive systems. Companies may also assume the role of system integrator, companies that typically package their own software or hardware with additional, out-sourced components and communications services to provide a turnkey system for a given application.

The predominant focus among the profiled companies is on product research and development and system integration. A number of the companies also offer consulting and training support for their products and systems. Although some companies produce the hardware for their products, many systems employ out-sourced hardware components.

6.4.4.6 Alliances and Working Relationships

Very few of the profiled companies indicated that they were completely self-contained and operated independently of other companies or organizations. The vast majority reported that they were involved in one or more alliances or working relationships with other companies and organizations.

Some of the more common forms of working relationships reported included the following:

- 'Integrators' obtaining complementary hardware or software components, or communications or other services, as needed to complete their system, through out-sourcing;

- Companies acting as marketing and sales agents for other companies with complementary products or services. Often done reciprocally, as this increases market reach;
- Companies 'adding value' and 're-selling' other companies products, the added value often being a new or enhanced software-based capability;
- Companies contracting with other companies to obtain specialized services such as geomatics, call-centre, training and courseware, or similar;
- Membership in industry associations to increase visibility;
- Collaboration with academic institutions or centres of excellence, mainly for research purposes.

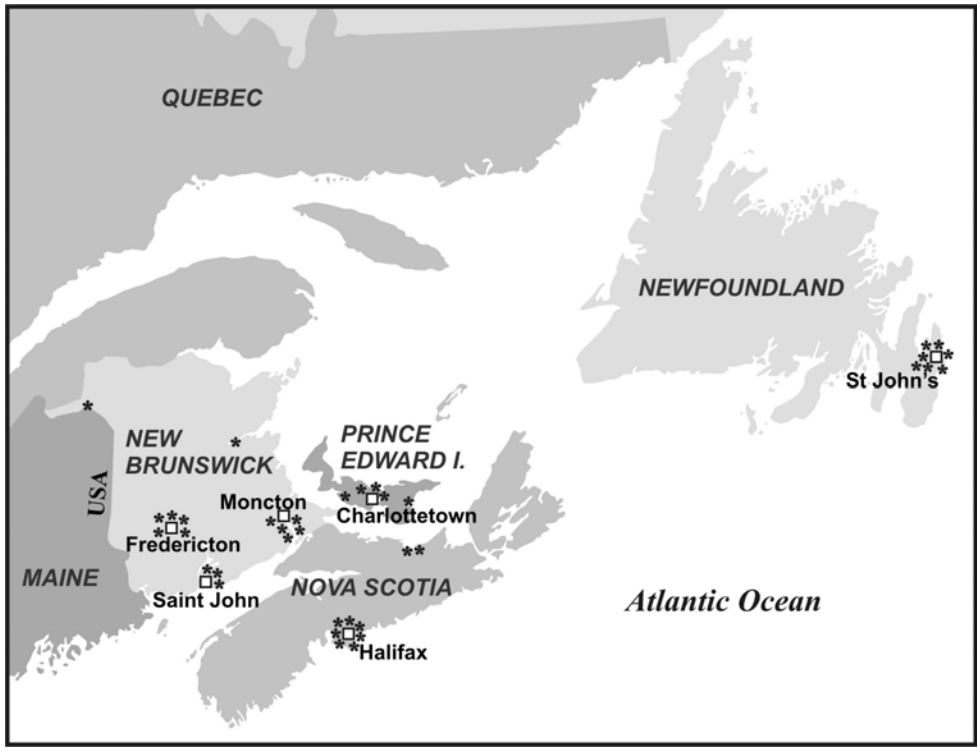
6.4.4.7 Characteristics of the Profiled Companies

Although there do not appear to be any predominant patterns, some commentary on the characteristics of the profiled companies is in order.

Geographic Distribution

Exhibit 6.7 shows the geographic distribution of the principal locations of the profiled companies. All of the Atlantic Provinces are represented in this group. Some firms, for example those involved with oceanographic sensors and other marine systems, are located close to their largest market in Newfoundland. Most are concentrated in and around the principal urban areas of Fredericton, Saint John, and Moncton, New Brunswick; St. John's, Newfoundland and Labrador; Halifax-Dartmouth, Nova Scotia; and Charlottetown, Prince Edward Island. Several of the companies have located in smaller communities, presumably for quality-of-life reasons and low overhead costs.

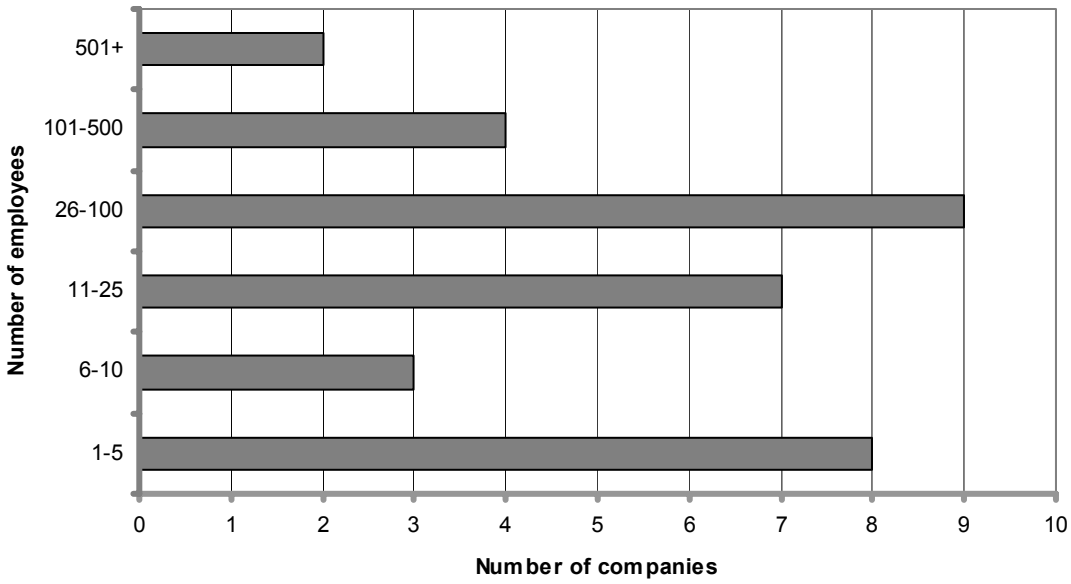
Exhibit 6.7 – Geographic Distribution of Profiled Companies



Company Size

A range of company sizes is represented by the profiled companies as shown in Exhibit 6.8. About one-third of the companies employ fewer than 10 employees and about one-half employ between 11 and 100 employees. The companies profiled employ a total of 4,900 employees, about 66% of which are located in Atlantic Canada. Leaving aside the two largest companies, Jacques Whitford and xwave, the remaining companies employ about 1,400 with 93% of those located in Atlantic Canada.

Exhibit 6.8 – Size Distribution of ITS-capable Companies in Atlantic Canada



Market Geography

There is no consistent pattern in terms of market geography. At one end of the spectrum are firms whose market is virtually all within the Atlantic Region. At the other end are firms that do not have a market in the region but deal mainly with international clients. There are also many companies that fall somewhere in between. Neither was there any pattern in terms of future growth, some indicating they wanted to expand their market share in the Atlantic Region or Canadian markets, others suggesting a focus on penetration or expansion with respect to international markets.

6.4.5 Concluding Observations

This review of the Atlantic Region ITS capabilities yields the following summarized observations:

- A range of capabilities relevant to ITS development and implementation is resident in Atlantic Canada.

- Although only a few companies in Atlantic Canada are currently producing for the ITS market, there are many firms with latent capabilities that could be adapted to ITS. Such transfers will be contingent upon the availability of an adequate market and complementary skills, technologies and resources to access that market. This inventory will be of assistance with regard to the latter.

- The most obvious 'clusters' of ITS-applicable technology lie in the areas of information technology, sensors and surveillance, and geomatics. There are also clusters of supporting activities such as more general information technology, courseware and e-learning, translation and customer contact centres.

- Few companies operate independently. The vast majority rely on one or more strategic alliances or other working relationships with industry and academia. These relationships provide access to complementary expertise and experience, research, hardware and software components, or simply a broader market reach.

- There is a strong network of potential support for the further development of an ITS industry in the form of industry associations (particularly information technology), centres of excellence, high-level academic institutions, and incubators/accelerators.

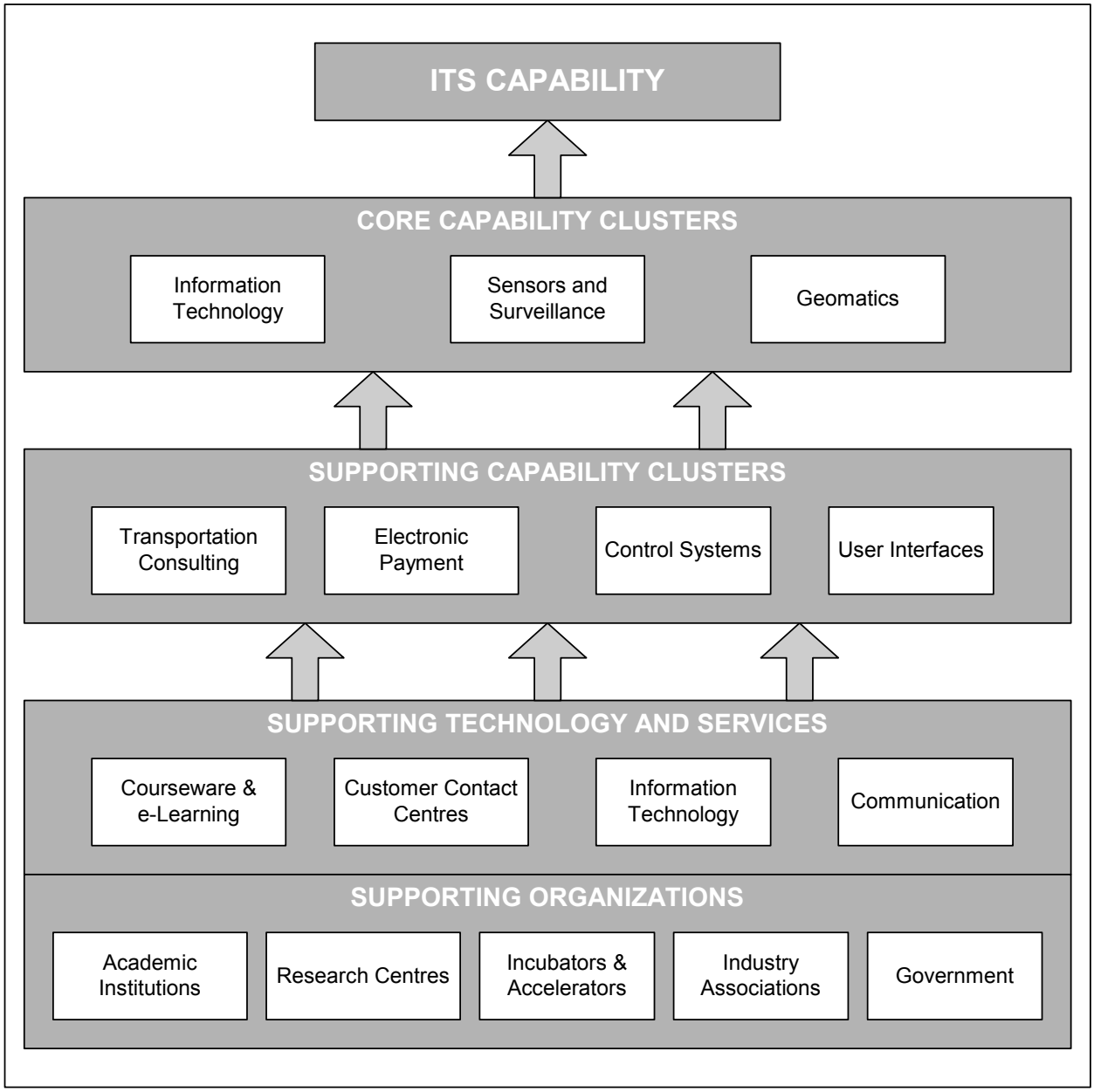
- The roles played by the companies profiled in the Capabilities Inventory range from integrators who package components from other manufacturers, perhaps with internally developed software and interfaces, to create turnkey systems; to niche companies who specialize in one or a small group of closely-related products or services. Seimac Limited and Approach Navigation Systems Inc., both profiled in the previous section, are both integrators and product developers.

- While many of the businesses identified as ITS-capable are actually involved in ITS-analog rather than ITS activities, many of them have indicated a capability to adapt to ITS requirements **provided there is a large enough market.** This would likely necessitate the penetration of larger, international markets.

- Many of the ITS-capable companies profiled serve a predominantly international market, with only a few operating predominantly in the Canadian market and only a very few serving a significant market in Atlantic Canada.

Exhibit 6.9 provides a hierarchical summary of the ITS-capable businesses, organizations, agencies, and institutions present in Atlantic Canada. These represent a range of possible levels of participation in the implementation of the recommended ITS strategy for Atlantic Canada, from core enabling capabilities to supporting services. It may be that many of the enabling technologies and supporting services needed to implement the proposed ITS strategy, with some adaptation and out-sourcing, can be found in Atlantic Canada.

Exhibit 6.9 – Summary of ITS Capabilities Hierarchy in Atlantic Canada



6.5 ITS CASE STUDIES

This section provides a current snapshot of what is happening in the world of Intelligent Transportation Systems in the Atlantic Provinces. It summarizes the current status of real-world ITS activities in the region from two perspectives; ITS projects in place or underway, and companies active in ITS products and services. It presents a capsule summary of the ITS Showcase held in Halifax on April 25, 2002.

6.5.1 Context – Key Considerations in ITS Implementation

ITS in the Atlantic Provinces, as is the case across the rest of Canada, is in a state of relative infancy. It is only in the last decade, with a few exceptions, that ITS has begun to emerge as a mainstream strategy to facilitate the movement of people, goods, services, and information. This is particularly critical to maintain the economic competitiveness of the Atlantic Region. This emergence is a result of several factors, including the recognition that traditional approaches to addressing transportation needs and problems are constrained by limited resources, namely time, money, and space. Also a factor is the availability of advanced 'enabling' technology, often developed to meet defence needs (an example might be Global Positioning Systems), that is adaptable to transportation purposes.

The Atlantic Provinces Regional ITS Strategic Planning Study has illustrated that there are a number of unique considerations related to the role of ITS in the region in the context of the rest of the continent. Specifically, the functional needs within the region focus on the efficient movement of goods, with provision of comprehensive traveller information, and a number of considerations related to rural transportation environments such as incident response and winter maintenance. The application environment is characterized by a relatively low, widely dispersed population base, and extreme climate conditions. These needs and characteristics of the Atlantic Region point to some of the evolving areas of the ITS industry, such as cargo tracking and security, and business models for advanced traveller information. Some of the more developed areas within ITS, such as urban traffic management, are less relevant in the Atlantic context.

Through this study of the Atlantic Region two fundamental principles have emerged which will underlie the implementation of the proposed ITS strategy:

The proponents of most Intelligent Transportation Systems initiatives will have to draw knowledge, technology, products, and services from a pool that will involve multiple, collaborating businesses, organizations, agencies, and academic institutions.

ITS initiatives combine a range of applications that involve enabling technologies from the fields of information technology, communications, instrumentation (sensors), custom electronics, geomatics, control systems, user interfaces, marketing, and training. Two of the key challenges associated with implementing ITS are:

- The integration of the physical systems, including new and legacy systems, and the role of interoperability standards.

- The forging of a common purpose and commitment among the many stakeholders involved in some application environments, such as border crossings.

The ITS projects showcased in this report typically exhibit these characteristics of multi-disciplinary stakeholders working together to apply enabling technologies.

Given the burgeoning nature of ITS, most companies involved in ITS will need to address a market that goes beyond the scope of regional ITS demand, either geographically, or involving non-ITS areas that share similar functional requirements.

In part, this is simply a corollary of the reality that private-sector involvement in ITS often comes about as a by-product of involvement in another area, such as defence, aerospace, marine operations, or communications, that shares analogous problems and solutions. This gives rise to the term "ITS-analog" which will crop up in the text from time to time. For the several companies that are showcased, it is clear that ITS is not their core business. Instead, they may have recognized that the products and services they were applying in another area had potential application to address transportation needs, given a market and appropriate adaptation and packaging.

It is apparent, in reviewing the brief company profiles contained in the ITS Capabilities Inventory that most companies involved in ITS or ITS-analog applications have developed or are seeing the need to develop an international market for their products and services. This is typical of the ITS industry, and is not unique to the ITS industry. As a comment on the industry as a whole, most companies providing products and services are targeting a particular application within the ITS arena. An example would be a Road Weather Information System (RWIS) provider, or a traffic management system software provider. As a result, any given company is active in a very targeted specialized technology area within an industry which is relatively specialized as a whole. Hence, most suppliers to the industry must be active in international markets. There are numerous examples of ITS suppliers in Canada that conduct over 80% of their business in the United States and overseas markets.

6.5.2 ITS in the Atlantic Provinces – A Solid Beginning

Existing ITS projects in Atlantic Canada, as well as the projects proposed in conjunction with the ITS strategy recommended in this study, have emerged from the identification of a need or a problem that was either not amenable to more traditional solutions or was perhaps seen as more effectively addressed using ITS solutions. These projects have arisen from a desire to improve service to customers or the public at large, reduce costs, or address a specific problem, along with recognition of the opportunities that ITS presents to achieve these objectives.

Take for example, the Province of New Brunswick's current WIM (Weigh-In-Motion) initiative. The re-alignment of the highway served by a commercial vehicle weigh-station meant that the highway was no longer visible from the inspection facility, making enforcement difficult. A traditional solution might have been to move the inspection facility, an expensive proposition. However, the Province recognized that the solution to this problem could be combined with reducing delay to commercial vehicles in a key trade corridor, and reducing collision risk at the weigh-station access points by implementing a WIM facility – an ITS solution. Also recognized was an opportunity to evaluate WIM technology for potential application on a more widespread basis.

Another example is the implementation of an adaptive traffic signal control system (SCOOT) in the Regional Municipality of Halifax. Given the mature nature of the central city, it was recognized that traditional approaches, namely increasing physical capacity, were not available to address increasing traffic congestion. Enter SCOOT (Split Cycle Offset Optimization Technique), a means of increasing operational efficiency and squeezing more capacity out of the existing road system. It helped that reducing congestion, relative to previous operations, would reduce delay for the travelling public. A reduced need to manually update signal timing plans, a costly process, was another recognized benefit of this ITS solution.

The examples of WIM and SCOOT are indicative of the region's ability to adopt state-of-the-art ITS solutions. While these technologies were not developed within the region, it is noteworthy that resources within the region have been successfully able to develop and exercise a program related to these technologies, including installation design, procurement, deployment and integration, and ongoing operations and maintenance. This speaks to skill sets and expertise which is evolving within the operating agencies in the region related to ITS applications. Given the continent-wide, and international scope of many suppliers, it is often typical of deployment that products are sourced internationally. In the case of WIM equipment, one of the world's leading suppliers is International Road Dynamics based in Saskatoon, Saskatchewan. The SCOOT system has its foundations from the Transportation Road Research Laboratory in the United Kingdom.

Current ITS initiatives in the Atlantic Provinces, along with those put forward through the ITS strategy proposed in this study, have been backed up by a planning process that recognizes the progression from an assessment of user needs and objectives, through identification of opportunities, to the putting forward of concrete projects. This represents a promising start and a solid foundation to build upon.

6.5.3 The ITS Showcase

The current study included an ITS showcase in Halifax, Nova Scotia on April 25, 2002, attended by approximately 40 people. This event was designed to showcase existing ITS efforts in Atlantic Canada, both from the perspective of the projects that have been undertaken or are underway, and from that of the businesses that are leading the way in the ITS marketplace. More than this, however, the showcase was intended to identify participants in the ITS field and provide fertile ground for the identification of possible collaborations, strategic alliances, and the other working relationships that will be necessary for successful ITS implementation.

The Halifax showcase addressed the penetration of international markets and exposed the participants to several existing ITS initiatives, including the "smart" snowplow, RWIS (Road Weather Information Systems), fleet tracking and management, and geomatics as an ITS enabling technology. The ITS Atlantic Roundtable identified candidate businesses to feature in the showcase. The resulting participants included:

- Seimac Limited (fleet tracking and management, road weather (RWIS)-related meteorological forecasting).
- Approach Navigation Systems Inc. (road weather information systems (RWIS)).
- Geoplan Consultants Inc. (geomatics).
- Future Learning Inc. (courseware and e-learning).
- Pinter Consulting Services (advanced modelling/analysis for operations research).

Seimac, Approach Navigation, and Geoplan represent examples of businesses which are actively marketing ITS systems or enabling technologies. Future Learning and Pinter Consulting represent examples of businesses offering supporting services with applications in ITS. An invitation was extended to a broad range of stakeholders who had participated in the study workshops and focus groups to join in

the half day showcase session in Halifax as a presenter and/or exhibitor. The presentation sessions as noted above provided a meaningful cross-section of technology areas, and business experiences for key ITS, or ITS-related firms within the region. Beyond the organizations participating as presenters, there was limited further involvement from other organizations in terms of the showcase exhibit area. It should be noted that many of the smaller firms participating in the study expressed an interest in participating in the showcase but were influenced by other pending commitments and deliverables. To put the showcase in the context of the national ITS industry, the 2002 ITS Canada Annual Meeting in Toronto attracted 120 participants and 8 exhibitors over a two day period.

The following sections showcase the current ITS initiatives in Atlantic Canada, and the key companies that volunteered their time to address the showcase participants.

6.5.4 ITS Project Case Studies

The following profiles cover nine projects that have been completed or are underway across the Atlantic Provinces. This may not be an exhaustive list, but it gives a good idea of the range of initiatives currently being pursued. In many cases, the key enabling hardware or software products included in the application have not necessarily originated from within the region. However, the projects are noteworthy from the perspective of the experience of the installation, integration, operations and maintenance resources within the region associated with the various projects. The identified projects are:

- Province of New Brunswick – WIM (Weigh-In–Motion project at Longs Creek);
- Strait Crossing Bridge Limited – bridge traffic surveillance and management;
- St. John's, Newfoundland – transit AVL (Automatic Vehicle Location*) and schedule management and information system;
- Halifax Regional Municipality, Nova Scotia – "GoTime" real-time bus tracking and schedule management and information system;
- Province of Nova Scotia – RWIS (Road Weather Information Systems);
- Halifax-Dartmouth Bridge Commission – electronic payment (MacPass) and bridge traffic management;
- Halifax RM, Nova Scotia – SCOOT advanced traffic signal control system;
- Province of Nova Scotia – "smart" snowplows; and
- Provincial Governments of Atlantic Canada – tourist and travel information websites.

Detailed project profiles are included as Appendix P. In some cases, the systems needed to implement these projects were assembled locally, such as the RWIS systems integrated for the Province of Nova

* AVL (Automatic Vehicle Location) – AVL refers to the use of spatial-recognition technology to identify communicate the location of a fleet of vehicle. This can boost dispatch efficiency and service reliability.

Scotia by Approach Navigation Systems Inc. Regional companies typically also supply the installation, maintenance, communications, and similar services. However, much of the ITS technology currently comes from outside the region. In the case of the RWIS systems in Nova Scotia, the basic components are produced by Qualimetrics in the United States. Other 'outside' companies supplying to the region include SGI, GMSI, Intrex, and Transcore/Amtech. Other ITS systems have necessarily originated outside the region such as New Brunswick's weigh-in-motion system which will be supplied by IRD in Saskatoon. Although capabilities exist in the Atlantic Region to develop and implement ITS systems (see Section 7), in only a few cases to date have companies in the region penetrated the ITS market to the point where they are now identifiable as an ITS system supplier.

6.5.5 ITS Company Case Studies

The companies showcased in this section represent a sample of the many ITS-capable companies resident in the Atlantic Provinces. The full list of companies reviewed under the Economic Development and Academic/Research activities is included as Exhibit 6.6. The products and services of these companies are readily identifiable as ITS or ITS-enabling and they were present at the Halifax showcase. They are:

- Seimac Limited – fleet tracking and management, road weather (RWIS)-related meteorological forecasting;
- Approach Navigation Systems Inc. – road weather information systems (RWIS);
- Geoplan Consultants Inc. – geomatics;
- Future Learning – computer-based winter operations training.

Appendix Q includes profiles of each of the showcased companies. The profiles include descriptions of their ITS-related services and provide some basic information on the company.

The case studies reflect a variety of experiences in entering the ITS market, drawing upon expertise from other sectors. For example, Seimac brings their RWIS site-specific forecasting services based upon extensive meteorological services for the maritime oil and gas exploration and production industry. Most recently, through the resources of their parent organization, the Chelton Group of Companies, Seimac is bringing advanced MSAT satellite communications services to the commercial vehicle operations industry. Whereas standard cellular phone operations use microwave towers to connect, the MSAT service is based on high-powered satellites beaming signals to a receiver the size of a briefcase. This allows drivers in remote areas to have a reliable and static-free telephone call from virtually anywhere.

In the case of Approach Navigation Systems, the organization has drawn upon core strengths in airport navigation, illumination and communications systems, and automated weather observation stations, to develop ITS areas of business, namely RWIS deployment and Fixed Automated Spray Technology (FAST) for bridge de-icing.

Geoplan Consultants have a strong history of working in the transportation sector with a specific focus in geomatics and geographic information systems. As an extension of these core strengths, Geoplan is pursuing opportunities for increasing involvement in ITS applications involving real-time location referencing, such as enhanced 911 services, fleet management, and route guidance/navigation.

Future Learning is an example of one of the many ITS capable companies within the region that can provide supporting services. Their core strengths are courseware and e-learning for a range of applications and their impetus for involvement in the ITS market was in response to a specific solicitation for computer-based winter operations training services which originated in Minnesota.

In some cases there are opportunities for companies within the region to work in partnership and provide complementary services. For example, the forecasting services offered by Seimac can complement the RWIS deployment, maintenance and operations activities which may be undertaken by Approach Navigation System.

In summary, there is a general trend wherein the companies which are participating in the ITS market have transferred technologies from other related industries which have an industrial presence in the region. It is most likely that the initial ITS activity would occur within the region, but this is not necessarily always the case. Drawing upon the resources of related companies, or partnerships with other organizations, offers opportunities to deliver more complete applications, and expand geographic reach.

6.6 MARKET ANALYSIS

This section builds on previous chapters that identified the current level of Intelligent Transportation Systems development in the Atlantic Region, and maps these against the potential regional, national, and international markets. It goes on to determine the preparedness of the Atlantic Canada ITS industry toward increasing its share of the international ITS market, and gauges the relevance of current Atlantic ITS efforts and future capabilities. The chapter concludes by providing strategic recommendations for industry advancement.

6.6.1 The ITS Market

This section looks to characterize the demand side of ITS by discussing deployment in different regions. Although ITS first appeared in the 1970's and 1980's, only when the U.S. federal government became actively involved in the early 1990's did the market blossom. Since then, Europe and Japan have joined the U.S. as the three largest ITS markets. Some fundamental differences exist between the ITS funding programs of the three regions. Whereas the U.S. program emphasizes planning and deployment, Europe and Japan weight their funding more toward research and development. In addition to these three markets, many developing regions are starting to look to ITS to help stimulate growth. Some of these burgeoning markets have been highly accessible to the Canadian ITS industry.

Atlantic firms that may be wary of entering the international market can look to successful examples from across the country. Canadian firms are active and well-respected players on the world stage. For example:

- Saskatoon-based IRD is the leader in Weigh-In-Motion deployment across the continent;
- Mark IV Industries produces in Mississauga the readers and tags for the widely deployed IAG E-Z Pass electronic toll collection system;
- Other Canadian firms operating abroad are Ledstar (VMS), EJS (traffic sensors), Delcan, IBI Group, McCormick Rankin and SNC Lavalin (engineering services and software).

The development of ITS architecture in the major deployment centres around the world signifies an important shift in the make-up of the ITS market. The move marks a transition from a less-developed, burgeoning market where products are 'built-to-specifications' to a more-established, commodity-based market where pre-existing products are adapted to meet agency needs. The advantage of a commodity-based market with a set of standards defining the products and interfaces is that established suppliers are able to deliver the product at a lower cost, because they have previous experience and work to draw from. However, it also permits new entrants because smaller firms can develop their products based on the standards, instead of trying to develop and market purely proprietary systems. This translates to an increase in ITS deployment with the benefits trickling down to the traveller. Governments can stimulate the transition to a commodity-based market by offering steady levels of deployment funding, and leading standardization and architecture-building efforts.

The rest of the section will introduce the major markets that are accessible to the Atlantic Canada ITS industry. The North American market, the most feasible target, is discussed in three sub-sections: Atlantic Canada Region, Canada, and the United States. A fourth sub-section discusses international markets including Europe, Japan and other emerging markets.

6.6.1.1 Atlantic Canada Region

Various projects in the Atlantic Provinces demonstrate the region's capabilities in developing ITS market packages[*]. Implementation of an advanced traffic signal control system (SCOOT) in the Regional Municipality of Halifax, and the current Weigh-In-Motion (WIM) initiative in New Brunswick demonstrated successful progressions from an assessment of user needs and objectives, to the identification of opportunities, through to deployment. Other examples of projects in motion are St. John's, Newfoundland's transit Automatic Vehicle Location (AVL) and schedule management and information system, and the Province of Nova Scotia's Road Weather Information Systems (RWIS) initiative. Most recently, the Confederation Bridge in partnership with Transport Canada is implementing StraitPass, a commercial vehicle electronic toll collection system. Typically the technology has been imported to the region and local designers/constructors have participated in the deployment. As an example, TransCore provides electronic toll tags and readers for the Atlantic Region.

In developing an ITS Strategic Plan for Atlantic Canada, transportation needs were first identified and prioritized. Exhibit 6.10 summarizes the needs as identified under Step 2 – User Services Plan, with high-priority needs highlighted:

Exhibit 6.10 – Atlantic Canada ITS Needs

Need	Description
1	Expedited Border-Crossing Inspection and Clearance for Commercial Vehicles
2	Reduce Rural Road Collisions Through Early Detection of Adverse Conditions
3	Reduce the Incidence, Severity and Cost to the Community of Road Collisions
4	Improved Safety in Road Work Zones
5	Enhanced Management of Winter Maintenance Operations
6	Expedited Weight, Credential, and Safety Checks for Commercial Vehicles
7	Road Emergency Notification and Information System for Rural Areas

[*] Market packages refer to a group of pieces from the ITS Architecture required to implement a service.

Need	Description
8	Improved Ferry Services, Particularly Nova Scotia – Newfoundland
9	Provide Travel Incentives and Traveller Information to Promote Tourism in Atlantic Canada
10	Enhanced Safety and Security for Travellers and for Transportation Operators and Facilities
11	Enhanced Ability to Detect, Verify, and Respond to Incidents on Major Roadways
12	Enhanced Tracking and Real-Time Management of Containers and Other Goods at Intermodal Terminals
13	Real Time Transit Service Monitoring and Public Information
14	Improve Management of Fleet Transportation Services
15	Real-Time Management of Parking Operations

Consultation with the stakeholder community yielded Sixteen User Services as most appropriate for dealing with the region's needs. Exhibit 6.11 highlights the services. Appendix R provides descriptions of each user service, along with associated enabling technologies.

Exhibit 6.11 – Higher Priority User Services

1.1	Traveller Information
1.4	Traveller Services and Reservation
2.1	Traffic Control
2.2	Incident Management
2.4	Environmental Conditions Monitoring
2.5	Operations and Maintenance
2.6	Automated Warning and Enforcement
3.1	Public Transport Management
4.1	Toll Roads, Parking and Transit
5.1	Commercial Vehicle Electronic Clearance
5.5	Intermodal Freight Management
5.6	Commercial Fleet Management
6.1	Emergency Notification and Personal Safety
6.3	Disaster Response Management
6.4	Emergency Vehicle Management
8.1	Weather and Environmental Data Management.

As part of the Atlantic ITS Strategic Plan, a series of projects were recommended. They were identified as having significant potential based upon the needs analysis and the corresponding User Services definition. Exhibit 6.12 is a summary of the final list of the twenty-two projects recommended in the Plan. A brief description of each project can be found in Section 5.1.3. Any organization seeking further details in terms of project system definition can refer to the corresponding market packages in the ITS Architecture for Canada.

Exhibit 6.12 – Recommended Project List

Project Reference	Project Name
TI-1	Atlantic Provinces Advanced Traveller and Tourist Information System
TM-1	Atlantic Provinces ARWIS Expansion
TM-2	Wildlife Detection in Atlantic Canada, Scoping Study and Pilot Project
TM-3	Implementation of Fixed Automated Spray Technology (FAST) for Bridge De-icing
TM-4	Red Light Camera Pilot Project
TM-5	Portable Changeable Message Sign (PCMS) for Work Zones
TM-6	Smart Snowplow Expansion
TM-7	Bridge Incident Management Scoping Study
PT-1	Urban Transit Real-Time Information Service
PT-2	Community Transit Fleet Management
EP-1	Parking Electronic Payment and Monitoring
EP-2	Atlantic Canada Transaction Tag
EP-3	Smart Card Pilot Project
CV-1	Integrated Intermodal Information System
CV-2	Atlantic Trade Corridor Border Security and Electronic Inspection
CV-3	Atlantic Canada Electronic Permitting for Oversized and Overweight Vehicles
CV-4	Port Operational Information Extranet
CV-5	Port Container Security
CV-6	Airport Groundside Transportation Management
CV-7	Commercial Fleet Management Program
EM-1	Wireless Network Expansion
EM-2	Atlantic Provinces Disaster Response Plan Scoping Study

Notes:
TI – Traveller Information
PT- Public Transport
CV- Commercial Vehicle
TM – Traffic Management
EP – Electronic Payment
EM – Emergency Management

Various funding sources were identified in Section 3.4. Transport Canada, for example, has several programs available that can potentially fund ITS projects. While some of the sources are open to nearly

all ITS initiatives (i.e. ACOA's Atlantic Innovation Fund, NRC's Industrial Research Assistance Program), others are channelled to specific User Service Bundles*. For example:

- Transport Canada's Moving on Sustainable Transportation Program, and Environment Canada's Green Fund Climate Change Action Fund, focus on sustainable transportation initiatives.

- Transport Canada's Freight Efficiency and Technology Initiative, and the U.S. Department of Transportation Federal Highway Administration's TEA-21 – Coordinated Border Infrastructure Program, offer funding to freight and smart border technologies.

Exhibit 6.13 summarizes the major funding sources for ITS projects in Atlantic Canada and identifies which User Service Bundles are targeted by each source. Generally the funding programs can be categorized as product development or infrastructure management based. The product oriented programs are applicable to any user service area. An example of this type of program is PRECARN, an organization of private sector companies that co-fund research. Initiatives such as the Canada infrastructure program focus on investments in physical infrastructure to enhance safety and mobility.

Exhibit 6.13 – Canadian Funding Opportunities

Funding Source	1. Traveller Information Systems	2. Traffic Management Systems	3. Public Transport Services	4. Electronic Payment Services	5. Commercial Vehicle Operations	6. Emergency Management Services	7. Vehicle Safety and Control Systems	8. Information Warehousing Services
Transport Canada								
Strategic Highways Infrastructure Program (SHIP)	✓	✓		✓	✓	✓		
ITS Deployment and Integration Plan	✓	✓	✓	✓	✓	✓	✓	✓
Moving On Sustainable Transportation (MOST) Program	✓	✓	✓	✓				
Urban Transportation Showcase Program	✓	✓	✓	✓				
Freight Efficiency and Technology Initiative					✓			
Climate Change	✓	✓	✓	✓				
Ministry of Finance								
CCRA Tax Credit	✓	✓	✓	✓	✓	✓	✓	✓
Canada Infrastructure Program								
Physical Infrastructure Program	✓	✓	✓	✓				
Strategic Infrastructure Program	✓	✓	✓	✓				
Environment Canada								
Green Fund Climate Change Action Fund (CCAF)	✓	✓	✓	✓				
National Research Council								
Industrial Research Assistance Program (IRAP)	✓	✓	✓	✓	✓	✓	✓	✓

* A logical grouping of user services that provides a convenient way to discuss the range of requirements in a broad stakeholder area.

Funding Source	1. Traveller Information Systems	2. Traffic Management Systems	3. Public Transport Services	4. Electronic Payment Services	5. Commercial Vehicle Operations	6. Emergency Management Services	7. Vehicle Safety and Control Systems	8. Information Warehousing Services
Industry Canada								
Lean Logistics Technology Roadmap					✓			
Transportation Association of Canada								
Various Project Opportunities	✓	✓	✓	✓	✓	✓	✓	✓
Atlantic Canada Opportunities Agency								
Atlantic Innovation Fund (AIF)	✓	✓	✓	✓	✓	✓	✓	✓
Business Development Program (BDP)	✓	✓	✓	✓	✓	✓	✓	✓
Provincial Governments								
New Brunswick Innovation Fund	✓	✓	✓	✓	✓	✓	✓	✓
Provincial Tax Credit Programs	✓	✓	✓	✓	✓	✓	✓	✓
U.S. Department of Transportation Federal Highway Administration								
TEA-21 Coordinated Border Infrastructure Program		✓			✓			
Precarn								
IRIS (Institute for Robotics and Intelligent Systems)	✓	✓	✓	✓	✓	✓	✓	✓
T-GAP	✓	✓	✓	✓	✓	✓	✓	✓
Regional Alliance Program	✓	✓	✓	✓	✓	✓	✓	✓

Note that the Department of National Defence has a strong presence in Atlantic Canada and might offer programs that would help develop ITS-related technologies. Furthermore, there are a number of opportunities for non-monetary means of support. Examples include trade missions led by ITS Canada and Trade Team Atlantic, led by ACOA and the provincial governments.

Of the eight User Service Bundles, Emergency Management Services (6), Vehicle Safety and Control Systems (7) and Information Warehousing Services (8) have the most limited sources for funding.

Firms considering entering the ITS Market may wish to consider the clustering of funding sources, and focus on the Use Service Bundles where there are more funding sources.

6.6.1.2 The Canadian Market

Canada has historically been at the forefront of ITS deployment. The primary focus of development has been toward Advanced Traffic Management Systems. Examples of this include:

- Halifax, Red Deer, and City of Toronto's Split Cycle Offset Optimization Technique (SCOOT) systems, which provide real-time traffic adaptive signal control;
- Toronto's Road Emergency Services Coordination Unit (RESCU) corridor traffic management system;
- Ontario's COMPASS and a similar freeway management initiative in Montreal; and

- Highway 407 Electronic Toll Route running through the Greater Toronto Area, which was the world's first all-electronic open access toll road.

Other areas of development have been:

- Commercial Vehicle Preclearance at inspection stations under the Automated Vehicle Identification (Ontario) (AVION) project.

- Commercial Fleet Management (operation of taxis and limousines at Lester B. Pearson International Airport); and

- Advanced Public Transportation Systems and Electronic Payment (Burlington Smart Card Farebox Collection System).

- Road Weather Information Systems (RWIS) development and deployment in regions across the country.

Canadian Needs

Urban congestion is clogging Canadian inner-city highways and arterials and putting strain on the economy. Rising urban population bases and rising incomes lead to greater traffic demands in cities where road infrastructure development has curtailed in recent years. Increasingly, system planners are turning to Advanced Traveller Information Systems (ATIS), Advanced Traffic Management Systems (ATMS), and Advanced Public Transport Systems (APTS) to deal with the problem. Urban congestion management should continue to be a key need for Canada in the future.

Trade corridors, including the Atlantic Coast trade corridor and the Quebec City-Montreal trade corridor, play an integral role in Canada's transportation system. ITS initiatives to increase volume, improve safety, reduce delay and incident-detection time are often considered for sections along these corridors. As volume and congestion along these corridors increases, this trend is sure to continue. This is true not only for corridors within Canada, but also for north-south corridors connecting Canada and the United States. The Canadian federal government has announced $1.2 billion over 3 years to improve border security and efficiency.

With the majority of urban centres situated within one hour of the Canada-U.S. border, ITS and related smart border initiatives have recently emerged as important tools for improving the operation of border crossings. Related to this are CVO initiatives, including border pre-clearance and Weigh-In-Motion technologies.

Other critical needs are starting to be dealt with using ITS. Rural areas in Canada are beginning to look at RWIS deployment as a viable strategy for improving safety, particularly during times of inclement weather and networking the information. Transit agencies are looking to ITS for ways to improve service and attract ridership.

Several enabling technologies will be important in developing ITS solutions. GPS (including differential GPS) is a relatively mature technology and useful for Automatic Vehicle Location (AVL) systems, such as for transit or freight. Short-range communication is important for many ITS applications, including for

electronic tolling, AVL, CVO, border pre-clearance, and traffic monitoring. Vehicle-to-vehicle communications, a much less developed area within ITS, can be applied in intersection collision avoidance and vehicle platooning.

Deployment and the Role of Transport Canada

Deployment of ITS across Canada has typically been spearheaded by government. In addition to Provincial and Federal investment, Municipal governments provide significant funding for ITS projects in the country's large urban centres. There is also an increasing role for private firms to deploy and operate systems. Electronic Toll Highways, Commercial Vehicle Operators, and Border Crossings are three services where the private sector assumes a big delivery and operations role.

In the ITS Plan for Canada[20], Transport Canada identified six challenges to keeping Canada's transportation system successful:

1. *Congestion in densely populated corridors*: Although urban transportation falls under the jurisdiction of the municipalities and provinces, urban congestion affects the performance of our national and international transportation networks. Greater integration of urban and inter-city transportation modes is needed; this will only happen with all levels of government and stakeholders working together.

2. *Environmental pressures, especially climate change*: About 26% of Canadian Green House Gas emissions are attributed to transportation, split evenly between urban and inter-city transportation.

3. *Competing pressures for limited financial resources*: Innovative financing mechanisms are necessary as governments evaluate the level of infrastructure required to meet the needs of users in a way that is financially, socially and environmentally sustainable.

4. *Preserving and improving existing infrastructure to accommodate growing demand*: Canada's existing network is not designed to support the expected growth in traffic (50-100% increase in private-vehicle traffic over the next 25 years), and even if funds were available to build the required infrastructure, the environment would not be able to sustain it.

5. *Ensuring the safety of our transportation system*: Transport Canada is committed to making Canada's transportation system one of the safest in the world.

6. *Providing services to clients and customers more effectively and efficiently*: This includes reducing congestion, improving response times to accidents and incidents, faster toll collection systems on roads and bridges, faster and more efficient regulatory compliance measures for commercial vehicles on highways and at border crossings, enhanced information about alternative transportation options, improved intermodal transfers, collecting and sharing information for improved decision-making, etc.

In addition to funding deployment, the Federal government has been active in ITS in other ways. Transport Canada recognizes its role in stimulating ITS development and deployment across the country and putting the country's ITS industry in a position to compete in the growing global market place. In the Plan, three streams of activity are identified:

1. Raise awareness and demonstrate that wide-spread use and interoperability of ITS can improve safety and mobility and facilitate interprovincial and international trade and tourism;

2. Support strategic deployment and integration of ITS to maximize the use and efficiency of existing infrastructure and meet future mobility needs more responsibly;

3. Strengthen Canada's ITS industry to take advantage opportunities in the expanding global market place. 'Showcase' deployments, such as the Greater Toronto Area's COMPASS in the late 1980's, directly benefit the operator, but also have the secondary benefit of industrial development for the participating firms. In doing so, Canadian firms gain an advantage when bidding for similar projects in other areas of the world.

To that effect, Canada's ITS Plan is founded on five interconnected pillars:

1. **Partnerships for Knowledge**: Various partners need to play a critical role to successfully develop and implement the ITS Plan, including all levels of Canadian government, the private sector, including ITS Canada, suppliers of ITS technologies, and operators of transportation services and systems, academia and our North American counterparts.

2. **Developing Canada's ITS Architecture**: The architecture (http://www.its-sti.gc.ca[21]) will provide the framework for deploying ITS applications across agencies, jurisdictions and systems and ensuring that the products and services are compatible. The architecture defines the functions of various components and specifies how they will be interconnected to work together, as well as identify the standards needed to ensure that ITS components operate in a consistent and predictable way.

3. **A Multimodal ITS R&D Plan**: For Canada's ITS industry to capture a significant portion of the global ITS market, the Federal government will have to continue to support R&D. Based on this premise, Transport Canada has several ventures aimed at encouraging innovation. The Transportation Development Centre has supported a variety of multimodal R&D projects to demonstrate the potential and feasibility of ITS, as well as having encouraged the development of new ITS applications.

4. **Deployment and Integration of ITS Across Canada**: Transport Canada will provide limited funding to accelerate the deployment of ITS across all modes. A deployment plan will guide and manage deployment activities supported by the federal government. Appendix S provides a list of Canadian ITS proposals selected for funding for 2002/03-2003/04.

5. **Strengthening Canada's ITS Industry**: Canada has the opportunity to capture a significant share of the global market based on its communications and information technology capabilities. The federal government will work with the provinces and the private sector to develop export opportunities for Canadian ITS firms.

Unlike the U.S., Europe and Japan, Canada does not have a single large dedicated stream of funding for ITS deployment. Instead, ITS projects draw on funding from smaller programs. Transport Canada is in the 2nd year of a 30-million dollar 5-year plan geared towards developing partnerships for deployment as well as a nationwide CVO network and RWIS. Also, Transport Canada provides funding to ITS through other projects. Growing environmental considerations such as the Kyoto Agreement will put added

pressure on transportation to become more efficient, potentially increasing the sources for ITS funding. Provinces, municipalities and industry are also relied on for funding ITS deployment. In the past, Canada has been a leader in advancing the industry in targeted areas, an example of which is the 407 Electronic Toll Route in Ontario. But without further investment, Canada will lose its competitive advantage.

6.6.1.3 The U.S. Market

The U.S. ITS market is well-developed, with funding coming from all levels of government. However, compared to Japan and Europe, the United States began investing in ITS relatively late. The Intermodal Surface Transportation Efficiency Act (ISTEA) marked the entrance of the United States into the ITS arena. The act, introduced in the early 1990's, galvanized the industry and the role of the Federal Government. It mandated the development of a National Architecture and put forth a National Program Plan that involved preparing separate ITS plans for the top 75 urban centres in the country.

ISTEA earmarked $660 (USD) million from the federal government for ITS related projects. In combination with funding to ITS under the Department of Transportation's regular budget, total investment into ITS R&D and deployment was in excess of $1.1 billion by 1997, the year that the act expired. Of the allocated funds, 57 percent was devoted to operational tests and ITS corridor projects, with the balance for research and development, creating the system architecture and other specific programs. The Next Transportation Efficiency Act (NEXTEA) recommitted the government to ITS funding, with $1.3 billion slated for the period from 1998-2002[22]. The program has funded research, technology development and testing and deployment of first-generation ITS applications. It focuses on six key areas:

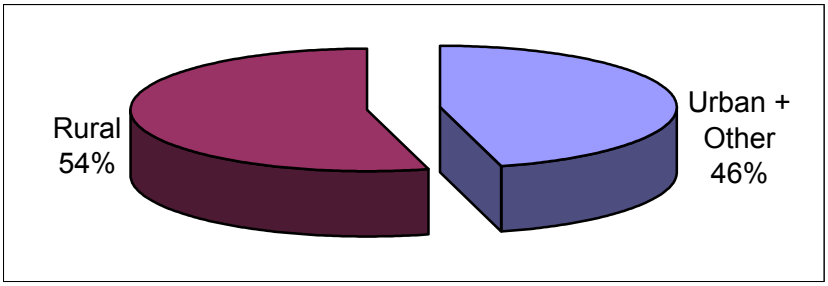
- Enabling Research, which promotes a comprehensive system architecture and standards for ITS;
- Advanced Metropolitan Travel Management, which addresses traffic management, traveller information and transit management;
- Advanced Rural Transportation Systems, which applies ITS to address safety and mobility problems in rural areas;
- Commercial Vehicle Operations, to increase safety, productivity and efficiency in commercial vehicles;
- Advanced Collision Avoidance and Vehicle Safety Systems; and
- Automated Highway Systems, to promote communications between "smart" vehicles and the transportation infrastructure.

The Transportation Equity Act for the 21st Century (TEA-21) set federal transportation spending at $217 billion for 1998-2003. For the first time, TEA-21 allowed ITS projects conforming to the U.S. National Architecture to be financed through mainstream, federal-aid highway and transit categories. This change effectively mainstreamed ITS and was symbolic of its increasing acceptance as an integral part of the national transportation system.

Appendix T characterizes the United States Federal Government funding of ITS projects for 2002.

Interestingly, funding in rural areas account for half (53%) of the total funds (Exhibit 6.14). This includes projects such as RWIS, roadside safety, and automated crash notification. Small urban centres situated in rural areas receive 28.7% of the total funds; cities such as Shreveport, Louisiana, (population: 200,000) and Fargo, North Dakota (population: 91,000) receive significant funding (over $750,000) for ITS projects. This funding is at a level comparable to that of large urban centres in the country (29.2%). Thus, there is significant opportunity in rural-oriented ITS development, with nearly $65 Million (USD) invested by the Federal Government in 2002. Like in Canada, border crossings and trade corridors in the United States also receive significant ITS funding; in 2002, nearly 10% of the Federal ITS allocations went to border and corridor-related projects.

Exhibit 6.14 – U.S. ITS Expenditures



Recall that in Section 3.1, the Atlantic Provinces Priority User Services matched up well with the U.S. Rural ITS Development Track. This, combined with the fact that over 50% of Federal ITS funding in the United States goes toward rural projects presents an opportunity for to showcase rural ITS applications in their respective provinces and transfer them to markets in the United States and the rest of Canada.

The National ITS Program Ten-Year Vision

ITS America is the non-profit professional society that works with the U.S. Federal Government to foster public/private partnerships to increase the safety and efficiency of surface transportation through the application of advanced technologies. In January 2002, ITS America, published a Ten-Year Vision for the National ITS Program[23]. The objective of the vision is to "advance the safety, efficiency and security of the surface transportation system, provide increased access to transportation services and reduce fuel consumption and environmental impact". More specifically, five goals are identified against which progress can be measured. The goals are:

1. Safety: a reduction in annual transportation-related fatalities by 15% overall by 2011.

2. Security: a transportation system that is well-protected against attacks and responds effectively to natural and manmade threats and disasters, enabling the continued movement of people and goods even in times of crisis.

3. Efficiency: to save at least $20 billion per year by enhancing throughput and capacity with better information, better system management, and minimizing congestion by providing efficient end-to-end movement of people and goods, including quick, seamless intermodal transitions.

4. Mobility/Access: universally available information that supports seamless, end-to-end travel choices for all users of the transportation system.

5. Energy/Environment: to save a minimum of one billion gallons of gasoline each year and to reduce emissions at least in proportion to this fuel saving.

The plan proposes a series of Programmatic and Enabling Themes that describe the opportunities, benefits and challenges of the transportation system of the future and activities required to realize this system. Programmatic Themes, presented in Appendix U, reflect opportunities to apply technology to the problems and priorities of surface transportation. Enabling Themes (Appendix V) set the stage and lay the groundwork for the application of technology to surface transportation.

6.6.1.4 The International Market

Japan

Japan was the first country to invest significantly in ITS, beginning in the 1970's. Two major efforts, the Road Automobile Communications System (RACS) and the Advanced Mobile Traffic Information and Communication System (AMTICS) were in effect in the 1980's and dealt with traffic management and traveller information systems both for expressway traffic (RACS) and arterial street systems (AMTICS). By the 1990's, both programs had been completed and the Vehicle Information and Communication System (VICS) was put in place to develop complete system integration with real-time traffic management and route guidance as the primary objectives. The Japanese efforts are probably the most advanced in the world in terms of implementing fully operational infrastructure for drivers across the country.

Through its National ITS budget, Japan invested $665 (USD) million for the fiscal year beginning in April 1996 – almost double the amount requested by the U.S. DOT in its 1997 budget. About $100 million is allocated to R&D in Japan's automated highway system initiative, with the rest going toward ITS deployment. Some experts suggest that growing financial deficits could weaken the government's ability to follow through on ITS investments in the future. It should be noted that whereas there is much activity in the Japanese market, there is still a low level of international participation. Non-Japanese companies have had little success outside of niche areas.

Europe

European investment into ITS began with two primary elements, PROMETHEUS and DRIVE, and has exceeded $1 billion (USD) since 1987. PROMETHEUS ran until 1994, and was aimed at developing technologies for active driver support, cooperative driving, and traffic management. The project received investment in the order of $770 million, and was primarily a private sector effort. The DRIVE program focused on road infrastructure technologies in the area of demand management, traveller information systems, traffic management, fleet management, and other areas. The program has seen over $500 million invested from government, and also has a significant private sector component.

Currently, the European Union promotes ITS development through the Trans-European Network for Transport (TEN-T). The TEMPO program was introduced in 2001 to provide longer term funding, thus supporting medium and long-term projects. Of the $1.2 (B Euros), $200 M comes from the government.

In September 2002, the European Commission will implement Framework Six. This research framework will run until 2006 and provide a total of $2 (B Euros) for research and overall coordination efforts of ITS projects between member states[24].

Emerging Markets

Although the U.S., Europe and Japan are the three largest markets, there are several emerging markets that could prove to be lucrative. Latin America and Southeast Asia are the most promising, with the Indian sub-continent and Eastern Europe also showing some potential. In most cases, toll roads and urban infrastructure projects are receiving the most attention. This suggests an opening for ITS in terms of Electronic Tolling, Advanced Traveller Management Systems (ATMS), Advanced Public Transportation Systems (APTS), and fleet management. More specific examples include:

- Brazil currently is looking to develop a large network of tolled highways that would draw from both the Electronic Tolling sector as well as ATMS;
- Fleet management is essential in Singapore's port to maximize intermodality and security;
- The Chilean Government has traditionally been a strong supporter of public transit and this is expected to extend to APTS projects;
- Argentina and Chile are both active in ITS Planning and are developing their National Architecture;
- Electronic enforcement is a more commonly accepted practice, with examples such as Brazil's red-light cameras and Singapore's electronic road pricing system.

6.6.2 Strengths, Weaknesses, Opportunities, Threats (SWOT)

The potential market for ITS developed in Atlantic Canada is broad. Any given firm should target niche functional or geographic areas within the ITS industry. The primary geographical area that Atlantic Canada industries typically target is North America, with sights also set on developing regions such as South America and Southeast Asia. This section presents a SWOT (Strengths, Weaknesses, Opportunities, Threats) Analysis of the Atlantic ITS industry and academic capabilities with respect to the global marketplace.

In performing a SWOT Analysis, one examines both internal and external characteristics that influence the direction that the industry should take. Internal Strengths and Weaknesses are created and controlled by the Atlantic industry. On the other hand, external Opportunities and Threats cannot be controlled by the Atlantic ITS industry, but must still be reacted to and/or compensated for appropriately.

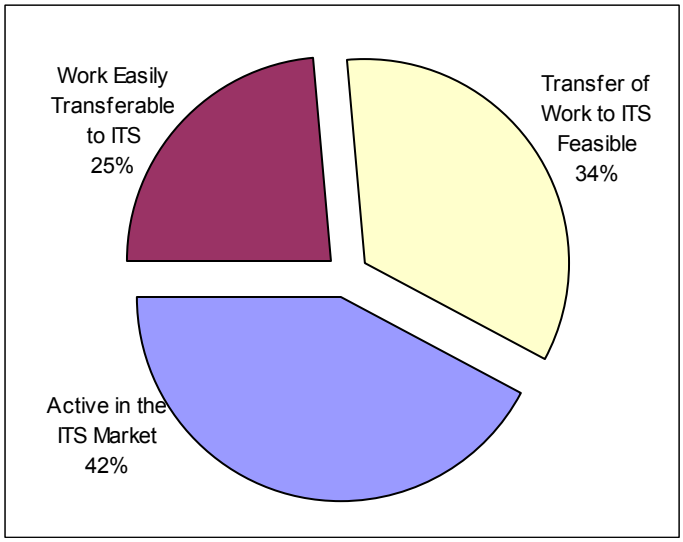
6.6.2.1 Strengths

Established Providers

The Atlantic ITS Industry has some companies that are established providers to ITS markets around the world. In addition, there are others prepared to introduce ITS work into their own vision should there be

market potential. Exhibit 6.15 shows the proportion of those providers that are already working in ITS to those that are potential providers.

Exhibit 6.15 – Potential Providers' ITS Experience



Current Atlantic ITS Industry capabilities are not evenly distributed among the different ITS user service bundles. Appendix W provides a listing of potential ITS providers for each user service bundle.

Exhibit 6.16 presents the number of potential ITS providers for each of the user service bundles. Exhibit 6.17 goes on to show how many of the providers in each bundle have work experience in ITS or would be able to enter the market if demand existed, as well as the number of providers with foreign experience. From the list of 38 providers profiled, half were involved in Traffic Management Services. Also strongly represented are Public Transportation Services and Commercial Vehicle Operations. On the other side of the spectrum are Electronic Payment Services and Information Warehousing Services with only 13% of potential ITS providers in the region doing work related to those fields. When examining only the 25 providers that are already involved in the ITS market or could easily adjust their work program to access it, Traveller Information Services takes a more significant role with 9 potential ITS providers.

Experience dealing with international customers is an indispensable commodity when discussing promoting industry participation in global markets. Whereas on a whole there are a fair number of providers with international experience (74% overall), some bundles, such as Traffic Management Services (12 of 19, or 63%) and Traveller Information Services (5 of 9, or 56%) have a significantly lower percentage with international experience.

Exhibit 6.16 – Number of Potential Providers for each User Service Bundle

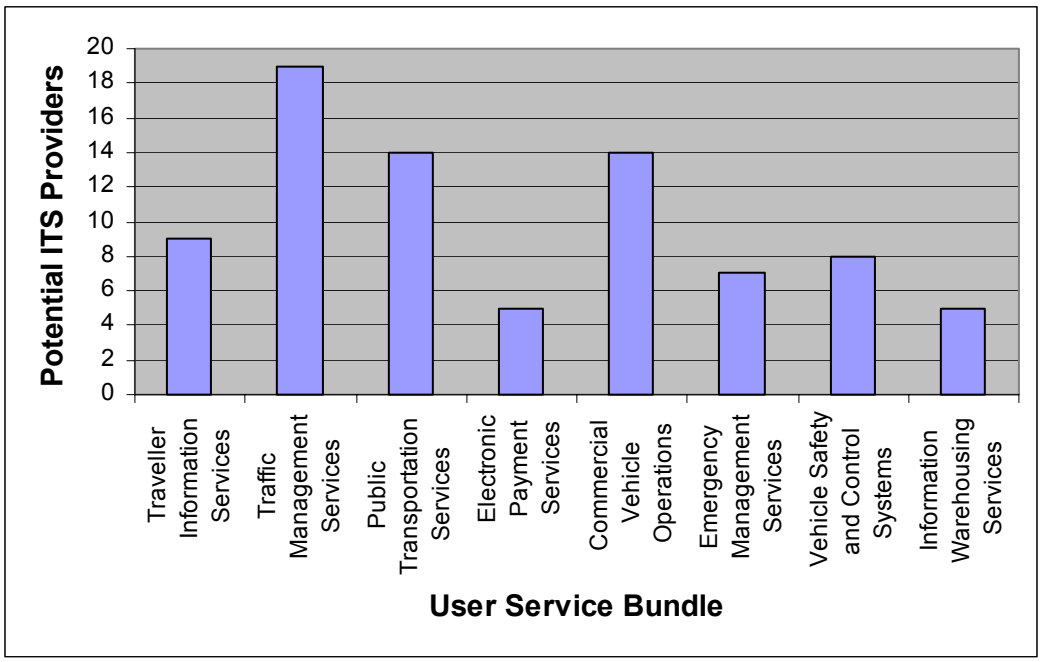


Exhibit 6.17 – Summary of Atlantic Canada Potential ITS Providers

User Service Bundle	No. of Potential ITS Providers		No. with Majority of Work in ITS		No. with Work Easily Transferable to ITS or Already Involved in ITS		No. with International Experience	
Traveller Information Services	9	24%	6	16%	9	24%	5	13%
Traffic Management Services	19	50%	8	21%	15	39%	12	32%
Public Transportation Services	14	37%	7	18%	10	26%	9	24%
Electronic Payment Services	5	13%	4	11%	4	11%	4	11%
Commercial Vehicle Operations	14	37%	9	24%	13	34%	12	32%
Emergency Management Services	7	18%	4	11%	6	16%	5	13%
Vehicle Safety and Control Systems	8	21%	4	11%	4	11%	7	18%
Information Warehousing Services	5	13%	3	8%	3	8%	5	13%
Overall	38	100%	16	42%	25	66%	28	74%

Niche Areas

Some areas of ITS in the Atlantic Region have established providers that would be capable of increasing their share of the international market. In addition, areas of ITS that have been targeted for development for internal reasons (i.e. deployment in the region) may also be considered for export as a secondary

purpose. By exploring this information at the User Sub-Service* level, we obtain a clearer picture of which niche areas are best suited for the Atlantic Canada ITS Industry. Exhibit 6.18 provides a summary of User Sub-Services that match best the Atlantic's strengths. Appendix X offers a brief description of these services as well as potential providers of each.

Exhibit 6.18 – Niche Areas

User Sub-Service	
2.4.3	RWIS (Road Weather Information Systems)
2.5.1	Infrastructure Maintenance Management
3.1.1	Transit Vehicle Tracking (also known as Automated Vehicle Location)
3.1.2	Transit Fixed-Route Operations
5.5.1	Freight In-Transit Monitoring
5.6.1	Fleet Administration
6.4.1	Emergency Response Management

Other Strengths

There are various core capabilities that would be supportive of ITS implementation. The Atlantic Region is internationally recognized for the development of cores competencies in courseware and e-learning applications. Specific areas of activity in which this industrial strength can support the ITS industry are:

- Driving simulators for passenger vehicles or specialty vehicles such as snow ploughs in order to analyze the human factors considerations associated with new technology applications;
- Emergency services dispatch; and
- Commercial fleet management/dispatch.

Customer contact centres in Atlantic Canada provide voice and web based support services for many large multi-national corporations and public sector entities. With the increasing level of deployment, the focus of ITS applications is increasingly the management of real-time information. Examples of areas of ITS that could benefit from Atlantic Canada's strength in this sector are:

- Incident reporting/management;
- Advanced traveller information systems;
- Fleet management.

* User Services and more specific User Sub-Services represent what the system will do from the perspective of the user. A user might be the public or a system operator.

Other supporting capabilities include the Atlantic Region's experience in the translation service industry, information technology, and telecommunications.

In addition to these sectors, there are various academic/research centres that are able to support the industry. University of New Brunswick, New Brunswick Community College, Memorial University, Dalhousie University, and Mount Saint Vincent University all have programs related to transportation which have incorporated some degree of ITS into the curriculum at the undergraduate, graduate, or post-graduate level. The Research and Productivity Council (RPC), Concept + Inc. (Genieo), and the Electronic Commerce Centre are some of the research centres that provide research development and testing services to assist in the technological innovation process.

Incubator/Accelerator Companies are set up to provide business start-up facilities, training, mentoring, and related services. Some also promote technology transfer from higher-level academic institutions. These companies may be found throughout the Atlantic Canada Region, and include:

- Centre of Excellence in Information Technology (New Brunswick)
- TechPEI/Atlantic Technology Centre (Prince Edward Island)
- Crown of the Valley Development Corporation/Venture Centre (Newfoundland)
- InNOVAcorp/Technology Innovation Centre (Nova Scotia)

The 'clusters' of ITS technology lie in the areas of information technology, sensors and surveillance, and geomatics. This implies that right now Atlantic Provinces firms could contribute somewhat to Traveller Information, Traffic Management, and Commercial Vehicle Operations, and Information Warehousing projects.

6.6.2.2 Weaknesses

The Atlantic Provinces firms that are providing ITS services, or firms that are considered to be ITS-capable, are generally quite small. As described in Task 6.5, one-third of the companies employ fewer than 10 employees, and about one-half employ between 11 and 100 employees. Smaller companies can overcome size disadvantages through seeking out partnership and pooling resources. However, small firms with innovative solutions can be tempted to sell their ideas before they can be put into practice and mass marketed.

Smaller organizations face a number of challenges:

- They do not have the financial resources to fund extensive research and development efforts. The high technology nature of ITS suggests that the industry must be committed to research and development.
- They cannot support a continent wide sales, distribution and technical support network.
- They generally cannot take advantage of "technology transfer" opportunities, compared to larger firms with multiple strategic business units.

Given these weaknesses, the firms have little room for error, and therefore must be cautious in their business decisions.

6.6.2.3 Opportunities

There are a number of developments that can serve as opportunities for firms in Atlantic Canada.

Development of ITS Standards

The ITS industry is maturing. For many years the systems were proprietary in nature. Therefore once a system was implemented, the company that supplied the system had exclusive access to that client. However, from a client perspective, this has been seen as a major problem since it limited competition, and prevented integration and communication with related systems. Over the past decade, there has been a concerted effort to develop ITS standards. The best known effort is the National Transportation Communications for ITS Protocol (NTCIP), to provide an open communications standard that ensures the interoperability and interchangeability of ITS devices. As these standards are completed, new market entrants can design their devices to meet these standards.

Funding

There has been sustainable funding for ITS, as evidenced by the ISTEA and TEA-21 programs for the past decade. Therefore ITS providers, and potential ITS providers can be confident of an ongoing stream of funding for ITS projects. These funding sources have been identified in Exhibit 6.13.

Canadian ITS Success Stories

Atlantic Provinces firms may wish to consider seeking partnerships with complementary firms in Canada to deliver showcase projects, and to use the experience and the profile to then access external markets.

There are existing Canadian firms that have participated in Canadian showcase projects, and then developed channels to access the international market. Examples include:

- Siemac has developed advanced, lower cost commercial fleet tracking solutions using Canadian marine satellite (MSAT) technology and is actively marketing in the U.S.;

- Ledstar, an electronic variable message sign (VMS) vendor based in Toronto developed advanced LED displays for COMPASS in Toronto, and has grown to be one of the leading VMS manufacturers in the U.S. market;

- IBI Group developed freeway traffic management software (the RESCU system) for the City of Toronto. The software has been marketed to, and adapted for projects in Connecticut, and in Western New York (NITTEC);

- Delcan developed freeway traffic management software for COMPASS in Toronto, and has since marketed and applied their systems in the U.S. and Asia-Pacific.

For the firms that are already familiar with ITS technology, they can pursue opportunities to apply that technology to other fields. A good example is Approach Navigation Systems (ANS), a small firm

operating in Dieppe, New Brunswick, which is profiled in Appendix Q. ANS is an integrator, assembler, installer, and project engineer for RWIS and related systems, which is primarily deployed on road networks. However, they have pursued the application of RWIS pavement monitoring technology for airport runways.

Canada's low cost base combined with free trade has proven to be an opportunity for industry. Canadian companies have leveraged off the cheaper dollar with great success. An example of this is Variable Message Signs, with Canadian-produced signs prevalent in the U.S. market. The high tech nature of the ITS industry renders it consistent with provincial strategies to diversify their economic base from traditional economic sectors.

KPMG's annual competitiveness study (http://www.competitivealternatives.com/main.htm), a comparison of business costs in North America, Europe, and Japan, ranked Canada as an overall cost leader for 2002 with a cost index of 85.5, a 14.5 percent cost advantage over the US (US=100). Cost indices were even more favourable for several Atlantic Canada cities including Moncton, Charlottetown, Truro, and St. John's.

Other Support Resources

There are some Canadian organizations available to support firms who wish to access the world market. These include:

- ITS Canada [www.itscanada.ca] and Trade Team Atlantic which, among other things, organizes trade missions where firms have a chance to identify opportunities abroad;
- CIDA (Canadian International Development Agency) [www.acdi-cida.gc.ca], which offers funding for work in developing markets;
- Export Development Corporation (EDC) [www.edc.ca], a Crown corporation that facilitates Canadian exports by providing loan guarantees for financing; and
- Transport Canada's International Cooperation Branch that facilitates and coordinates Canadian expertise working in overseas markets.

There are many other resources that Atlantic Region firms can use to access information on the ITS industry. There is a wealth of periodicals, professional associations, and conferences which provide information on the projects, the technologies, and the participants.

There are a number of Canadian and International Associations that provide information and education in ITS. These include: ITS Canada, CTRF, TAC, ITE and CITE.

ITS Canada (www.itscanada.ca) promotes the application of ITS technologies by increasing awareness of the benefits and strategic importance of ITS, facilitating information exchanges through workshops and conferences, providing a national focus for development of Canadian standards and participating in international standards process, providing input to government agencies on policy, funding and ITS delivery, and by facilitating training for ITS users, operators, and young professionals. ITS Canada has a committee dedicated to Education and Training. In addition to providing information on which Canadian

institutions offer some level of education in ITS, the committee also offers a training course in ITS Architecture.

The **Canadian Transportation Research Forum (CTRF) (www.ctrf.ca)** is an association for Canadian transportation professionals who work for public and private owner/operators or academic institutions. At the CTRF's Annual Conference, papers are presented from a wide range of industry, government and academic perspectives. A typical Annual Conference includes sessions on: airline regulation; national railway policy; logistics; motor carrier issues; new directions in transportation policy; marine transportation issues; ports policy; financing strategies; transportation and regional economies; education; grain transportation; safety and operations; cost recovery; modeling; system management; and trade and transportation. CTRF publishes these papers in a Proceedings book for its members and other interested parties. ITS applications are reflected in many of these topics.

Transportation Association of Canada (TAC) (www.tac-atc.ca) is a non-profit association of transportation stakeholders in government, industry and educational institutions. TAC offers a neutral forum for gathering and exchanging ideas, information and knowledge in support of technical guidelines and best practices. TAC deals with ITS through the Traffic Operations and Management Standing Committee. The committee is currently comprised of members from provincial and territorial governments, the federal government, municipal governments, relevant Canadian associations, educational institutions, and private sector companies. This committee deals with the development of traffic control devices, applications and practices. In the past few years, ITS has played a more prominent role in the development of traffic control devices. The annual conference and exhibition includes sessions specifically dealing with ITS.

The **Institute of Transportation Engineers (ITE) (www.ite.org)** is an international individual member educational and scientific association with over 15,000 members worldwide. ITE has over 11 area-of-interest councils that serve as forums to define issues and develop solutions. More than 100 activities are currently underway including the development of standards and recommended practices, informational reports and handbooks. ITE also offers educational and professional development opportunities to members. Through the councils, ITE holds regional and international conferences, exhibits, and seminars that draw hundreds of members and regional players.

The **Consortium for ITS Training and Education (CITE) (www.citeconsortium.org)** is a unique organization of universities, associations, and private sector members focused on providing comprehensive ITS (Intelligent Transportation Systems) training and education. CITE has developed a number of interactive web-based courses geared to graduate students and current professionals who wish to enhance their knowledge and skills in ITS. Graduate level for-credit courses developed by CITE are offered through CITE member universities. Training courses for continuing education units are available directly through CITE. The Canadian academic institutions that are members of CITE, and offer the ITS courses include Dalhousie University, University of Toronto, Carleton University, and University of Calgary.

The International ITS Index is a reference manual, most recently published in 1999, that contains over 1800 profiles of ITS participants in North America, Europe, and Asia-Pacific. It therefore serves as a valuable reference manual for private sector firms that wish to enter, or have entered the ITS market. The participant profiles include a description of the products and services, technologies deployed, project involvement and corporate background, as well as contact information.

A sampling of the participants that can present opportunities in North America includes:

ITS America, based in Washington, D.C., was mandated by the U.S. Congress in 1991 to coordinate the development and deployment of intelligent transportation systems in the United States.

The ITS JPO is based in Washington, D.C. It provides strategic leadership for the U.S. Department of Transportation's ITS Program in the areas of program planning, budgeting, outreach, system architecture development, program evaluation, and institutional and mainstreaming issues. This agency recently released an important reference manual titled "ITS/Operations Resource Guide 2002". It provides information on documents, videos, websites, training courses, software tools, and points of contact for ITS.

Transportation Research Board (TRB) is based in Washington, D.C. The TRB manages a program titled "Ideas Deserving Exploratory Analysis" (IDEA). The IDEA program has an ITS component (ITS-IDEA) that focuses on demonstrating new and innovative products and methodology for ITS applications, including highway systems and safety, intermodal systems, and high speed rail systems. It solicits proposals for innovative concepts that will have an impact in any of the ITS user service areas.

The International Bridge, Tunnel and Turnpike Association (IBTTA) is based in Washington, D.C. It represents toll bridges, tunnel and turnpike authorities in 22 countries. Its members include more than 85 toll authorities and agencies, operating more than 300 toll facilities worldwide.

The National Electrical Manufacturers Association (NEMA) is based in Virginia. Members of the association are national and international manufacturers of electrical and electronic products. The mission of the NEMA Transportation Management Systems and associated Control Devices Section is to originate and participate in the creation, maintenance, promotion and implementation of national standards for transportation systems and devices.

There are also a number of web-based news groups that provide information on ITS activities. An example is the Transportation Communications Newsletter, which is published daily. A free subscription can be obtained by sending an e-mail message to: transport-communications-subscribe@yahoogroups.com

6.6.2.4 Threats

The threats to Atlantic Provinces can be primarily categorized by the barriers to entering the ITS market. The main barriers are the public sector procurement processes, and the strength of the firms already in the ITS market.

Public Sector Procurement Processes

In each province or state, there can be specific requirements of firms providing services in a state. For example, in the state of Michigan, all principals of a firm must be registered as professional engineers in that state. Many U.S. cities require the proponents to include designated Disadvantaged Business Enterprises ("DBE's") on their teams. DBE's are firms that are owned by, or have a significant proportion of employees, that are categorized as disadvantaged, based on gender, ethnic background, and other criteria. Finally, in many jurisdictions, the proponents must be pre-qualified in order to be eligible to submit bids to provide services.

The barriers listed above are the formal barriers. Firms must also deal with a parochial culture, whereby local firms are generally favoured based on familiarity, and also to promote the local economy. It can take considerable time and effort to deal with these barriers.

Positioning of Existing ITS Service Providers

Another major barrier to Atlantic Canada firms that wish to enter, or have entered the ITS market is the strength and positioning of the existing ITS service providers.

One method of assessing the threat posed by these ITS participants is to examine the strength of participants by ITS category, and by geographic region. For this exercise, the focus is on North America. In addition, Canadian players which would be vying for the same North American market opportunities are noted. Most of the companies as noted do not have a permanent presence in Atlantic Canada.

In order to obtain information on the existing ITS service providers, there are some published reference documents. An prime resource document is the International ITS Index, which is a reference manual, most recently published in 1999, that contains over 1800 profiles of ITS participants in North America, Europe, and Asia-Pacific. It therefore serves as a valuable reference manual for private sector firms that wish to enter, or have entered the ITS market. The participant profiles include a description of the products and services, technologies deployed, project involvement and corporate background, as well as contact information.

Information from the International ITS Index, as well as information from other sources, has been used to provide representative profiles on the strength of the competition in many of the ITS areas of business.

Traveller Information Systems

TRAVEL AND TRAFFIC INFORMATION PROVIDERS

Major players include SmartRoute Systems, Metro Networks, and Surface Systems Inc.

Significant consolidation has occurred in this sector over the past three years. Westwood One supplies radio and television stations with information services and programming. It is the largest U.S. outsource provider of traffic reporting services and the largest radio network. In 1999, it merged with Metro Networks, and in 2000 it acquired the operating assets of SmartRoute Systems. Westwood One is present in 80 of the largest U.S. markets.

Surface Systems Inc. is the world's leading full-service weather information provider for the transportation and utilities industries. SSI established the world's first meteorological centre dedicated to providing pavement specific weather forecast information. The SSI Weather Centre provides weather forecasting and decision support for over 500 localized forecast sites in 45 U.S. states, using proprietary forecast models and methods.

NAVIGATION AND ROUTE PLANNING

The participants can be loosely grouped. One group consists of companies that have a long history of providing in-vehicle audio systems, including Alpine, Clarion, Delphi Delco, Pioneer, and Sony. Others are firms with a more direct ITS focus, such as Motorola and Siemens ITS North America.

Motorola is a global leader in providing integrated communications solutions and embedded electronic solutions, with 150,000 employees worldwide. One of its many business sectors produces integrated electronic systems for automotive applications.

MAP DATABASE VENDORS

The notable players include ETAK, MapInfo, ESRI, and Navigation Technologies Inc.

ETAK is now known as Tele Atlas North America, a division of Tele Atlas. Tele Atlas claims to be a worldwide leading provider of digital map data, offering the broadest map coverage of the world, and delivering the most accurate, complete and current digital maps available from any single source. Its head office is in the Netherlands.

MapInfo is also a global company, headquartered in Troy, New York, with more than 600 employees worldwide including subsidiaries in Canada, the UK, Germany, Australia and Japan. Its primary product is location information, including names, addresses, routing directions and traffic patterns.

ESRI is the privately-owned maker of ArcView and ArcInfo as well as a series of other GIS products. With a presence in the field dating before ArcInfo's first commercial release in 1981, ESRI has grown to more than 2,500 employees. Over half of these (1,400) are based in Redlands, California, the company's world headquarters.

Navigation Technologies is a global company, headquartered in Chicago, with 100 field offices in 18 countries. It is a leading provider of digital map information and related software and services used in a wide range of navigation, mapping and geographic-related applications, including products and services that provide maps, driving directions, turn-by-turn route guidance, and fleet management and tracking.

Traffic Management

TRAFFIC MANAGEMENT SYSTEMS

Participants that have not been previously profiled include Peek Traffic Systems, Inc, based in Florida, and Safetran Traffic Systems, Inc. based in Colorado. Major participants that are not profiled include Econolite Control Products, Inc. based in California. Canadian participants include Delcan, IBI Group, and Fortran Traffic Systems, which are all based in Ontario.

VARIABLE MESSAGE SIGNS

Some of the better known manufacturers include Daktronics, Inc, Ledstar, Inc., and Skyline Products, Inc.

Daktronics, Inc. is based in South Dakota. It designs, manufactures, sells and services dynamic visual communication systems for customers worldwide. Daktronics has installed tens of thousands of scoreboards and display systems in more than 70 countries, and is recognized as a world leader in arena and stadium scoring systems.

Skyline Products, Inc. is based in Colorado. It manufactures and installs light emitting diode (LED) variable message signs on urban freeways, rural highways, and in trailblazing systems.

Canadian participants include Groupe Infocite Inc. of Quebec, Ledstar, Inc. of Ontario, and Mark IV Industries, of Ontario.

Groupe Infocite produces LED variable message signs for highway management systems and all modes of transportation terminals.

Ledstar Inc. pioneered the LED based Variable Message Sign with North America's first system installed in Toronto, Canada in 1991. Ledstar is at the forefront of LED technology Variable Message Signs, with clients across North America.

Mark IV Industries is profiled under *Electronic Toll System Integrators.*

TRAFFIC DETECTORS AND OTHER SENSORS

Some of the major players include 3M Intelligent Transportation Systems, Cohu Electronics Division, Image Sensing Systems, Inc., Microwave Sensors, Inc., and Nu-Metrics. There are a number of significant Canadian players, including EIS Electronic Integrated Systems, Inc., International Road Dynamics (IRD), and Novax Industries Corp.

3M Intelligent Transportation Systems, based in Minnesota, uses optical communications to provide temporary priority for emergency vehicles and transit vehicles at signalized intersections. It also markets an integrated fleet operations system, traffic signal equipment, and magnetic lateral warning and guidance tape to be used in vehicle safety control systems.

Cohu, Electronics, based in San Diego, provides closed circuit television surveillance systems. Image Sensing Systems, based in Minnesota, produces the well-known Autoscope wide area vehicle detection system. Microwave Sensors, Inc., based in Michigan, produces microwave and ultrasonic vehicle and pedestrian detection systems. Nu-Metrics, based in Pennsylvania, manufactures portable and permanent traffic counters.

EIS, based in Ontario, manufactures and distributes Remote Traffic Microwave Sensor (RTMS) units for traffic management systems and traveller information systems.

International Road Dynamics is based in Saskatoon, Saskatchewan. IRD describes itself as a multi-discipline, technology company with the expertise to integrate complementary ITS technologies. IRD offers multi-systems solutions by integrating a number of different technologies to the desired functionality. Its products include Traffic Data Collection Systems, Automated Truck Weigh Stations / Commercial Vehicle Operations, Driver and Fleet Management Systems, Automated Toll Systems, and Traffic Safety and Advisory Systems.

Novax Industries Corporation, based in British Columbia, manufactures and distributes microwave detectors, as well as traffic signal controllers, audible pedestrian signals, and transit vehicle priority equipment.

Public Transport/Commercial Vehicle Operations

VEHICLE POSITIONING SYSTEMS/AVL

The notable participants include Motorola, and Qualcomm Inc.

Qualcomm Inc. is headquartered in San Diego, California. It offers products such as QTRACS and OmniTRACS. The OmniTRACS system now provides mobile communications, position location and logistics management support for over 400,000 vehicles in 32 countries.

There are three Canadian firms of note listed. The first firm is Research in Motion Limited, based in Waterloo, Ontario. A second firm is AVeL-Tech, Inc. a private company located in Laval, Quebec. AVeL-Tech markets an Automatic Vehicle Location (AVL) system. Finally, AVL Systems Ltd. was founded in 1987 in Calgary. AVL Systems Ltd. is a systems integration company focused on the business of designing and implementing automatic vehicle location systems for a variety of applications, most of which are in the broad areas of fleet management and safety/security. Since 1996, AVL Systems has carried out projects involving ships, locomotives, ambulances, snow plows, helicopters, tanks, and a variety of commercial and military vehicles.

FLEET MANAGEMENT SYSTEMS

The major players include Qualcomm, HELP – Heavy Vehicle Electronic License Plate Inc., Lockheed Martin IMS and Roadnet Technologies Inc.

HELP, Inc. is a non-profit corporation based in Phoenix, Arizona that works with the transportation industry in nine states to develop and implement technology services to benefit motor carriers.

Lockheed Martin IMS is headquartered in Washington, D.C. It is a partner with HELP, and operates the PrePass weigh station bypass service, which allows commercial vehicles to be weighed at highway speeds and have their credentials checked without stopping, on behalf of HELP.

Roadnet Technologies, Inc., is a United Parcel Service Logistics Group company located in Maryland. It produces software packages that, for example, compute least-cost routes for commercial vehicles.

Electronic Payment Services

ELECTRONIC TOLL SYSTEM INTEGRATORS

Major players include Amtech Transportation Systems Group, Lockheed Martin IMS, and TransCore. There are a number of major Canadian-based participants, including Mark IV Industries, Inc. and SIRIT Technologies, Inc.

TransCore Inc. is a company with 1800 employees distributed at more than 80 locations throughout the world. They specialize in the supply of toll collection systems, commercial fleet management systems, and traffic management and traveller information systems. They have pursued a growth strategy through the acquisition of four transportation service companies, including Amtech Transportation Systems.

Lockheed Martin is a global company with over 125,000 employees, principally engaged in the research, design, development, manufacture and integration of advanced technology systems, products, and services for government and commercial customers.

Mark IV Industries is based in Ontario. Mark IV IVHS, supplies the majority of Electronic Toll Collection (ETC) equipment in the Northeastern United States. It is the largest supplier of its kind in North America. The E-ZPass[sm] system - which relies on Mark IV transponders, is the largest and most successful intelligent transportation system (ITS) implementation in the world. Mark IV IVHS has supplied systems for Canada's Highway 407, and for border crossing projects. Mark IV also markets commercial vehicle operations systems, dynamic message signs, as well as parking and transit systems.

SIRIT Technologies Inc., headquartered in Ontario, is an international company that facilitates business-to-consumer transactions using innovative wireless technologies. SIRIT is a worldwide leader in Automatic Vehicle Identification (AVI) solutions for toll road users, a parking lots, and commercial vehicles.

Other ITS Service Providers

CONSULTANTS

The ITS Index lists close to 200 consultants ITS services in North America. There are generally two categories of ITS consultants. The first type are ITS specialists that are active in all parts of North America, and in most if not all areas of ITS. An example is TransCore. The second type are regional civil engineering firms that have some ITS project experience. These regional firms can be converted to opportunities if they are used as a local presence for teaming purposes.

TRANSPORT RESEARCH FACILITIES

There are many transport research facilities in the United States, and they receive millions of dollars of funding annually. Some of the better known facilities include the Volpe National Transportation Systems Center, located in Massachusetts, and Mitretek Systems of Washington, D.C.

UNIVERSITIES

The ITS Index lists 57 participants category, including seven Canadian institutions. The Canadian institutions include Carleton University, Concordia University, Mohawk College, Royal Military College of Canada, University of Montreal, University of Calgary, University of New Brunswick and the University of Victoria.

A prominent university that performs ITS research is the Texas Transportation Institute, which is part of the Texas A & M University System.

In summary the major participants in ITS are very large firms with international experience. In many cases, ITS is only one of many areas of business. Therefore, these firms are able to take advantage of economies of scale in conducting research and development, manufacturing, and delivering and supporting their products.

In light of the size of the existing sector participants, firms in the Atlantic Region might look to developing innovative approaches that might be of interest to the major players, or serving in a local support role.

6.6.2.5 Relevance Map

The ITS Relevance Map is an technique used to identify key areas in which the Atlantic Region has ITS capabilities, and for which there is a significant market pull. It deals with three fundamental dimensions of relevance: Products, Processes, and Players. These are combined in two combinations: products vs. players, and products vs. processes. Each of these dimensions is broken down into its components, and when crossed, a matrix is formed to capture the interactions. The ITS Relevance Map technique involves responding to the following questions for the cells in the matrices:

1. How much is the Atlantic Region doing now in this area of ITS?

2. How good is the region at this now?

3. Considering the ITS marketplace, what is the potential for Atlantic Canada players to increase their market presence?

The results are scaled from 1-5, with 1 being the worst and 5 the best. A '-' indicates an insignificant amount of work has been done to date. Using an equal weighting of the three questions to determine a group average, we obtain a quantitative comparison of which sectors of ITS are the best suited for the Atlantic Canada Region.

Exhibit 6.19 – Product vs. Players Matrix

		Traveller Information Systems			Traffic Management Services			Public Transport Services			Electronic Payment Services			Commercial Vehicle Operations			Emergency Management Services			Vehicle Safety and Control Systems			Information Warehousing Services		
Player	Sector	q1	Q2	q3	q1	q2	q3	q1	q2	q3	q1	q2	q3	q1	q2	q3	q1	q2	q3	q1	q2	q3	q1	q2	q3
Owners/ Operators	Public	2.5	2.5	3.5	2.5	3	2.5	3	3	2.5	-	2	3.5	1.5	2	3	2	2.5	2	-	-	-	2	2.5	-
	Private	-	-	-	2	3	2	-	-	-	3.5	3.5	3	3	3.5	4	-	-	-	-	-	-	-	-	-
Research/Academia		-	-	-	1.5	2	2.5	-	-	-	-	-	-	-	-	3	-	-	-	1.5	2.5	1.5	-	-	-
Provider	Surveillance	1	1	1	2.5	2.5	2.5	-	-	-	-	-	-	2.5	3.5	4.5	-	-	-	-	-	-	-	-	-
	Data Processing	2	2	3	2	2	2	2	2.5	2	2.5	2.5	2.5	3	3	3	2	2.5	2	-	-	-	2	2.5	2.5
	Control	-	-	-	1.5	2.5	1.5	2.5	2.5	2.5	1	2	1	2.5	2.5	2.5	2	2	2	-	-	-	-	-	-
	Traveller Interface	1	1.5	2.5	1.5	2.5	1	1.5	2	2	2	2.5	2.5	2	2	2	-	-	-	-	-	-	-	-	-
	Navigation	1	3	1	1	3	3	1	2	3	-	-	-	2	2.5	2.5	-	-	2.5	-	-	-	-	-	-
	In-Vehicle Sensors	-	-	-	-	-	-	1	2	2	1.5	2.5	1	2.5	3	3.5	-	-	-	1.5	3.5	2	-	-	-
	Communications	2.5	2.5	2	2	2	2	2	2	2	2	2.5	2.5	3	3.5	4	3	3	3	-	-	2.5	-	-	2
	Provider Average	1.5	2	1.9	1.7	2.4	1.9	1.7	2.1	2.1	1.8	2.4	1.8	2.3	2.7	3.0	2.2	2.4	2.3	1.3	3.3	2.3	2	2.5	2.3
	Average	1.6	2.1	2.1	1.8	2.5	2.0	1.8	2.2	2.1	2.1	2.4	2.2	2.3	2.7	3.1	2.2	2.4	2.2	1.4	2.8	2	2	2.5	2.3
	Group Average	1.9			2.1			2.1			2.3			2.7			2.3			2.1			2.3		

Exhibit 6.20 – Product vs. Function Matrix

ITS Related Functions	Traveller Information Systems			Traffic Management Services			Public Transport Services			Electronic Payment Services			Commercial Vehicle Operations			Emergency Management Services			Vehicle Safety and Control Systems			Information Warehousing Services		
	q1	q2	q3	q1	q2	q3	q1	q2	q3	q1	q2	q3	q1	q2	q3	q1	q2	q3	q1	q2	q3	q1	q2	q3
R&D	-	-	-	2	2.5	2	-	-	-	-	-	-	2	2	2.5	1	2	1	1.5	2.5	2.5	-	-	-
Pilot-Projects/Demonstration	1	-	-	2	-	-	2	2.5	3	2	-	-	1.5	2	2.5	1	-	-	-	-	-	1	-	-
Market Introduction	2	1	2	3	3	-	2.5	2	2	3	3	3	3	3.5	2.5	1.5	-	-	-	-	-	-	-	-
Market growth/penetration	1	1	1.5	2	2.5	3	1.5	1.5	2	2.5	2	3	2.5	3	2.5	1	1	-	-	-	-	-	-	2
Average	1.3	1	1.6	2.1	2.6	2.5	1.8	1.9	2.3	2.3	2.3	2.9	2.2	2.4	2.4	1.1	1.5	1	1.5	2.5	2.5	1	-	2
Group Average	1.3			2.4			2.0			2.5			2.3			1.2			2.2			1.5		

In Exhibit 6.19, Product vs. Players Matrix, the activity and the potential for Atlantic Canada players to increase their market presence, is below average (below a score of "3") for all eight user service bundles. This can be attributed to the relatively small size of the Atlantic Canada ITS market, and the small size of the firms with ITS, or ITS-applicable experience. The highest rated user service bundles are Commercial Vehicle Operations, and Electronic Payment. This reflects the activity by firms such as Seimac Limited, and the number of electronic payment facilities present in Atlantic Canada, for example. They are also the user service bundles with the greatest potential for growth.

In Exhibit 6.20, Product vs. Function Matrix, once again all eight user service bundles are scored as below average. The rows reflect typical step in the product cycle process. It can be seen that a relatively small amount of research and development and pilot projects are being conducted in the Atlantic Region. More of the activity is based on implementing actual systems.

The highest ratings are found in Electronic Payment Services, Traffic Management Services and Commercial Vehicle Operations. This reflects the fact that the Atlantic Region has a number of "mature" systems in place in each of these areas.

6.6.3 Market Summary

The ITS market analysis yields the following observations:

- The three largest international markets are the United States, Europe and Japan.
- Whereas the U.S. program emphasizes planning and deployment, Europe and Japan weight their funding more toward research and development.
- Canada has historically been at the forefront of ITS deployment, with the focus on Advanced Traffic Management Systems, Commercial Vehicle Systems, Commercial Fleet Management, and Advanced Public Transportation Systems.
- Many examples of successful Canadian firms active and well respected on the world stage.

- The development of ITS architecture in the major deployment centres implies a more standardized, less 'built-to-spec' approach. Although this means a lower profit margin, the deployment volume will increase.

- There is a diverse set of sources from which Atlantic Canada can obtain funding assistance for the different projects identified as having potential in the Strategic Plan.

- Historically at the forefront of ITS deployment, Canada could lose its competitive advantage without a commitment for further investment from the Federal Government. The ITS Plan for Canada gives scope to the different activities that Transport Canada will undertake to promote development, but does not formalize a long-term fixed funding mechanism.

- The United States government has invested substantially in ITS deployment over the past decade, most recently with NEXTEA's $1.3 billion (USD) from 1998-2002. From this, over half of the funds have been used for rural ITS projects. In addition, funding of small urban centres was at a comparable level to large urban centres.

- Although Japan invests significant funds toward ITS, there is a low level of international participation. Non-Japanese companies have had little success outside of niche areas.

- Under Framework Six, Europe will be investing $2 billion (Euros) for research and overall coordination efforts of ITS projects between member states.

- Emerging markets in developing countries can often present opportunities to Canadian companies. Latin America and Southeast Asia are the most promising, with the Indian sub-continent and Eastern Europe also showing potential.

- Traveller Information Services, Traffic Management Services, Public Transport Services, and Commercial Vehicle Operations are the User Service Bundles with the most established providers in the Atlantic Canada Region.

- Road Weather Information Systems, Infrastructure Maintenance Management, Transit Vehicle Tracking, Transit Fixed-Route Operations, Freight In-Transit Monitoring, Fleet Administration and Emergency Response Management are niche areas that Atlantic Canada is well positioned to increase its market share.

- The primary weakness of most Atlantic Region firms is size. Given the size of the firms, and their resources, it is important for the firms to make educated business decisions about which opportunities should be pursued. Firms should focus on selecting niches within the ITS industry. Ideally, they will select niches in which they can take advantage of transfers of technology from other business sectors to the ITS sector.

- The development of standards permits Atlantic firms to develop ITS products. There are lessons learned from other successful Canadian ITS firms. There are numerous supporting services and institutions for firms seeking to expand their work to ITS. This includes but is not limited to ITS Canada, CIDA, Transport Canada, established cores competencies in

courseware and e-learning applications, customer contact centres and telecommunications, as well as Academic and Research Centres.

- The Relevance Map technique identified Commercial Vehicle Operations, Electronic Payment Services and Traffic Management Services as the three User Service Bundles that the Atlantic Region best stands to gain a market share of.

- The primary challenge to developing the ITS industry is helping Atlantic Canada firms overcome some of the disadvantages they face from their small size and limited experience.

This document contains many tools for ITS firms and potential ITS firms to develop a business plan. Firms can start by checking the key enabling technologies mapped to the higher priority user services in Appendix R. They can then identify local applications by reviewing the project profiles summarized in Section 5.1.3. If they wish to look to the U.S. in the short term, then Appendix T presents the U.S. program.

6.7 RECOMMENDATIONS

Public Sector

There are measures which the industry participants can undertake to help develop the ITS industrial base in Atlantic Canada: The federal and provincial and municipal governments should continue to promote ITS showcase projects in Atlantic Canada, and these initiatives should include an evaluation component. For example, any recommendations from the Atlantic Provinces Regional ITS Strategic Planning Study that promote ITS deployment in the region will also promote economic development in the region.

Governments should raise awareness and promote education in appropriate fields to engage latent capabilities of the region. This includes encouraging and funding showcase projects, liaison with clusters and IT associations, incorporation of ITS into the traditional transportation planning framework, and promoting ITS as a viable solution to transportation-related environmental, economical, and performance concerns.

The Transport Canada ITS research and development program should be active in its role to bring private sector and academic institutions together to develop ITS products, in the Atlantic context.

Industry Canada should develop a strong association with ITS Canada, and cooperate on initiatives such as international trade missions.

The federal and provincial governments should undertake to increase the profile of ITS industry opportunities within existing infrastructure development programs.

The research intensive nature of the ITS industry and the small size of the ITS firms comprising the industry in Atlantic Canada suggests that public sponsored R&D incentive programs (e.g., enhanced R&D tax credits, etc.) should be considered by government as options for stimulating R&D investment and hence developing the ITS industry. Aside from encouraging more private sector R&D spending, government should facilitate increased R&D collaboration between industry and academia in an effort to optimize R&D investment.

In organizing and promoting ITS workshops and conferences, government departments and ITS organizations should work to ensure events are communicated to appropriate individuals involved in economic development as well as to those individual involved in the deployment aspect. This would involve communication among and between departments with transportation mandates and departments with economic development responsibilities, both at the federal and provincial levels.

Private Sector

ITS information sources are provided throughout the document. The existing ITS firms are presented as threats, but they could be converted to opportunities if appropriate partnerships are developed. Funding sources can be contacted prior to program announcements, in order to prepare submissions, or develop ideas for projects to be proposed to potential clients.

The firms should begin to track funding opportunities, with an initial focus on the Canadian market. They should pursue working relationships with established Canadian ITS firms. Through these working relationships, they should pursue Canadian projects to serve as showcase opportunities.

With respect to the U.S. market, they should seek working relationships with both the large ITS firms, and the regional civil engineering firms with ITS experience.

In the case of the large ITS firms, the focus should be on marketing unique ITS, or ITS-related products or services, that could be offered to clients as part of larger packages. Firms should concentrate on the niche areas as identified in Section 6.3.

In the case of regional civil engineering firms with ITS experience, the Atlantic Provinces firms can offer technical skills and products in niche areas, in exchange for the access to local markets offered by the regional civil engineering firms.

Academia

The academic institutions should explore the possibility of becoming a Centre of Excellence for ITS education and research. The University of Toronto has established an ITS testbed, however, the focus is more on urban applications. An Atlantic Region academic institution could instead focus on area strengths such as geomatics, and area needs, such as rural ITS applications. Given their current activity in ITS work, a potential lead potential candidate would be the University of New Brunswick.

The model for creating the Centre of Excellence should include partnerships with private sector firms. Private sector firms through cost contributions, can sponsor ITS research and development activities. These activities in turn provide students with the training to supply the private sector firms with the necessary skilled labour.

Academic institutions should provide programs which reinforce the skill sets required by the ITS industry including transportation/traffic engineering, traffic operations, logistics, information technology, software development, telecommunications, and system integration.

Collaborative Effort

Many of the actions as noted above emphasize the need for industry sectors to work together. Collaborative initiatives which engage the public, private and institutional/academic sectors play an important role in accessing new markets. Existing entities such as ITS Canada, and various regional clusters, IT associations, etc. should help to reinforce the opportunities as set forth in this analysis through outreach to the stakeholder community. A specific opportunity is the ITS Canada Annual General Meeting planned for Fredericton in April 2003. All parties are encouraged to learn more about ITS Canada and consider the benefits of membership. Ongoing collaborative efforts should be directed through the efforts of the ITS Roundtable, and provide a continued forum for information exchange using tools such as the current *www.itsatlantic.com* web portal.

6.8 REFERENCES

[1]. Zinck, M. "Intelligent Transportation Systems: Economic Implications for Atlantic Canada." Internal report prepared for Atlantic Canada Opportunities Agency. Moncton. NB. 2000.

[2]. "Rural ITS Toolbox". U.S. DOT's rural ITS support contractors – Science Application Corporation, Castle Rock Consultants, Transcore and the Western Transportation Institute. January 2002.

[3]. "Report on Advancing Economic Cooperation in Atlantic Canada". Prepared for the Atlantic Provinces Economic Council.

[4]. "Joint Canada-United States declaration on Smart Border Initiative". Media. December 12, 2001.

[5]. Zinck, M. "Intelligent Transportation Systems: Economic Implications for Atlantic Canada." Internal report prepared for Atlantic Canada Opportunities Agency. Moncton. NB. 2000.

[6]. Forest Integration Group Limited. "ITS University and Colleges Output Study". Report prepared for ITS Canada. August, 2000.

[7]. Zinck, M. "Intelligent Transportation Systems: Economic Implications for Atlantic Canada." Internal report prepared for Atlantic Canada Opportunities Agency. Moncton. NB. 2000.

[8]. Parvianinen, J., Ledoux, R., Carette, C. "National Inventory of IVHS Programs and Related Activities in Canada." Prepared for Transport Canada and Industry Canada. December 1994.

[9]. Johnson, W., Harmelink, M. "Intelligent Transportation Systems in Canada: Current Priorities and Future Directions." The Second World Congress on Intelligent Transport Systems. November 1995.

[10]. Robinson, J., Buckley, J. "Strategy for Developing an ITS Industrial Base in Canada." Prepared for Transport Canada and Industry Canada. December 1996.

[11]. Forest Integration Group Limited. "ITS University and Colleges Output Study". Report prepared for ITS Canada. August, 2000.

[12]. "Study on ITS Applications within the Canadian Trucking Industry." Prepared for Transport Canada by Sabounghi and Associates and Delcan Corporation. November 1999.

[13]. "E-Commerce and the Canadian Trucking Industry-Handbook." Prepared for Transport Canada, Industry Canada and the Canadian Trucking Alliance by IBI Group and Sabounghi & Associates. March 2001.

[14]. Zinck, M. "Intelligent Transportation Systems: Economic Implications for Atlantic Canada." Internal report prepared for Atlantic Canada Opportunities Agency. Moncton. NB. 2000.

[15]. "Report on Advancing Economic Cooperation in Atlantic Canada". Prepared for the Atlantic Provinces Economic Council. 1997.

[16]. "ITS National Investment and Market Analysis". Prepared for ITS America and U.S. Department of Transportation by Apogee Research Inc. and Wilbur Smith Associates. May, 1997.

[17]. Joint EIA/ITS America. "Forecasting the Market Potential of Intelligent Transportation Systems Into the 21st Century". Forecast Conference of Intelligent Transportation Systems Opportunities, Arlington, VA: Electronics Industry Association. 1997.

[18]. Apogee Research, Inc. and Wilbur Smith Associates. "ITS National Investment and Market Analysis". Prepared for ITS America and U.S. Department of Transportation. 1997.

[19]. Robinson, J., Buckley, J. "Strategy for Developing an ITS Industrial Base in Canada." Prepared for Transport Canada and Industry Canada. December 1996.

[20]. "An Intelligent Transportation Systems Plan for Canada: En Route to Intelligent Mobility." Prepared by Transport Canada. November 1999.

[21]. "ITS Architecture for Canada" Release 1.1. http://www.its-sti.gc.ca/. Prepared for Transport Canada. Visited June 2002.

[22]. Sprecher, M. H. "Transportation Takes the NEXTEA Plunge." Prepared for Government Technology magazine. May 1997.

[23]. "The National Intelligent Transportation Systems Program Plan: A Ten-Year Vision." Prepared by ITS America. January 2002.

[24]. EUROPA Intelligent Transportation Systems website. http://europa.eu.int/comm/transport/themes/network/english/its/html/its_activities.html/. Visited June 2002.

7. NEXT STEPS

The Strategic Planning process has been critical in terms of engaging stakeholders, rationalizing needs, and developing strategic action items for advancing the applicable ITS solutions. It should be emphasized that the plan extends beyond the strategic perspectives and identifies specific action items and a series of projects. This underscores the need to set in place and maintain a regional program to oversee the follow on activities. It is recommended that, under the direction of the Council of Atlantic Premiers, the project Steering Committee Group remain in tact beyond the course of the project to fulfil a number of functions including:

- Ongoing engagement of the stakeholder community through the ITSAtlantic.com portal and various meeting forums in an effort to oversee the enactment of strategic action items to address institutional considerations;

- Provide oversight and coordination in the definition and undertaking of projects contributing to the deployment plan;

- Provide an ongoing monitoring role to track progress against the plan.

It is important that the ITS community in the Atlantic Region maintain this common point of reference, and common representation to other industry participants such as Transport Canada and the I-95 Corridor Coalition.

In conclusion, the plan has taken the initial steps in terms of engaging the stakeholders and undertaking analysis; the emphasis is on continued involvement and actions among the stakeholders at the strategic and deployment level, under the stewardship of the Steering Committee.