ATLANTIC

A Thematic Long-term Approach to Networking for the Telematics and ITS Community

A Partnership of ITS Communities in Europe and North America

FINAL REPORT

Phase 3

CANADIAN ATLANTIC NETWORK

A Partnership of ITS Stakeholders in Canada

Prepared by the Core Team

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In collaboration with Participating Partners and Sponsors

May 2004

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PREFACE

ATLANTIC (A Thematic Long-term Approach to Networking for the Telematics and ITS Community) is an international cooperative undertaking that aims to foster information exchange and policy debate related to the application and development of intelligent transport systems (ITS). ATLANTIC originated as a project sponsored by the European Union under the 5th Research Framework with self-sustaining partners in Canada and the United States.

ATLANTIC is organized into 8 work groups focused on different topics related to telematics and ITS. Each work group completed a discussion paper on their assigned topic under the direction of a Work Group leader and rapporteur with inputs from student assistants and members of the ATLANTIC network. The discussion papers are intended to focus attention on the state of the practise and state of the art of ITS in Canada as input to debate on the priority research and development needs for ITS in Canadian universities and research organizations.

This document is the final report of the Canadian ATLANTIC Network Project for the period from January 2003 to May 2004. It summarizes the accomplishments and the conclusions reached by the ATLANTIC Canada network in the sponsored Phase 3 of network operations.

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ACKNOWLEDGEMENTS

The ATLANTIC Canada network acknowledges the leadership and contributions provided by its partners in Europe and the United States. The principal partners include Dr. John Miles (United Kingdom), Steve Morello (France), Ian Catling (United Kingdom), Richard Harris (United Kingdom), Isabelle Dussutour (POLIS), Siegried Rupprecht (Germany), Professor Chelsea White (USA) and Professor Kan Chen (USA).

The ATLANTIC Canada network acknowledges the sponsorship provided by Transport Canada, Ministry of Transportation Ontario and Ministère des Transports du Québec. The encouragement and support of the sponsors greatly contributed to the success of the ATLANTIC Canada network. (See The Sponsors for a list of contact persons in each of the sponsor organizations.)

The ATLANTIC Canada network acknowledges the key roles played by the ITS professionals who acted as the leaders and rapporteurs of the 8 work groups in Canada. They provided the intellectual and writing skills to assemble and document the ATLANTIC Canada discussion papers. They also assisted greatly to grow the ATLANTIC Canada network by identifying and contacting potential members and securing their participation in the network activities. The ATLANTIC Canada network is grateful to the leaders and rapporteurs for their commitment to the network and perseverance in the face of difficulties that ensured the success of ATLANTIC in Canada. (See The Work Groups for the names and affiliations of the work group leaders and rapporteurs.)

The ATLANTIC Canada network acknowledges the roles played by the two lead universities, the University of Toronto, ITS Centre and Testbed, and the Université de Montréal, Centre de recherche sur les transports, who organized and managed the network project. The staff of the two centres, in particular Rosa Leo at the ITS Centre and Testbed and Josée Vignola and Moïra Warner at the Centre de recherche sur les transports, played vital roles in the administration and conduct of the network project. (See The Core Team for contacts at the two lead university centres plus the coordinator.)

Finally, the ATLANTIC Canada network acknowledges with gratitude the many work group volunteer members who contributed their knowledge and expertise to the discussion papers and to energizing the activities of the work group forums. (See Appendix B for a list of all the ATLANTIC Canada network members.)

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THE SPONSORS

Transport Canada, Ministry of Transportation Ontario and Ministère des Transports du Québec provided sponsorship and technical support for the ATLANTIC Canada network Phase 3. The contact persons assigned by the sponsoring ministries to participate on the ATLANTIC Canada Steering Committee were the following:

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THE WORK GROUPS

The Work Groups are the operational units of the ATLANTIC Canada network. A leader, who in most cases comes from the academic sector, and a rapporteur, who in most cases comes from the private sector, lead each work group. This division of labour was adopted to give the work groups a balance of theoretical and real-world perspectives. The topics for the 8 work groups were chosen to correspond to those set by the European partners. This was done because the topics corresponded reasonably well to the Canadian ITS architecture categories and it facilitated international comparisons with work done by the partners in Europe (and the U.S.). The Work Group topics and the leaders and rapporteurs (first and second name respectively) together with their affiliations are as follows:

- Work Group 1.1 – Traffic and Travel Information Systems
  Ata Khan Ph.D., Professor, **Carleton University**, Ottawa
  Paul Frigon, President, **PSR Group Ltd.**, Ottawa
- Work Group 1.2 – Network Monitoring and Traffic Management & Control
  Baher Adbulhai Ph.D., Associate Professor, **University of Toronto**
  Lina Kattan, Ph.D. Candidate, University of Toronto
- Work Group 1.3 – Urban Public Transit ITS Research & Development in Canada
  Amer Shalaby Ph.D., Assistant Professor, University of Toronto
  Brendon Hemily Ph.D., **Hemily and Associates**, Toronto
- Work Group 2.1 – Intermodal Freight, Pre-clearance and Logistics
  Teodor Crainic Ph.D., Professor, **UQAM** & Director, ITS Lab, **Université de Montréal**
  Lewis Sabounghi Ph.D., Principal, **Sabounghi and Associates**, Bainsville (Ontario)
- Work Group 2.2 – Intelligent Vehicle & Intelligent Vehicle-Highway Systems
  Denis Gingras Ph.D., **Université de Sherbrooke** (Québec)
  William Johnson Sc.D., **Consultant**, Ottawa
- Work Group 2.3 – Electronic Road User Charging Systems and Smart Cards
  Muhammad Mustafa Ph.D**., IBI Group**, Toronto
  Baher Adbulhai Ph.D., Associate Professor, University of Toronto
- Work Group 3.1 – User Acceptance and Impact Assessment
  Issam Kayssi Ph.D., Associate Professor, University of Toronto
  William Johnson Sc.D., Consultant, Ottawa
- Work Group 3.2 – Human Machine Interface & User Friendly ITS: Human Factors
  Jeff Caird Ph.D., Associate Professor, **University of Calgary**
  Ling Suen, Director of Planning, **ICSA Inc.**, St. Lambert (Quebec)

There are 6 universities and 6 private sector firms represented among the Canadian work group leaders and rapporteurs (names highlighted in bold on first mention above).

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THE CORE TEAM

The University of Toronto, ITS Centre and Testbed, and the Université de Montréal, Centre de recherché sur les transports, jointly manage the ATLANTIC Canada network. The Core Team who provide the overall leadership and guidance for ATLANTIC Canada includes Professor Baher Abdulhai (University of Toronto), Professor Teodor Gabriel Crainic (Université du Québec à Montréal and Université de Montréal) and Dr. William Johnson (Consultant, Ottawa), the Canadian Coordinator for ATLANTIC.

For further information, contact a member of the Core Team as follows:

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INTRODUCTION

ATLANTIC is an acronym for A Thematic Long-term Approach to Networking for the Telematics and ITS Community. It is a cooperative undertaking with partners in Europe, the United States and Canada under the auspices of the Science and Technology Agreements between these national entities. The network project began as a funded initiative under the European Commission's 5th Research Framework with self-funded partners in North America. It began operations in Europe in May 2001 and active Canadian participation began in July 2001.

The Canadian ATLANTIC Project has sought to link the ITS research and development (R&D) experts in Canada in a cooperative network to build and expand the national ITS knowledge base and the capacity for innovative research and development. The participants in the ATLANTIC Canada network have included academics, public sector policy makers and private sector professionals. These participants contributed to the work of the network through one or more of the 8 Work Groups organized by the project (see the Acknowledgements section for a list of Work Group topics and leaders).

This is the final report of Phase 3 of the ATLANTIC Canada network project. Phase 1 covered the initial collaborative work with international partners and Phase 2 covered collaboration with Transport Canada to establish the sponsorship partnership that made the fully funded Phase 3 possible. This report summarizes the accomplishments of the ATLANTIC Canada network and the conclusions reached in Phase 3. The reader can find the full details of the networking results in the discussion papers produced by the 8 Work Groups. These are posted on the ATLANTIC Canada website as full discussion papers and as abbreviated synopsis papers (the synopsis papers are available in English and French). The ATLANTIC Canada website address is www.crt.umontreal.ca/atlantic/.

BACKGROUND

a) European Initiative

The European Commission as part of its Fifth Framework for Research and Development initiated a call for proposals for thematic networks related to transport topics in 2000. A condition of the competition was that the European consortia that submitted proposals were required to find partners in North America to participate in their networks. This trans-Atlantic cooperation was instituted under the terms of the Science and Technology Cooperation Agreements between the European Union and Canada and the United States. Under the terms of these agreements, each national participant had to be self-financed.

The ATLANTIC Thematic Network emerged as a proposal from a consortium of European partners to fund a thematic network for telematics and intelligent transport systems (ITS). They entitled their proposal ATLANTIC - A Thematic Long-term Approach to Networking for the Telematics and ITS Community. The consortium invited partners in Canada and the United States to join the thematic network as self-supporting participants with their own focal points (or nodes). Two Canadian university centres, the University of Toronto ITS Centre and Testbed, and Université de Montréal Centre de recherche sur les transports, accepted the challenge to establish a joint Canadian node and to organize a national network of researchers.

In the U.S., the ATLANTIC partners were based at the University of Michigan (subsequently, one partner relocated to the Georgia Institute of Technology).

The European Commission under Directorate General 13, the Information Society Technologies Programme (IST), agreed to fund the European partners beginning in May 2001. The Canadian partners were then empowered to firm up their plans and to seek funding support for their participation in the ATLANTIC thematic network.

b) Canadian Response

The Canadian participation in ATLANTIC has proceeded in three phases:

- Phase 1 - Preliminary discussions with European and U.S. partners between September and December 2000 led to agreement in principle to participate in ATLANTIC which was confirmed in letters of intent from the Canadian partners to the European partners and from Transport Canada to the European Commission.
- Phase 2 - A Canadian ATLANTIC project proposal and action plan was developed as the basis for a formal approach to potential funding partners and research participants soliciting their support and participation. This activity, begun in July 2001 with seed funding support from Transport Canada for out-of-pocket expenses, resulted in a full proposal and work plan for a Canadian ATLANTIC project dated August 2001. Transport Canada offered to match funding support from other sponsors of the project in the next phase.
- Phase 3 - Implementation of the ATLANTIC Canada project began in January 2003 when funding commitments were confirmed from three sponsors: Ministry of Transportation of Ontario, Ministère des Transports du Québec and Transport Canada.

The overall goal of Phase 3 of the ATLANTIC Canada network project was to foster a cooperative environment for the establishment and growth of university-based ITS research and development activities in Canada.

c) International Partners

The ATLANIC Canada network was conceived as an integral part of the international ATLANTIC network (see www.atlan-tic.net). An essential undertaking of the ATLANTIC Canada organizers was to coordinate their activities with those of the international partners.

The international partners include participants from the following organizations (note that Canadian partners are listed in Acknowledgements and in Annex A).

Europe (Partners):

ARTTIC (Brussels); Ankerbold International Ltd (UK); Ian Catling Consultancy (UK); ISIS (France); POLIS Cities and Regions Network (pan-European); Rupprecht Consult (Germany).

Europe (Other participants):

Aspen Enterprises (UK); Austin Analytics (UK); Babtie (Prague); Carte Blanche (France); City of Rome (Italy); City of Rotterdam (Netherlands); City of Cologne (Germany); National Assembly for Wales (UK); Paris Metropolitan Region Public Transport Authority (STP); Transver (Germany); Stuttgart Public Transit Authority (Germany); TRL (UK); UITP

European (Brussels); University of Athens (Greece); University of Southampton (UK).

USA (Partners):

University of Michigan; Georgia Institute of Technology.

USA (Other participants):

Bishop and Associates; PBS&J Inc.; (others).

ATLANTIC NETWORK IN CANADA

a) Organization

A Core Team (or Project Management Committee) consists of two technical managers, one from each of the two lead universities, and one coordinator, a consultant from the private sector. The role of the Core Team is to organize and provide overall leadership for the various project activities and follow up with progress reports and website postings (in both official languages of Canada). The Core Team conducted its business via e-mail and met occasionally when required as the Project Management Committee or PMC.

The project Steering Committee consisted of the Core Team members and representatives of each of the three sponsors. The role of the Steering Committee was to monitor the progress of the project and to provide feedback on work activities and project results. The Steering Committee met 3 times on March 17, 2003, October 24, 2003 and May 27, 2004.

The Work Groups consist of a leader (usually an academic), a rapporteur (usually a professional from the private sector) and the interested ITS professionals from the full list of all ATLANTIC Canada participants.

b) Work Groups

The ATLANTIC Canada network in Phase 3 used 8 work groups to develop ITS discussion papers. The topics were the same as those used by the European partners in order to facilitate international benchmarking. There were 8 topics clustered in 3 categories as follows:

- Integrated Transport (3 Work Groups):
  - Telematics-based Traffic and Travel Information Services
  - Network Monitoring and Traffic Management and Control
  - Intermodal Collective Transport Information
- Technologies and Services (3 Work Groups):
  - Intermodal Freight Information, Pre-clearance & Logistics (logistic chains)
  - Intelligent Vehicles and Intelligent Vehicle Highway Systems
  - Electronic Road User Charging and Integration with Other Payment Systems
- Assessment and Evaluation of ITS (2 Work Groups):
  - ITS User Acceptance and Impact Assessment
  - Human Machine Interface/User Friendly ITS

The work group leaders and rapporteurs are listed under "The Work Groups" at the beginning of this report.

c) Work Program

The funded Phase 3 of the ATLANTIC Canada network project undertook to deliver the following work items at the request of the sponsors (reference Annex A of Transport Canada contribution agreement with University of Toronto):

- Finalized work plans
- Press release to announce ATLANTIC
- Website for ATLANTIC Canada project
- Quarterly progress reports
- Discussion papers on 8 selected ITS and telematics topics for wide dissemination
- Final report on ITS research and development in Canada
- Canadian ITS workshop
- Report on ITS training in ATLANTIC for undergraduate and graduate students
- Plans for follow up ITS research and development proposals to funding agencies.

The Ministry of Transportation Ontario requested the following additional deliverable (reference minutes of meetings with Ministry officials):

- Identify items of "take-away value" to ITS stakeholders.

The accomplishments of ATLANTIC Canada Phase 3 in terms of these deliverables are summarized in this report.

d) Project Milestones

A summary of the ATLANTIC Canada project activities and milestones with dates when the milestone were accomplished is given in Appendix A.

e) Information Dissemination

Information about the ATLANTIC Canada network project was reported regularly in quarterly progress reports, in website postings of news-worthy events (e.g. workshop, presentations at conferences), newsletter articles (e.g. ITS Canada) and in the circulation of the draft discussion papers to work group members, including both Canadian and international partners. The final discussion papers, as well as their French and English synopsis reports, will be disseminated to the network participants as well as at large, as publications of the Centre de recherche sur les transports.

NETWORK ACCOMPLISHMENTS

a) Network

The ATLANTIC Canada network has focussed its attention on the academic community and this community's links to the public and private sectors with respect to ITS research and development. It has succeeded in attracting academic participants from 8 universities across

Canada. These participants represent ITS centres of research as well as including individual professors. All are well known in their respective fields and were significant contributors to the overall project objectives. These key players engaged the assistance of 6 students to prepare inputs to the discussion papers and participate in the workshop events.

The ATLANTIC Canada network also attracted another 70 professionals who share an interest in ITS and who contributed their knowledge and advice to enhance the value of the final discussion papers. The challenge is to continue to hold the interest of the participants in any future format of the ATLANTIC network.

A consolidated list of the ATLANTIC Canada network participants is given in Appendix B.

b) Discussion Papers

The discussion papers are major deliverables and output results of the ATLANTIC Canada network project. Discussion papers on 8 ITS thematic topics were completed (2 papers were produced under one topic) and all have been posted on the ATLANTIC Canada website. A synopsis version of each discussion paper is also posted on the website and these are in both English and French (see next section for URL address of the website).

The titles of the discussion papers and brief summaries of the conclusions and recommendations appear in the section "ITS R&D Priorities for Canada".

c) Website

A website for the ATLANTIC Canada network was established at the Université de Montréal, Centre de recherche sur les transports as a focal point for the Canadian ATLANTIC network. Its purpose is to disseminate general information about the ATLANTIC Canada network and specific information about project results. The website format is in both English and French. The documents posted are generally in the language in which they were prepared (the full discussion papers are all in English). However, the synopses of the discussion papers are posted in both English and French.

The URL address of the ATLANTIC Canada website is www.crt.umontreal.ca/atlantic/ .

d) Workshop

The ATLANTIC Canada network organized and hosted an ITS Workshop on October 24, 2003 at the Delta Hotel and Suites in Ottawa, Ontario. This fulfilled the project deliverable to convene a workshop to present and discuss the interim results of the Work Group research activities. There were 44 attendees. Kristine Burr, Assistant Deputy Minister, Policy, Transport Canada, opened the workshop. There were presentations by each of the Work Groups and a panel discussion on future networking. The outcome was a success in terms of providing useful feedback from network participants on the draft discussion papers and of promoting discussion on future networking options among participants. The workshop outcome including the presentations is posted on the ATLANTIC Canada website.

e) Students

An objective of the ATLANTIC Canada network project was to involve students in the activities of the network. In this regard, the project was very successful in attracting highly motivated and qualified students. The students who contributed to the discussion papers were doctoral candidates. One student was the winner of the first ITS Canada Michel Van Aerde Scholarship in 2002. Another student (conference exhibit participant) was the winner of the ITS America award for the best student paper in 2003. The student members of the network are included in the list of all network members that appears in Appendix B.

The experience gained with students was very positive for the project. Much was learned on how to attract and employ students in the work of the network. The input expected from students is different from the input expected from seasoned ITS professionals. However, much insight has been acquired on how to involve students in a thematic network and this will be used in a future version of the network.

f) National & International Cooperation

The ATLANTIC Canada network node has been very active in participating in ATLANTIC international events. The international partners cooperated to present coordinated presentations at the ITS World Congresses in Sydney, Australia, Chicago, Illinois and Madrid, Spain (see www.atlan-tic.net for details). Core Team members were participants in workshops organized by ATLANTIC partners in Brussels in September 2001, Washington D.C. in January 2002, Birmingham U.K. in April 2003.

The U.S. partners have established a successor organization to the ATLANTIC U.S. network project. Established formally within ITS America by the Board of Directors, the Special Interest Group for International Research and Learning (or "SIGIRL" for short) is a spin-off of ATLANTIC and responds to the U.S. partners wish to "institutionalize" ATLANTIC for a long-term future. SIGIRL is open to members from any country and membership of ITS America is not a pre-requisite. ATLANTIC Canada members can join SIGIRL and participate in its activities and many have done so.

A key continuing activity of SIGIRL is to conduct "Orange Book" exercises to focus attention on high priority topics of wide interest in the ITS community. One of the first topics to be examined was "predicting travel time in road networks". The ATLANTIC Canada Work Group 1.1 (Traffic and Travel) was invited by SIGIRL to host a workshop for this Orange Book exercise. This took place at Carleton University in Ottawa, Ontario in July 2003. The outcome of the workshop was to benchmark and assess the knowledge base and state of the art for the topic "predicting travel time in road networks". ITS America and the supporting members of SIGIRL plan to release the results of the workshop at the ITS America Annual Meeting 2004.

Members of the ATLANTIC Canada network have participated in a number of international cooperative networks as a result of being introduced through ATLANTIC. For example, the International Benefit Evaluation and Cost committee (IBEC) is dedicated to develop and disseminate knowledge of best practises in the field of ITS benefit assessment. This international effort highlights the importance of this type of knowledge for developing policy and making investment decisions related to ITS.

Members have also participated in and contributed to the STELLA thematic network for transport-related issues. STELLA is a thematic network similar to ATLANTIC whose focus is the broad reach of transport issues that affect social and economic progress. STELLA is a funded by the European Commission in Europe and by the National Science Foundation in the United States. Note that some STELLA workshop activity has been organized in Canada by interested academics and others as a local endeavour.

The most successful example of national cooperation has been the interaction with members of the AUTO21 Network of Centres of Excellence. This network is funded by the federal Granting Councils and represents a significant commitment of talent and resources over the next 14 years linked to the needs of the automotive industry in Canada. The ATLANTIC Canada Work Group 2.2 fits especially well with Theme F "Intelligent Vehicles and Vehicle-Highway Systems". The Auto21 coordinator for Theme F has agreed to be the leader of the ATLANTIC Canada Work Group 2.2 "Intelligent Vehicles and Vehicle-highway Systems", thus establishing a strong link between the 2 networks.

Nationally, a strong interest has emerged in the potential to create "centres of excellence" for ITS research and education and to extend this to a network of such centres in Canada. The ATLANTIC Canada network has provided a forum to promote these ideas and to debate the form they might take with input from experts and policy participants.

The interaction and networking among ATLANTIC Canada participants has resulted in one specific example of a consortium forming to seek funding for a cooperative ITS R&D project. This project, co-led by the University of Calgary's Cognitive Ergonomics Research Laboratory and Carleton University's Transportation Research Centre, was successful in its bid for project funding from the AUTO21 Network of Centres of Excellence. Many other consortia have formed partly as a result of initial discussions fostered by ATLANTIC Canada but details were not available in time for this report.

STAKEHOLDER VALUE

The ATLANTIC Canada network project provides a variety of products and services that will be useful and valuable to ITS stakeholders. It is expected that each group of stakeholders will find value in different network outcomes. While it is not possible to meet all expectations, the ATLANTIC Canada network project has tried to produce outcomes of particular value to its participants and to its sponsors. This is a necessary condition for securing participation and sponsorship in the first place. It is also essential for retaining interest and participation in future networking activities. Therefore, it is useful to review the network outcomes in light of real stakeholder expectations to ensure that value is being generated by the network activities and deliverables.

a) Stakeholder Expectations

At a high level, the stakeholder groups and their expectations are as follows:

- Academic participants are seeking:
  - leverage to obtain R&D funds for ITS
  - partnering opportunities for R&D proposals

- potential technology transfer opportunities
- training opportunities for students.

- Public sector sponsors are seeking "take-away value" in the form of:
  - documentation of the state of practice and the state of art of ITS in Canada
  - steps toward ITS Centres of Excellence across Canada
  - identifying leading edge innovations that deserve adoption in Canada.
- Private sector participants are seeking:
  - pre-competitive knowledge of next-generation ITS innovations
  - insight into future trends in ITS policies and socio-economic directions
  - access to opportunities for R&D partnering and technology transfer.

b) Take-away Value Examples

The discussion papers prepared by the ATLANTIC Canada work groups contain a great deal of technical information about the state-of-practice and the state-of-art of ITS in Canada (i.e. corresponds in particular to Public Sector Sponsor "Take-away Value"). This includes benchmarking of ITS for traffic information, traffic monitoring/management/control, public transit, freight operations, electronic road charging and benefit evaluation and cost. More specialized knowledge of ITS R&D related to vehicle systems and ITS assessment criteria for human factors has also been compiled. These are major contributions to the current state of ITS knowledge in Canada and are valuable tools for policy makers to assess and understand the relative strengths and weaknesses of ITS deployment and ITS R&D capabilities across the country. This information, of course, is time sensitive and, while it provides a snap shot of conditions in 2003-2004, it will need to be updated periodically to retain its relevance and accuracy. For this reason, the discussion papers should be revisited and updated from time to time in the future.

At the level of specific leading edge ITS innovations, the following examples illustrate the value-added information that the ATLANTIC Canada network has identified from its review of current ITS best practice in Europe, the U.S. and Canada. It is recognized that with the broad scope and very small scale of the ATLANTIC Canada network project it is not feasible to explore every opportunity in depth or detail. The objective here is to highlight a number of major opportunities that the ATLANTIC Canada network has identified that have potential value to sponsors and that warrant further, in-depth study. As such, the following examples illustrate specific items of stakeholder "take away value" and indicate how the ATLANTIC Canada network project has identified some practical results for sponsors and other stakeholders. Each example is described briefly including potential benefits and a reference is provided to obtain further information.

- U.K. Traffic Information Centre – this concept of one centre for the entire English highway network makes one contracted consortium responsible for collecting, analyzing and disseminating traffic information to travelers, thus relieving the Highway Authority of responsibility for the technical and marketing aspects of ITS traffic and travel information. This provides an interesting approach that Canadian road transportation authorities may wish to explore for their jurisdiction. The European ATLANTIC partners have presented excellent papers on this subject that are invaluable as no-cost introductions to the U.K. TIC concept.

Reference: Traffic Control Centres & its applicability to Atlantic, Presentation by David Kamnitzer (IBI Group), ATLANTIC Workshop, Washington D.C. January 2002, (posted on www.atlan-tic.net).

- European Travel and Traffic Information Services – the ATLANTIC European partners have completed an extensive assessment of travel and traffic information services (TTIS) across Europe and, to a lesser extent, reported on comparisons with North America. These services are documented in workshop presentations, working papers and final reports. They include an overview of TTIS principles and planning approaches, country profiles, background assessment for Transport Direct (U.K.) and a comparative analysis of European and North American practice. Canadian researchers and policy makers will find this knowledge base useful background information for Canadian efforts to develop a broad travel and traffic information strategy. In particular, the document "TTI Benchmarking" at the TTI Forum at the POLIS Annual Conference in November 2002 contains an overview of benchmarking of TTIS in Europe including both theory and practice.
  Reference: TTI Services Forum, ATLANTIC Website, (posted on www.atlan-tic.net).
- Traffic Signal Preemption – is now a proven technique with a track record of successful application in Toronto and other major cities with significant demonstrated benefits in terms of reduced transit vehicle (bus and streetcar) travel time and vehicle fleet size. It is now a prime candidate for widespread adoption by Canadian transit operators. The techniques now used in practice are still mainly first-generation methodologies and there is potential to improve operations still further by using second and third-generation algorithms. Canadian universities have contributed significantly to the knowledge base on which this ITS application is based and are able, with appropriate support, to continue to develop the algorithms for Canadian conditions.
  Reference: Discussion Paper by Work Group 1.3 Urban Public Transit ITS R&D in Canada, Prepared by Prof. Amer Shalaby (U of Toronto) and Brendon Hemily (Hemily & Associates), March 2004, (posted on www.crt.umontreal.ca/atlantic/).
- City freight transport logistics – is emerging as a significant area of new study in response to the need to reduce urban air pollution and to improve the economics of goods movement in urban areas. The European knowledge base in this area is rapidly developing based on in-depth studies and experience with innovative solutions while the Canadian knowledge base in this field is very limited. This represents a fertile opportunity for Canada to acquire tangible benefits quickly by learning from European experience and exploring the applicability of new concepts in Canadian conditions in university-based research centers.
  Reference: Discussion Paper by Work Group 2.1 Intermodal Freight, Pre-clearance & Logistics - Freight ITS, Prepared by Prof. Teodor Gabriel Crainic (UQAM & CRT, U de Montréal), March 2004, (posted on www.crt.umontreal.ca/atlantic/).
- Tracking dangerous goods movements – is an issue for urban transportation in particular because of the consequences of accidents involving dangerous goods moving through densely populated urban areas. A recent Canadian-led development is an ISO standard for the data and message sets for tracking and monitoring dangerous goods using modern electronic communication equipment. This draft standard will be balloted in late 2004 and will be available for field-testing and deployment in 2005, presenting opportunities for Canadian private and public agencies in which to participate and play lead roles.

Reference: Discussion Paper by Work Group 2.1 Intermodal Freight E-data Issues – Standards and related efforts, Prepared by Dr. Lewis Sabounghi (Sabounghi & Associates), March 2004, (posted on www.crt.umontreal.ca/atlantic/).

- User Acceptance Studies and Benefit Evaluation Studies – the experience and depth of knowledge related to these types of studies is very extensive in Europe and the U.S. Their experience in this area is extensive, especially that of the U.S. where a database of ITS benefit evaluation studies has been assembled and put on a website by the U.S. Department of Transportation for easy access by all users. Canadian stakeholders would benefit if a similar database were established based on Canadian examples and experience. While the U.S. database is relevant to Canadian conditions, there are differences in detail that would justify having a parallel Canadian database to document and archive Canadian ITS benefit evaluation experience and knowledge. This should be done in close collaboration with European and U.S. partners, possibly coordinated through the International Benefit Evaluation and Costs (IBEC) cooperative work group. Complementing such a static database, there should also be an on-going national program of benefit evaluation studies in order to add new case studies to the database and to develop new methodologies suited to Canadian conditions. This could be an activity for a future ATLANTIC Canada network to undertake using its university-based resources.
  Reference: Discussion Paper for Work Group 3.1 User Acceptance and Impact Assessment – ITS Benefit Evaluation & Cost State of the Art & Practice in Canada, Prepared by Prof. Issam Kaysi (U of Toronto), March 2004. (posted on www.crt.umontreal.ca/atlantic/).

There are other examples of leading edge ITS innovations in the ATLANTIC Canada discussion papers. It is recommended that the sponsoring agencies review the discussion papers in collaboration with the ATLANTIC Canada Work Group leaders and rapporteurs to identify similar examples of opportunities for further investigation.

ITS R&D PRIORITIES FOR CANADA

This section summarizes the conclusions and recommendations of each of the Work Groups as recorded in the discussion papers (for the complete ATLANTIC Canada discussion papers, see the section References).

a) WG 1.1 Traffic and Travel Information Systems

The Work Group 1.1 has prepared an extensive overview of traffic and travel information services (TTIS) across Canada including the ITS elements that provide input data for TTIS. Canada has a good base of ITS implementations in the TTIS service areas. As a result of strategic plans developed by governments at all levels and by the private sector, priorities are being defined for further applications.

Most Canadian TTIS services are driven by the public road sector. However, private initiatives can be found in large urban areas.

In a number of ITS initiatives reviewed, some TTIS services are logically interconnected with other ITS systems.

Canadian applications of TTIS are shaped by the socio-economic, demographic, and environmental characteristics of Canada. However, there are similarities with ATLANTIC partners in terms of existing practices.

A number of research areas have been defined in the discussion paper, covering all facets of TTIS. As in the case of existing practice, these reflect Canadian needs. Also, there is much common ground with other ATLANTIC partners. The research areas are:

- Develop dynamic real-time TTIS (e.g for road construction zones)
- Dial-in 3-digit telephone number for traffic and travel information (e.g. "511" service in the USA)
- Assess role and effectiveness of highway advisory radio (HAR)
- Assess requirements for different market segments (e.g. requirements for pre-trip and during-trip information)
- Utility to travellers and other users of TTIS-generated information and acceptable levels of reliable forecasting
- InfoStructure – assess the density of data collection networks for effective functioning of such a system in Canadian conditions
- Develop business models and ad-hoc broker models for TTIS services and assess factors that affect the formation and success of a TTIS business.

On the basis of the above noted conclusions and research opportunities, the following recommendations are made:

(1) Research is recommended to overcome information gaps in order that road transport systems in Canada can fully capture the benefits that ITS and related information technologies can provide.

(2) Further integration of TTIS with other ITS elements is highly desirable for enhancing user and broader societal benefits.

(3) Given that in Canada there is much research interest as well as expertise in the TTIS areas and that, other than financial constraints, there are no inherent hurdles to developing and adopting these innovations, it is in the best interest of all stakeholders if research in TTIS services is enhanced.

(4) Since financing of R&D in TTIS is a substantial hurdle in the current financial environment, characterized by reduced availability of venture capital and reduced government budgets, special efforts should be made by the private as well as the public sector to address this issue.

b) WG 1.2 Network Monitoring and Traffic Management & Control

The Work Group 1.2 has prepared an in-depth overview of road network monitoring and traffic management and control in jurisdictions across Canada. The discussion paper has concluded that Canada has good strengths in ITS as confirmed by the various applications mentioned in the discussion paper. These include Network Monitoring, Detection and Diagnosis, Weather and Environment Monitoring and Traffic Control and Management.

These systems are being used to enhance road user convenience, efficiency and safety on urban and rural roads in the Canadian provinces.

However, there are still significant practices and research and development needs to meet the growing demands of travellers and the economy in Canada. These can be summarized as follows:

On the state-of-the-practice side:

- In the area of Network Monitoring, ITS in Canada would benefit from the use of Probe Vehicles as used in the U.S.
- In the area of advanced Traffic Control and Management systems, Canada needs more intensive application of Ramp Metering to manage more efficiently its freeway systems. In addition, Canada should further explore the possibility of integrating freeway and surface street control (i.e. integrated corridor control). Canada can also benefit from the European experience in the area of congestion pricing as well as parking guidance to alleviate the congestion in its major city centres. This is not to advocate congestion pricing although it merits further investigation.

On the state-of-the-art side:

- The Canadian research in the area of transportation management needs to expand its involvement in the area of Dynamic Traffic Assignment. This research effort is, as illustrated in the Work Group 1.2 discussion paper, is relatively under-explored in Canadian universities and research centers as compared to U.S. and especially Europe. Addressing this research topic is becoming increasingly urgent as ITS gains market penetration in Canada.

Apart from the ATLANTIC partners, it is important to note that ITS in Canada can also benefit tremendously from the Japanese ITS experience specially in the areas of in-vehicle navigation systems, parking guidance, as well as pedestrian support systems. It is notable that the use of route guidance in Japan is years ahead of the rest of the world.

c) WG 1.3 Urban Public Transit ITS R&D

The Work Group 1.3 discussion paper provides an overview of transit ITS and transit research and development in Canada and identifies R&D needs for several transit ITS areas. The paper focuses on two key areas, namely, TSP (Transit Signal Priority) and Intelligent DRT (Demand Responsive Transit), and elaborates on their R&D needs[1].

On the research side, the paper shows that advanced research has been undertaken in Canada on various aspects of TSP. Examples include the development of advanced control algorithms (e.g. adaptive TSP) and models (e.g. prediction and performance models), the development of simulation tools for TSP evaluation (e.g. SimTransit) and the assessment of TSP systems. These research efforts are very important and vital to keep Canada on par with other countries in the area of TSP. In order to further the leading-edge TSP research already carried out and to improve the chances of deploying advanced TSP systems in Canada, a number of significant R&D needs have been identified. They fall into two categories:

[1] Another two significant areas of transit ITS are addressed by other workgroups of the ATLANTIC project, namely transit customer information systems (Workgroup 1.1) and smart card systems (Workgroup 2.3)

- Basic research to improve the algorithms used or develop new approaches to TSP, and
- Applied research to evaluate experience to date, assess issues, and encourage further deployment.

The first category includes the following topics:

(1) Designing TSP-Based Operational Control Strategies,
(2) Artificial Intelligence-Based TSP,
(3) Implications of Signal System Design and Traffic Parameters on TSP Request Activation Strategies,
(4) Integrated TSP With Traffic Adaptive Signal Control Systems, Involving Optimization-Based Priority,
(5) Corridor-Based TSP,
(6) Technical Options for Conditional Priority,
(7) Development of Differential Priority Algorithms and Systems, and
(8) Hybrid Application of Unconditional/Conditional Control for TSP.

The second category includes the following topics:

(1) Development of an Analytic Framework for Selecting Corridors and Intersections for TSP Treatment,
(2) TSP and Transit Scheduling: Best Practices for Maximizing the Benefits of TSP under Different Conditions,
(3) TSP and Automatic Vehicle Location (AVL): Factors Affecting the Transit Agency's Technology Development Strategy, Technical and Management Implications, and Cost-Effectiveness Considerations,
(4) Integrating Physical and Signal Priority Measures for Transit: Inventory, Best Practices, and Issues,
(5) Traffic Controllers and TSP: Technical Requirements for Alternative TSP Strategies and Inventory of Traffic Controllers and Technical Characteristics,
(6) The Role of TSP in BRT System Design, and in BRT-Specific Planning Tools,
(7) Impact of Bus Operator Behavior on Transit Schedules Under TSP,
(8) Review of Major European TSP-Related Demonstration Programs, Identified Benefits, and Implications of Lessons Learned for Canadian Deployment of TSP.

Intelligent DRT (Demand Responsive Transit) is the second transit ITS area on which this paper focused. Canada is a world leader in Intelligent DRT software, providing two world-renowned system providers, namely Trapeze Inc. of Mississauga, Ontario and GIRO Inc. of Montreal, Quebec. Both provide software solutions for planning, scheduling and dispatching of DRT operations. Also, advanced research has been undertaken including the development of dynamic scheduling algorithms and models, the development of simulation tools for the evaluation of intelligent DRT (SimParatransit) and the planning/scheduling of advanced flex-route transit.

In order to maintain Canada's leading position in this ITS area, ten R&D needs have been identified. These include:

(1) Development of Dynamic Scheduling Algorithms for Intelligent DRT,
(2) Planning under Uncertainty and Real-time Information,
(3) Exploration of Distributed Computation Platform for Intelligent DRT,

(4) Development of Data Fusion and Estimation Algorithms,
(5) Development of Scheduling Algorithms for Integration of Fixed Route Transit and DRT,
(6) Planning and Scheduling of Advanced Flex-route Transit,
(7) Intelligent DRT: Inventory, Best Practices, and Issues,
(8) Development of Operations Manual for Intelligent DRT,
(9) Planning Tools for Intelligent DRT, and
(10) Review of International Programs on Intelligent DRT, Identified Benefits, and Implications of Lessons Learned for Canadian Deployment.

d) WG 2.1 Intermodal Freight, Pre-clearance & Logistics

The Work Group 2.1 discussion paper aims to assess ITS achievements with respect to the transportation of freight and to identify challenges, opportunities, and promising research and development directions. The situation in Canada is our primary concern. It is strongly believed, however, that it cannot be isolated from the main international developments.

Similar to many other ITS areas, Freight ITS development proceeds along three major, parallel but complementary, directions. The first concerns the development of vehicular and infrastructure elements. This topic is addressed by the ATLANTIC Work Group 2.2 *Intelligent Vehicles and Vehicle-Highway Systems*. Therefore, the discussion paper addressed the second and third directions only.

The second direction concerns the electronics **hardware** for location, tracking, and communication, as well as the associated information-technology **software**. The third targets the **methodologies** – models and algorithms – required to process the data and transform it into timely and meaningful information and intelligent advice for advanced system and fleet planning, management, operations, and control systems. The ultimate performance and long-term success of ITS applications depends on a balanced and harmonious integration of these two aspects.

Research and development efforts are currently under way in several areas. The methodological developments of recent years in the various fields of operations research, combined with recent advances in computer science, in particular in parallel and distributed computing, put the required models and methods within reach. More efforts are still needed, however, in particular relative to:

- Integration of various systems, including border and port security systems, ATMS, ATIS, CVO, and AFMS.
- Real-time allocation of resources and management of operations, including real-time fleet management and vehicle re-routing. The issues are different but equally challenging whether urban or interurban transportation is considered, or whether the real-time decisions depend on the congestion and demand conditions only, or must account for and coordinate with the decisions of other agents (e.g., Customs or port operations).
- Planning and management of integrated logistics networks (chains) and the links to ITS, AFMS (and real-time management) in particular.
- Trade-offs between accuracy of results and response time in real-time settings.

- Development of the next generation of planning models and methods for carrier or shipper operations that integrate the stochastic and dynamic aspects of ITS.
- Development of the next generation of urban/regional planning systems that reflect the utilization of CVO and AFMS technologies.
- Arbitration between central processing and the utilization of the computing power of on-board computers and the next generation of transponder devices.
- Particular attention should be paid to the long-term maintenance of deployed ITS infrastructure and data processing systems at all levels. Neglect would spell disaster for ITS.

Canada has the people and institutions to address the Freight ITS challenges and issues. The support and financing from government and industry sources is required to undertake this effort.

e) WG 2.2 Intelligent Vehicle and Intelligent Vehicle-Highway Systems

The Work Group 2.2 discussion paper was developed in collaboration with the principal researcher from the Auto21 Network. The Auto21 Network of Centres of Excellence is now the leading player in orchestrating and guiding advanced automotive research at Canadian universities in collaboration with industry and government. Most of the content of the discussion paper for this topic has emerged from the work of Auto21.

Several concepts are emerging to make automobiles smarter:

- Networked vehicles - involving both intra- and extra-vehicular communications; cars will be linked to infrastructures, service centres and among themselves
- Total awareness - various sensors are becoming available and more efficient radar, Infrared (IR) and intelligent vision systems will allow on-board computers to analyze in real-time the immediate vicinity of a vehicle and help to automate its behaviour in hazardous situations or warn the driver of immediate danger; this will lead to Automated Driver Assistance Systems (ADAS)
- ADAS - will appear naturally in a few years when all its essential constituents will be already available in vehicles (e.g. navigation, human-machine interface, sensors and computing modules); these modules first need to be introduced gradually and individually into vehicles before fully operational ADAS will be available
- Big cultural changes - automotive manufacturers, road infrastructure constructors and managers as well as other manufacturing sectors (e.g. telecommunications, computing, storage, etc) will need to cooperate and work together; standards and manufacturing process automation will become a major challenge in this area.

Intelligence brought into the vehicle must bring simplicity and ease of use to the passengers and driver (the driver will one day become optional).

Smarter vehicles will also revolutionize traffic management systems as well as the vehicle servicing and maintenance chain.

The impact of China should not be overlooked. In 1999, less than 2% of automotive R&D in China was devoted to electronics and, today, it is over 20%. China produced over 4 million vehicles in the first 11 months of 2003 and production is steadily increasing.

Canada's future in the automotive sector lies more in the development of smart distributed high technology industries (e.g. telecom, navigation, computing, artificial intelligence (AI)) adapted to future automotive needs rather than relying on a strategy of attracting Original Equipment Manufacturer (OEM) assembly plants to Canada controlled by foreign companies.

Automating a vehicle can be dangerous if the technology integration is not done wisely. Long standing testing and certification will be required to insure safety to passengers, to the other vehicles and to pedestrians.

f) WG 2.3 Electronic Road User Charging and Smart Cards

The Work Group 2.3 discussion paper includes an overview of electronic road user charging services and smart card applications across Canada. A wide-range of opportunities exists throughout Canada for both Electronic Road User Fee Collection and Smart Card Systems. More specifically, the following describes opportunities identified by the work group.

- *Multiple Applications*

Agencies and private groups are increasingly more interested in multi-application systems. Canadian organizations have historically kept with or gone beyond global technological standards. Furthermore, understanding that Canadian systems have not reached their full potential, establishes a need to expand the capabilities of current systems.

- *Involvement of Financial Industry and Other Sectors*

Collaboration with financial sector members (banks, credit card companies, etc.) and vendor groups may ease implementation burdens such as costs and resources and therefore, provide additional opportunities for agencies and private groups interested in ERUC and/or Smart Card systems. Multiple application design concepts may interest a variety of potential stakeholders allowing for faster progress of applications. The Barrie, Ontario pilot program discussed in section 2.3.1, is an example of financial sector involvement.

- *Interoperability of Systems*

Discussion between major groups and organizations will help in ascertaining some of the many multi-agency and multi-application opportunities available that are not being pursued due to insufficient standards and specifications with respect to interoperability. The companies and agencies that want to expand their current range of services must be prepared to work together with the needs and wants of other interested parties.

- *Address End User Requirements*

Development of stand-alone or multi-application systems will help maintain user satisfaction and loyalty with increased system options. End user benefits may include:

- Frequent use of service discounts;
- Availability of multiple services;
- Event-based discounts and customer loyalty programs;
- Customer service.

The final goal of any system implementation is to improve service to the end user and, therefore, the most important group to satisfy is the system end user.

g) WG 3.1 User Acceptance and Impact Assessment

The Work Group 3.1 discussion paper has compiled an overview of relevant material regarding ITS impact assessment in Canada. The work in this area in Canada is limited and there is need for more input from various sources and experts, notably along the following dimensions:

- Other benefit/impact assessment studies
- Studies reporting on other ITS deployment domains or impact areas
- Studies comparing pre-deployment and post-deployment conditions.

As such, the proposed ongoing work focus in the short term needs to:

1) Continue to solicit input from experts regarding other Canadian examples of benefit and cost assessments,
2) Define Canada's future R&D needs in the context of ITS benefits assessment, and,
3) Suggest/formulate means through which ITS benefits assessment can be "institutionalized" as an ongoing function in support of ITS development and deployment in Canada.

Initial suggestions regarding these last two points are presented next.

Proposed R&D Tracks

Based on the analysis and synthesis of the trends and observations from the impact assessment material presented in this report, Canada's future R&D needs in the context of ITS benefits assessment may be identified along the following three proposed tracks:

1. Gaps exist in the benefits assessment "matrix" (see WG 3.1 Discussion Paper for full details), and such gaps need to be covered through field studies and theoretical efforts
2. There is a need to establish a Canadian benefits assessment database
3. There is need to develop guidelines for integrating impact evaluation in future ITS deployment studies. In this regard, common definitions and measurements of benefits are called for since simple variations in the evaluation methodology can affect the benefits estimate.

Institutionalizing Benefits Assessment

ITS benefits assessment needs to be "institutionalized" as an ongoing function in support of ITS development and deployment in Canada. Towards that end, it is recommended that a Canadian ITS "benefits assessment network" be established in order to:
(i) share experiences and knowledge,
(ii) maintain a benefits database,
(iii) assist in development of guidelines for impact evaluation, and
(iv) support public agencies & ITS technology providers.

This national network should be linked with organizations such as the International Benefit Evaluation Costs (IBEC) cooperative work group to facilitate cooperative sharing with partners in other countries.

h) WG 3.2 Human Machine Interface & User Friendly ITS

The Work Group 3.2 discussion paper's main focus is a survey of experts designed to capture the current status of how to establish whether an in-vehicle ITS device is safe or not, which is critical to the development of viable ITS systems. In addition to identifying discussion threads for further study and reporting on the questionnaire results, the discussion paper advances a number of additional research and development topics that require further concerted efforts. These include:

1) The human factors implications of cooperative in-vehicle/in-vehicle and in-vehicle/infrastructure systems.
2) Evaluation of in-vehicle products over the course of a number of design cycles with different evaluation steps has not been fully developed.
3) The focus of the expert questionnaire was on the empirical evaluation of systems; however, the validity and reliability of cost-effective means such as modeling and usability needs to be established.
4) Extrapolation of driver performance with a device to increases or decreases in crashes, injuries and fatalities needs to be empirically established; projections of ITS safety benefits are based on a number of implicit assumptions and the estimates based on them tend to be highly speculative (cf., OECD, 2003).
5) A workshop or roundtable consisting of invited experts should be held to discuss state of the art of human factors research results on ITS and to arrive at priorities in the research agenda proposed in the preceding bullets; in addition, it could be the forum to explore the infrastructure issues of ITS, which has not been addressed in this discussion paper.

FUTURE NETWORKING ACTIVITIES

The ATLANTIC Canada network project has demonstrated a vital capacity for academic researchers and public and private sector professionals to collaborate together for their mutual benefit and for the collective contributions they can make to the common store of ITS knowledge and information. It is believed by the participants that Canada would benefit from a continuation of the networking activities. There is also a willingness to continue to network and cooperate on productive activities under similar arrangements as the current project.

The future directions for ITS research and development networking should logically build on the most successful elements of the ATLANTIC Canada network project. These elements include the following activities:

- *Annual workshop – most important opportunity for academics, public sector and private sector professionals to meet and exchange views and ideas related to ITS R&D*
- *Website – where completed and draft documents can be posted to facilitate and information exchange and enable cross Canada participation*
- *Sponsored discussion papers - on priority topics to increase knowledge for decision making by public agencies and private firms or to explore feasibility of ITS topics*
- *Student involvement – to perform research tasks and to expand the pool of ITS professional expertise in Canada*
- *Networking – to facilitate forming consortia to develop ITS R&D funding proposals and technology transfer projects.*

It is recommended that more specific proposals to continue the ATLANTIC Canada network be presented in a separate submission to potential sponsors and other interested parties.

CONCLUSIONS & RECOMMENDATIONS

The Canadian ITS R&D community is ready to take on the many challenges and opportunities outlined in the discussion papers. **The financing of research, particularly university research, is probably the most important hindering factor**. There is almost no funding specifically targeted at transportation research and even less for university-based research.

It is recommended that a coordinated effort be undertaken with leadership from the federal and provincial transport ministries, bringing together the industrial and university communities, to address the requirement for ITS research financing. A program of research funding with precise and transparent rules and schedules should be created. Funding should be made available both for large-scale cooperative projects and for focussed developments.

The ATLANTIC Canada network has demonstrated that Canadian universities are ready and willing to cooperate together on ITS research and development activities. The proposal for an ITS network of centres of excellence, similar to the Auto21 Network but focussed on the full spectrum of broad ITS issues and not on car technology, should be pursued in a proactive mode. The program should be defined, and funding should be secured, to cover a period of time compatible with the requirements of an innovative, value-creating national research program. Research projects should be defined with a 3-year life-cycle while support for centres of excellence should be defined for 5-year periods. In each case, rules for renewal of funding support would be specified in advance.

This pro-active approach to supporting and encouraging ITS research and development will ensure that Canada recovers its role as a significant contributor to ITS invention and innovation in the future. By adopting a networking structure that encompasses the academic, public and private sectors, the transfer of knowledge and expertise from the university research laboratories and research centres will be facilitated and socio-economic benefits maximized for Canada and Canadians.

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APPENDIX A

ATLANTIC CANADA PROJECT MILESTONES

(Phase 3 to May 2004)

❖ *Note: These are major milestones.*

❖ Canadian ATLANTIC agreements confirmed with sponsors	Jan 2003
• Core Team finalize work plans for January to and draft project guidelines	December 2003 Jan 2003
❖ **Progress Report #1** summarizing accomplishments to date in 2002 for submission to sponsors and for posting on website	13 Jan 2003
• Mobilize key participants in the Canadian ATLANTIC project	Jan/Feb 2003
• Announce launch of Canadian ATLANTIC Phase 3	Feb 2003
❖ Initiate draft work plans for discussion papers – Work Groups	Feb 2003
❖ **Canadian ATLANTIC Steering Committee meeting** with sponsors and interested participants to present work plans	17 Mar 2003
❖ **Progress Report #2** summarizing accomplishments to date in 2003 for submission to sponsors and for payment milestone	21 Mar 2003
• Initiate work on Canadian ATLANTIC websites (UoT and U de M)	Apr 2003
• ATLANTIC Workshop in conjunction with Smart Moving Conference (Birmingham U.K. international event)	10 Apr 2003
• ATLANTIC Exhibit at ITS Canada to raise awareness & solicit input	Apr 2003
❖ **Complete drafts of outline discussion papers** to circulate to experts	May 2003
• Initiate recruitment of experts using draft outline discussion papers and initiate research to summarize ITS R&D in Canada	May 2003
❖ **Progress Report #3** summarizing accomplishments to date in 2003 for submission to sponsors and for posting on website	30 Jun 2003
• Canadian ATLANTIC website upgrade www.crt.umontreal.ca/atlantic/	Oct 2003
• Project work over summer period	Jul-Aug 2003
• Complete first drafts of discussion papers	15 Oct 2003
❖ **Convene Canadian ATLANTIC Workshop (Ottawa)**	**24 October 2003**
• Canadian ATLANTIC Steering Committee meeting	24 October 2003
❖ **Progress Report #4** summarizing accomplishments to date	31 October 2003
• Canadian ATLANTIC participation at international 10 ITS WC, Madrid	Nov 2003
• Complete second drafts of discussion papers	Mar 2004
• Plan for follow-up ATLANTIC network activities and R&D	Mar/Apr/May 2004
• Complete final report	Apr/May 2004
• Participate at ITS Canada AGM, Calgary	May 11, 2004
• Convene Canadian ATLANTIC Steering Committee meeting	May 27, 2004
❖ **Canadian ATLANTIC Project Phase 3 Completed**	**May 2004**

APPENDIX B
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