Intelligent Transportation Systems (ITS) Strategic Plan

September 2000

Alberta
INFRASTRUCTURE

Alberta Infrastructure

Intelligent Transportation Systems (ITS)

Strategic Plan

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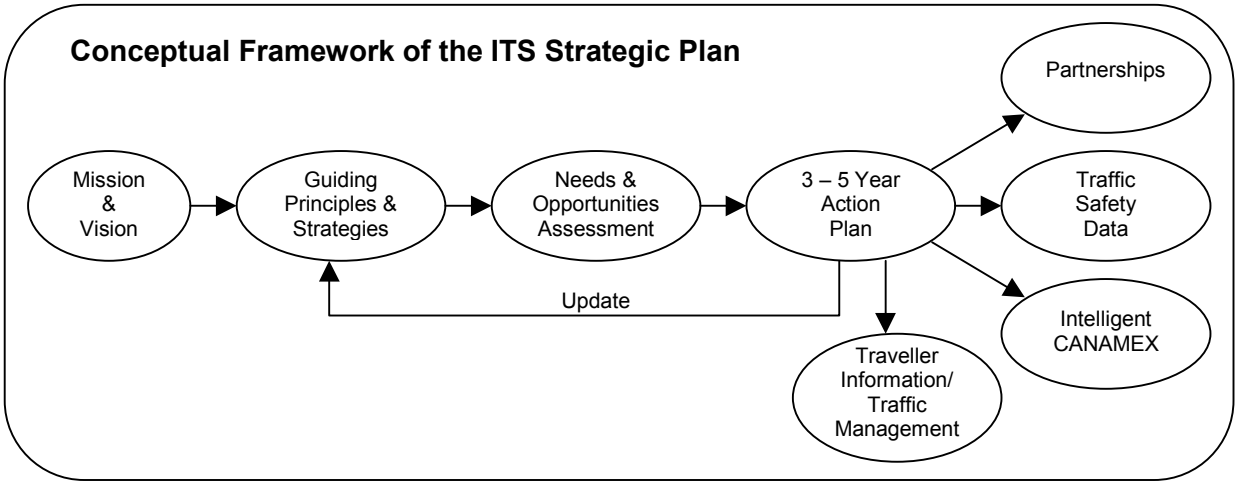
1. Introduction

The new millennium will see Alberta continue to experience considerable growth in exports and tourism. Increasing e-commerce and value-added production are shifting Alberta's traditional resource based economy to a new economy that relies heavily on just-in-time performance and integrated transportation logistics systems. This new economy requires safe and more efficient transportation services and highway infrastructure to sustain growth and competitiveness.

Governments are now turning to the emerging and evolving technologies known as intelligent transportation systems (ITS) for solutions to help them meet the many challenges and demands placed on transportation systems.

This strategic plan, developed by a task group of divisional representatives within Alberta Infrastructure, provides a vision for the future of ITS in Alberta's transportation system and outlines strategies for Alberta Infrastructure to develop and deploy these technologies to improve the safety, efficiency and capacity of the provincial transportation system. The strategies focus on a coordinated and controlled approach to the integration of ITS into the department's operations. Based on inputs collected from department staff and a review of existing and potential departmental ITS applications (Appendix A shows the results of the review), this strategic plan recommends a 3 to 5 year action plan, and identifies a number of priority highways as an ITS testbed. The following diagram illustrates the conceptual framework of this plan:



The strategic plan is a living and flexible document that provides strategies and a framework based on current needs and technologies. Due to the rapid-changing nature of technology, it is impossible to identify all existing ITS opportunities. This strategic plan will require regular refinement and updating over time to capture new technologies and new policies and practices.

2. Background

What is ITS?

ITS is about adaptive, intelligent integration of vehicles, drivers and the transportation system. Integration, through advanced information processing (computers), of communications and sensory technologies and management strategies, can improve the safety, capacity and

efficiency of the transportation system. Communications and information processing technologies allow information on the transportation system – both vehicles and infrastructure – and real-time road and environmental conditions, to be collected, processed and disseminated for better decision-making. Examples of ITS applications include changeable message signs that can display real-time information collected by sensors and warn motorists of collisions, road and weather conditions; and automated vehicle inspection stations that can electronically identify and provide expeditious clearance to commercial vehicles. Appendix B provides references for more background information on ITS.

What are the Benefits of ITS?

Through effective integration with the transportation system, ITS provide a broad spectrum of technology-based tools that aid the development of solutions to save lives, money, time and the environment. ITS allow road authorities to better manage and maintain the transportation system and enforce regulations by providing real-time and reliable information. ITS technologies can build on each other, providing higher order benefits through system integration and assistance to multiple users. As technologies change and evolve, additional benefits will continue to be identified. However, some examples are:

Improve Safety: Pre-trip and en-route road and weather information systems can advise motorists of traffic, road, environmental and emergency conditions. Real-time information can assist route planning, ease frustration and reduce road rage. Congestion reduction measures can reduce travel time and collisions. Surveillance systems and wireless emergency location systems can automatically detect incidents and trigger the emergency notification and dispatch process. The end result of these applications is the reduction in loss of life, injuries and costs, which benefits society as a whole.

Did you know?

In 1998, there were over 98,000 traffic collisions in Alberta which resulted in over 25,000 injuries. The societal costs of these collisions are enormous. Real-time information, congestion reduction and emergency notification may help reduce these costs.

Increase Productivity: Automatic vehicle identification, screening of safety records and vehicle weights, can provide a seamless commercial vehicle system, increase the efficiency of the inspections services, and provide pre-clearance opportunities for commercial vehicles. Real-time integrated transportation system data collection can improve the efficiency of the data collection process and facilitate traffic forecasting and planning. ITS can provide information about transportation trends and the performance of the transportation system, which can lead to better management and operations, more efficient allocation of resources, and improved system performance.

Did you know?

Oregon's Green Light Project uses weigh-in-motion and automatic vehicle identification systems to electronically verify a vehicle's weight, registration and safety status, and grant weigh station bypass. Over 200,000 bypasses were given in 1999. It is estimated that over the next 10 years, the system will preclear over 2.88 million trucks, saving industry over $10.7 million in operating costs while saving 144,000 hours in travel.

Source: "Nomination for the Oregon Green Light Project", ITSA Award nomination, December 1999.

Did you know?

The US Department of Transportation estimates taxpayers can save up to 35% on infrastructure investment as a result of ITS deployment.

Source: US DOT "Intelligent Transportation Systems Benefits: 1999 Update".

Reduce Costs: The integration of ITS into the existing transportation system is becoming simpler, cheaper and more cost effective. With increasing congestion and the rising costs of providing additional infrastructure, ITS offer innovative alternatives to capital improvements. Once integrated, ITS can increase the efficient movement of vehicles, thereby increasing roadway capacity and reducing or delaying the need for additional infrastructure.

Help the Environment: Incident management systems can improve emergency clearance times and reduce vehicle delay. Automatic vehicle identification at inspection stations and border crossings can reduce the number of commercial vehicle stops and starts. Real-time adaptive traffic signal controls can reduce travel times and vehicle idling. The effect of these applications is a reduction in fuel consumption and greenhouse gas emissions.

Did you know?

Per major incident, San Antonio's TransGuide incident management system is estimated to reduce fuel consumption by 2600 gallons and average delay by 700 vehicle-hours. This translates into annual savings of $1.65 million to commuters.

Source: US DOT "Intelligent Transportation Systems Benefits: 1999 Update".

Current Situation at Alberta Infrastructure

The department has implemented a handful of ITS applications. However, ITS projects are undertaken on an ad hoc and as required basis, and there is a need for a more systematic and focused approach to ITS development and deployment. A review of the department's weigh-in-motion operation also recommended that an ITS strategic plan be developed. With the take-over of key primary highways in cities, the department may be looked upon to provide ITS in urban as well as rural areas.

Alberta is in an enviable situation with respect to ITS deployment. The population is such that critical congestion is not yet a major issue. The existing number of ITS applications is low enough to allow for an integrated approach to development.

Other Canadian jurisdictions are moving forward with ITS development. Appendix C gives an overview of ITS in Canada.

3. Mission, Vision and Objectives

The **Mission** of this ITS strategic plan is twofold:

- to assist Alberta Infrastructure in meeting its mandate of providing a safe and effective provincial transportation system through the planning, deployment and integration of intelligent transportation systems technologies; and

- to position Alberta Infrastructure to take advantage of the rapid development of technology and to maintain and improve Alberta's competitiveness in a fast-moving knowledge-based economy.

The **Vision** for the future of ITS in Alberta's provincial transportation system is to have well developed and integrated systems in place for:

- the travelling public to make and adjust their travelling plans;
- Alberta Infrastructure and partners to better manage, operate and maintain the transportation infrastructure and improve the safety of the travelling public; and
- commercial vehicle operators to improve their productivity, efficiency and competitiveness.

The **Objectives** of this plan are to:

- bring an articulated and systematic approach to planning, deploying and integrating ITS technologies that conform to the North American ITS Architecture; and
- serve as a roadmap for Alberta Infrastructure to set the direction and strategies for future ITS investment and deployment.

4. Guiding Principles and Strategies

The following are key principles and strategies to guide Alberta Infrastructure to develop and deploy ITS.

Principle No. 1	**ITS are developed and deployed in a coordinated, systematic and cost-effective manner.**

Strategy

Establish a permanent ITS Standing Committee, championed by an Executive Sponsor, to coordinate all ITS initiatives within Alberta Infrastructure. This Committee will be responsible for coordinating all ITS initiatives, updating the ITS strategic plan, keeping abreast and advising the department of new ITS technologies and opportunities, and representing the department in coordinating with other levels of government and external stakeholder groups on all ITS related matters.

Stage the development and deployment of ITS to build on past experiences (both successes and failures) and existing accepted architecture in an incremental manner. It is important that the costs and benefits of ITS deployment be evaluated and that the performance and effectiveness of existing and future ITS initiatives be closely monitored and measured.

Adopt a building block, modular approach to make use of proven technologies, and focus resources on priority roadway sections that will reap the greatest benefits.

Principle No. 2	**Alberta Infrastructure's ITS applications should be seamlessly integrated, compatible with systems in neighbouring provinces and states, and meet North American ITS architecture standards.**

Strategy

Cooperate and participate with Transport Canada and other jurisdictions and agencies in the development of the Canadian and regional ITS architectures to ensure interoperability and integration of ITS technologies, and work with industry and other stakeholder groups to develop ITS architecture and technical standards.

Principle No. 3	**ITS are well integrated in the planning, design, construction and maintenance of the transportation infrastructure.**

Strategy

Integrate ITS early in the planning and design process, and make provisions for future ITS installations. Installation of ITS devices should be coordinated with construction and maintenance activities to minimize traffic interruption and costs. ITS technologies should be used to meet specific needs of the department and enhance service delivery.

Principle No. 4	**ITS development and deployment are sustainable.**

Strategy

With the increasing awareness of ITS, program managers should allow for ITS initiatives in their program budgets. ITS deployment should continue to be funded by sponsoring areas.

The department should actively pursue opportunities for cost-sharing through partnerships with the federal government, other provincial and municipal governments, and the private sector.

Principle No. 5	**Alberta is open to ITS technologies, partnerships, new knowledge and innovation.**

Strategy

Show the department's commitment to ITS by establishing the ITS Standing Committee and adopting the strategic plan. The Standing Committee will keep abreast of the latest technological developments, and promote ITS development and deployment by entering into partnerships with the private sector, stakeholder groups, municipalities and other governments in undertaking joint projects.

To be proactive and responsive, the Standing Committee will assess and react to initiatives and proposals from external groups, with a positive view to leveraging contributions from others to maximize mutual benefits, and leveraging the latest ITS developments to improve the department's business.

Principle No. 6	**Alberta Infrastructure's staff and partners are well informed of the potentials and limitations of ITS and of the department's direction.**

Strategy

Raise the awareness of ITS by collaborating with the academic and research community and suppliers, such as universities, the Centre for Transportation Engineering and Planning (C-TEP), and the Van Horne Institute, to organize conferences, demonstrations and seminars on ITS.

Did you know?

A lack of understanding and knowledge of ITS has been identified as one of the major barriers to ITS deployment in many jurisdictions.
Source: TAC Multi-Modal Council 1999 ITS survey.

Develop and maintain an interactive web site on the internet/intranet, posting information on ITS initiatives and latest developments and with links to other ITS sites.

5. Priority Highways - an ITS Testbed

As the provincial highway system is extensive, it would be impractical to deploy ITS applications on all provincial highways. It is important to focus the department's resources on areas where the needs and the potential benefits are the greatest. However, there are some applications, such as traffic safety data collection, that are not roadway specific.

For the purpose of prioritizing for ITS applications, the following highways should receive first priority and serve as a testbed for ITS initiatives:

- Highway 2 between Calgary and Edmonton, including Deerfoot Trail in Calgary and the southwest section of Anthony Henday Drive in Edmonton,
- Highway 1 between Calgary and Banff, and
- Highway 4 at the Coutts border crossing.

Over time, ITS technologies can also be applied to other major highways, for example:

- Highway 43 between Edmonton and Grande Prairie,
- Highway 16,
- Highway 1 east of Calgary,
- Highways 2 and 4 between Coutts and Calgary, and
- sections of Highway 63 north and south of Fort McMurray.

6. Recommended 3 - 5 Year Action Plan

The recommended action plan focuses on four parallel but interconnected streams of activity over the next 3 to 5 years. In accordance with the systematic and incremental approach of this Strategic Plan, the action items identified are the first steps toward the long-term deployment goals. These short-term action items concentrate on planning for future ITS deployment and monitoring ITS developments. Significant deployment is likely to be beyond the 3 to 5 year timeframe identified, and will be subject to the availability of funding and resources.

The recommended action plan is mostly based on a review of the department's existing and long-term ITS needs and opportunities as shown in Appendix A. The lead department area is identified after each action item.

a) Partnerships for knowledge and success

- Establish a permanent ITS Standing Committee that will coordinate all ITS initiatives. [lead - Policy and Planning]

- Raise the awareness of ITS by working in conjunction with the Centre for Transportation Engineering and Planning (C-TEP) or universities to organize seminars, developing an informative web site, etc. [lead - Technical Standards]

- Continue to participate in the development of Canadian ITS architecture and standards. [lead - Policy and Planning]

- Keep abreast of ITS development in other jurisdictions through national and international forums and ongoing information sharing. [lead - ITS Standing Committee]

- Work with ITS product and service suppliers to explore new technologies. [lead - Technical Standards]

- Ensure access to future fibre-optic and telecommunications networks for ITS applications through negotiation and development of agreements with telecommunications companies, and through work with Alberta Innovation and Science on the development of the high-speed, high bandwidth Internet network. [lead - Technical Standards]

Current Situation and Estimated Timeline

Many of the items under this activity stream will be of an ongoing nature. Work is currently underway on the development of the Canadian ITS architecture. An ITS awareness seminar, with speakers from Transport Canada, ITS Canada, the Cities of Edmonton and Calgary, consultants, suppliers, etc., was held on September 8, 2000.

b) Traffic Safety Data Collection

This project will allow law enforcement officers to have direct access to complete and accurate driver and vehicle information, allowing them to use a full scope of information to make immediate decisions in the areas of traffic safety. The capture of the information, on a province-wide basis, will lead to more accurate and timely safety information which will be used to develop and monitor safety programs for all Albertans.

This project aims to implement an electronic capture of violation, collision and inspection information at the scene of an event by law enforcement members. The use of smart forms, barcode scanners, Global Positioning System (GPS), etc., will increase data accuracy and reduce data input. A wide range of stakeholders have been involved in the development of a concept. The following steps are to be taken:

- Continue to prepare a detailed systems requirement document and business case options. [lead - Driver Safety]

- Pursue unique funding arrangements such as fees attached to driver licensing services (license registrations). Electronic Data Systems Corporation (EDS), our technology partner, is looking at funding this project with payback over time as one option for consideration. [lead - Driver Safety]

- Contact and investigate systems that other jurisdictions have implemented. [lead - Driver Safety]

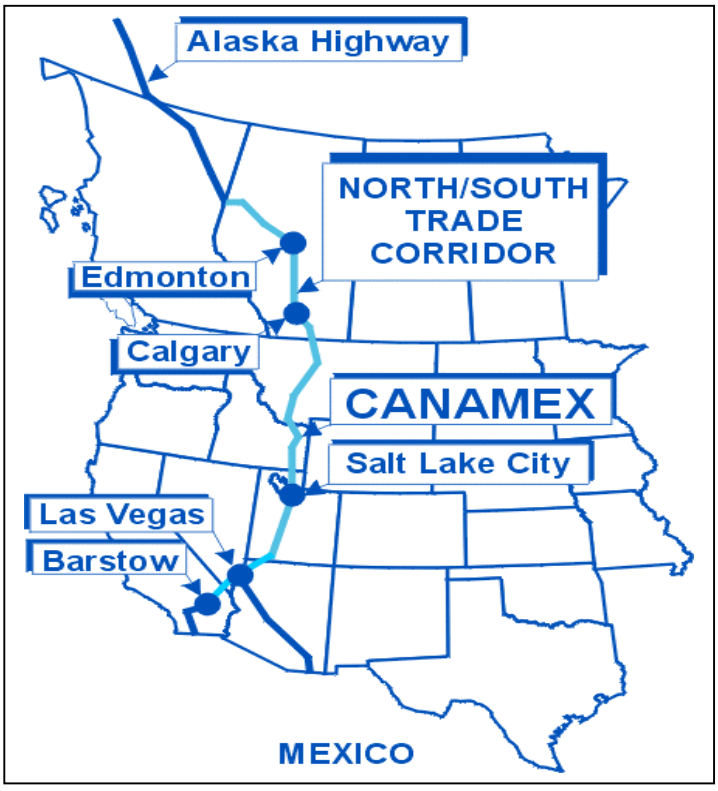
Current Situation and Estimated Timeline

The items under this activity stream are currently ongoing and will likely be completed by December 2000. The next steps would be to seek approval of the project plan and funding from the Deputy Ministers of involved departments. Once this approval is received, a detailed project implementation plan will be developed. This will require extensive consultation and collaboration with stakeholders.

c) Intelligent CANAMEX Trade Corridor

With the growth of trade and commercial vehicle traffic, governments are now facing the challenge of being more efficient in the regulation of commercial vehicle weights and dimensions, and mechanical fitness, without creating unnecessary delays, impeding freight mobility, and losing competitiveness. ITS can play a significant part in reducing delays through reduced paperwork, etc.

The US is a significant trading partner not just for Alberta, but for other Canadian provinces. Many provinces have already taken steps to demonstrate or implement ITS on their north-south trade corridors (British Columbia's Pacific Rim International Trade Corridor, Manitoba's North America International Trade Corridor, and Ontario's Michigan-Ontario-New York ITS Border Crossing Systems).



Over 80% of Alberta's international exports are US bound. Truck traffic growth on the North-South CANAMEX Trade Corridor is expected to continue, particularly with the completion of the four-laning by 2007. Alberta should take a more proactive approach to planning ITS on the CANAMEX Trade Corridor, particularly at the Coutts border crossing.

ITS offer a broad range of opportunities to improve commercial vehicle operations

(CVO). Some of these technologies include electronic clearance, weigh-in-motion, inspection support systems, on-board safety monitoring, etc. To ensure system compatibility and maximize the benefits, an Intelligent Transportation Systems/Commercial Vehicle Operations (ITS/CVO) plan is required to define system needs, address institutional and deployment barriers, identify opportunities, develop a system architecture to ensure interoperability with our CANAMEX state partners and neighbouring provinces and territories, and recommend a prioritized program of deployment. For the next 3 to 5 years, the following steps should be taken:

- Initiate discussion with the US and Canadian federal governments (Transport Canada and Canada Customs and Revenue Agency) and CANAMEX state partners to proceed with an ITS/CVO plan for CANAMEX. Upon agreement of all parties, proceed with developing a detailed terms of reference for the ITS/CVO plan. [lead - Policy and Planning]

- Develop a cost-shared comprehensive Intelligent Transportation Systems/Commercial Vehicle Operations Plan for CANAMEX. [lead - Policy and Planning]

Current Situation and Estimated Timeline

Design is underway for a joint Canada/US border crossing facility at Highway 4 in Coutts. There will be provisions for ITS applications at the joint facility. The department has ongoing discussions with the US and Canadian federal governments and CANAMEX state partners on a number of harmonization issues regarding CANAMEX. Due to the number of stakeholders involved and the complexity of the issues, the negotiation for the development of an ITS/CVO plan may take some time to complete. Upon agreement of all parties, the development of the plan will proceed.

d) Traveller Information/Traffic Management System

The actions under this activity stream focus on identifying the needs along the proposed ITS testbed highways and addressing these needs through relevant ITS technologies such as road weather information systems, incident management systems, and traffic signal coordination. Two components have been identified.

Traffic Control [lead - Technical Standards]

The department has over 100 traffic signals with more to come through the take-over of secondary highways. A significant number of the traffic signal controllers are reaching the end of their service life and will require upgrades. To ensure that upgrades occur systematically and include ITS capabilities, the department should:

- Review the condition of traffic signal controllers and related components currently used at traffic signal locations across the province (including two digit and three digit provincial highways and provincial highways through cities that will be under the department's jurisdiction), and develop an upgrade plan taking into account available funding.

- Based on the results of the review, proceed with upgrading traffic signal controllers and related components under Alberta Infrastructure's responsibility. The upgrades could include ITS capabilities, such as real-time equipment monitoring, data downloads and remote signal time changes and coordination.

Traveller Information/Traffic Management [lead - Technical Standards]

The department currently has three changeable message signs (CMS) and one operational highway advisory radio (HAR) system. With the take-over of the Deerfoot Trail Road Weather Information System (RWIS) subsystem, and the construction of the southwest leg of Anthony Henday Drive, Alberta Infrastructure will be assuming responsibility for some major urban expressways. To ensure that current ITS requirements and future opportunities are identified, and that deployment of ITS technologies occurs systematically, the department should:

- Survey, study and assess, with the assistance of consultants, travellers' needs along Highway 1, between Calgary and the Banff Park gates, and along Highway 2, between Edmonton and Calgary, including Deerfoot Trail and the southwest link of Anthony Henday Drive.

- Support research to develop, fine-tune and verify new ITS-driven simulation modeling for Deerfoot Trail. Using the new models and surveyed travellers' demands, predict new travel patterns and behaviour, and develop new scenarios of demands for the highway infrastructure.

- Based on the above, and in collaboration with stakeholders including Edmonton and Calgary, develop an initial Traveller Information/Traffic Management Plan for the above highways with various ITS scenarios and alternative costs. The plan will:

  i. Develop appropriate system architecture that will conform to the national ITS architecture.

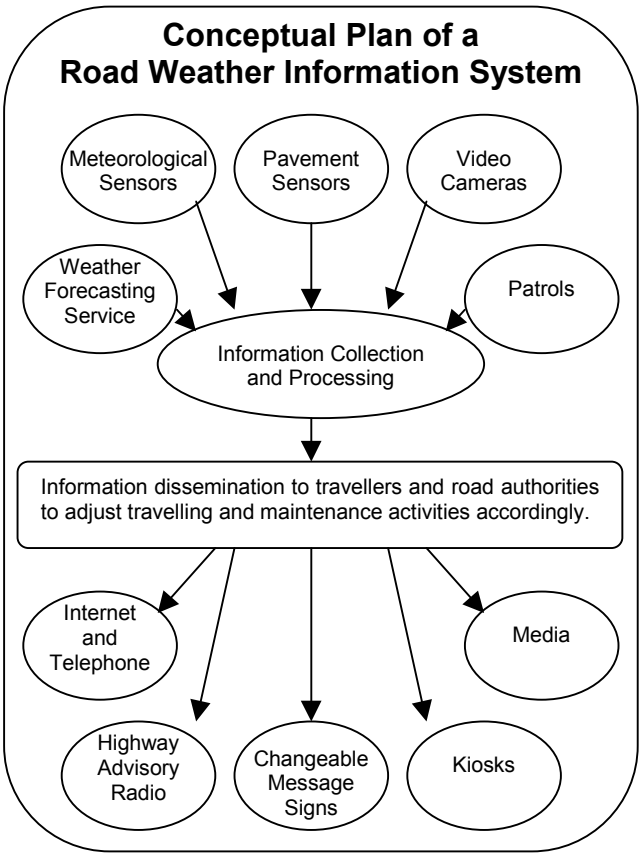
  ii. Determine the technical requirements of a Road Weather Information System (RWIS). The system will be to serve both maintenance contractors and the travelling public. This will include continued dialogue with Environment Canada on any joint development.

  iii. Determine the technical requirements for pre-trip and en-route traveller information, including any standards and data dictionaries being developed.

  iv. Identify stakeholders.

  v. Identify and resolve overlapping jurisdictional and technical issues that will impact the department's North-South (CANAMEX) Trade Corridor program and the planned ITS development along this corridor, and ensure system interoperability.

  vi. Assess the operation of Deerfoot Trail for opportunities for ITS solutions.



vii. Assess opportunities for integration of ITS in the planning and design of the southwest leg of Anthony Henday Drive in Edmonton.

viii. Assess the need for an operations control centre.

Some of the technologies that could be assessed for deployment are:

i. Permanent highway advisory radio (HAR) systems at strategic locations to broadcast messages on the FM band.

ii. Additional changeable message signs (CMS) at key locations along the highways.

iii. Some initial testing of an incident detection system with closed circuit television cameras and induction loops along Deerfoot Trail and Anthony Henday Drive. This could be integrated with CMS and HAR and tied to existing city emergency services and dispatch call centres.

iv. Tie-in of all CMS and HAR to the Road Weather Information System (RWIS) with the potential for fog/smoke sensors and micro and macro-weather pattern prediction models.

v. Temporary speed monitoring and display systems to warn travellers of construction and maintenance activities.

vi. Advanced video-based traffic data gathering equipment.

vii. Microwave, cellular, and land-based fibre optics infrastructure.

viii. Internet-based interactive information systems at homes, businesses and public kiosks.

ix. Over-height warning detection, weigh-in-motion scales, and automatic vehicle identification systems for commercial vehicles ("Intelligent CANAMEX Trade Corridor").

- Once a Traveller Information/Traffic Management Plan has been developed, identify funding sources and potential partnerships, and proceed with incremental implementation provided funding is available.

Current Situation and Estimated Timeline

Approval has been received to spend $600,000 upgrading traffic signal controllers and related components this year. This money will be used to review the condition of traffic signal controllers and related components and to proceed with first priority upgrades. The upgrading of traffic signal controllers will be of an ongoing nature.

The survey of travellers' needs is likely to commence in 2001, pending available funding. The research to develop, fine-tune and verify new ITS-driven simulation modeling for Deerfoot Trail is currently underway and is estimated to take about 2 years. Based on these initiatives, a Traveller Information/Traffic Management Plan could be developed starting in 2002. However, as the design work for the southwest leg of Anthony Henday Drive is already underway, there may be some urgency to fast-track some of the Traveller Information/Traffic Management planning work in order to integrate potential ITS applications in the design.

The following chart shows the estimated timelines for the action items under this activity stream.

TASK			2000		2001				2002				2003				Comments
			Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	
Traveller Information/ Traffic Management System	Traffic Control	Review traffic signal controllers and develop an upgrade plan															Funding is approved
		Upgrade traffic signal controllers															Ongoing initiative
	Traveller Information/ Traffic Management	Survey travellers' needs on key routes															
		Support ITS modeling for Deerfoot Trail															Initiative currently underway
		Develop Traveller Information/ Traffic Management Plan															
		Identify potential funding sources and proceed incrementally															Will be an ongoing initiative

7. Cost and Responsibility Summary

The following table shows the assignment of responsibility to department areas with respect to leading, funding and participating in the four streams of activity. The sponsoring areas would be responsible for funding these initiatives, including the initial studies and possible future deployment. Some of the associated costs identified would be internal, such as staff time and travel costs.

It is important to note that the costs identified over the next 3 to 5 years are largely associated with planning. Because of the go-slow approach of this Plan, deployment of ITS will be limited over the next 3 to 5 years.

The potential long-term deployment costs, in the order of magnitude, have been estimated and indicated in the table. The development of plans for the Intelligent CANAMEX Trade Corridor and Traveller Information/Traffic Management System will more accurately identify capital deployment and operating costs, and may recommend additional costs for the deployment of ITS technologies. Given the preliminary and planning nature of the action items, it is premature to estimate operating costs at this time.

Legend ● Lead ◓ Co-lead / Major participant ○ Participant		Infrastructure Policy and Planning	Technical Standards	Program Management	Regions	Driver Safety	Vehicle Safety & Carrier Services	Dangerous Goods and Rail Safety	Inspection Services	Transport Engineering	Corporate Services	Contractors	Consulting Engineers	Suppliers	Other Agencies & Organizations	Estimated initial study costs over the next 3 - 5 years ($ 000)	Estimated long-term capital deployment costs ($ 000)
Partnerships for knowledge and success	Establish ITS Standing Committee	●	◓			◓					◓					Internal costs	n/a
	Organize seminars on ITS	◓	●			○					○			○	◓		
	Development of Canadian ITS architecture and standards	●	◓						○						◓		
	Keep abreast of ITS developments	◓	●	○	○	◓	○	○	◓	○	◓	○	○	○	◓		
	Explore new technologies	◓	●	◓	◓	◓	◓	◓	◓	○	○	○	○	◓	○		
	Development of telecommunications agreements	◓	●		○						○				○		
Traffic Safety Data Collection	Prepare systems requirements and business case					●	◓				○			○	◓	To be determined	To be determined
	Pursue unique funding arrangements					●	◓				○			○	◓		
	Contact other jurisdictions					●	◓				○			○	◓		
Intelligent CANAMEX Trade Corridor	Initiate discussion on a CANAMEX ITS/CVO Plan and develop terms of reference	●	◓	○	○		◓	◓	◓	◓	○				◓	Internal costs	$500 to $1,000 per inspection station
	Develop a CANAMEX ITS/CVO Plan	●	◓	○	○		◓	◓	◓	◓	○				◓	$500	
Traveller Information/ Traffic Management System	Review traffic signal controllers, develop an upgrade plan	○	●	○	◓							○	○		○	$150	n/a
	Upgrade traffic signal controllers		●	○	◓							○	○	◓	○	n/a	$10,000
	Survey travellers' needs on key routes	◓	●	○	○	○	○	○	○	○	○		◓		◓	$300	n/a
	Support ITS modeling for Deerfoot Trail	○	●							○			○		◓	$150	n/a
	Develop Traveller Information/Traffic Management Plan	◓	●	◓	◓	○	○	○	○	○	○		◓		○	$300	n/a
	Identify potential funding sources and proceed incrementally	◓	●	◓	◓	○	○	○	○	○	○		◓		○	Internal costs	$5,000 to $10,000[1]

[1] Based on US Department of Transportation ITS Joint Program Office "ITS Benefits Database and Unit Cost Database", http://www.mitretek.org/its/benecost.nsf/CostHome?OpenFrameSet

8. Conclusions and Moving Forward

Fueled by the rapid advancement of computer and information technology and consumers' demand for innovation and efficiency, ITS technologies will continue to improve and evolve at a phenomenal rate. This new information and knowledge driven economy is a reality and not just a fad. The payback of deploying ITS technologies could be significant, if a focused, systematic and incremental approach is taken.

As a first step, this strategic plan focuses on Alberta Infrastructure's core businesses, and provides directions and strategies for the department to explore ITS opportunities. It represents a first, small but cautious and sensible step toward deploying ITS technologies to help improve the department's service delivery. Of the four streams of activity, the Intelligent CANAMEX Corridor and the Traveller Information/Traffic Management System require further work to define system needs, identify opportunities and develop system architecture. This is consistent with a systematic and incremental approach.

When more action items are identified in the future and results are more quantifiable, the next update of the strategic plan should include performance indicators to monitor the progress and measure the effectiveness of all ITS initiatives.

The ITS Standing Committee will play a significant and critical role in promoting and coordinating all ITS initiatives. The various ITS initiatives will be led by different divisions; however, it will be the Standing Committee's responsibility to keep abreast and advise the department of new ITS technologies and opportunities, coordinate the different concurrent activities, and ensure compatibility and interoperability among different systems and technologies.

Implications

As the majority of the action items in the next 3 to 5 years involve assessing needs, exploring opportunities and developing plans, most of the work will likely be done by consultants, and the immediate impact on the department's resources would therefore be minimal. The estimated costs of these studies are shown in the preceding section. As these initiatives proceed to deployment, there will be an impact on the department's resources. The extent of the impact will be assessed and determined by the deployment plans.

The decision to proceed further with deployment will be based on results of benefit-cost analyses, meeting the department's needs and improving the department's service delivery, as indicated in the Guiding Principles and Strategies section. Eventually, the goal is to integrate ITS features in the design and construction of highway infrastructure so that deploying ITS would not be a separate consideration in most cases.

Recognizing the emerging trend, many provincial/state and municipal jurisdictions are developing ITS strategic plans. The US and Canadian federal governments are developing national ITS architectures and providing technical and financial support for ITS initiatives. Regardless of the direction and strategy taken by Alberta Infrastructure with respect to ITS, technologies will continue to evolve and advance. Maintaining the status quo means continuing the current ad hoc approach.

The adoption of this plan does not necessarily imply that the department fully embraces and actively promotes ITS. With a recurring theme of taking an incremental and building block approach, this plan provides directions and strategies to explore opportunities for using ITS to improve the department's program and service delivery.

Recommendations

- The Executive adopt this ITS strategic plan.

- The Executive establish an ITS Standing Committee and appoint an Executive Sponsor. Each division head may appoint a representative to the Standing Committee with the understanding that this appointment may require a fair time commitment. The Committee may assess the need for additional resources at a later date to meet future needs and priorities.

- The sponsoring areas continue to be responsible for funding the initial studies and long-term capital deployment identified in this plan.

- The Standing Committee initiate work with the lead areas to undertake the action items identified in the action plan.

In conclusion and to move forward, a firm commitment from the Executive and support and cooperation of all department areas are key to the success of future ITS initiatives.

APPENDIX A

Identifying and Mapping Department Opportunities to ITS User Services

ITS User Services	Department Functions and Activities	Where are we now / current situation	Opportunities		
			3 – 5 years	5 – 10 years	10+ years
Traveller Information Services - Provide travellers with pre-trip and en-route information for route planning and optimization	• Advise en-route travellers of current road and weather conditions	• Use of 3 Changeable Message Signs (CMS) • Highway Advisory Radio (HAR) at 1 site with the potential for 2 others	• Expanded HAR and CMS systems • Portable HAR/CMS systems for use in conjunction with maintenance activities and construction zones	• Installation of bridge ice and fog warning systems at some bridge sites	• Fully integrated Road Weather Information System (RWIS) with HAR/CMS • Digital broadcasting RWIS • Installation of bridge ice and fog warning systems at all bridge sites • Animal detection and warning systems at some sites
	• Provide current road and weather conditions for pre-trip planning	• Alberta Motor Association (AMA) road reports via telephone and on the internet • City of Calgary has one Road Weather Information System (RWIS) subsystem on Deerfoot Trail	• Expanded Highway Advisory Radio (HAR) • Development of RWIS	• Current construction and maintenance schedule on the internet and at kiosks (rest areas, shopping malls, etc) • Current road and weather conditions on the internet, with links to other sites (Environment Canada, AMA) • Tourist specific information available at selected sites	• Continued use of road conditions on the internet and at kiosks with the inclusion of real-time Closed Circuit Television (CCTV) images • Continued placement of construction and maintenance activities on the internet and at kiosks
Traffic Management Services - Monitor and adjust vehicle flow for optimization and improved safety	• Traffic management in construction and maintenance zones	• Potential testing of Highway Advisory Radio (HAR) on specific maintenance or construction projects during Summer 2000	• Portable HAR/ Changeable Message Signs (CMS) systems for use in conjunction with maintenance activities and construction zones • Speed management via video detection and CMS		• Automatic vehicle speed control in speed restricted zones
	• Manage traffic signals controlled by department	• Conventional traffic signal management	• Potential upgrade of existing signals with remote capabilities and network co-ordination		• All traffic signal controllers fully on line with emergency pre-emption and integrated vehicle counts

ITS User Services	Department Functions and Activities	Where are we now / current situation	Opportunities		
			3 – 5 years	5 – 10 years	10+ years
Traffic Management Services (cont.)	• Manage traffic on major urban and rural routes	• Will be assuming responsibility of Road Weather Information System (RWIS) subsystem on Deerfoot Trail in Calgary (includes Changeable Message Signs (CMS) and ice detection system) • Will be reviewing ITS applications and potential for deployment on Anthony Henday Drive in Edmonton and Deerfoot Trail in Calgary • Emergency call boxes (2-way communications) deployed along Highways 1 (Calgary to Banff), 2 (Calgary to Edmonton), 2A (Blackfalds) and along Deerfoot Trail – program under review and may be abandoned	• Make provisions for future ITS applications in the design of major urban routes • Introduce an incident management system which will include adding Closed Circuit Television (CCTV) cameras along Deerfoot Trail		• Freeway and incident management systems with CCTV on major routes with automatic red-light adjustment (possibility of red light cameras) with real-time traffic signal control adjustments • Real-time warning at rail crossings • In-vehicle real-time warning at rural highway intersections • Implement an operations control centre to manage various ITS programs • Investigate/ implement ramp metering as part of freeway management tools for Deerfoot Trail • Investigate/ implement High Occupancy Vehicle (HOV) lane development for Deerfoot Trail
Commercial Vehicle Operations - Monitor truck compliance and movements for improved safety and efficiency	• Track overweight/ over-dimension vehicles and log hauls	• No means of tracking truck movements • Log haul vehicles follow predefined routes based on weight • Transportation Routing and Vehicle Information System (TRAVIS) under development	• TRAVIS, including route selection, fully operational		• Global Positioning System (GPS) tracking truck movements. Possibility of truck permits being paid on a per kilometre basis • GPS tracking of log hauls with links to the weigh scales at the mill
	• Facilitate commercial vehicle US border crossing	• Joint border crossing facility	• Facilitated border crossings (pre-clearance, Vehicle Inspection Station (VIS), Weigh-in-Motion (WIM), automatic data exchange)		
	• Administer commercial vehicle permits and licenses	• International Rate Program (IRP), and Canadian Agreement on Vehicle Registration (CAVR)			• Automated inter-provincial and international permitting

ITS User Services	Department Functions and Activities	Where are we now / current situation	Opportunities		
			3 – 5 years	5 – 10 years	10+ years
Commercial Vehicle Operations (cont.)	• Enforce weight and dimension regulations, and hours of service	• One semi-operational Automatic Vehicle Identification/ Weigh-in-Motion (AVI/WIM) site at the Leduc Inspection Station • A WIM site is being planned for Deerfoot Trail in Calgary	• Make provisions for future ITS applications in the planning and design of facilities	• Fully operational AVI and WIM along our North-South Trade Corridor (NSTC). System could be integrated with a database for traffic forecasting for easy Equivalent Single Axle Load (ESAL) determination	• Fully integrated AVI/WIM system along major provincial highways • On-board hours of service, fleet and driver management with Geographic Information System (GIS)
	• Process vehicle clearance at inspection stations	• Weigh-in-Motion (WIM), International Rate Program (IRP), prorate. Vehicles stop at scale for weighing and document check (including dangerous goods)		• WIM and transponders to identify vehicle and dangerous goods, including a link to registries or IRP (prorate) to validate registration	
	• Determine road bans	• Road bans determined manually			• Automatic monitoring of thaw/frost in roadbeds (with posting on internet)
Information Warehousing - Collect transportation data for improved efficiency and integrated decision making	• Administer driver records and licensing	• Traffic violation data received via electronic interface with Alberta Justice. Data entry problems and court interface can be delayed up to 3 days after the conviction • Basic suspension information available to officers through terminals in vehicles or via radio communication • Officers fax information (predisposition, vehicle seizures, hearings, etc.) to department for manual entry	• Electronic data input (information still passed through an interface with Alberta Justice) • Basic information available to all officers from laptops in the vehicle • Some electronic completion and transmittal directly to Alberta Infrastructure	• Full suspension information available to the officer on in-vehicle computers	• Fully on-line integrated and automated among police agencies, Alberta Justice, Government Services and Alberta Infrastructure, that updates suspension and conviction information automatically • All forms completed and transmitted electronically in real-time
	• Collect collision data	• Data hand recorded and passed into either a city or provincial data entry unit - significant room for error	• Information inputted electronically into Motor Vehicle System (MOVES) database at event. Global Positioning System/ Geographic Information System (GPS/GIS) collision locations and special location monitoring		• Fully integrated electronic system (including vehicle seizure information, suspensions, fines, etc.) • Collision records available graphically • Use vehicle “black box” data recorder for collision analyses

ITS User Services	Department Functions and Activities	Where are we now / current situation	Opportunities		
			3 – 5 years	5 – 10 years	10+ years
Information Warehousing (cont.)	• Collect traffic data	• Collect speed and Weigh-In-Motion (WIM) data • Automated loop and manual traffic counts • Using 15 year old Dangerous Goods origin/destination (O/D) data	• Automatic vehicle classifier that goes beyond the standard classification when doing traffic counts • Combine traffic behavioural data with roadway parameters to develop, fine-tune and verify new ITS driven simulation modeling	• Investigate/ implement new traffic data collection technologies	• Expanded use of intelligent traffic counting • Closed Circuit Television (CCTV) monitoring for O/D surveys on major corridors and traffic studies at major intersections[2] • Potential for dangerous goods O/D surveys • Use "smart" vehicle probes and roadside links to obtain real-time traffic and other conditions • Use ITS-developed micro/macro simulation models for testing new ITS standards and implementations
	• Collect road and related inventory data	• Global Positioning System (GPS) videolog van – collects GPS tagged video images of highway and roadside objects • Purchasing GPS backpack to gather culvert and guardrail inventory	• Continue to investigate digital videolog technologies	• Integrate videolog data with the department's Geographic Information System (GIS)	• Fully integrated GIS-based road inventory and appurtenance management
	• Construction and maintenance monitoring	• Winter 99/00 trial of maintenance tracking using Global Positioning System (GPS) • Pilot project was done on construction material quantity monitoring	• Possible use of GPS for snow plow tracking and invoicing	• Construction material quantity measuring via GPS/ transponder technology • Maintenance work performance-based monitoring system	
	• Collect geotechnical data	• Manual data collection process with twice yearly site visits			• Automated remote instrumentation (data loggers, video cameras) to monitor potentially unstable geotechnical sites

[2] Traffic data collection via department systems or in conjunction with in-vehicle systems, and subsequent modeling or microsimulation, may affect the real-time decisions of the department's ITS.

ITS User Services	Department Functions and Activities	Where are we now / current situation	Opportunities		
			3 – 5 years	5 – 10 years	10+ years
Emergency Management Services - Identification, notification and guidance for improved response times and increased safety	• Assist with emergency response to Dangerous Goods (DG) incidents • Review of local authorities' DG route designations	• Manual DG document check • Using 15 year old DG origin/ destination (O/D) data		• Automatic DG identification via transponder • Provision of Global Positioning System mapping for easier emergency response to incidents	• Potential for DG O/D surveys using intelligent traffic data collection • Incident detection on major routes with advisories via Changeable Message Signs, Highway Advisory Radio, etc. • Install infrastructure to handle automatic vehicle emergency response Mayday systems
Electronic Payment	• Applications with potential are electronic toll collection and smart card payment systems. These applications would be private sector or industry driven but may impact Alberta Infrastructure				
Public Transport Services	• These applications (e.g. Global Positioning System tracking of transit and bus units, multi-modal and accessible computerized reservations systems, automatic taxi dispatch) will be municipality and industry driven but may impact Alberta Infrastructure with respect to funding, leadership and integration with our Traveller Information Services				
Vehicle Safety and Control Systems	• Certain department applications will require co-ordination with industry – for example, the implementation of in-vehicle real-time warning at rural highway intersections or automatic vehicle speed controls will require integration with vehicle technology • Certain applications will be industry driven but may impact the department with respect to infrastructure issues (e.g. installation of private transmitters along right of way, magnetized stripping on highways for vehicle-to-vehicle and vehicle-to-highway communication)				

LIST OF ABBREVIATIONS

AMA	Alberta Motor Association
AVI	Automatic Vehicle Identification
C-TEP	Centre for Transportation Engineering and Planning
CANAMEX	CANada, AMerica, MEXico 1,700 mile highway corridor
CAVR	Canadian Agreement on Vehicle Registration
CCTV	Closed Circuit Television
CMS	Changeable Message Sign
CVO	Commercial Vehicle Operations
DG	Dangerous Goods
ESAL	Equivalent Single Axle Load
GIS	Geographic Information System
GPS	Global Positioning System
HAR	Highway Advisory Radio
HOV	High Occupancy Vehicle
IRP	International Registration Plan
MOVES	Motor Vehicle System
NSTC	North-South Trade Corridor
O/D	Origin/Destination
ROW	Right of Way
RWIS	Road Weather Information System
TRAVIS	Transportation Routing and Vehicle Information System
VIS	Vehicle Inspection Station
WIM	Weigh-in-Motion

APPENDIX B

References

Publications

1. *An Intelligent Transportation System Plan for Canada: En Route to Intelligent Mobility*, Transport Canada, TP 13501 E, November 1999.

2. *Development of Canadian Architecture for Intelligent Transportation Systems - Final Report*, Transport Canada, June 2000.

3. *Intelligent Transportation Systems Benefits: 1999 Update*, US Department of Transportation Federal Highway Administration, May 1999.

4. *The Oregon ITS Strategic Plan: 1997-2017*, Oregon Department of Transportation, May 1998.

5. *Technology in Rural Transportation "Simple Solutions"*, US Department of Transportation Federal Highway Administration, FHWA-RD-97-108, October 1997.

Web Sites

1. http://www.its.dot.gov

2. http://www.itsdocs.fhwa.dot.gov

3. http://www.itscanada.ca

4. http://www.itsa.org

5. http://www.mitretek.org/its/benecost.nsf/CostHome?OpenFrameSet

APPENDIX C

An Overview of ITS in Canada

Deployment Issues

A recent Transportation Association of Canada (TAC) national survey of provincial jurisdictions identified opportunities and barriers to ITS deployment in Canada:

Opportunities for ITS	Barriers to ITS Deployment
• Enforcement of regulations • Safety, road maintenance • Border crossings/trade corridors • Data collection, traveller information • Traffic management	• Lack of funding, and high costs relative to benefits • Lack of adequate staffing with necessary skills and knowledge • Lack of national and regional strategies

Canada faces unique challenges when it comes to ITS. Distinct features such as our large land mass, dispersed population, climate, existing ITS, use of the metric system, communication requirements (including infrastructure and bilingualism), and organizational relationships, will all affect how ITS becomes integrated into our transportation systems provincially, nationally and internationally.

Transport Canada

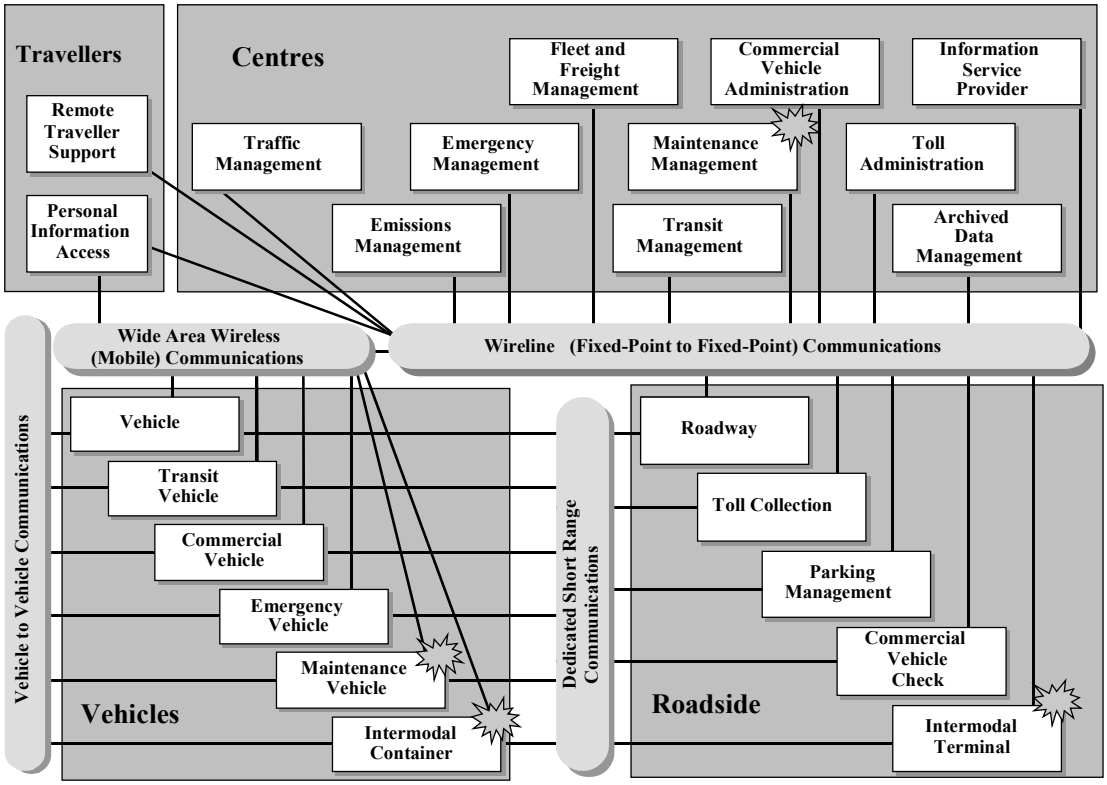
Transport Canada has assumed a key role in developing a national ITS plan. In November 1999, Transport Canada released "An ITS Plan for Canada: En Route to Intelligent Mobility." Transport Canada promotes the use of ITS, and has suggested that future federal funding will likely be available for ITS projects. The plan focuses on five activity areas: partnerships for knowledge, developing Canada's ITS architecture, multi-modal ITS research and development, deployment and integration of ITS across Canada, and strengthening Canada's ITS industry. The activity areas are at varying stages of development. Input from the relevant stakeholders, including Alberta, is being sought.

Development of a Canadian ITS Architecture

In June 2000, Transport Canada released a final report on the development of the Canadian ITS Architecture. This report presents a review of international architecture development and available ITS technologies, and their applicability to Canada. The report proposes a framework for the Canadian ITS Architecture and identifies a number of Canadian ITS User Services.

Once completed, the Canadian ITS architecture will provide a framework for communication among the various ITS technologies. This is necessary to ensure that interoperable deployment of ITS can occur across the nation and with the US. Given our country's close ties to and the benefits of interoperability with the US, Canada's Architecture is being modeled after the American's. However, Canada's distinct features are being considered in the development of our national ITS architecture. The following diagram illustrates the framework of the Canadian ITS architecture:

The Canadian Architecture for I T S



Other Jurisdictions

Canada has used ITS for over 25 years and other Canadian provinces are moving forward with ITS development. Every province has at least one ITS application and many provinces are also developing ITS strategic plans to coordinate deployment. The most common ITS applications are in Travel and Traffic Management Services, Public Transport Services, Commercial Vehicle Operations and Electronic Payment.