

**Automation of Commercial Vehicle Compliance Systems in Western Canada**

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## **Abstract**

Commercial vehicle transportation in Canada is a significant industry, both in terms of its contribution to the Gross Domestic Product (GDP) and in its contribution to the overall economy. In 2005 the trucking industry (including for-hire carriers, private carriers, owner-operators and courier firms) generated an estimated \$67 billion in revenues in Canada. Trucking is the most significant transportation method for trade with the United States, accounting for 61 per cent of trade in terms of value. Exports shipped by trucks from Canada totaled \$185.8 billion. In terms of employment, the trucking industry as a whole employed 356,124 people in 2005. Given the significance of the trucking industry, it is important to have an efficient, safe and well managed system, including proper inspection, monitoring, and control. This paper will describe innovations in British Columbia and Alberta to facilitate necessary inspection and monitoring of commercial vehicle activity, while maintaining an efficient transportation system.

The British Columbia Green Light Transponder Corridor is a 5 station commercial vehicle bypass system set up on the Trans-Canada Highway from Port Mann in Vancouver to Golden at the border with Alberta. This transponder based system is designed to bypass compliant commercial vehicles for a 12 hour period so cross-Province long-haul trucks do not need to be rechecked at all 4 subsequent stations, saving time and resources for the drivers and station operators. A database is maintained by the Province for carrier credentials validation. Automatic Vehicle Identification (AVI) Readers are used at all 5 stations to identify participating trucks and Weigh-in-Motion technology is employed at eastbound and westbound corridor entry points to ensure weight compliance.

In Alberta, the Commercial Vehicle Pre-clearance System is also a transponder based bypass system deployed at 12 weigh station facilities across the Province. Partners in Compliance (PIC) carriers with excellent safety and inspection records are able to bypass at any of the 12 stations (16 AVI systems). International Road Dynamics, Inc., designed and built each system and is responsible for the development, hosting, maintenance and operating of the PIC transponder database. Random inspections are conducted to ensure safety compliance and future upgrades to use Weigh-in-Motion Technology were taken into account for each site design.

## **Introduction**

Commercial vehicle transportation is crucial to the ongoing strength and growth of Canada's economy. Transport Canada's annual report – Transportation in Canada 2006 provides a quantification of the importance of commercial vehicle transportation to the economy (1). In 2005 the trucking industry (including for-hire carriers, private carriers, owner-operators and courier firms) generated an estimated \$67 billion in revenues in Canada. Trucking is the most significant transportation method for trade with the United States, accounting for 61 per cent of trade in terms of value. Exports shipped by trucks from Canada totaled \$185.8 billion. In terms of employment, the trucking industry as a whole employed 356,124 people in 2005.

Strong economic growth in Western Canada is resulting in accompanying growth in the transportation sector. This growth can put a strain on the capacity, safety, and sustainability of the highway infrastructure. Monitoring and enforcement of safety and weight regulations have long been a task of highway agencies to preserve the roadway from damage due to overloading and to ensure the safety of road users. With increasing growth, streamlining any cumbersome transportation processes is now essential to preserving and operating the transportation infrastructure in a safe and efficient manner.

Intelligent Transportation Systems (ITS) technologies have been applied to address a variety of transportation problems and offer potential solutions for commercial vehicle operations as well. Systems that provide value to commercial carriers as well as the managing agencies are the ones most likely to be adopted and evolve into a sustainable solution.

Solutions that reduce inspection and monitoring processing time for drivers mean an increase to the revenue per payload for carriers, and a reduction or optimization of Ministry enforcement resources. Reductions in damages to the environment by reducing emissions and other byproducts may also be realized. Effective solutions must also address safety, infrastructure protection and projected expansion to be feasible and of value on a long term basis.

British Columbia has seen sustained economic growth through 2007 in many areas, including job creation, investment in mining operations, and sales of oil and gas rights. British Columbia led Canada with a growth in small businesses of 11 percent between 2001 and 2006 (2).

Alberta's economic growth rate was the strongest in Canada between 1996 and 2006, averaging 4.3 percent per year, and is expected to continue strong growth. Over this time period, Alberta's exports of goods and services more than doubled to \$90.1 billion, including a doubling of the exports of manufactured goods, and the creation of approximately 465,600 new jobs (3).

Alberta and British Columbia have both turned to ITS as part of their solution to address the growing volume of commercial vehicle traffic, develop innovative approaches to

commercial vehicle enforcement, and improve carriers' operational efficiency. An overview of how ITS is being used in each province is provided.

### **Alberta PIC Pre-clearance System**

Partners in Compliance (PIC) is a joint venture program between Alberta Transportation (AT) and Alberta Motor Transport Association (AMTA) to recognize carriers with exemplary safety and inspection records and assist carriers to develop self regulated compliance. This program needed a tangible incentive for carriers to produce a feasible program with more immediate benefits for participants. AT partnered with International Road Dynamics, Inc. (IRD) to design the Pre-clearance System that forms the basis for re-engineering the PIC program to attract industry participation.

The Alberta PIC Pre-clearance System is designed so that the fleet of motor carriers on the PIC approved carriers list can bypass designated weigh stations. This ensures drivers spend less time in reporting to weigh stations, increasing operational efficiency and maximizing revenue for both compliant carriers and the Province. The Province can focus its enforcement resources on non-compliant and higher risk carriers.

Alberta has multiple weigh stations or Vehicle Inspection Stations (VIS) on major routes across the province. Twelve sites, as illustrated in Figure 1, were selected to have Automatic Vehicle Identification (AVI) systems installed to identify trucks equipped with transponders and whether they are on a bypass list as they approach the weigh station. Eight sites were single direction sites, and two sites were bi-directional sites with two separate desks at the station to handle the two directions of traffic. All 12 stations are connected via the Internet to an AVI Central Database which can accommodate up to 50 AVI Pre-clearance systems. Each system was designed and located in such a way that future Weigh-In-Motion (WIM) equipment may be integrated on to the mainline.

IRD designed a database with a web-enabled user interface to allow authorized PIC personnel to enter credential information and digital photos of vehicles and drivers. The database develops a list of authorized bypass vehicles called the "Bypass List" every 24 hours. This list is downloaded to each site so each valid transponder read by the AVI system can be checked against this list.

The Alberta PIC Pre-clearance System includes the following components:

- Transponders
- AVI Antenna and Reader
- IRD Software and Database System
- Wireless Communication System
- A real-time bypass vehicle record display on Station PC

In a typical application, the solar powered AVI readers are installed in advance of the existing weigh stations, sufficient distance upstream from the stations to allow the trucks to navigate the ramp and enter the station area, as illustrated in Figure 2. Also, the AVI system location has been determined to optimize the location for any future addition of

Weigh-In-Motion equipment in a more advanced screening approach. The proposed location of the AVI poles would coincide with the location of the In-Cab Notification devices in the more complete screening system approach.

Each pole supports a pole mounted electronics box, a solar array and the antenna system, as illustrated in Figure 3. Additionally, the pole accommodates an RF spread spectrum antenna that is be used to provide communications between the reader the Scale House computer.

Any vehicles carrying a PIC transponder tag will be picked up by the reader which will send the tag ID information to the Scale House PC by a wireless RF link. The Scale House PC will check this tag ID against the most recent “Bypass List”. IRD developed a database which manages this “Bypass List”. This list is comprised of PIC authorized bypass vehicle records with associated transponder IDs. This “Bypass List” is updated through a secure Web-enabled user interface which allows authorized PIC personnel to add or modify motor carrier information. Specific information regarding each vehicle and a digital image of that vehicle is added to the record and stored in the database. This list is currently compiled daily and is sent out to the Scale House PC at each pre-clearance site/workstation. The main components of the system are illustrated in Figure 4.

If the vehicle tag ID is found on the “Bypass List”, the green bypass signal is illuminated on the transponder inside the vehicle, indicating to the driver to bypass the Scale House. Simultaneously the AVI transmits the transponder ID to the scale house PC to access the corresponding vehicle record for display on the monitor. This record displays pertinent vehicle credentials and the digital image associated with that vehicle. This visual inspection is another check point to ensure that the PIC pre-clearance vehicle records are correct and that the right vehicle is bypassing the VIS.

Any vehicles without a transponder or a transponder ID that is not on the “Bypass List” will not be signaled to bypass and are expected to report for inspection. A list of all transactions is saved to allow authorized users to review the information at a later date.

IRD is the Transponder Administrator for the PIC project, hosting the database, selling transponders and adding carrier information to the database. This comprehensive approach does not require extra resource from the PIC program personnel and the PIC program receives a portion of the proceeds from the transponder sales.

## **BC Green Light Transportation Corridor**

The BC segment of the Trans Canada Highway system is a key commodities route and carries very high volumes of commercial vehicle traffic from the Vancouver lower mainland area to Alberta and other destinations to the east. The commercial vehicles are a combination of short haul and long haul vehicles with a drop-off of local trucks east of Hope. To regulate this critical transportation infrastructure, from the Alberta Border to the City of Vancouver there are 5 major weigh station/inspection sites. During hours of

operation, all commercial vehicles must report for safety and weight inspection but due to the high volumes of commercial vehicles on this route enforcement cannot process these sheer numbers efficiently. One issue that results from this excess volume is the costly delays to the carriers waiting to be inspected, which increase transportation and commodity prices. Another issue is road safety due to a high number of trucks merging off and on the highway and the potential for a back up on the inspection station entrance ramp.

There are a number of regular commercial carriers using this route that are consistently compliant to weight and safety laws and regulations. Based on this fact British Columbia Ministry of Transportation (BC MOT) and International Road Dynamics, Inc. (IRD) have designed a compliant carrier bypass system called the Green Light Transportation System (GLTS). The core idea is to identify these compliant carriers and drivers, and to bypass their vehicles from Golden to Port Mann. The payoff for both carriers and the BC MOT is a reduction in time for compliant vehicles spent at weigh station facilities.

This system is comprised of three major components: hardware upgrades to each station, a database system to track participating commercial fleets, and a unique transponder that is carried by all participating vehicles. Any participating vehicle that is up-to-date on safety compliance will be added to a ‘good to go’ (GTG) list which is downloaded to each station daily. As the vehicle enters the Corridor via Golden or Port Mann it is verified for weight compliance via the Weigh-in-Motion (WIM) scales. If their transponder is on the GTG list and their weight is compliant, they will be able to bypass all subsequent stations on the corridor in the next 12 hours. Should there be inconsistencies with credential information the station operator is able to override the automatic decision and assign or revoke the vehicle GTG status.

The location of the GLTS sites is illustrated in Figure 5. Both Golden and Port Mann WB had existing WIM systems in place, and therefore required minimal updates. Hunter Creek, Kamloops eastbound and westbound and Laidlaw stations had only static facilities and required the addition of Automatic Vehicle Identification (AVI) components which will read the vehicle transponder as the truck approaches the stations at highway speeds. The Hunter Creek installation is illustrated in Figure 6. Solar powered AVI readers and writers with Radio Frequency (RF) communication were installed upstream from the station to detect transponder equipped vehicles. Any vehicles that are ‘good-to-go’ in the system will automatically be signaled to bypass these stations while all other commercial vehicles must report. A random pull-in process is designed into the system for spot checks of carriers to ensure that safety and credential information is up-to-date. This random pull-in percentage can be controlled by the system administrator based on their discretion. All AVI equipment at these stations is also designed such that WIM scales may be added in the future with minimal changes to the existing equipment location.

The development of the database system by Sierra is to incorporate all of BC MOT’s legacy databases. Once this system is incorporated it will provide functionality so that a comprehensive credentials system can be utilized for the GLTS. It also provides for possible expansion of this program for other uses including tracking of hazardous goods,

traffic information services during disaster alerts, and even emergency monitoring of at risk vehicles.

## **Summary**

Growing economies in Western Canada are reliant on a safe and efficient commercial vehicle transportation system, but are at the same time straining the transportation infrastructure and the management of commercial vehicle operations. Previous methods of monitoring and enforcement can't keep up with today's demands, and new approaches are needed to ensure proper monitoring and compliance without unduly hindering the movement of goods.

With the number of technologies existing today to solve our transportation problems it is imperative to a program's success to apply each solution in a way so as to address the needs of all participants. Both the PIC Pre-clearance Program and the Green Light Transportation Corridor are endeavoring to improve the safety and protection of the transportation network by applying ITS technology, while facilitating the efficient movement of goods.

## References

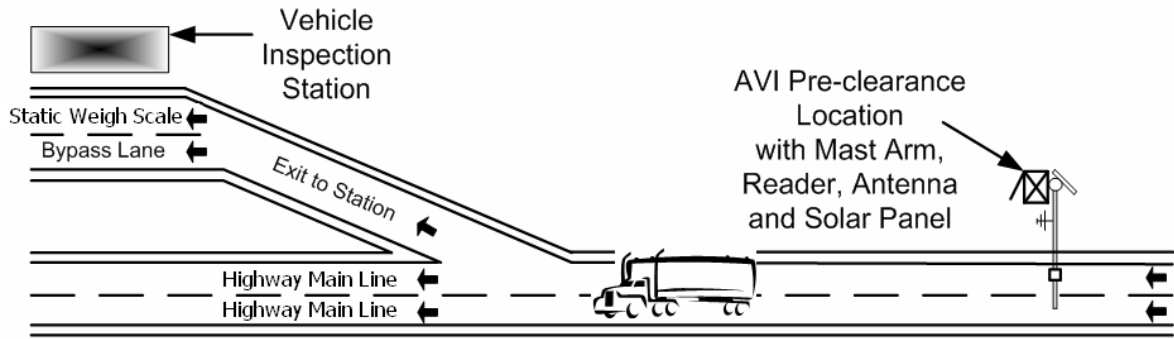
1. Transport Canada, Transportation in Canada 2006, accessed at <http://www.tc.gc.ca/pol/en/anre/menu.htm> , April 14, 2008
2. Positive Economic Indicators, Province of British Columbia, accessed at [http://www.gov.bc.ca/keyinitiatives/economic\\_indicators.html](http://www.gov.bc.ca/keyinitiatives/economic_indicators.html) , April 14, 2008
3. Alberta Canada, A Wealth of Opportunity, accessed at <http://www.alberta-canada.com/economy/economicResults/> , April 14, 2008



# Figures



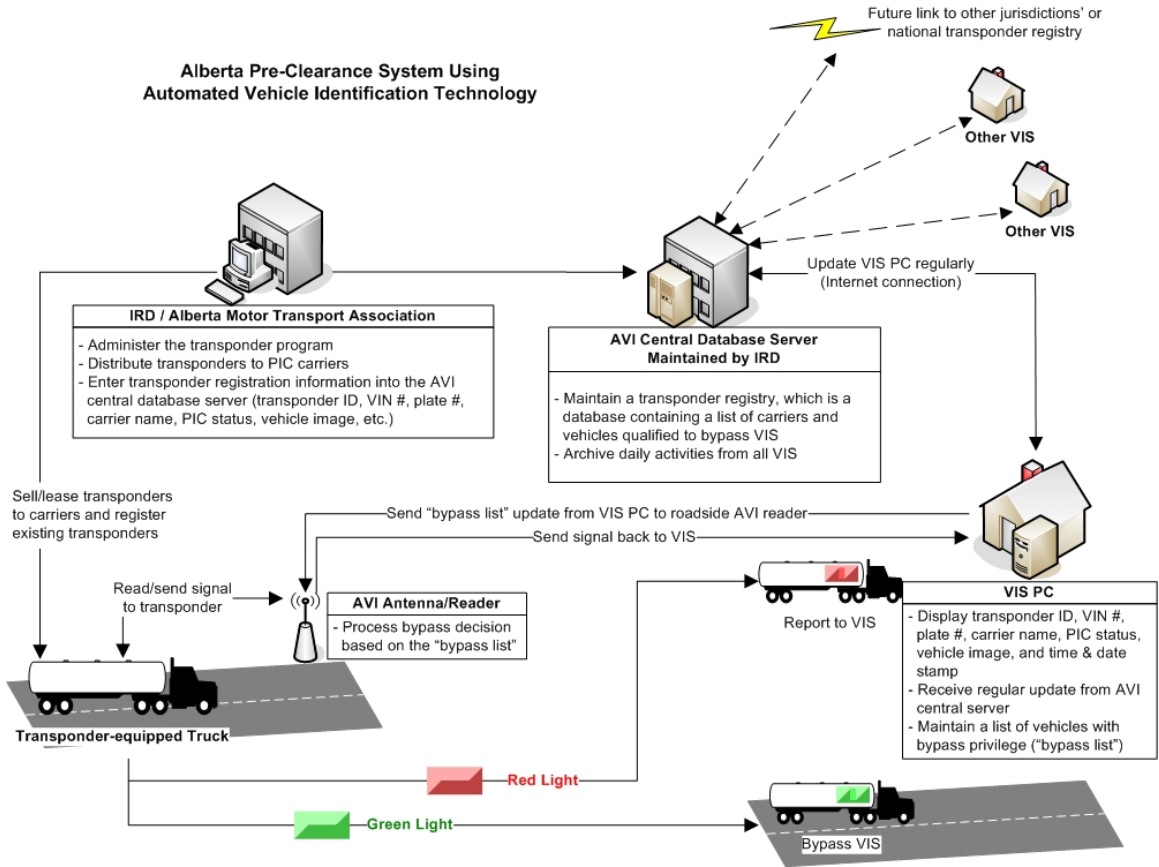
**Figure 1: Location of Alberta PIC preclearance sites**



**Figure 2: Typical layout for Alberta PIC pre-clearance site**



**Figure 3: Photograph of roadside hardware at Strathmore PIC pre-clearance site**



**Figure 4: PIC preclearance business process diagram**



**Figure 5: Green Light Transportation System site locations**



**Figure 6: Photograph of Green Light Transportation System site at Hunter Creek**