



International Seminar on ITS  
in Road Network Operations

# INNOVATIVE CONCEPTS AND NEW TECHNOLOGIES FOR REGIONAL MULTI-JURISDICTIONAL INTEGRATED TRAFFIC MANAGEMENT

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## ABSTRACT

With their significant economic influence and continuous growth, many major urban regions around the world often attract a large portion of their country's respective total population and jobs, and extend over large geographical areas, administered by multiple jurisdictional agencies. As such, these major urban regions are increasingly the economic engines that drive, not only their respective country's economy, but also the world economy. Transportation is vital to the social and economic health of these mega-urban regions. But with their continuous growth, there is increasing traffic congestion within these regions, and there is a continuous and growing need to manage transportation within the region by more efficient and more cost effective means. This paper examines innovative concepts and new technologies currently being employed for the integrated management of transportation in regional multi-jurisdictional urban areas.

## PROBLEM STATEMENT

Major urban regions around the world, such as Kuala Lumpur, Singapore, Hong Kong, Tokyo, Los Angeles, New York, and London to name a few, are increasingly the economic engines that drive, not only their respective country's economy, but also the world economy. As the world's markets become more and more open, one can envisage that these large urban regions will more often directly compete with each other in the marketplace.

Transportation is, and will continue to be, vital to the social and economic health of these major urban regions. However, for most if not all of these mega-urban areas, despite comprehensive networks of multi-modal transportation links that are already in place, the transportation system

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in these regions face many challenges. Continued growth in population, employment and trade has led to the placement of increasing demands on the transportation system, challenging the efficiency of the network. Inefficient movement of people and goods reduces productivity, wastes energy, increases emissions, compromises safety, and threatens the quality of life.



As these large metropolitan ‘cities’ often attract a large portion of their country’s respective total population and jobs, they typically extend over large geographical areas, administered by multiple jurisdictional agencies. Each of these jurisdictional agencies may (or may not) be implementing the appropriate solutions, such as centralized traffic signal control systems.

In the past, these traditional ITS solutions have proven to demonstrate significant benefits (e.g., from the coordination of traffic signals, etc.), and this local jurisdictional approach has served the individual municipalities and jurisdictional agencies reasonably well. However, with the continued growth of these large metropolitan areas, there is a growing need for seamless transportation links that efficiently move both people and goods across local jurisdictional boundaries via multiple transportation modes. A traveller sees the transportation system as one integrated network that serves all modes. To manage the network effectively and in a manner that will satisfy the ‘customers’, a multi-modal, regional approach is required. And in implementing regional transportation strategies, there is also typically the need to develop and implement solutions that are capable of integrating with the local jurisdictions’ existing legacy systems.



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### **REGIONAL SOLUTIONS**

The following sections examine innovative concepts and new technologies currently being employed by two large multi-jurisdictional regions for the integrated regional management of transportation within their respective urban areas.

The Greater Vancouver Regional District (GVRD) consists of a federation of 21 different local municipalities, covering an area of some 300,000 hectares, and is Canada's gateway to the Pacific Rim, with excellent airport, seaport, road and rail infrastructure. Los Angeles County is a large geographic area that encompasses over 1 million hectares, a population base of more than 10 million people, and over 80 municipal jurisdictions.

The transportation systems in these respective regions are made up of a network of provincial/state freeways, municipal arterials and public transportation facilities that are operated and maintained by a multitude of public agencies. Until recently, many of these agencies managed their transportation systems using stand-alone ITS systems. While effective in their own right, collectively they lacked a regional approach to traffic management.

A key first step in providing effective solutions on a regional basis is assembling, integrating and disseminating real-time information to:

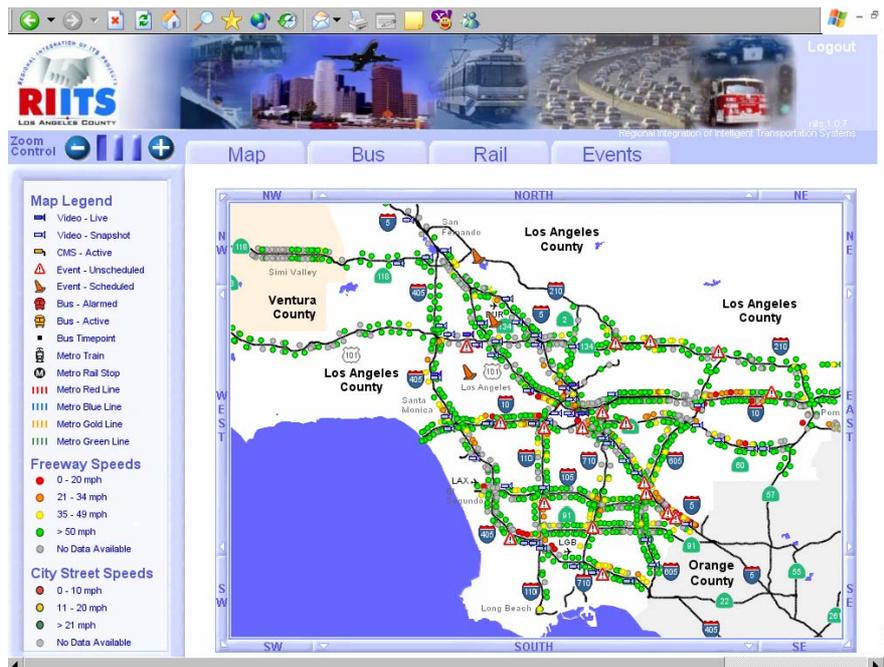
- Operating Agencies – For the exchange of transportation-related information to facilitate coordinated transportation system management; and
- Travellers – To inform travellers in a timely and accurate manner about travel times and any situations that impact on transportation services so that those travellers have sufficient information to make informed decisions regarding their trip (e.g., to travel now or at a different time, to drive and/or take public transportation, etc.).

### **REGIONAL INTEGRATION OF INTELLIGENT TRANSPORTATION SYSTEMS**

The Regional Integration of Intelligent Transportation Systems (RIITS) project is an initiative sponsored by the Los Angeles County Metropolitan Transportation Authority to implement a county-wide network interconnecting public agencies for the exchange of transportation-related information to facilitate coordinated transportation system management. Specifically, the project included an initial deployment of a network with 15 transportation management and emergency management agency connections for the exchange of transportation-related information,

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including freeway and arterial traffic congestion and events, bus and rail information, and video surveillance.



The RIITS project is one of the largest public partnerships for the sharing of transportation information, including some of the largest freeway, arterial, transit, and emergency management agencies in the country as well as air and sea port ground-side agencies.

Using the latest web-based technologies and the latest Centre-to-Centre (C2C) Extensible Markup Language (XML) standards, the information that is collected by the RIITS Network is integrated and disseminated to users in three ways: 1) a secure browser-based map display for authorized agency users, 2) a data feed that is made available to Information Service Providers to allow private companies to add value and reach a broad audience, and 3) a data feed to agencies to allow integration of the data into their existing systems.

The initial deployment of the RIITS Network was completed at the end of 2004. An institutional framework, consisting of a configuration management process and a committee, has been established as part of the project to manage changes that are introduced into the RIITS Network over time.

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The Regional Integration of ITS in Los Angeles County is a way of providing a more strategic approach to traffic management by providing a regional network to interconnect multiple transportation agencies and their ITS systems. This approach presented a significant opportunity to improve multi-modal and cross-jurisdictional transportation efficiency throughout the region.

### REGIONAL TRAFFIC SIGNAL COORDINATION AND MANAGEMENT

In many large urban metropolitan areas, individual municipalities have typically installed their own traffic signal control systems to control the signalized intersections within their respective jurisdictions. In the past, this approach has served the individual municipalities and jurisdictional agencies reasonably well; experience has shown that traffic signal control and management systems have proven to reduce congestion by reducing vehicle stops, delays, fuel consumption and emissions, and reducing travel times. However, with the continued growth of the various individual municipalities, there is a growing need to coordinate the traffic signal operations between adjacent municipalities and jurisdictions.

To address this need in the Greater Vancouver Regional District (GVRD), the Greater Vancouver Transportation Authority (also known as 'TransLink') is currently implementing an Integrated Regional Signal System (IRSS) that will facilitate coordinated operation between jurisdictions on the major arterial road links within the GVRD, while also allowing the individual jurisdictions to maintain their legacy systems and their autonomy with respect to signal control equipment selection and signal timing plan implementation.

Utilizing open system architecture and new standards for web-based centre-to-centre communications protocol, the IRSS will allow individual agencies to:

- Share information and data that would encourage coordinated operations, as well as encourage common standards, across jurisdictional boundaries;
- Send and receive event notices to/from adjacent municipalities to trigger special pre-defined signal timing plans (e.g., in response to incidents, special events, etc.); and





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- Receive priority requests from fleet management systems (e.g., emergency vehicles, transit vehicles, etc.) based on vehicle location, schedule adherence, etc.

The sharing of information between agencies is considered to be crucial to the effective implementation of other regional ITS programs planned for the GVRD. In this respect, over the longer term, the IRSS can provide the necessary links between signal operations and other regional ITS initiatives (e.g., traveller information, integrated traffic management centre, etc.) to support the implementation of regional traffic management strategies that support all modes of transportation, and extend to both arterial and freeway networks.

### **REGIONAL TRAFFIC MANAGEMENT CENTRE**

Traditionally, the basic operational roles of a Traffic Management Centre (TMC) have been highway focused (e.g., for incident detection and freeway traffic management). With a wide variety of ITS solutions typically being initiated by various agencies in large metropolitan areas and the growing awareness of the need for integrated regional solutions, open system architecture and new standards for web-based centre-to-centre communications protocol are also providing opportunities for new concepts in the design and operations of Regional TMCs. The role of a TMC may be more multi-modal, and multi-agency in nature. The TMC may support a wider array of ITS applications that address not only the needs of highways, roads, transit, marine and air, but also commercial goods movement and border security.

The British Columbia Provincial Ministry of Transportation in British Columbia, in conjunction with TransLink, is currently developing a concept of operations for a Regional TMC that is intended to be an integrated multi-agency facility that would support ITS applications and infrastructure throughout the Greater Vancouver Regional District. Alternatives for the Regional TMC that will be developed during this project will be based on the following three concepts:

- Centralized TMC facility that achieves integration through co-location of a multitude of agencies and operations in one geographic centre;
- Multiple TMC's distributed throughout the GVRD that achieve integration through data sharing and system inter-operability as appropriate; and
- Hybrid approach where some operations are co-located based on need or common interests, while others are integrated using virtual techniques.

In fulfilling the project objective, the Regional TMC can support coordinated sharing of information and interoperability between agencies through joint operation and maintenance of ITS applications. The TMS could serve as the centre for monitoring and control of traffic



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conditions, provide coordination between modes (e.g., transit, air, marine and road), act as the clearinghouse for data and information exchange, and provide support for other transportation programs.

### **REGIONAL ADVANCED TRAVELLER INFORMATION SYSTEM**

To better assist travellers in the planning and implementation of their travel plans within the GVRD, TransLink is currently implementing a Regional Advanced Traveller Information System, which they've named iMOVE. Whereas many existing transportation information systems focus on specific groups or types of travellers (e.g., transit users or airline passengers only), the iMOVE functionality requires that different types of travel information be assembled and structured in such a way that it is useful to and accessible by all types of travellers with various travel characteristics. This will necessarily include multi-modal travellers whose travel plans require several modes of transportation (e.g., private car, transit, ferry, etc.).

The currently on-going project takes advantage of TransLink's corporate structure to bring together the efforts of many existing regional agencies to create an integrated and unified regional traveller information service. The primary objective of the project is therefore to provide a traveller information system for the GVRD that makes use of multiple information delivery systems to provide trip information to the traveller, when and where it is required, in the appropriate format, and with the appropriate content and timing, to effectively support travel decisions such as choice of mode, choice of route, and timing of the trip.

iMOVE will gradually develop over time as the availability of information (such as real-time as well as planned transit schedules, incident detection, etc.) becomes more widely available and dependable. But even in its initial phase, iMOVE will dramatically change the way in which traveller information is collected, then analyzed and made available to the public in a convenient and easy to understand format. The approach involves using technologies that will allow data to be applied between different applications, thereby allowing the sharing of data between agencies and the application of the same data for more than one purpose. A key secondary objective of the project will be the dissemination of information to other regional transportation agencies, as well as to TransLink partner agencies, to allow these agencies to learn from and improve their participation in iMOVE.

iMOVE will promote the coordination and dissemination of transportation information between multiple agencies, including the local municipalities, public transit authorities, airport authority, port authorities, and the Provincial Ministry of Transportation, to provide improved mobility to the public in the Greater Vancouver Regional District.

## CONCLUSION

With their significant economic influence and continuous growth, major urban regions around the world often attract a large portion of their country's respective total population and jobs, and extend over large geographical areas, administered by multiple jurisdictional agencies. Until recently, individual jurisdictions within these large metropolitan areas managed their transportation systems using stand-alone ITS systems. While effective in their own right, collectively they lacked a regional approach to traffic management.

Transportation is, and will continue to be, vital to the social and economic health of these major urban regions. There is a growing need for seamless transportation links that efficiently move both people and goods across local jurisdictional boundaries, and consequently, a growing need for regional transportation strategies and solutions. Transportation authorities must look to innovative concepts and new partnerships as well as new technologies for these strategies and solutions.