

WG 1.3 Discussion Paper: Urban Transit ITS R&D in Canada

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Work Group 1.3

Discussion Paper

- Overview of Public Transport ITS R&D Needs in Canada
 - State of Practice
 - Transit ITS R&D Needs
- Topic: Transit Signal Priority (TSP)
 - Canadian State of the Practice of TSP
 - Canadian TSP R&D
 - TSP R&D Needs

Transit ITS in Canada

- Early deployments of multi-function Transit ITS systems
- Stand-alone Transit ITS systems (APC, TSP)
- Transit ITS planning
- Transport Canada's ITS deployment grant program

Transit and ITS Deployment Grant Program

- Calgary-Traffic Signal Priority
- Go Transit-Rail Information Systems
- Ottawa-Intelligent Transit Vehicle Subsystem
- Outaouais-Dynamic Message Signs
- Peterborough-Integrated Traffic Control and TSP
- Richmond-Vancouver Rapid Transit Evaluation
- St John's Nfld-Metrobus GPS-based AVL System
- Toronto IMS Multi-Application Smart Card
- Waterloo-TDM Initiative
- York Region-TSP

Transit ITS in Canada

- Clearly much interest in ITS in the Canadian transit community
- Increased thinking, and some limited deployments (only 1 new full ITS since 1997)
- But, *highly constrained fiscal environment* (among the most constrained in developed world)

Canadian Transit ITS R&D Needs



- Transit ITS R&D Needs Related to Specific Applications
- Data-Related Issues and Applications
- R&D Needs Related to Transit ITS Deployment

Transit ITS R&D Needs related to Specific Applications

- Transit Signal Priority (TSP)-technical and institutional issues
- Real-time transit operations control models using AVL
- Transit automated customer information systems
- Transit contactless smart card automatic fare collection systems -institutional and technical barriers
- Dynamic routing and scheduling of demand responsive transit.

Data-Related Issues and Applications

R&D Needs



- Role of GIS and location-based data in Transit ITS applications
- Use of APC and AVL data for planning, management, and customer info
- Integrating ITS with standard transit planning methodologies and practice

R&D Needs related to Transit ITS Deployment

- Benefits and cost-effectiveness of Transit ITS applications
- Transit ITS and the Canadian ITS Architecture
- Inventory of Transit ITS deployments
- Transit requirements in municipal trunk radio systems in new / reorganized municipalities

Transit Signal Priority (TSP)

- Passive TSP
- Active TSP
 - *Unconditional TSP*
 - *Conditional TSP*
(*schedule, headway, in future passenger load*)
- Adaptive TSP

Overview of the Canadian State of TSP Practice

- TSP in Toronto (demo in 1990, over 200 intersections)
- Isolated deployments of intersection control (e.g. Eglinton Bus Station, Edmonton)
- Recent limited corridor deployments (e.g. Quebec City, Longueuil, and Calgary)
- Recent deployments of TSP-enabled control systems
- TSP as part of Bus Rapid Transit (BRT) (TransLink)

Recent Canadian TSP R&D Activities

- Advanced TSP systems
 - SPPORT Model – University of Waterloo
 - Integrated System of Adaptive Traffic Signal Control and TSP – U of T
 - Adaptive Signal Priority for Automated Headway Control – U of T

Recent Canadian TSP R&D Activities

- Models/algorithms supporting advanced TSP systems
 - Bus Arrival and Departure Time Predictive Model Using AVL and APC Data – U of T
 - Multi-Attribute Performance Measurement Model for Advanced Public Transit Systems – Ryerson University

TSP R&D NEEDS:

Basic Research



- Designing TSP-Based Operational Control Strategies
- Artificial Intelligence and TSP
- TSP Request Activation Strategies
- Technical Options for Conditional Priority
- Differential Priority Algorithms and Systems
- Hybrid Application of Unconditional and Conditional Control for TSP

TSP R&D NEEDS: Applied Research



- Analytic Framework for Selecting TSP Corridors And Intersections
- TSP and Transit Scheduling: Best Practices
- TSP and AVL: Factors Affecting Technology Strategy
- Integrating Physical and Signal Priority Measures for Transit

TSP R&D NEEDS: Applied Research (ctd)

- Traffic Controller Equipment and TSP
- Role of TSP in BRT System Design
- Impact of Bus Operator Behavior on Transit Schedules under TSP
- Review of Major European TSP-Related Demonstration Programs (e.g. PRISCILA, ROMANSE, etc.)

Conclusions

- Much interest in Transit ITS
- Many identified R&D Needs
- TSP is an area of growing interest in the Canadian transit industry
- However, there are significant R&D Needs both applied and basic, to maximize the potential benefits: