Transit Signal Priority

WHAT IS TRANSIT SIGNAL PRIORITY?

Transit Signal Priority (TSP) is an operational strategy to facilitate the movement of transit vehicles through signalized intersections. It is typically done by giving transit vehicles an extended green or reduced red at signalized intersections under certain pre-defined conditions (e.g., late arriving buses only). This allows for more reliable travel times and improved schedule adherence. Experiences from prior TSP deployments across the country generally indicate average bus travel time savings between two (2) to twenty (20) percent (depending on existing signal delay) with minor impacts on the cross street traffic. Eight (8) percent to twelve (12) percent is the most typical range for bus travel time savings based on data from the Transit Cooperative Research Program.

KEY COMPONENTS OF TSP SYSTEM

A TSP system consists of two primary components:

- Priority request generator (PRG) – located on transit vehicles
- Priority request server (PRS) – located inside traffic signal cabinet

The priority request generator determines whether a vehicle is in need of preferential treatment (priority), and if so, to communicate the vehicle’s request for priority to the priority request server. The priority request server receives and prioritizes priority requests from different priority request generators, and communicates the service request to the traffic signal controller. Transit and traffic management centers often serve as a role to monitor and maintain system performance and operations.

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1 ITS America, “Transit Signal Priority: A Planning and Implementation Handbook”
District of Columbia DOT Transit Signal Priority Design and Implementation  
*Washington D.C.*

KAI led the transit signal priority system (TSP) design for over 100 signalized intersections within the District of Columbia along four corridors. The project goals include an assessment of up to 130 intersections along four corridors, signal timing modifications for transit signal priority, and detailed design at the selected intersections for TSP equipment. The design will include signal timing modifications, traffic controller assessment and parameter modifications, priority equipment designs, and wiring. KAI also extensively tested the BiTran 233 controller to assess its capabilities and limitations for implementing TSP.

HART Transit Signal Priority Pilot Study  
*Tampa, Florida*

KAI led a project to demonstrate TSP along portions of three selected corridors: Fletcher Ave, N 56th St, and Nebraska Ave. The results of the demonstration provided critical input into the completed design of HART’s initial implementation of their BRT system (known as MetroRapid) along the Fletcher Ave and Nebraska Ave corridors. Through stakeholder input, the TSP technology has been selected as a GPS/Radio based system that will be integrated with HART’s existing Automatic Vehicle Location (AVL) system to provide conditional priority (i.e., conditioned upon bus lateness). The project will also allow for the demonstration of emergency vehicle preemption using the same TSP technology and participating emergency response agencies include Hillsborough County and the City of Temple Terrace.

TriMet Cornell Road Transit Priority Design & Implementation Project  
*Portland, Oregon*

KAI is leading the systems engineering concept alternatives analysis, design, specification, and upcoming implementation, testing and signal timing modifications in suburban Washington County, Oregon, adjacent to the Intel™ World Campus. The project includes 18 intersections along the major arterial, Cornell Road. 12 intersections are controlled by an adaptive signal system (Rhythm’s InSync), and the remaining run in Northwest Signal Voyage. KAI will assist the County with TSP signal timing settings, and implementation testing verification and validation of bus travel time improvements.
Jacksonville Transit Authority ITS Signal Priority Program Study
Jacksonville, Florida
KAI completed a TSP implementation project along Atlantic Boulevard in Jacksonville, Florida at six Naztec controlled signalized intersections. This project involved reviewing alternate TSP strategies and technologies as well as conducting “before” and “after” evaluations on bus and auto performance measures. The GTT Opticom GPS system was chosen as the bus detection system for the implementation, its first transit application on a US bus system. An interface between the bus detection system and the bus Automatic Vehicle Location (AVL) system was developed to test “conditional priority” along the corridor. This project also identified an implementation strategy to expand TSP application to other portions of the Jacksonville region. KAI is currently developing final technical specifications for a vehicle detection technology, defining corridor screening criteria, and applying the screening criteria to identify a priority corridor and intersections for JTA’s TSP expansion.

WMATA TIGER Implementation of Transit Treatments
Washington D.C.
KAI is assisting WMATA with implementing transit preferential treatments across the metropolitan Washington area as part of the TIGER Grant funding for the “Priority Bus Transit in the National Capital Region” project. KAI is working with the regional traffic and transit agencies to identify opportunities to improve transit service and reliability. As part of this effort, a regional TSP technology was defined through functional and system requirements and is consistent with the regional TSP concept of operations. KAI is leading the technical development and review of this effort. In addition, KAI is the technical lead to identify opportunities to implement TSP along Virginia Route 7. The effort will include preliminary engineering review of candidate intersections, design of the TSP system and intersection upgrades, system implementation, acceptance testing, and performance measurement.

Federal Transit Administration Transit Signal Priority Research
The purpose of this research was to provide a resource for transit agencies seeking to improve transit travel times and reliability of transit trips through the implementation of Transit Signal Priority (TSP). While TSP has been successfully implemented across the nation, there are a number of issues that transit agencies face when designing and implementing TSP. The results of the research assisted transit agencies in addressing a number of specific issues, including identifying appropriate TSP strategies, selecting decision-making and analytical tools, applying industry standards, and improving data collection. Guidance on the application of the NTCIP 1211 standard, Object Definitions for Signal Control and Prioritization, was a major focus of the research. The project team consisted of the National BRT Institute at University of California at Berkeley, the University of South Florida, and KAI in collaboration with the California Department of Transportation and the Florida Department of Transportation, http://www.dot.ca.gov/newtech/researchreports/reports/2008/tsp_research_tools_final_report.pdf