Module 8: Arterial Management and Transit Signal Priority: Understanding User Needs for Signal Control Priority (SCP) Based on NTCIP 1211 Standard, Part 1 of 2

Table of Contents

Module Description

This module is an introduction to Intelligent Transportation Systems (ITS) Transit Standards for improving transit service along arterials, with a focus on transit signal priority. Modules 1 to 3 are recommended prerequisites for participants and are, respectively, Introduction to ITS Transit Standards; Transit Management Standards, Part 1 of 2; and Transit Communications Interface Profiles (TCIP) Part 1 of 2.

The logical next step for the participant after taking this module is Module 9: Arterial Management and Transit Signal Priority: Specifying Requirements for Signal Control Priority (SCP) Based on NTCIP 1211 Standard, Part 2 of 2.

1. Introduction/Purpose

Transit managers are looking at transit signal priority as a potential tool to improve schedule adherence, improve transit vehicle efficiency, make transit service more reliable, and improve transit vehicle travel times with minimal negative impacts to normal traffic operations. Signal Control Priority (SCP), which transit signal priority (TSP) is a subset of, is an operational strategy that provides preferential treatment (priority) to facilitate the movement of fleet vehicles such as transit, emergency service, and commercial fleets, through signalized intersections.

This module (Arterial Management and Transit Signal Priority: Understanding User Needs for Signal Control Priority (SCP) Based on the NTCIP 1211 Standard) is the first of a two-module set in arterial management. This module will introduce participants to the benefits of an SCP system, describe the components that may make up an SCP system, and provide an overview of how to identify and use applicable ITS standards to procure and operate an SCP system. This module also helps participants understand the scope of applicable ITS standards and assists in identifying the user needs of an SCP system. Although the discussion in the module will be for an SCP system in general, the focus will be on transit signal priority (TSP), which is a subset of SCP.

This module will also provide an example case study, demonstrating how a transit agency might work with a traffic signal department to select an architecture for an SCP system, determine the features to be included in the SCP system, and how to develop a procurement specification.

The second module of the two module-set on arterial management (Arterial Management and Transit Signal Priority: Specifying Requirements for Signal Control Priority (SCP) Based on NTCIP 1211 Standard) focuses on using the ITS standards to develop project specifications for procuring an SCP system.

2. Samples/Examples

The following is a complete list of the user needs identified in NTCIP 1211 v02.

2.4	Architectural Needs
2.4.1	Integral Entities
2.4.2	Provide Live Data
2.4.3	Support Multiple Instances of an Entity
2.4.4	Compressed Data
2.4.4.1	Provide Compressed Data between a Management Station and a PRS
2.4.4.2	Provide Compressed Data between a Management Station and a CO
2.5	Features
2.5.1	Interface – Management Station to PRS
2.5.1.1	Manage the PRS
2.5.1.1.1	Determine PRS Identity
2.5.1.1.2	Determine PRS Configuration
2.5.1.1.3	Configure Reservice Period
2.5.1.1.4	Configure Time to Live Period
2.5.1.1.5	PRS Clock Synchronization
2.5.1.2	Determine Priority Request Criteria
2.5.1.3	Monitor the PRS
2.5.1.4	Retrieve Log Data from the PRS
2.5.2	Interface – Management Station to CO
2.5.2.1	Configure Priority Strategies
2.5.2.2	Determine Priority Strategies
2.5.2.3	Monitor the CO

3. Reference to Other Standards

- **AASHTO/ITE Traffic Management Data Dictionary,** AASHTO/ITE, v3.03c, July 16, 2014. http://ite.org/standards/tmdd/
- **NTCIP 1202:2005 v2.19 – National Transportation Communications for ITS Protocol, Object Definitions for Actuated Signal Controllers (ASC),** AASHTO/ITE/NEMA, v02.19, November 2005. http://www.ntcip.org/
- **NTCIP 1211 Version v02.24, National Transportation Communications for ITS Protocol, Object Definitions for Signal Control and Prioritization (SCP)**, AASHTO/ITE/NEMA, v02.24, September 2014. http://www.ntcip.org/
- **NTCIP 9001 Version v04, National Transportation Communications for ITS Protocol, The NTCIP Guide**, AASHTO/ITE/NEMA, July 2009. http://www.ntcip.org/
- APTA TCIP-S-001 4.0.0, APTA Transit Communications Interface Profiles. American Public Transportation Association, http://www.aptatcip.com/

4. Case Studies

Actual case studies can be found in *Transit Signal Priority (TSP): A Planning and Implementation Handbook*: ITS America, May 2005. http://www.fta.dot.gov/documents/TSPHandbook10-20-05.pdf

5. Glossary

Term	Definition
AASHTO	American Association of State Highway and Transportation Officials.
APTA	American Public Transportation Association
CAD/AVL	Computer Aided Dispatching/Automatic Vehicle Location
CO	Coordinator
Concept of Operations	A document that describes the purpose for a system project, including a description of the current and proposed system, as well as key user needs that the new system is required to address.
Coordinator	A logical device or program/routine that provides coordination. An integral part of a Traffic Signal Controller.
ICM	Integrated Corridor Management
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation Systems
Management Station	Defined as a computing platform that manages NTCIP field components, such as a PRS or a CO. A management station may be a traffic management center or a maintenance laptop that a field technician may use on a trip to visit the component.
NEMA	National Electric Manufacturers Association
NTCIP	National Transportation Communications for ITS Protocol
Preemption	Per NTCIP 1202:2005, the transfer of the normal control (operation) of traffic signals to a special signal control mode for the purpose of servicing railroad crossings, emergency vehicle passage, mass transit vehicle passage, and other special tasks, the control of which requires terminating normal traffic control to provide the service needs of the special task.

Term	Definition
Priority	The preferential treatment of one vehicle class (such as a transit vehicle, emergency service vehicle or a commercial fleet vehicle) over another vehicle class at a signalized intersection without causing the traffic signal controllers to drop from coordinated operations. Note: Priority may be accomplished by a number of methods including changing the beginning and end times of greens on identified phases, changing the phase sequence, or inclusion of special phases, without interrupting the general timing relationship between specific green indications at adjacent intersections.
Priority Request	The information that describes a need for priority service based upon user-defined criteria (such as the number of minutes behind schedule, vehicle occupancy levels, vehicle class, etc.). Note: A priority request is sent from a Priority Request Generator to a Priority Request Server (PRS).
Priority Request Generator (PRG)	A logical or physical entity that initiates a priority request.
Priority Request Server	A logical or physical entity that manages and prioritizes one or more service requests.
PTV-DAT	PTV-DATa manager. A logical entity on a public transit vehicle responsible for data management.
PTV-PRI	Public Transit Vehicle-PRIority. A logical entity on a public transit vehicle responsible for management transit signal priority functions, including the generation of priority requests.
Service Request	The information that describes a priority service to be processed by the Coordinator within a Traffic Signal Controller. Note: A service request is sent between a Priority Request Server and a Traffic Signal Controller.
Signal Control Priority (SCP)	An operational strategy that provides preferential treatment (priority) to facilitate the movement of fleet vehicles through signalized intersections.
TCIP	Transit Communications Interface Profiles
TMC	Traffic Management Center
TMDD	Traffic Management Data Dictionary
Transit Signal Priority (TSP)	A subset of Signal Control Priority focusing on transit fleet vehicles.

6. References

Transit Signal Priority

- *Transit Signal Priority (TSP): A Planning and Implementation Handbook*: ITS America, May 2005. http://www.fta.dot.gov/documents/TSPHandbook10-20-05.pdf

Systems Engineering

- *Systems Engineering Handbook - A Guide for System Life Cycle Processes and Activities*, Version 3.2, INCOSE, 2010.

- United States Department of Transportation Federal Highway Administration. *Systems Engineering Guidebook for Intelligent Transportation Systems Version 3.0*. November 2009.http://www.fhwa.dot.gov/cadiv/segb/

- *Building Quality Intelligent Transportation Systems Through Systems Engineering prepared for Intelligent Transportation Systems,* Joint Program Office U.S. Department of Transportation by Mitretek Systems, Inc., FHWA-OP-02-046, April 2002. Available online at: http://ntl.bts.gov/lib/jpodocs/repts_te/13620.html. Accessed March 23, 2011.

7. Study Questions

1. **How can SCP directly improve the attractiveness of transit to travelers?**
   a) Lower cost of transit
   b) Improved reliability of service
   c) Provide more frequent transit service
   d) Improve passenger loads
2. **Which of the following components determines which priority requests to service?**
   a) Priority Request Generator
   b) Priority Request Server
   c) Coordinator
   d) Traffic Vehicle

3. What is not a significant factor in selecting an architecture for an SCP System?

a) Communication Infrastructure

b) Current capabilities on the transit vehicle

c) Current capabilities of the transit vehicle driver

d) Current capabilities of the traffic signal controller

4. Which is not a benefit of using ITS Standards?

a) Supports interoperability

b) Eliminates institutional issues

c) Lowers integration costs

d) Makes procurements easier

5. Which of the following user needs are not supported by NTCIP 1211 v02?

a) Need to know the distance of the public transit vehicle from the intersection

b) Need to configure priority strategies

c) Need to exchange priority requests

d) Need to exchange service requests

6. What do the ITS standards define?

a) The conditions that must be satisfied for the PRG to generate a priority request

b) The process that the PRS prioritizes priority request

c) How the CO implements the priority strategy

d) The interfaces between the components of an SCP system

7. Which of the following is <u>NOT</u> a characteristic of an ICM program?

a) Sharing information between agencies

b) Coordinating between different modes of transportation

c) Providing traveler information

d) Improving maintenance of transit vehicles