New Jersey Department of Transportation
Bureau of Research

Technical Brief

Real-Time Signal Performance Measurement

This research identifies and develops metrics, guidelines, and deployment strategies necessary to conduct real-time monitoring of traffic signal performance based on existing and planned infrastructure resources and the New Jersey Department of Transportation (NJDOT) needs. This research is especially important for New Jersey (NJ) with the deployment of Adaptive Traffic Signal Performance Measurement (ATSPM) and the establishment of the Arterial Management Center (AMC).
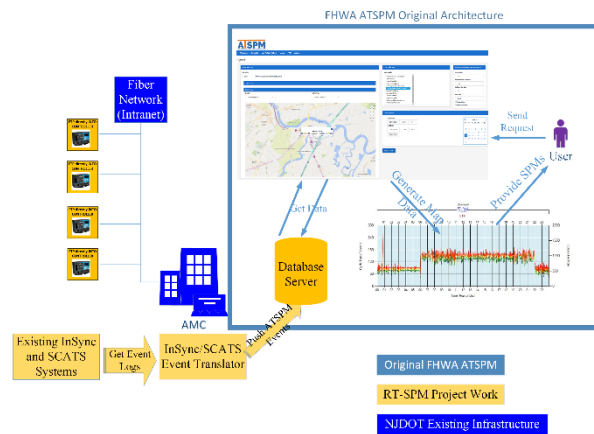
Background

Traffic signal performance measurement and visualization provide insights as operational tools to help traffic management center get more benefits from infrastructure investment. ATSPM system uses high-resolution (0.1 sec) data to support data-driven decision-making process and allows consistent and dynamic monitoring of signal-controlled intersection. This project developed ATSPM considering existing implementation options according to agency capabilities and resources. The research team specifically designed the system based on Adaptive Signal Control System (ATSC) and ATSPM open-source software to develop an economically justifiable ATSPM for arterial traffic management in New Jersey.

Research Objectives and Approach

The overall goal of this project is to recommend and develop performance metrics, system architectures, data management, and strategies for deploying ATSPM systems using existing and planned NJDOT arterial infrastructure and technologies. The research team recognizes that the deployment of various adaptive traffic control systems such as InSync and SCATS systems on major NJ corridors and networks have extended the capability for building real-time performance measures. This study's primary perspective is twofold: 1) how to utilize existing field data and equipment to establish Signal Performance Measures (SPMs) for real-time monitoring, and 2) what additional data and equipment may be employed to generate additional SPMs while automating the real-time traffic signal monitoring process.

Findings

ATSPM has many advantages over traditional traffic signal monitoring and management process. When to implement Automated Traffic Signal Performance Measures (ATSPM), it is

important to take into account those existing, forthcoming and planned infrastructure. Considering that NJDOT is actively deploying adaptive signal control technology on major NJ corridors, the incorporation of various adaptive traffic control systems such as InSync and SCATS systems have created a foundation for building real-time performance measures. To implement an ATSPM system successfully in NJ, the research team has accomplished the prototype for the first phase. The following key research problems have been investigated.

Create Inventory of Existing NJDOT Arterial Management System: The team investigated several signal performance systems including InSync, SCATS, and TRANSCOM fusion application interfaces and different types of detectors and their availability. The team also conducted intensive review on state-of-the-art-and-practice of ATSPM system and identified ways of migrating the system to NJ.

Identify Performance Metrics and Measurement Methods for NJDOT ATSPM System: The team has conducted comprehensive review of SPMs that is built in ATSPM system. The team has also investigated customized SPMs that can be generated by NJDOT detector and travel time data.

Develop System Architecture and Concept of Operations for NJDOT ATSPM System and established a bench test of ATSPM located on TCNJ's campus. To leverage the existing ATCS system, the team has developed signal event conversion program to translate SCATS and InSync history log file to event code that can be recognized by ATSPM.

Real-Time Traffic Signal Data Management Guidelines. In this project, research team created data management manual for data process. The team validated the outputs through a comprehensive process. The team also completed the test to automatically connect to ATSPM database using VPN and MSSQL database management system.

Develop Deployment Strategies Considering Existing, Planned, and Future Systems/ Conduct Case Studies of System Deployment. The team has started pulling one-month data into their platform of ATSPM. Large scale deployment of this system will be conducted in phase two.

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Research Title in Full
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