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New Jersey Department of Transportation Bureau of Research

Research at a Glance

Technical Brief

REAL-TIME TRAFFIC SIGNAL SYSTEM PERFORMANCE MEASUREMENT (PROJECT NO. 2016-14)
Phase III: System Integration, Intersection Deployment, and Control Center Dashboard Development

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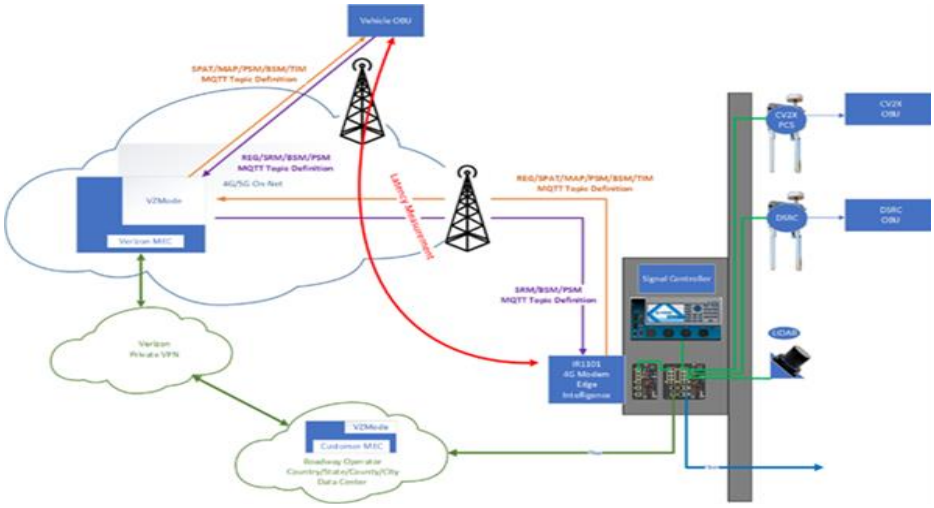
Traffic signal performance measurement and visualization provide insights as operational tools to help traffic management centers get more benefits from infrastructure investment. ATSPM system uses high-resolution (0.1 sec) data to support the data-driven decision-making process and allows consistent and dynamic monitoring of signal-controlled intersection.

Research Problem Statement

This project developed the ATSPMs system considering existing implementation options according to agency capabilities and resources. During phase 3, the research team expanded ATSPM deployment to all SCATS signals on Routes 1, 18, 73, and 130 and used an AutoGUI-based interface for data detection and extraction. The team also collaborated with industrial partners to deploy CV technologies, experimented with SAE J2735 messaging to support pedestrian safety applications and developed an ODM and QA/QC platform for monitoring CV datasets.

Research Objectives

The primary objective of phase 3 will enable safety and mobility applications to improve intersection safety, reduce congestion and environmental impact, and improve the performance of New Jersey arterial corridors. The NJDOT ATSPM 3.0 will overcome the challenge to evaluate and monitor signal performance in real time, reduce the heavy data collection load through intersection-based distributed data collection and analytics. The designed system will be tested on intersections instrumented with connected vehicle technologies to enable more intersection specific applications and performance monitoring capabilities to improve safety and efficiency.



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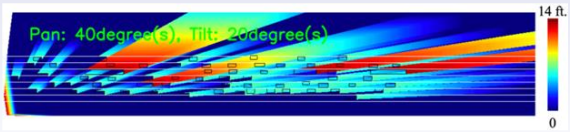
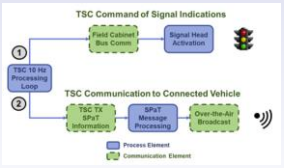
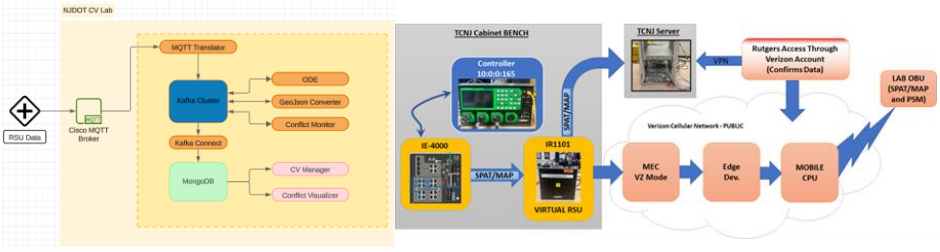
Methodology

- **Sensor Performance Evaluation and Boundary Condition Analysis:** A sensor blind zone analytic and a pedestrian safety application comes with lab-based latency testing are provided under CV environment.

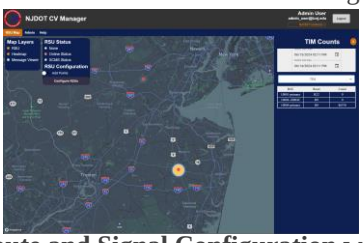


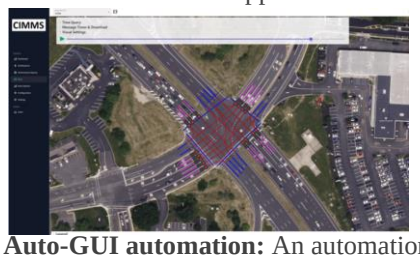


- **V2X Message Processing and Validation:** Establishing a V2X message processing and validation architecture within NJDOT's CV lab environment. Lab-based physical and virtual RSU are tested for ensuring reliable CV2X message transmission.

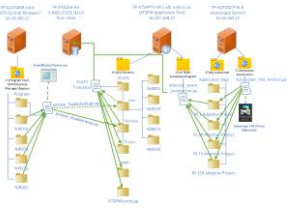


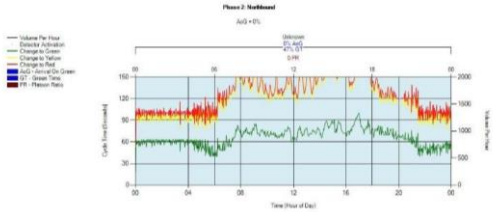
- **CV Manager and QA/QC Platform:** V2X message processing pipeline serves as the data source for the CV manager and conflict visualizer applications.



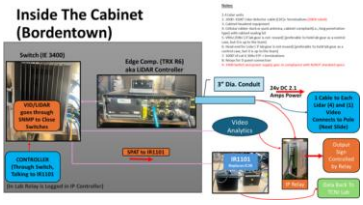


- **Route and Signal Configuration with Auto-GUI automation:** An automation pipeline for data configuration and archiving.





- **NJDOT Test Site Deployment:** A virtual RSU system with LiDAR and corresponding edge devices are installed at Bordentown test intersection.



Results

NJDOT ATSPM 3.0 provide extended arterial performance metrics for arterial intersections instrumented with CV RSU technologies, provide more efficient and cost-effective performance monitoring solutions for arterial traffic signals, and help meet and exceed the strategic goal to accelerate the deployment of ATSPM system.

This brief draft summarizes FHWA-NJ-2024-005, "Real-Time Traffic Signal System Performance Measurement (Project No. 2016-14) Phase III", produced through the New Jersey Department of Transportation Bureau of Research, 1035 Parkway Avenue, P.O. Box 600, Ewing, NJ 08625 in cooperation with the U.S. Department of Transportation Federal Highway Administration. The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the NJDOT or FHWA. This report does not constitute a standard, specification, or regulation.

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