UNIVERSITY TRANSPORTATION CENTER

RESEARCH BRIEF

PROJECT TITLE: **A Hierarchical Priority-based Control of Signalized Intersections in Semi-Connected Corridors**

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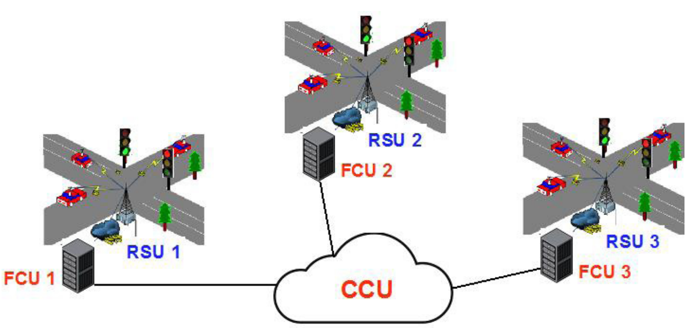
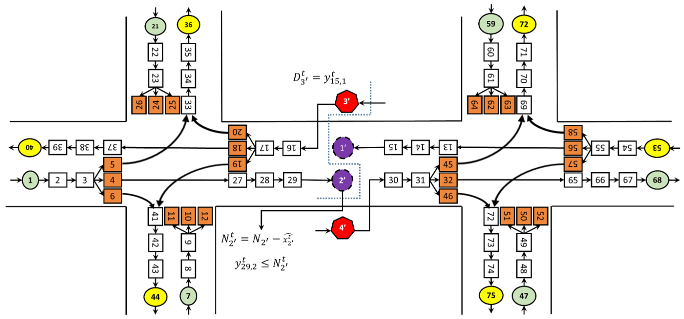
INSTITUTION: MULTI-INSTITUTION PROJECT
ESTIMATED COMPLETION DATE: AUGUST 2020
SPONSORS: THE PACIFIC NORTHWEST TRANSPORTATION CONSORTIUM, WSDOT, UI

Background

Connected vehicles, the internet of things, and smart infrastructure technologies facilitate the exchange of real-time, highly granular information between individual users in transportation networks, system operators, and the supporting infrastructure through communication standards. Harnessing this emergent ubiquitous connectivity and its resulting data stream opens unexplored possibilities to improve network mobility, specifically by optimizing the timing of signalized intersections. The goal of this project is to improve mobility in connected and semi-connected corridors by developing corridor-level priority-based signal timing optimization algorithms capable of working with the existing signal system and connected vehicle technologies. This study will facilitate the transition from the existing and legacy traffic signal control system technology to a connected vehicle environment. The proposed project will address technological, data analysis, and methodological aspects of this transition.





Research Project

The main objective of this research is to develop efficient distributed yet coordinated algorithms to control signalized intersections in connected and semi-connected (when not all vehicles have connectivity capability or refrain from sharing intentions for privacy reasons) corridors. The research will enhance traffic signal optimization formulations to allow for the incorporation of connected vehicles and existing point detector data in the models, the distribution of decisions at both the intersection and the corridor levels to reduce computational complexity, and the coordination of control decisions among various intersections by a distributed cloud-fog based communication network to push solutions towards global optimality. The research will address computation and communication needs required to implement the proposed optimization system in the field by developing, testing, and validating a hierarchical cloud-fog architecture. The proposed architecture allows intersection- and corridor-level optimization algorithms to be performed and control decisions to be communicated to traffic signal system using existing control hardware and communication technology.

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