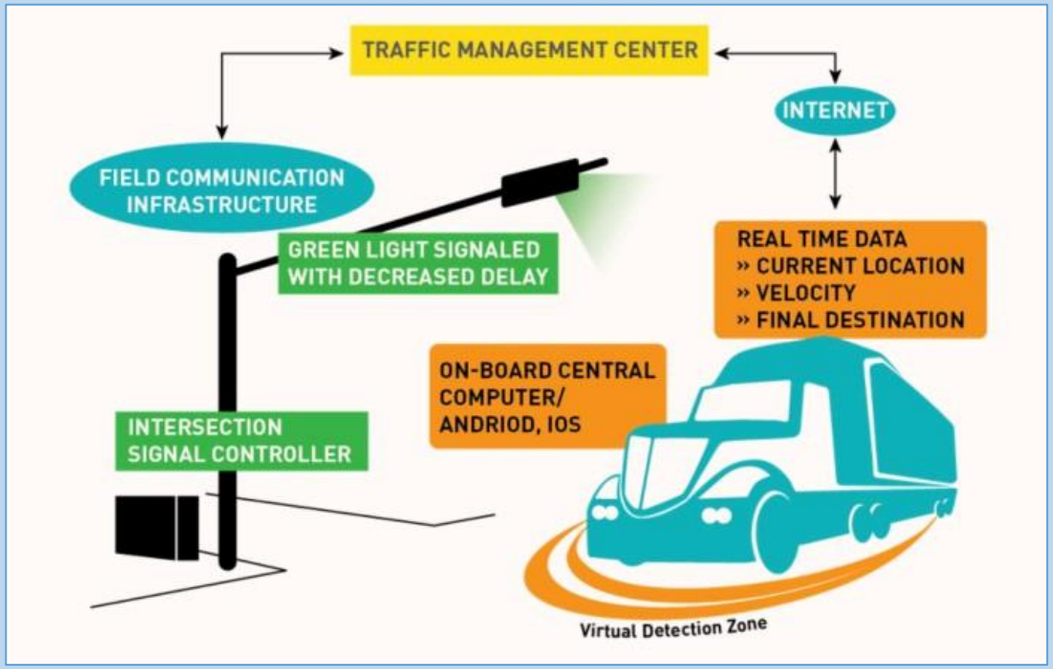
FDOT Freight Signal Prioritization

CASE STUDY

Using connected-vehicle communication technology to link trucks with traffic signals and expedite freight flow.

Freight Challenges	Congestion, Last Mile Access
Data Sources Used	Wireless Address Matching, Global Positioning System
Analytical Approaches	Speed, Location, Identification



Connection Between Technological Elements in CV/AV Freight Applications

Source: FDOT, Florida Automated Vehicles. [Online]. Available: http://www.automatedfl.com/Pilot-projects.html

WHAT ARE THE FREIGHT CHALLENGES?

Traffic signals on “last mile” arterial corridors linking highways with local areas can impede the efficient flow of traffic because vehicles must stop as they travel through the corridor. Stopping has a particularly negative impact on the flow of trucks as they are slow to accelerate to free-flowing speeds from a stopped position at a traffic signal. Adjusting traffic signal timings to reduce the number of stops trucks must make on specific “last mile” corridors could improve freight mobility and reduce congestion. For example, signal timings could be lengthened or shortened to ensure that trucks have to stop fewer times.

WHAT WAS THE GOAL OF THE PROJECT?

Miami International Airport (MIA) is a major hub for the import and export of perishable goods. The trucks that carry goods from MIA to nearby warehouses and distributors follow fixed, repetitive routes at and operate 24 hours a day. The Florida Department of Transportation (FDOT) has developed a pilot project to test Freight Signal Prioritization (FSP) along these frequently-traveled corridors. The goal of this project is to determine if real-time changes to traffic signal result in an actual improvement in truck travel time.

WHAT DATA SOURCES WERE USED?

For this pilot, trucks communicate wirelessly with roadside infrastructure that is linked to FDOT’s traffic management center. A specific communication protocol has not been defined, but will likely be related to the Digital Short Range Communications (DSRC) radio system that enables some connected vehicle applications. Onboard recording devices will log a truck’s location via GPS, as well as a truck’s speed, and final destination. This information will be broadcast to roadside DSRC stations, which then communicate with the centralized traffic operations center.

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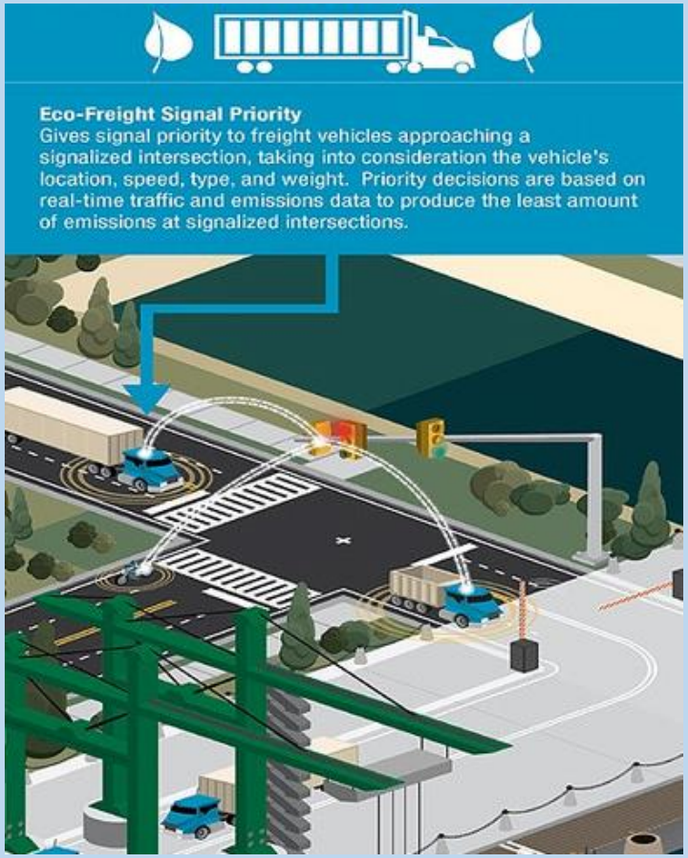

Eco Freight Signal Priority
Source: USDOT, Intelligent Transportation Systems Joint Program Office. [Online]. Available: https://www.its.dot.gov/infographs/Eco_freight_signal.htm

Contact Information

FDOT Agency Resources. [Online]. Available: http://www.fdot.gov/agencyresources/contactus.shtm

WHAT ANALYTICAL APPROACHES WERE APPLIED?

This system relies on observations of wireless device addresses to identify trucks that are eligible for signal prioritization action. The wireless communications device in each truck has a unique wireless network address. This address is necessary for radio broadcasts to be "assigned" to specific devices, and devices will only process information that is prefaced with their specific address. Observations of a truck's address can be used to pinpoint its location within the network, and prompt a signal prioritization action. Under the pilot system, a vehicle's GPS device records the vehicle's location, speed, and final destination. As the truck approaches or travels along the instrumented corridor, its onboard DSRC radio equipment broadcasts this speed, location, and destination information to roadside receivers. In turn, the receivers send this information to a centralized traffic control center, which determines whether or not traffic signal timings should be shortened, lengthened, or kept the same to improve the truck's travel time through the corridor.

The Florida pilot has three stages. First, connected vehicle transmitters will be installed on trucks from participating companies, and GPS information on travel time throughout the corridor will be collected. Second, the GPS information that these vehicle transmitters send will be received by and saved at Miami-Dade County's traffic management center. Third, signal prioritization programs will operate to modify traffic signal timings at non-peak hours, and the effect of these timing changes on travel times will be measured by comparing the GPS records of truck speeds before and after timing changes are implemented.

HOW WERE THE RESULTS VISUALIZED OR COMMUNICATED?

This proposed pilot project has not been completed. However, visualization of various system elements has assisted in communication about the project's technical aspects. For example, the figure presented on the left shows how various technological elements of the project are connected, and the types of information that are communicated between technological elements.