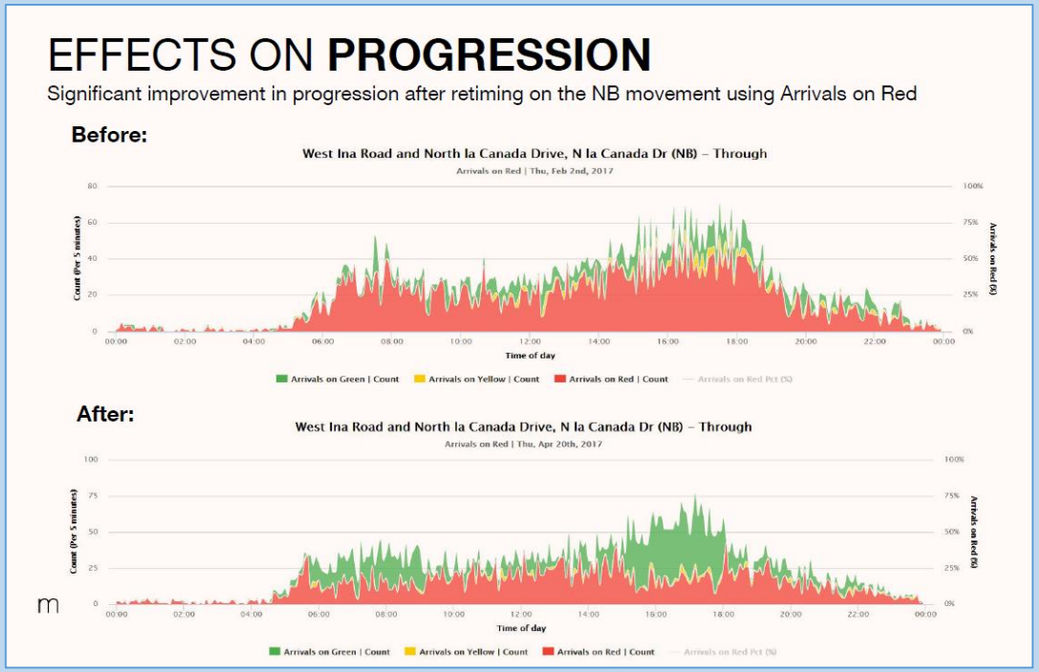
Measuring Arterial Performance

CASE STUDY

Identifying and visualizing the impacts of road closures on last-mile freight and traffic flows.

Freight Challenges	Congestion, Last Mile Access
Data Sources Used	Inductive Loop Detectors
Analytical Approaches	Speed, Location



Example of Miovision Traffic Data Visualization
Source: Tony Brijpaul, "IMPROVING FREIGHT (AND TRAFFIC) FLOW THROUGH URBAN CORRIDORS", Miovision.

WHAT ARE THE FREIGHT CHALLENGES?

Highway construction projects such as ramp closures can increase traffic volume or alter the flow of traffic on surface streets. This increased or altered traffic creates urban congestion for all vehicles and disrupts the efficient movement of trucks along “last mile” surface streets. Dynamically changing traffic signal timing at peak congestion times along these corridors to accommodate changes in traffic patterns as a result of highway lane or ramp closures can reduce congestion and improve “last mile” access from surface streets to free-flowing highways.

WHAT WAS THE GOAL OF THE PROJECT?

The Arizona Department of Transportation needed to rebuild portions of West Ina Road, a major arterial in the Tucson area, and this work would result in the 18-month closure of the road’s access ramps for I-10. The Pima County DOT wanted to remotely monitor the corridor’s intersections and observe traffic patterns before, during and after construction. The results of this traffic performance analysis were used to (1) Monitor how traffic flow on a major arterial changed as a result of highway ramp closure; and (2) Adapt traffic signal timings along the arterial to improve overall traffic flow and minimize negative impacts on road users.

WHAT DATA SOURCES WERE USED?

Each intersection in the four-intersection study area is equipped with inductive loop detectors, which are used to provide data for traffic signal functions like the activation of protected left-turn signals. Raw data of vehicle counts from the detectors, along with records on traffic signal timing patterns are collected, reviewed and analyzed by data service technicians. This data is then visualized in graphs in real-time using Miovision’s proprietary software.

WHAT ANALYTICAL APPROACHES WERE APPLIED?

The inductive loops installed in the pavement at each intersection operate by detecting changes in the magnetic field above them.

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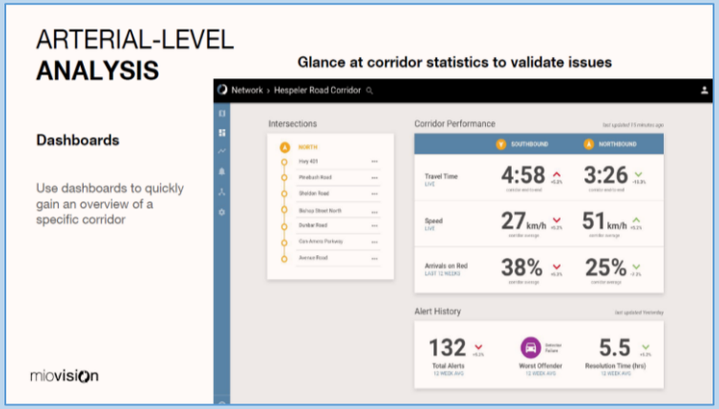

Example of Miovision Data Visualization

Tony Brijpaul, "IMPROVING FREIGHT (AND TRAFFIC) FLOW THROUGH URBAN CORRIDORS", Miovision.

Contact Information

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WHAT ANALYTICAL APPROACHES WERE APPLIED (Cont.)?

A metal mass such as a truck passing or stopping over the detector alters the magnetic field above the sensor, and this change can be recorded. Sensor information can then be sent to signal controllers, and used to trigger traffic signal events. Comparing observations of induction loop events at different locations and times can also be used to calculate a truck's speed.

Pima County DOT used an online analytics service called Miovision TrafficLink Portal to collect, store, and analyze induction loop event records. The TrafficLink system tracked volumes of vehicles passing over detectors as well more complicated events or measures, such as events when vehicles had to queue for multiple green light cycles to pass through an intersection, or measuring how long a vehicle took to pass through an intersection. Ultimately, the combination of inductive loop detectors and signal timing data provided information on the intersections' measures of effectiveness such as volume to capacity ratio and delay in travel time.

WHAT WERE THE RESULTS?

The result of this collaborative project was a publicly available real-time dashboard showing traffic flow at the intersections. The new data visualization provided by Miovision also helped the traffic designers to assess the impacts of the construction project on traffic performance and identify innovative methods to improve traffic flow at intersections. Armed with that information and the new ability to analyze signal performance remotely, Pima County DOT was able to more quickly handle the issues caused by construction, improve the mobility on the corridor, reduce traffic congestion and queue length at signals, and reduce emissions caused by idling vehicles. This example of collaboration between a private data analytics company and a local public agency demonstrates the potential partnership benefits for the public agencies as many of the agencies have limited resources or expertise to perform such detailed analysis and visualizations internally.

HOW WERE THE RESULTS VISUALIZED OR COMMUNICATED?

The online analytics portal provides the cities with tools to analyze and visualize their traffic data and also works with cities to explore potential uses of connected traffic signals. All of the resulting graphics of this Pima County DOT project were generated directly from the TrafficLink portal. Some examples of the data visualizations are on this page and the previous. Such presentation of data can help the planners to identify network mobility problems and seek solutions.