



miOVISION

Increased ridership and improved performance for Laval buses

A case study from **opticom**

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Executive Summary



Overview

When Société de transport de Laval (STL), the public transit system for the city of Laval in Quebec, Canada, was looking for an effective way to improve its bus network performance, it turned to Miovision Opticom and the Opticom Transit Signal Priority (TSP) system.

The TSP system in Laval provides buses with a green light to keep them on time – and data derived from the GPS-enabled system helps managers update and refine routes and schedules for a better rider experience and ultimately, an increase in passengers using the system.

Challenges

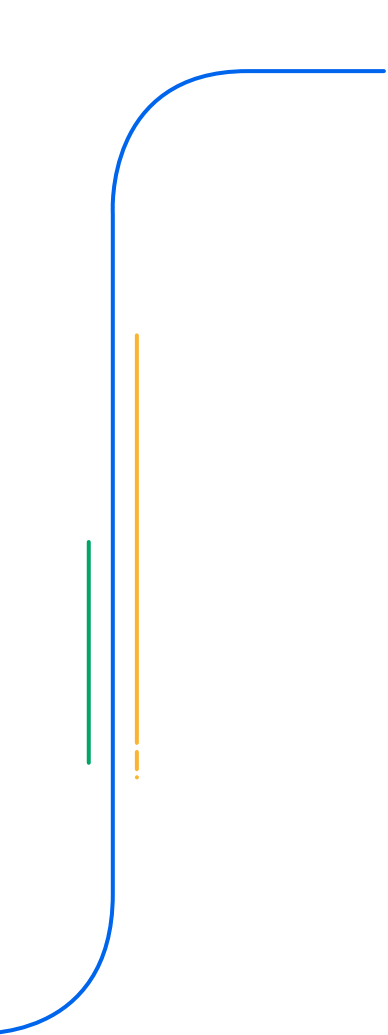
Increasing ridership with TSP

Laval is a rapidly growing city of more than 400,000 residents in Greater Montreal. STL's general manager Guy Picard said the city's mid-sized transit system includes a fleet of more than 300 buses.

"One in five people use the transit system during their rush hour commute," Picard said. "That's an increase of about 30 percent over the last eight years."

With the increased ridership, STL began to explore options for system improvements that would continue that trend and make for a better rider experience. Those goals led STL to implement a number of preferential bus measures, including reserved bus lanes, new boarding locations and bus stops and Opticom TSP.

STL currently provides more than 20 million passenger trips a year. Its strategic plan is to increase ridership by 40 percent between 2013 and 2022. The agency has previously attempted to encourage more ridership with limited success, Picard said.



“We tried to do that in a number of different ways in the past -- including a passenger information system based on GPS -- but we felt that it wasn’t enough,” Picard said. “To help increase ridership, it’s more important that the bus actually arrives on time.”

“We felt that the best way to increase the punctuality, reliability and speed of our bus services, as well as the most cost-effective and efficient way, was to implement a large-scale TSP system.”

The Process

Working with the Opticom Team

In order to increase ridership and improve bus efficiency in Laval, Opticom and STL began working on a TSP solution in 2013.

The deployment involved integrating with an existing CAD/AVL system so that conditional and relative priority could be used, based on passenger counts and schedule data. Opticom also has a system that would log and report intersection data and upload that from the buses when they returned to the garage.

STL’s head of network development Sylvain Boudreau said the experience of working with Opticom was very positive.

“Opticom treated us as a customer, but also as a partner,” he said. “The Opticom team assisted us professionally throughout the project. The local representative was always present and above all very proactive in the search for a solution that could meet our needs. I’d definitely recommend Opticom to other cities and transport agencies.”

The partnership with Société de transport de Laval has allowed Opticom to develop new TSP solutions that can be deployed in transit systems throughout the world.

The Opticom TSP system allows public transportation agencies to extend or truncate green cycle times at traffic signals for more accurate schedule adherence and to get riders to their destinations faster.

STL’s head of network development Sylvain Boudreau said the concept of using TSP is simple: “If a bus is running late as it approaches an intersection, it sends a signal that requests the duration of the red or green light to be adjusted by a

few seconds, allowing the bus to continue on its route without having to stop at the traffic light," he said.

The result is transit vehicles are on the road less, which can significantly reduce fuel and other fleet operations costs. The GPS-enabled equipment is installed on both vehicles and at intersections. The Opticom TSP system can help to increase ridership by changing and improving the behavior of buses, depending on passengers' needs.

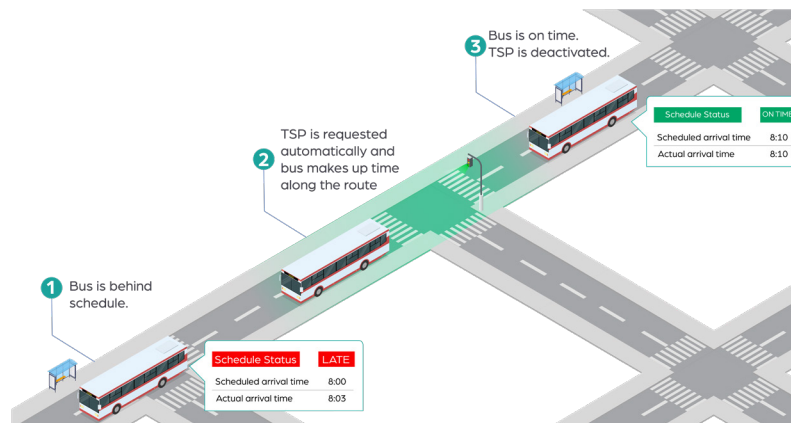
Positive Results

STL began testing the TSP system in 2013 on five buses and at seven intersections. The results were encouraging, Boudreau said.

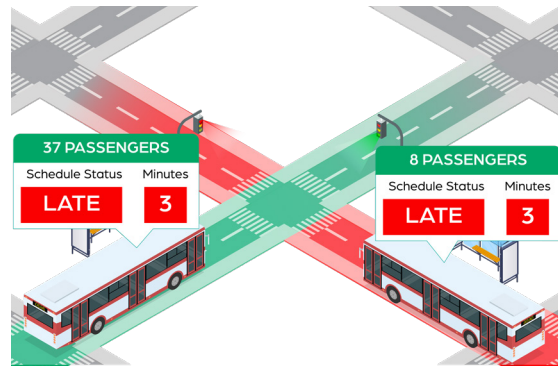
"The time savings were between 8 and 10 percent for the morning peaks, so we anticipate good results with the current project," he said.

Picard said that after testing the system, the agency looked to expand the solution to the rest of the service area.

"So we then analyzed every main intersection in the city and identified 227 where the TSP system was deemed to be effective, and so the Opticom system was subsequently installed at each of these," Picard said. "That's more than 90 percent of the intersections in Laval. It's a huge implementation."



Conditional Priority: The TSP system in Laval uses schedule data to determine if a request for priority is necessary. The bus will only request a green light if it is behind schedule.



Relative Priority: If two buses approach an intersection and request a green light, the bus with more passengers will have a higher priority over a less crowded bus.

Today, TSP equipment has been installed on 306 buses and 23 paratransit vehicles.

Conditional and Relative Priority

When developing a TSP solution for Laval, the Opticom team was asked to provide a system that considered some key aspects of the transit network, such as the fact that Laval's buses can change roles – from local to express or vice versa – as demand requires. And with so many vehicles in the system, there was a need to implement a means of deciding which buses receive priority and when, Boudreau said.

The solution was to send priority levels derived from the buses' on-board computers to the Opticom system. The different priority levels are determined by passenger counts and schedule data.

"If several buses approach an intersection at the same time, the one carrying the most passengers will have priority over those that are less crowded," he said.

The Opticom system also provides conditional priority, where buses only request priority if they are behind schedule.

"On top of being able to better respect our schedule, we'll also be able to reduce the variability of our travel times and ultimately improve our service," Boudreau said.

Passengers get a better experience when relative and conditional priority are used in tandem.

"Relative priority helps to maximize time savings for our clients, by using live passenger counts and schedule delays to determine which vehicle has the highest priority when two or more late buses approach the same intersection simultaneously," Boudreau said. "So the system takes into account both lateness and passenger load when it allocates priority at an intersection."

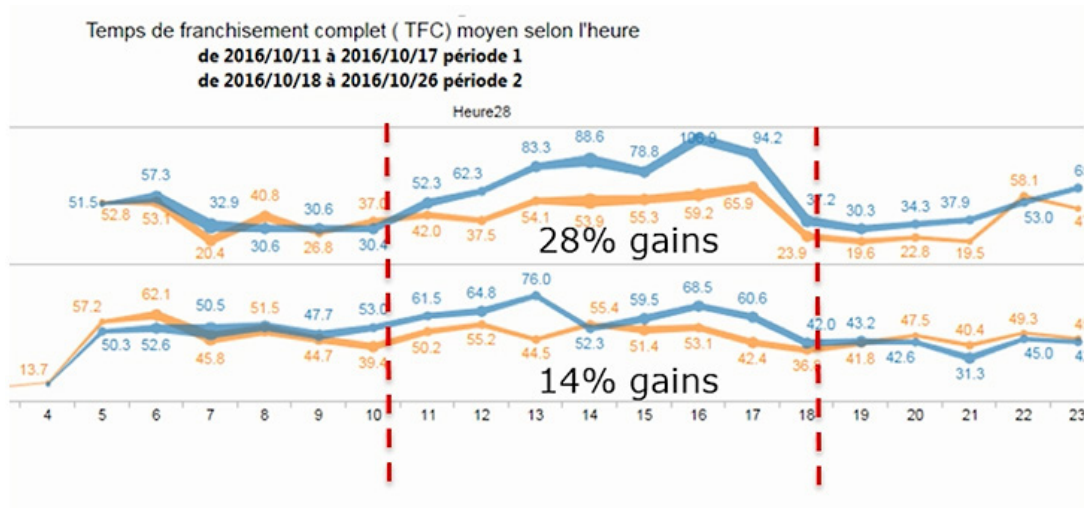
In total, STL uses 10 different levels or classes of priority to optimize performance and ridership experience.

Data Analytics

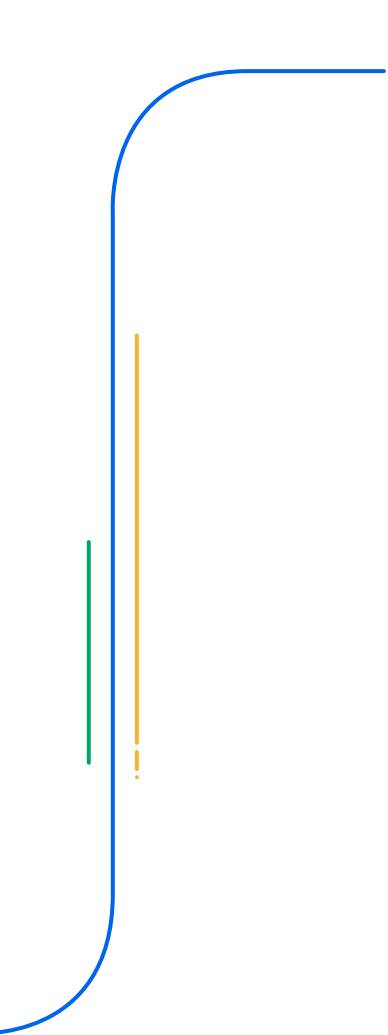
The TSP system is managed using Opticom Central Management Software (CMS), which Boudreau said is proving invaluable in helping to optimize performance.

"The CMS data is very useful as it allows us to evaluate how the TSP system is performing," he said. "The CMS records all communications between buses and traffic lights, including check-in and check-out times across the intersection zone, as well as requested priorities and green sense information."

Green sense information includes the total time a traffic light spent in the green phase and helps to determine TSP effectiveness. In Laval, there is no direct communication – fiber, Wi-Fi, cellular – between the management center and the intersections. Instead, working with STL, Opticom came up with a novel solution:



Data Analytics: GPS-enabled systems, like the one in Laval, allow users to create a number of reports that track the performance of the TSP system. In Laval, data from the buses and intersections are combined with data from passenger counters, CAD/AVL systems and fare boxes to quantify the impact of the TSP system.



Buses automatically upload their journey logs via Wi-Fi to the CMS, syncing all relevant data when they return to the bus garage. The intersection data is used for both improving performance of the TSP system and to help notify the Traffic and Operations departments if there are issues with intersections.

“Opticom developed special firmware that allows us to retrieve the intersection data from the buses using the STL Wi-Fi network,” Boudreau said. “Over the years, STL has built a huge data warehouse with the information it receives from embedded systems like fare boxes, passenger counters and CAD (Computer Aided Dispatch) and AVL (Automated Vehicle Location) systems. We keep records of all GPS positions second by second. That means any information which has a time can be associated with the position of the bus, as is the case with the Opticom data.”

STL linked the CMS database with the information in the data warehouse to add the TSP value to its reports.

“We use a geo-fencing system to track all possible movement at intersections,” Boudreau added. “This enables us to calculate the crossing times of our buses over the entire network. By combining that with our Opticom data, we can accurately quantify the impact of the TSP system on our operations and for our users.”

Results

Performance improvement

The combined data allows STL staff to analyze how the system is functioning and determine how and where to make improvements to schedules and routes.

“For example, in one of our reports we can compare two time periods to see how TSP affects operations at different times of the day or days of the week,” Boudreau explained. “Another report can tell us how much time is spent waiting at a traffic light or boarding people instead of driving. Implementation of the TSP system is changing our planning approach.”

Boudreau said the nature of the system means that it will be able to be tweaked and optimized over the next few years. The more it is used, the more data will become available, and the more STL will be able to make refinements. “It’s still early,” he said. “The challenge for us will be to increase the benefits of TSP year on year without impacting the other users that share Laval’s intersections, such as cars, pedestrians and cyclists.”

A few times a year we’ll be meeting with the City of Laval’s transportation

engineer to address any issues and to try to find solutions together.”

Many Benefits

STL believes the Opticom system can help to deliver network improvements that will get more people out of cars and onto buses.

“All of our surveys said the same thing: people need punctuality. People need good information. People need reliability. People need speed,” STL general manager Picard said. “With TSP, we address all of these issues. So, we’re very confident that we will be able to increase our ridership numbers.”

But it’s not just network efficiency and passenger satisfaction that Opticom is helping to provide. The operational efficiencies TSP delivers mean buses can be on the road less. Which is good news for the environment.

“With this project, we expect to decrease our carbon footprint by more than 30,000 metric ton (over 10 years),” Picard said. “That’s a huge impact on our environment. As in many North American cities, Laval is faced with congestion issues, and these are only increasing. The more this happens, the more the system will help us. So, the system is very helpful this year, but we can only see it becoming more useful and more efficient over the next five or ten years.”

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*– Guy Picard,
General Manger
Société de transport de Laval*

