

A photograph of a Metro Local bus in an urban setting. The bus is orange and white, with 'Metro Local' and a logo 'M' visible. The digital display on the roof shows the text 'FACE MASK REQUIRED PER FEDERAL LAW'. The background consists of modern glass skyscrapers.

Technology to Enhance Transit Bus Safety & Performance

A new era in smart traffic enforcement.

Technology to Enhance Bus Safety and Performance.

At its best, new technology enables us to achieve more than we could before, as we can leverage it to help us solve problems that were previously too expensive or difficult. For years public transit has struggled with the challenges faced by drivers stopping or riding in dedicated bus lanes or parking at bus stops. Recent advances in artificial intelligence and computer vision now make it possible to protect access to bus stops and dedicated bus lanes by using mobile camera solutions mounted inside buses to capture and enforce these traffic violations. Automated Bus Lane Enforcement (ABLE) and Automated Bus Stop Enforcement (ABSE) are valuable tools for transit agencies looking to enhance safety and performance.

Many transit agencies are currently engaged in system-wide updates to their services, including bus network redesigns and investing in dedicated or bus rapid transit (BRT) lanes and other infrastructure with the goal of increasing ridership and improving route efficiency and overall customer experience. Over the past decade and prior to COVID-19, bus ridership was falling even as the population in many large urban areas continued to grow.¹ Now, cities are seeing rates of traffic congestion as high or higher than before the pandemic.

Traffic in Paris, France, was 10% higher in September 2021 than September 2019.² Yet transit ridership remains lower than before COVID across most major cities.³

Public transit buses tend to face many challenges as they navigate travel routes. Pilot initiatives in cities that have implemented BRT projects with inconsistent or no enforcement have failed to meet planned performance goals because of the frequency of illegally parked cars, which prevent buses from utilizing the dedicated bus lanes and force buses into congested traffic lanes. Illegally parked vehicles at bus stops are also a well-known safety and accessibility issue for riders, preventing them from safely entering or exiting the bus at dedicated stops.

The challenge of enforcing dedicated bus lanes was one of four research questions examined by the Mineta Transportation Institute in its comprehensive 2012 report *Shared-Use Bus Priority Lanes on City Streets*.⁴ The report found transportation agencies are rarely able to develop and implement optimal bus lane enforcement strategies. Instead, they must work with limited tools, under stringent political and legal requirements.

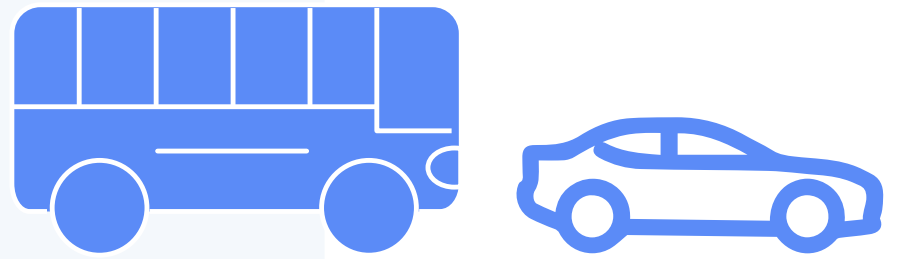


As agencies focus on increasing ridership, safety and operations, ABLE and ABSE are an important tool to leverage to help increase compliance with bus lane and bus stop riding and parking restrictions.

Increase Safety and Accessibility.

Vehicles that are illegally using bus stops and bus lanes are clear safety hazards, causing bus operators to change lanes more frequently, often through congested corridors, to continue moving. When a bus stop is blocked, a rider is forced to enter or exit into a lane of traffic, or worse, a driver is forced to abandon a stop until the riders can be discharged safely. This is a particularly difficult challenge for disabled riders, and for public agencies tasked with providing accessible space for them to enter and exit a bus.⁵

One 10-day study of a single block in Harlem, New York, found that bus stops were blocked by illegally parked vehicles 57% of the time.⁶



Improve Bus Speed.

One of the best ways to reduce congestion is to lower the number of vehicles on the road. Buses in major U.S. cities often operate as slowly as five miles per hour.⁷ After New York MTA began automated enforcement of bus lanes, they saw a 17% increase in speed along the dedicated bus lanes on the B44.⁸ The new dedicated lanes along SFMTA's Van Ness bus route are expected to increase speed by 30%.⁹

A 5% reduction in the number of vehicles traveling on L.A. highways each hour can create a 10-30% increase in average speed.



One big challenge for city leaders is to provide an option that is more attractive than driving. Dedicated bus lanes offer a clear strategy that affords many benefits, including convenient drop off at their intended destination, reduced costs, and ultimately reduced travel times.

New York's 14th Street bus lane showed that just months after launching in 2019:

Travel times were 30% shorter.
Ridership increased 17% on weekdays and 37% on Saturdays.¹⁰



One year after implementing dedicated bus lanes and more frequent service in Richmond, VA:

Ridership increased 17% at a time when transit use across the nation dropped by nearly 2%.¹¹



Improve Reliability and Rider Satisfaction.

Reliability and speed of travel are two of the top concerns of transit users, along with frequency.¹²

Dedicated bus lanes have proven to be an effective tool for reducing travel times and increasing bus ridership. Regular transit riders often cite enforcing bus lane and bus stop violations as priorities for transit agencies to address to improve the customer experience.

Researchers have found that transit use declined less among essential workers, people of color, and people with lower incomes. In fact, bus transit retained more riders than commuter rail in a number of cities.¹³ Agencies that focus on improving transit for these core riders are likely to be more successful at retaining them and growing transit use, rather than trying to lure back commuters who no longer utilize public transit. Transportation agencies and researchers are shifting their focus away from traditional, business corridor commute trips – in part because of how mobility is changing.

Vehicle traffic is up post-lockdown, especially in major urban areas, and more spread out throughout the day.¹⁴

Increase Mobility.

When properly implemented, bus lanes have demonstrated reduced delays and improved on-time performance.



Strict enforcement is necessary to maintain their use and integrity.

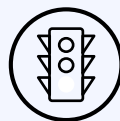
– National Association of City Transportation Officials

The criteria implemented includes:



Clear pavement markings and striping to separate the bus lane from other traffic

NACTO also recommends:



Transit Signal

Priority



Rules

on when drivers can use the bus lane to make a right turn.



Soft or hard barriers

between the bus lane and regular traffic lanes.

Bus enforcement technology records and monitors vehicles in the system's field of view. Some solutions also use automatic license plate recognition and event detection. The most advanced systems perform sophisticated analytics using computer vision and artificial intelligence to determine whether certain actions are legal, including vehicles entering the lane to make a right-hand turn, versus obvious violations such as parking in a bus lane.

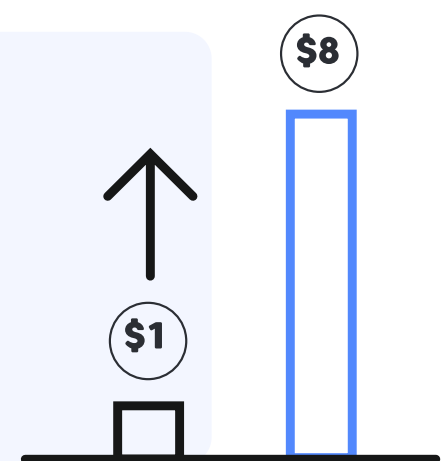


Reduce Operational Costs.

The good news is that automated enforcement works well and is highly cost effective. In 2019 Los Angeles Metro worked with peace officers to conduct a pilot project where they manually monitored a new dedicated bus lane, but they found that its high costs would probably prevent them from maintaining or scaling enforcement.¹⁵ In Washington, D.C., the National Capital Region Planning Board (NCRPB) found that enforcement is one of the most expensive and least beneficial strategies.

Camera-based automated bus lane enforcement must be able to capture and monitor all activity in its purview, and intelligently distinguish whether or not drivers are violating established rules and regulations.

The NCRPB also found that bus-only lanes enforced with on-bus cameras delivered the highest ROI, garnering almost \$8 for every dollar invested.¹⁶



How Does It Work?

Transit agencies typically aren't authorized to enforce parking or moving violations because they don't control right of way on public streets. That means that enacting a program requires coordination with parking authorities, law enforcement, and/or city departments of transportation or public works to create processes necessary to manage the program end to end.

Typically, authorization from a state legislature or other governing body is needed before an automated bus lane or bus stop enforcement program can be deployed.

In the United States some jurisdictions have prohibited camera-based enforcement. In this situation, local and state agencies and elected officials must work together to change those laws. Chicago, for example, has had dedicated bus lanes since 2015, but they've experienced only modest performance improvements, and even slower travel times, in part because the city is unable to use cameras to enforce bus lane rules.¹⁷

New York, meanwhile, quickly achieved a 30% reduction in bus travel times by using camera enforcement.¹⁸



This happened because New York City (NYC) transit worked closely with NYCDOT and NYPD to manage camera-based enforcement, and together, these agencies worked with the state government leaders to authorize legislation allowing for bus lane enforcement.¹⁹

Why Hayden AI for Bus Lane and Bus Stop Enforcement.

Hayden AI is quickly becoming a world leader in smart enforcement technologies. The company was founded on the belief that by combining computer vision with artificial intelligence, we can help governments automate manual processes, thus making public agencies more effective. To that end, we have leveraged our patented deep learning platform to partner with transit agencies across the globe as they look to better understand the obstacles they face in providing riders with the quickest, safest and most positive ridership experience possible. In addition to the enforcement benefits of our systems, Hayden AI technology captures valuable traffic data that can also be used to increase performance. By providing agencies with real-time insights into how effective their transit systems are operating, we are empowering them to make the best decisions possible with their dedicated riders in mind.



**Quickly becoming
a world leader in
smart enforcement
technologies**

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