

HOT Lanes Solutions

High Occupancy Toll



High Occupancy Toll (HOT) Lane Solution

Increasing traffic congestion on current roadways has caused road operators to explore new ways to improve service capacity, while making the best use of available resources. HOT lanes enable DOT's and Roadway Authorities not only a means to relieve congestion, but also bring a potential new source of revenue that may be used to fund needed transportation improvements in other areas, add new lanes, convert existing lanes, and increase capacity in particularly congested areas. A High Occupancy Toll (HOT) lane is a restricted-use High Occupancy Vehicle (HOV) lane with available capacity that can be used by qualified and properly equipped Single Occupant Vehicles (SOV) for a charge. Simply, put, HOT lanes provide a means to expand travel capacity on a given corridor without building more freeways or expanding existing ones.

The technology behind Xerox's ability to design and deliver a HOT Lanes solution is our VECTOR 4G suite of applications. It is the technical foundation for our lane and back office solutions and has been proven in hundreds of tolling lanes including multi-lane, free-flow designs. VECTOR 4G is a fully integrated lane and back office toll collection and transaction processing system including customer service and violation processing. VECTOR 4G provides an end-to-end, fully compliant ETC and back office platform that is secure and fully integrated as well as highly configurable and scalable. VECTOR 4G's design is based on open-systems information architecture with a table-driven modular design to allow adjustments for client's business rules and processes and to minimize the need for customization and the resulting maintenance requirements.

As urban roadway congestion continues to grow, roadways must carry far more traffic than was originally designed. Even with road widening measures over the years, there continue to be regular traffic jams during rush hours. To address the continuing increases in congestion, roadway authorities are moving toward implementation of HOT Lane solutions.

Our HOT tolling system integrates the following major subsystems:

Dynamic Pricing One of the more critical modules of the HOT lane solution is the provision of a Dynamic pricing subsystem. The dynamic pricing approach is based on providing the customer traversing through the HOT lanes with the best value of travel time saving and a sustained level of service.

Zone Controller Computer (ZCC) Xerox employs robust fault-tolerant high-availability zone controller computer designs that enable rapid identification and localization of vehicles, such that HOT lane solutions can be deployed with minimal disruption of existing infrastructure.

Automatic Vehicle Identification (AVI) As a vendor-neutral system integrator, Xerox is capable of employing reliable and proven DSRC technologies from a variety of quality suppliers. We are presently employing 915 MHz DSRC systems in our deployed ETC applications across the US. In addition, we are working with suppliers of the new US DOT 5.9 GHz standards which in the longer term may evolve into the standard for this technology. This work includes working with self-declaration HOT tags as a way, via a selector switch or button, to declare the number of occupants within a vehicle.

Automatic Vehicle Classification (AVC) Xerox uses proven non-intrusive vehicle profilers for detecting and classifying vehicles in a lane.

Violation Enforcement System (VES) Xerox uses advanced high-resolution VES cameras to capture front and rear images of vehicles for the purpose of violation enforcement and also to support video tolling requirements. We use automatic license plate recognition (ALPR) technologies to capture and then reliably decipher license plate numbers.

The Dynamic pricing algorithm employed by Xerox dynamically computes the toll price at a pre-configured frequency by processing traffic data received from a Traffic Management System (TMS) corresponding to the general purpose lanes and the HOT lanes in near real-time. Xerox understands that exchanging traffic data in real-time is critical to ensure that the information being passed on to the dynamic pricing algorithm is accurate as per the current traffic conditions.

The Dynamic Pricing subsystem maintains various fare tables including variable pricing, step-pricing, time of day, and congestion. The subsystem also defines holiday and special event pricing schedules. These parameters and attributes can be adjusted by an authorized person via a role based Graphic User Interface (GUI). The details of toll price computation rules are defined in consultation with our clients as part of business rules discussions.

Xerox has delivered hundreds of lanes that incorporate and integrate high resolution camera-based vehicle and license plate capture and recognition systems. We pioneered the process of optimizing both the image capture function with the OCR reading function to maximize revenue collection. Our solution integrates license plate OCR processing with our VECTOR 4G Zone Controller Computer in order to provide rapid and accurate results for real-time applications including violation processing and has the capability to process alerts including repeat violators, Amber Alerts, and general vehicles of interest

Xerox's HOT lane solution allows the flexibility of determining AVI antenna usage in the shoulder areas. This determination is typically performed by the governing authority on a case by case basis. Additionally, our system monitors inside and outside shoulders. If the decision is to not equip the shoulders with RFID read zones, all vehicles traveling in the shoulder lanes will be considered violators and treated accordingly. The AVC detects the vehicle and both front and rear VES cameras are triggered as the vehicle travels the system.

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