

"Creating a smarter & secure tomorrow"



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TECHNOLOGIES

# TrafScan<sup>®</sup>

INTELLIGENT | ACCURATE | EFFICIENT





**Urban traffic control systems require an updated approach to Image processing**



## Executive Overview

Cities are challenged by congestion and their infrastructure more and more as they expand. To keep traffic moving efficiently and to keep drivers and other road users safe, proper management is required. The Vehant Technologies TrafScan® Vehicle Detection System is a cutting-edge, high-resolution vehicle detection camera system that employs vision algorithms based on artificial intelligence and machine learning. It is a non-intrusive system made to notify urban traffic management systems on automotive movement. It allows for the automatic incident detection, queue length computation, and traffic density analysis, as well as the verification of vehicle presence, occupancy, count, and categorization at traffic signals to support traffic management.

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**A state-of-the-art, high-resolution vehicle detection camera system that uses machine learning and artificial intelligence-based vision algorithms.**

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## Traffic Management: Challenges and Solutions

The increase in road traffic and demand for transport has indeed led to serious congestion, delays, accidents, environmental issues, and reduced economic efficiency. Additionally, vehicles crossing a stop line or entering an intersection after the signal turns red contribute to the problem of red light violations.

To address these challenges, several solutions can be proposed.

### *Intelligent Traffic Management Systems*

Implementing advanced traffic management systems can help optimize traffic flow and reduce congestion. These systems use real-time data, sensors, and algorithms to monitor traffic patterns and adjust signal timings dynamically. By coordinating traffic signals and optimizing signal timings based on traffic conditions, congestion can be reduced.

### *Smart Intersection Technologies*

Deploying smart intersection technologies can enhance safety and efficiency at intersections. These technologies may include vehicle-to-infrastructure (V2I) communication systems, where vehicles can communicate with traffic signals to receive real-time signal information. This can help reduce red light violations by providing warnings to drivers approaching intersections when the signal is about to change.

### *Automated Enforcement Systems*

Installing automated enforcement systems, such as red light cameras, can help deter red light violations. These cameras capture images or videos of vehicles that run red lights, allowing authorities to issue fines or penalties to violators. The presence of such systems can act as a deterrent and encourage compliance with traffic signals.

### *Public Awareness and Education*

Increasing public awareness about the consequences of traffic congestion and red light violations can promote responsible driving behavior. Educational campaigns can emphasize the importance of following traffic rules, adhering to signal timings, and respecting intersections. This can help foster a culture of safe and law-abiding driving practices.

### *Infrastructure Expansion and Alternative Transportation*

Investing in infrastructure expansion and providing alternative transportation options can alleviate traffic congestion. By developing and improving public transportation systems, encouraging carpooling, and promoting cycling and walking, the reliance on individual vehicles can be reduced, thereby easing congestion and mitigating red light violations.

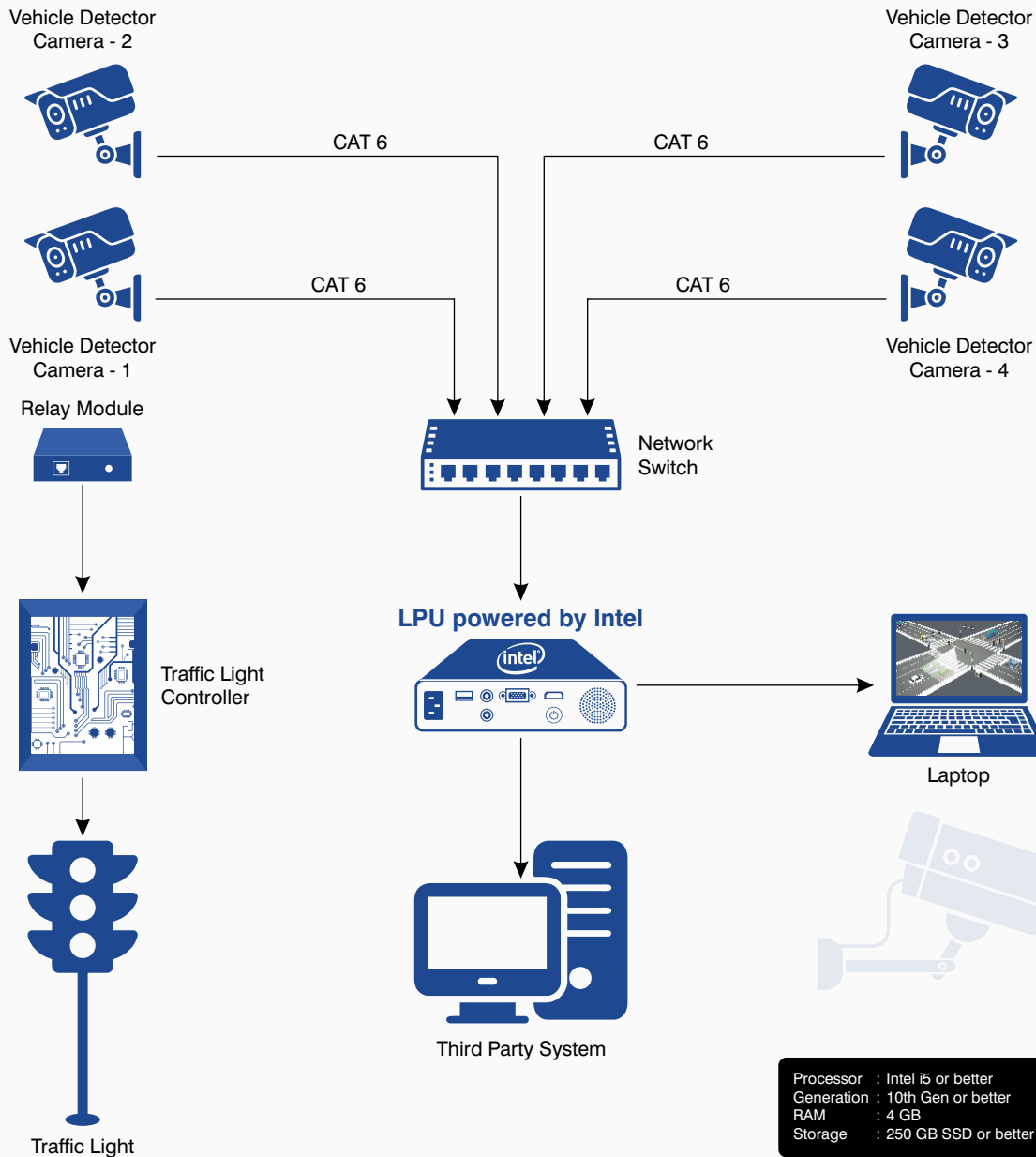
These solutions require a comprehensive approach involving collaboration between transportation authorities, traffic engineers, law enforcement agencies, and community stakeholders. By implementing a combination of technological advancements, enforcement measures, and behavior change initiatives, it is possible to address the challenges of traffic congestion and red light violations.

**Total Addressable Market for TrafScan® is nearly 1.5 to 2 million USD per annum in India.**



## System Architecture

TrafScan® Vehicle Detection System is built to capture license plate number and stop-line violation thus comprehensively detecting red light violation. They are adequately aimed to catch the licence plates and installed with IR illuminators on a cantilever/gantry at a height of 6 to 6.5 metres. They are mounted at every junction at the pre-specified site for all infraction locations and junctions. The Junction box contains the LPU, which is wired to the switch. The Control room system is linked to the LPU deployed at junctions via RF, OFC, and ISP (Internet Service Provider) communication.



## Components

**Edge compute device with Intel core i5 processor/4 GB RAM/250 GB SSD, 2 Intel LAN ports | 5MP vari focal camera | PoE network switch (with ports as per number of cameras at the location)**



According to network specifications, each camera end-point and junction end-point has dedicated and consistent network connectivity. System Integrator provides the needed bandwidth. The network uptime and service quality of the chosen Internet service providers are monitored by the system integrator to ensure that the LPU data is transmitted without interruption.

TrafScan® is designed considering end to end security and free from vulnerabilities and penetration. Encryption is used to protect the sensitive data stored on disk to maintain confidentiality and ensure non-tamperability. AES256 (also supports DES, AES-128, AES-192) is used to encrypt files in GCM mode as well as in transit. Along with the data, the system also stores a unique signature for every transaction using hash function and encrypted meta-information regarding the origin of data, which is used for verifying data integrity and chain of custody. Keys exchanged across systems are done using PKI algorithm. In addition, all data exchange over the network is secured using SSL transport with password authentication. OWASP guidelines are followed for web application security. Also, hardening at OS level, port blocking, IP whitelisting/blocking, firewall configuration and user level access can be configured for security.

The system has multiple APIs for different use cases. This flexibility allows users to choose the API that best suits their specific requirements, whether it's for data processing, machine learning, or other purposes. The system's openness to customization is another valuable feature.

Front-end customization allows users to personalize the system's appearance and functionality, making it more intuitive and user-friendly.

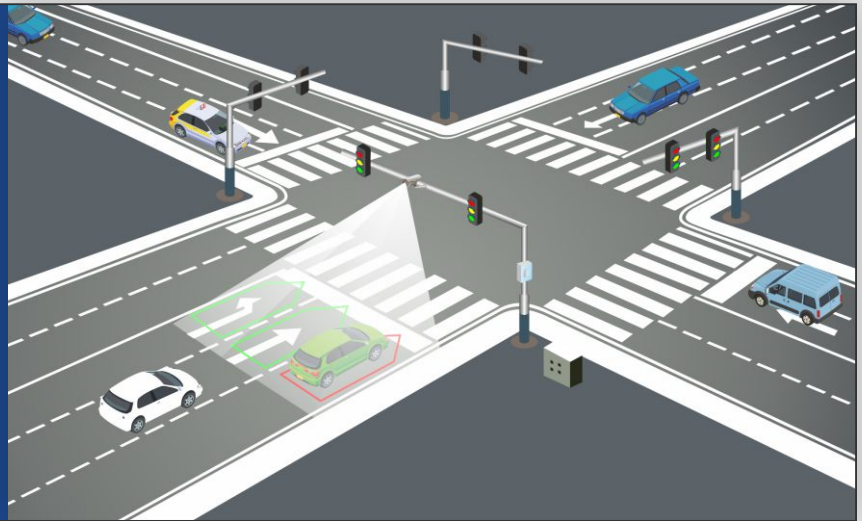
Report-level customization allows users to generate customized reports or outputs from the system. They can specify the level of detail, formatting, and specific information they want to include in the reports, making them more relevant and useful for their specific needs.

Overall, the availability of multiple APIs and the system's customization options enhance its versatility, adaptability, and user-friendliness, allowing users to tailor it precisely to their needs and achieve the desired outcomes.

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Traffic light  
synchronisation  
can result in  
significant  
time, fuel and  
environmental  
savings.  
”



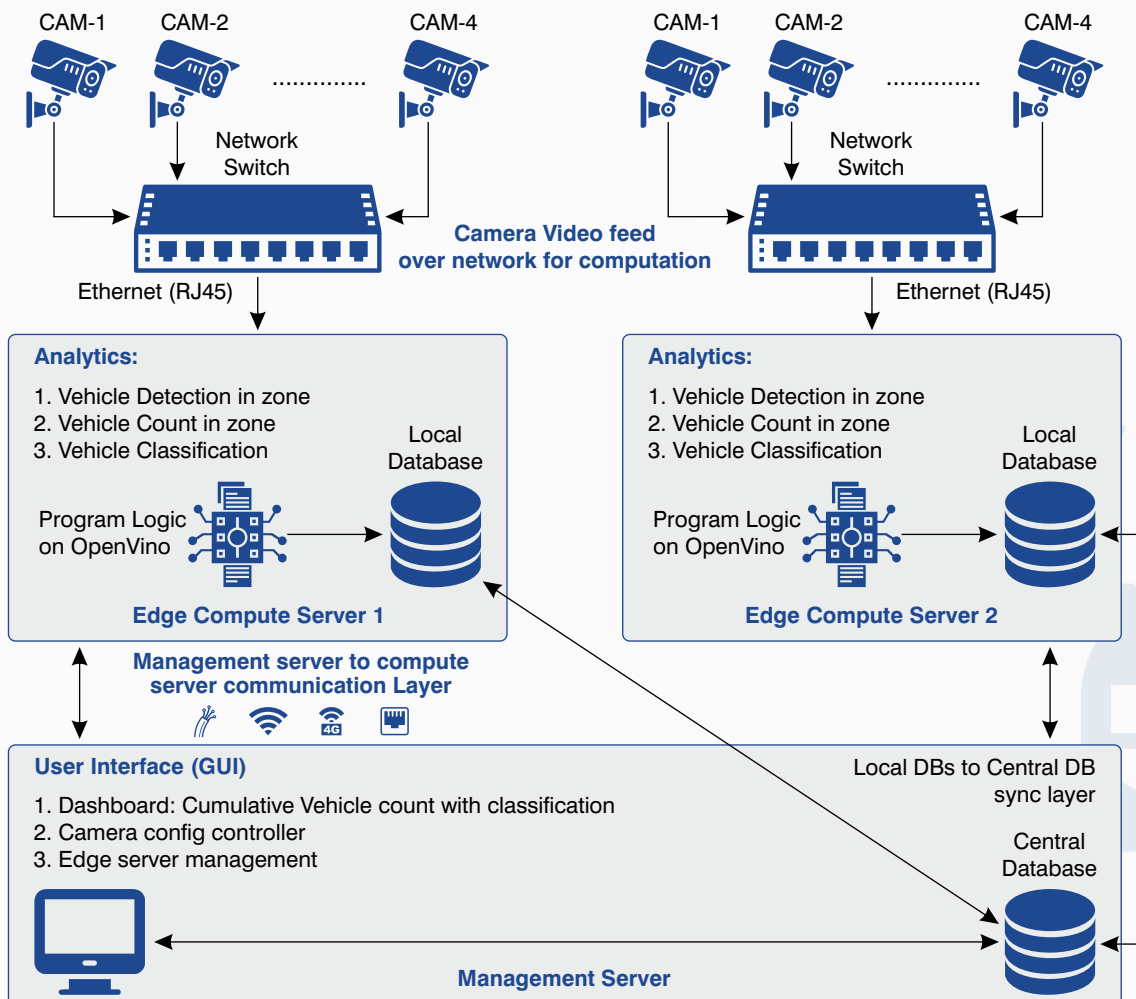
When a vehicle enters the detecting zone, specialised algorithms create traffic data such as presence, count, and classification of the vehicle. In order to change the state of the traffic light, the Intel processor sends data to the traffic controller based on the generated traffic data. Software in the central control room can also receive traffic data. The solution features Intel® Core™ i7 Processors, Intel® Distribution of OpenVINO™ toolkit and Intel® Media SDK.



**TrafScan® KPIs**

Vehicle Presence | Vehicle Count | Vehicle Classification - 7 classes | Queue Length | Headway Gap | Gap time | Average Speed

Block Diagram





## Objectives

- Reduces the amount of traffic
- Improves adherence to traffic regulations
- Reduces traffic incidents



## Use cases

- Traffic Monitoring
- Vehicle Presence & Vehicle Classification
- Traffic Density and Flow
- Urban Traffic Control
- High Resolution Data Analytics
- Red Light Violation detection



## Benefits

- Improves traffic flow by using cutting-edge, high-resolution visual data analytics to assist proactive traffic signal control and traffic monitoring.
- Real-time car and pedestrian detection, automatic and verified event alerts, and improved road safety are all contributed to.
- Use a system that is quick to install, simple to use, and compatible with existing infrastructure to maximize cost savings.



## Value Adding Factors

- Enables a variety of cutting-edge, high-resolution data analytics features, including vehicle count, headway, occupancy, and average speed, all of which are intended to optimize traffic management.
- With a high quality (5MP) camera, it is possible to count objects with an accuracy of over 90% and classify vehicles with an accuracy of over 80%, providing extremely accurate data to enhance traffic management and control.
- Facilitates traffic monitoring and decision-making by integrating and storing all collected data in one spot (such as a control room or web-based central application with operator dashboards).
- Provides an extensive picture of the movement of traffic at intersections, supporting both approaching and departing traffic, processing over 100 cars at once, and supporting queue lengths up to 85 metres.
- The solution enables cost savings and a high return on investment when integrated with video monitoring hardware.
- It offers flexibility to configure detection zones, modify the varifocal camera lens to suit the needs of the ground, etc.
- Enables advanced traffic management use cases, such as dynamic traffic signal control by supporting simple API interface with third-party applications.



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