

## Wipro Visual Intelligence in Traffic Intersection (VITI): Transforming Smart Cities and Transportation with Seamless Edge AI Services



### Authors

**Suman Sehra**

Senior Global Director  
IoT Smart Cities and Transportation  
Intel Corporation

**Yau Wai Yeong**

Segment Marketing Manager  
IoT Smart Cities and Transportation  
Intel Corporation

**Raj B R**

Practice Director  
IoT & Smart Cities  
Wipro Ltd

**Ashish Khare**

General Manager  
IoT & Smart Cities  
Wipro Ltd

### Industry Landscape: Hyper-Connected Road Infrastructure

Cities and communities around the world are urbanizing at an exponential rate. This growth is twofold: urban locations experiencing population spikes and urbanization spreading to rural areas, leading to a significant demand increase for urban mobility. Research experts project 68% of the global population will live in urban areas by 2050<sup>1</sup>, expanding urban city growth by more than  $2.5x^2$ .

To accommodate this population influx, city authorities around the world are seeking new ways to monitor infrastructure, manage intersections, help increase road safety, reduce congestion, improve emergency response time, and streamline city navigation.

Intelligent Transportation Systems (ITS) are the key to unlocking this market demand with cutting-edge technologies that deliver reliable, high-bandwidth, and low-latency support. Furthermore, the scalability of ITS enables a wide range of smart city use cases such as real-time tracking, cargo monitoring, and critical equipment monitoring.

In anticipation of smart city innovations, the ITS sector has adapted their software and applications to incorporate artificial intelligence (AI) and multi-access edge computing (MEC) to transform and automate smart city infrastructure.

### Challenges: Infrastructure Complexity and Outdated Legacy Systems

Traditional intersection management relies on inductive loop technology and pre-programmed timing delays of traffic light phases. These legacy devices with discreet fixed functions don't allow for upgrades to be made when new features come available and limit the opportunity for intelligent technology integration. Legacy infrastructure also often relies on human monitoring, leading to higher congestion rates, slower incident response time, inefficient use of human labor, and a greater risk of traffic incidents.

Legacy systems are quickly becoming antiquated as city authorities seek real-time visibility to enable smart city and intelligent transportation innovations. The main conundrum city authorities are facing is the capital and resource investments attached to outdated approach and the lack of assessable capital to implement a complete overhaul of smart city infrastructure – a critical issue the ITS sector must address.

# Wipro Visual Intelligence in Traffic Intersection (VITI): Transforming Smart Transportation with Seamless Edge AI Services

## The Wipro Visual Intelligence in Traffic Intersection (VITI) Solution

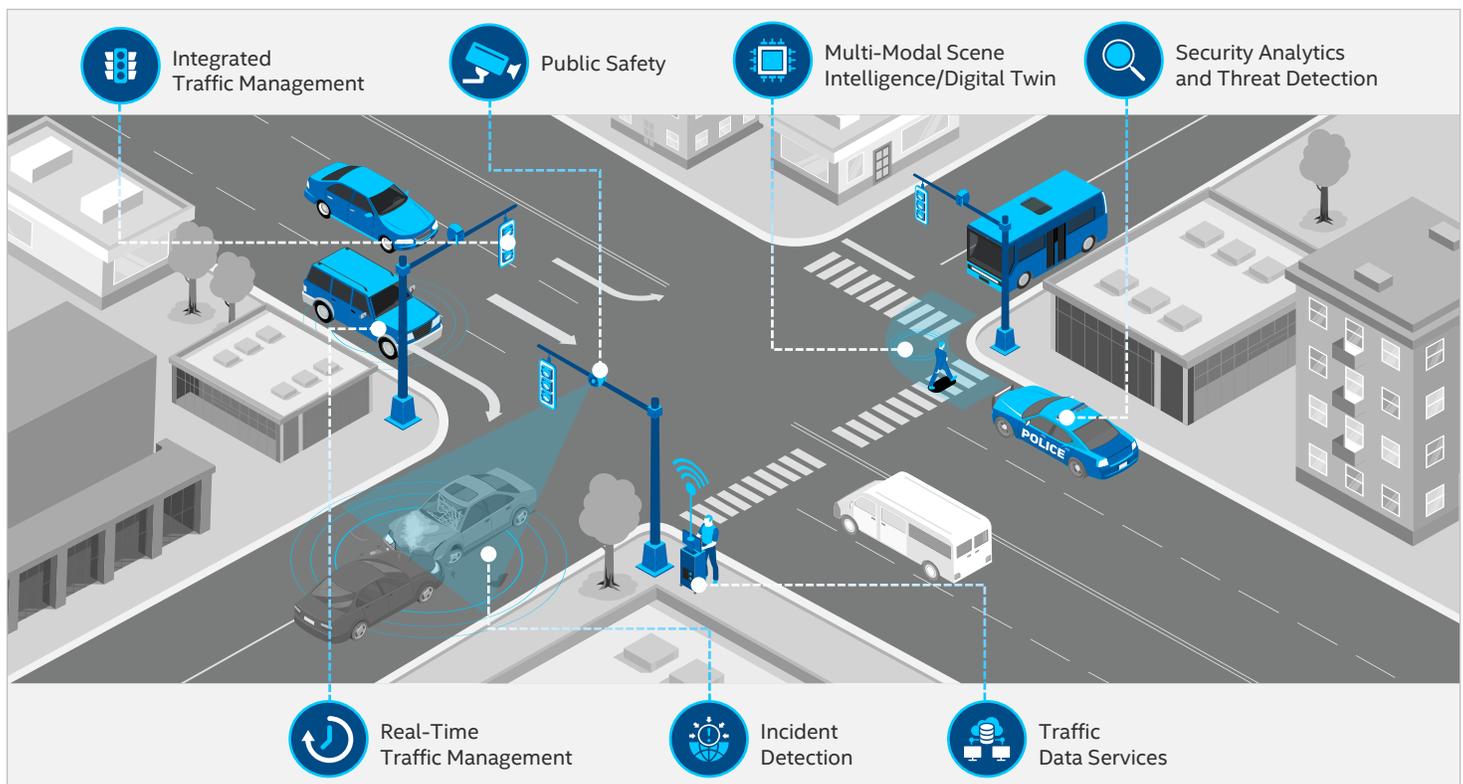
Using artificial intelligence and edge computing, the Wipro Visual Intelligence in Traffic Intersection (VITI) solution utilizes preexisting/enhanced video infrastructure to capture live intersection footage. This allows city authorities and ITS providers to avoid costly installations. Optimized by the Intel® Distribution of OpenVINO™ Toolkit, the solution enables detection of complex traffic situations and anomalies such as near real-time traffic management and incident detection.

### VITI in Action

Wipro VITI works by using various camera feeds to detect moving or stationary objects such as vehicles, pedestrians, bikers, and hazardous debris in real-time. The solution then employs GStreamer Video Analytics to process and transcode the object before deploying the CNN-based models within the streaming data.

Through trained deep learning models, objects are distinguished from the known environment background in order to classify the objects. The inference is then overlaid on the incoming data stream and sent to the cloud for further analysis.

After classification occurs the solution utilizes the OpenVINO™ Toolkit to track and analyze the objects movement throughout the environment, searching for anomalies such as vehicle collisions, pedestrian injuries, road-blocking debris, and speeding vehicles. Digital Twins are created in a 2D Map with Ground Plane to help visualize the traffic environment and streamline interaction monitoring. If detected, real-time alerts are sent to emergency responders, traffic monitors, or other authorized personnel – ultimately improving emergency response time and streamlining intersection management.



Above: Intelligent Traffic Intersection use cases enabled by Wipro VITI

## Solution Benefits

- Provides automatically triggered emergency response to incidents for reduced response times
- Uses speed detection and regulation of vehicles to streamline traffic management
- Enables fully centralized management of intersections and traffic flow for improved efficiency
- Collects and analyzes traffic data to inform decisions
- Monitors pedestrians by streets to enhance safety
- Integrates Vehicle-to-Infrastructure (V2I) communication:
  - Blind corner vehicle alerting
  - Free passage for emergency vehicles
  - improved autonomous vehicle communication

# Wipro Visual Intelligence in Traffic Intersection (VITI): Transforming Smart Transportation with Seamless Edge AI Services

## Solution Elements

### GStreamer Video Analytics

GStreamer is an open-source multimedia framework that connects directly to edge devices to encode or decode a media stream to act as a link between the video camera source and the video output for intersection visualization. It provides an efficient way to add audio and video support for the Wipro VITI solution without the need to digest vast amounts of media specifications<sup>3</sup>. The comprehensive core library offers a graph-based structure to enable arbitrary pipeline construction, enables high performance with low latency, and clean, simple, and stable API for both plugin and application developers<sup>4</sup>.

### Intel® Distribution of the OpenVINO™ Toolkit

The OpenVINO™ (Open Visual Inference and Neural Network Optimization) Toolkit enables developers to build and optimize AI-based computer vision models on Intel® hardware. Using the OpenVINO™ Toolkit, developers can take advantage of existing Intel® processor architecture to quickly build, optimize, and scale deep learning and visual inference applications. The toolkit allows the same application to be deployed across a large range of processors and environments, including CPUs, GPUs, FPGAs, on-premise, at the edge, or in the cloud.

### Intel® Processors

IoT and embedded Intel® processors enhance compute performance and power consumption of edge-enabled IoT. Intel® Xeon® Scalable processors power high performance edge servers for real-time analytics and AI on smart road sensor data.

### Wipro Smart i-Connect

Wipro Smart i-Connect (WSiC) is an Internet of Things an Enterprise IoT and M2M platform capable of delivering data acquisition, aggregation and integration with sensors, devices, controllers, and enterprise applications.

In the VITI solution framework, Smart i-Connect provides a rich set of features for managing and monitoring device networks, processing and visualizing collected data, and integrating with other enterprise systems using open-source APIs.

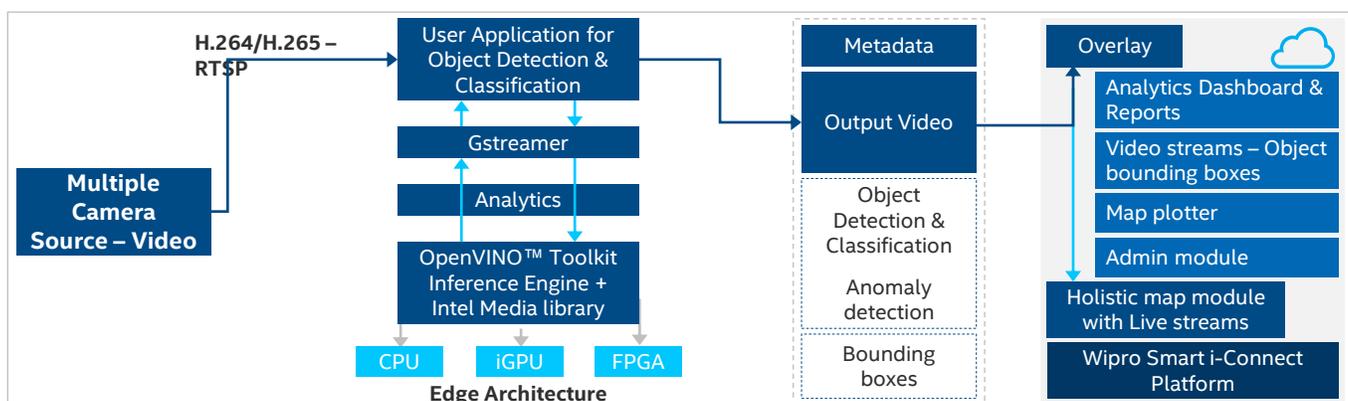
### Multi-Access Edge Computing

Multi-Access Edge Computing is a type of network architecture that provides cloud computing capabilities to process and store data at the network edge instead of some distant data center, which significantly reduces latency. In VITI, mission critical and low-latency video analytics workloads deployed at the edge detect incidents and the processed information is then sent to the cloud WSiC application to provide a centralized view of road infrastructure. Incident management and service management is initiated based on the alarms and events generated.

### Digital Twin

Wipro Smart i-Connect platform generates data models to create digital twins of different assets, services, processes, facilities, and environments. These models range from simple, such as a traffic load model, to complicated, such as representation of road network density within a geo-wide Intelligent Transport System. Additionally, the models can enhance existing system components with new properties, events, and operations.

WSiC components combines with data analytics technology, such as machine learning or complex event processing, to generate models that predict behavior of real-life avatars to further optimize their structure and lifecycle. The platform offers an out-of-the-box feature to monitor and manage the transport critical ICT infrastructure life cycle and provides built-in interfaces to integrate with 3D realty modeling software and Building Information Modeling (BIM) models.



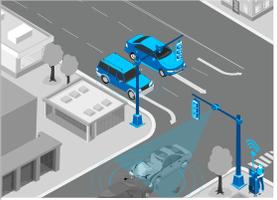
Above: Wipro VITI solution architecture

# Wipro Visual Intelligence in Traffic Intersection (VITI): Transforming Smart Transportation with Seamless Edge AI Services

## Wipro is Unlocking Possibilities Across The Smart City and Transportation Sector

The future of smart transportation and intelligent traffic monitoring is moving hand in hand with the rapidly advancing smart city landscape, which is motivating urban authorities to find scalable ITS solutions.

Wipro Smart i-Connect technology along with other VITI components and algorithms create the opportunity for a complete, cost-effective, end-to-end smart city solution that scales across other domain areas and use cases that are connected to the overall transport sector.

				
<b>Smart Roads</b>	<b>Smart Fleets</b>	<b>Smart Railways</b>	<b>Smart Ports/Terminals</b>	<b>Public Safety/Security</b>
<ul style="list-style-type: none"><li>▪ Congestion management</li><li>▪ Speed detection</li><li>▪ Traffic analysis</li><li>▪ Pedestrian safety</li><li>▪ Smart parking</li></ul>	<ul style="list-style-type: none"><li>▪ Real time tracking</li><li>▪ Telematics services</li><li>▪ Anomaly detection</li><li>▪ Asset security</li><li>▪ Cargo monitoring</li><li>▪ Route management</li><li>▪ Connected fleet</li></ul>	<ul style="list-style-type: none"><li>▪ Passenger dwell time analysis</li><li>▪ Yard management</li><li>▪ Freight &amp; cargo monitoring</li><li>▪ Track &amp; carriage monitoring</li><li>▪ Critical equipment monitoring</li></ul>	<ul style="list-style-type: none"><li>▪ Virtual queue management</li><li>▪ Passenger dwell time analysis</li><li>▪ Smart AVI</li><li>▪ Smart baggage detection</li><li>▪ Smart de-icing</li><li>▪ Cargo monitoring</li><li>▪ Incident management</li></ul>	<ul style="list-style-type: none"><li>▪ Anomaly detection</li><li>▪ Community safety</li><li>▪ Emergency response</li><li>▪ People counting &amp; spacing analytics</li></ul>

Above: Further Smart City applications enabled by Wipro

## Learn More

Learn how else Wipro and Intel are collaborating to shape the future

[wipro.com/partner-ecosystem/intel](http://wipro.com/partner-ecosystem/intel)

See other ways that Intel® technologies for smart roads are contributing to a more connected world

[intel.com/roadinfra](http://intel.com/roadinfra)

## About Wipro

Wipro Limited is a leading global information technology, consulting, and business process services company that uses cutting edge technologies to help clients adapt to the digital world and build a bold new future.

[www.wipro.com](http://www.wipro.com)

1. [Revision of World Urbanization Prospects](#), United Nations
2. [Future of Urban Mobility](#), Arthur D. Little & UITP
3. [GStreamer Multimedia Framework](#), Renesas, 2011
4. [GStreamer Features](#), GStreamer.org, 2012

### Notices and disclaimers

Intel is committed to respecting human rights and avoiding complicity in human rights abuses. See Intel's [Global Human Rights Principles](#). Intel® products and software are intended only to be used in applications that do not cause or contribute to a violation of an internationally recognized human right.

Intel® technologies may require enabled hardware, software, or service activation.

Performance varies by use, configuration, and other factors. Learn more at [www.intel.com/PerformanceIndex](http://www.intel.com/PerformanceIndex).

Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See backup for configuration details. No product or component can be absolutely secure.

Intel does not control or audit third-party data. You should consult other sources to evaluate accuracy.

Your costs and results may vary.

© 2022 Intel Corporation. Intel, the Intel logo, and other Intel marks are trademarks of Intel Corporation or its subsidiaries. Other names and brands may be claimed as the property of others.