

SOLUTION BRIEF

Smart City
Video Surveillance and Analytics



Videonetics Turns Video Data into Smart City Decision-Making with Intel® Architecture

A comprehensive smart video solution designed for complex urban environments

"Intel® Distribution of OpenVino™ toolkit helped us to achieve greater performance using the same range of processors. By leveraging the computing capability of Intel's built-in GPU on the processors, our deep learning engines are now distributed at various layers of our fog computing framework in video-based IoT solutions. We have come up with a new generation of applications in intelligent traffic management and intelligent video analytics, and in the smart urban analytics domain with a very low cost of ownership to our customers, thus enabling them to deploy these solutions at a much larger scale."

—Tuhin Bose, VP and CTO
Videonetics Technology Pvt. Limited



Executive summary

Today's cities face complex challenges from securing citizens to managing transportation systems to improving emergency responses. Video data gathered by smart cameras offers a rich, time-based record of urban environments, but the very volume and complexity of the information makes it difficult to analyse and act upon. Videonetics offers a comprehensive suite of video computing applications running on Intel® architecture to give modern cities the timely, accurate information that can improve efficiency and quality of life.

Challenges

Urban environments are growing rapidly; it is predicted that by 2025, 58 percent of the world's population will reside in cities.¹ Managing the diverse infrastructure, processes, agencies, and services that comprise urban areas is complex, ranging from transportation, utilities, and emergency responders to public safety and quality of life. Smart video has the capability to gather rich data in near-real-time, but these datasets can be massive, expensive to transmit and store, and difficult and labor-intensive to analyze.

Solution

Smart city surveillance aims to enhance public safety, check crime, maintain a smooth transportation system, and protect property. It is about making a city a better place to live in and providing its citizens a better quality of life. Videonetics offers a suite of intelligent and integrated video solutions to support complex surveillance requirements and increase security and traffic management in today's urban environments. The Videonetics open platform—together with Intel® architecture-based solutions from edge to cloud—works with a wide range of cameras and network video recorders (NVRs) to turn rich video data into actionable insight. With Videonetics and Intel, cities can help improve citizen safety, law enforcement, emergency response, and traffic management.

Hundreds of cameras can be contained in a single enterprise-class surveillance system, generating volumes of video storage. Videonetics powered by Intel architecture provides the constellation of key technologies to speed processing of massive datasets, while increasing insight and visibility into complex environments.

Videonetics' artificial intelligence (AI) and deep learning (DL) integrated visual computing platform includes video management software, video analytics, Video Précis, traffic management, retail business intelligence (BI), facial recognition, and cloud-based video hosting and analytics.

Based on Videonetics' development of their Artificial Intelligence and Deep Learning Visual Computing Platform*, the AI and DL framework automatically detects various types of patterns, features, intrinsics, objects, and events from the ocean of video data via a continual, supervised, automatic, self-learning mechanism. This allows users to draw conclusions about a particular behavior or situation and inform decision-making.

Drawing on a rich portfolio of intellectual property (IP), Videonetics' AI and DL framework can be seamlessly integrated into smart city infrastructure to meet the demands of a rapidly urbanizing population, enhancing security, safety, and quality of life. This state-of-the-art solution can make sense of the data being generated and transform it into predictive intelligence—thus supporting the transition from a smart city to an “intelligent city.”

Key features

Intelligent video management software

Open architecture

Videonetics' enterprise-class Intelligent Video Management Software (IVMS) is a hierarchical, distributed, modularly constructed, and well-engineered system for intelligent video surveillance spanning multiple sites.

This flexible, adaptable platform is designed to meet the requirements of existing workflows and diverse environments, whether single- or multi-site and single- or multi-server. The open architecture supports more choice of hardware and software to work with both legacy and new systems and equipment.

- Operating systems: Linux*, Unix*, Windows*, Mac*, and Android*
- Databases: MySQL*, Oracle, SQL Server*, and PostgreSQL DBMS
- Browsers: Firefox*, Chrome*, Safari*, and Microsoft Internet Explorer* (IE*)
- Cameras: All ONVIF-compliant IP cameras and encoders, and numerous non-ONVIF cameras and encoders (a list of supported cameras and encoders is available on request)

Smart load balancing

IVMS architecture is a true n + zero solution with built-in load balancing, ensuring all field cameras are always distributed among available servers. This eliminates the need for additional server hardware to counter recording or server failures.

Operating system independent

Built on open architecture principles to help ensure that the software is independent of any OS framework. The software can be deployed on Windows, Linux, and Mac OS for both server and client applications.

Open source or enterprise-class DBMS

Can be used with any open source DBMS (e.g., MySQL) or enterprise-class DBMS (e.g., MSSQL). High-availability mode is supported for enterprise-class DBMS.

Multilevel distributed storage

Local server storage space is used as a backup for NAS or SAN storage to ensure failsafe recording even when the main storage is unserviceable. When available, video data is transferred to the main storage, freeing local storage capacity. Recorded video is categorised as normal, critical, and event-based with snapshot views and visual categorisation to simplify analysis of enormous video datasets.

Integrated video content analytics

Videonetics Video Analytics framework is pre-integrated with IVMS that supports both server-based and edge analytics for Multiple Camera Multiple Applications (MCMA) using advanced multithreading processing.

Cloud aggregation

Live and recorded video streams, events, and alerts originating from each IVMS site in multi-site deployments can be aggregated across cloud locations or at remote data centres.

System dashboard

This feature exhibits actionable information on the status and health of all critical system components and their parameters, allowing users to make proactive and preventive decisions.

Database backup

Automatic, periodic backup of the database using a database backup application.

User management

In addition to rights and privileges assigned to users, it's possible in IVMS to restrict access to a specific camera or group of cameras to a user or group of users. IVMS allows two-way communication between operators and console import.

Alarm management tool

Unified alarm handling framework enables instant viewing of alerts and events from external hardware or the video analytics server on the live view panel. There are dedicated viewing panels for current events, hot-listed events, etc.

Intel® Vision Products

integrate advanced software and hardware to capture complex, dynamic visual content from the edge to the cloud, with exceptional richness and accuracy. By delivering data processing flexibility at the edge—both in cameras and on-premise servers—as well as scalability in the cloud, these solutions are driving next-generation artificial intelligence and analytics, and enabling powerful deep learning inferencing capabilities across various industries.

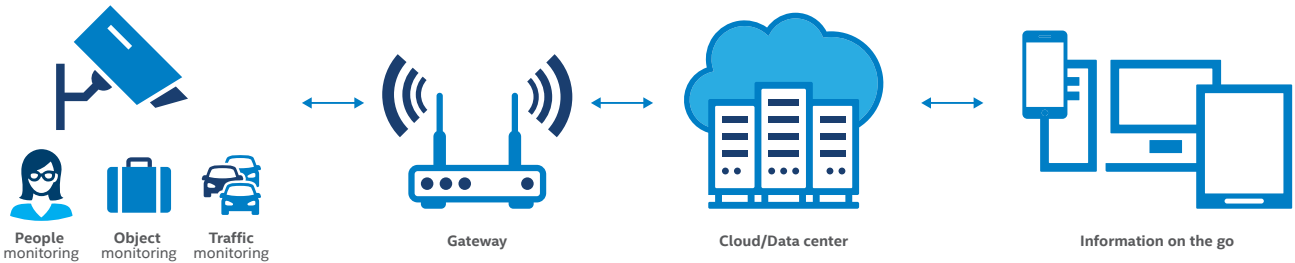
Solution offerings

Intelligent Video Analytics and Smart Urban Video Analytics

Videonetics adds sense to surveillance by automatically analysing and extracting meaningful and actionable information from enormous amounts of digital video data. Based on a rich set of video analytics engines developed in-house, Videonetics' different solutions have been successfully applied in diverse security and surveillance applications, including traffic, crowd, and people management, parking, building, retail, and critical infrastructure/object management. Introduction of an indigenously conceptualised and developed Deep Learning (DL) framework not only improves the performances of the existing analytics, but also paves the way for many new security and surveillance applications.

Moreover, incorporation of the DL framework results in true semantic analysis of the video data compared to syntactical analysis of the existing analytics. These improved and new surveillance applications are cost-effective and offer low carbon footprints. Especially developed and extensively field-tested for rugged Indian environments, the solution supports both server-based and edge analytics architecture and offers unprecedented scalability, scene adaptability, and flexible, automatic alert generation.

Analytics are accelerated by the Intel® Movidius™ Myriad™ X VPU, an Intel® Vision Accelerator Design product providing power-efficient, deep neural network inference for fast, accurate video analytics. Intel Movidius Myriad X VPUs are capable of operating on customisable complex networks and network layers with high compute and ultra-low power consumption, and can scale—simply by adding VPUs—while retaining their core efficiency.



Videonetics' video analytics on cloud running on Intel® processor-based servers simplifies access to video records and data

More smart city solutions from Videonetics

Intelligent Traffic Management System

Videonetics' Intelligent Traffic Management System is specially designed and architected to replace tedious manual processes used to track, regulate, and analyse vehicle movement on roads, and to enforce traffic rules to safeguard citizens and property. It acts as a true decision support system for traffic planners and traffic law enforcement agencies. The system is integrated with Videonetics' IVMS and video analytics in a unified, monolithic system architecture, so that video surveillance and traffic monitoring services complement each other.

Smart city use cases include intelligent traffic monitoring, law enforcement, speed detection, parking management, vehicle entry, and exit management. The customisable software platform has been developed specifically to suit urban traffic conditions and unique license plate patterns.

Video Précis

Videonetics' Video Précis technology is designed to accelerate accurate searches for sparse events and scenes in large video archives. The technology condenses meaningful activity in a scene in an overlapping time scale, allowing users to quickly glance through hours of activity in just a few minutes. This allows fast review of hundreds of events and identification of important clues.

Video Précis can also be integrated with Videonetics' intelligent video analytics, supporting the application of relevant filter criteria.

Video + Analytics on cloud (VOC)

Video + Analytics on cloud (VOC) is a cloud-enabled, real-time, subscription-based service enabling video surveillance with BYOD or leased hardware. It offers 24/7 secure access to records, as well as convenient viewing, storing, retrieving, and sharing of recorded clips. It can be seamlessly integrated with automation controls and other such value-add services for enhanced security.

The solution supports remote monitoring and automated alerts to authorised personnel.

VConnect*

Videonetics VConnect* is a unified central video monitoring software that enables remote monitoring of cameras connected to multiple autonomous video management systems (VMS) deployed at geographically dispersed locations from a central control room (CCR).

- ITMS suite of applications consisting of automatic number-plate recognition (ANPR), red light vehicle detection, and speed violation detection automatically identify all moving vehicles in a scene by license plate numbers
- Information (such as colour, silhouette, and watermarked/encrypted snapshots of vehicles) is stored in an event log database
- Sends out alerts without requiring a person to be physically present at the scene
- Can be easily integrated with other Videonetics' technologies, such as virtual loops for the Vehicle Actuated Traffic Signal Control System

KEY FEATURES

**Video analytics/
Smart urban video analytics**

- Enables multiple intelligent video applications from a single video channel
- Advanced multi-threading processing provides the ability to support Multiple Camera Multiple Applications (MCMA) in which multiple video channels support multiple applications available in the suite
- Unique algorithm analyzes a video sequence, detects moving objects in the sequence, and identifies and classifies human and inanimate/non-human moving objects
- Smart urban video analytics provide unique applications of graffiti and vandalism detection, garbage and litter detection, crowd anomaly detection, traffic monitoring, etc.
- Video analytics algorithms are uniquely tailored to work with different cameras, sensors, and lighting conditions
- Automatic dispatch system alerts operators and users instantly through email and SMS
- Field-tested in a wide range of environmental and lighting conditions, including high population density
- Customised to meet challenging infrastructure and fluctuating environmental conditions in urban environments

Facial detection and recognition

- Supports JPEG, JPEG 2000, RAW RGB, YUV, PNG, BMP, PPM, and PGM
- Captures faces from the live video stream in any video format (MJPEG, MPEG4, H.264, etc.)
- Camera-agnostic; works with any IP camera with at least D1 resolution size of video. For analog cameras, the system easily integrates with an encoder to do the face recognition at the server
- Fine-tuned assessment of variations in facial expressions, luminance, pose, etc.
- Highly accurate facial recognition independent of any resolution, 640 × 480 or higher
- Fast processing of new faces—takes no more than 0.01 second to train that face using a single core Intel® processor
- Reduces training time by training only new faces entered into database
- Once trained, the facial feature database is separate from the face image database in order to protect it from potential corruption or tampering of images
- Beard, moustache, and other changeable face features influence face recognition quality. When frequent face changes are typical for an individual, the database marks the images with an identical ID.
- The face database can be integrated with the personal history database, including name, age, sex, date of birth, address, unique identification number, employment history, etc.

Video Précis

- Deploy in stand-alone mode or as an integral part of Videonetics Enterprise VMS*
- No limitation in the number of cameras
- Operating system-independent (supports Linux*, Windows*, Unix*, and Mac*)
- Online and offline modes
- Watermarking and encryption
- Instantaneous results
- Low computation and no inherent server requirement
- Save in time, money, and manpower

Video + Analytics on cloud (VOC)

- Supports cloud hosting
- Supports common operating systems (Windows, Linux, Android, IOS*, Java*/Windows)
- Seamless integration through APIs, REST, XML, SOAP, OSGI, etc.
- Extensively tested platform
- Deployment-ready with minimal development
- Device manufacturer and protocol agnostic
- Supports ONVIF and IP standards
- Supports video compressions: H.264/MPEG4/MJPEG
- Supports camera/devices from multiple vendors
- Broadband gateway integration

More use cases

In addition to making cities smarter, Videonetics' video surveillance and monitoring systems and software products support the following industries:

Railways: Track monitoring, station monitoring, unmanned level crossing monitoring, and maintenance and security checking

Home security and surveillance: Intelligent perimeter, intrusion, trespassing, loitering, break-in prediction, unattended objects, tripwire, people counting and tracking, and face capture

Critical installations: Oil installations, nuclear power plants, and high security zones

Retail: Footfall, dwell time, signage, queue, etc.

Museum and antique artifact protection: Theft detection and tampering

Large installations: Airports, seaports, shopping malls, buildings, and stadiums

Conclusion

With Videonetics and Intel, cities can tap video data to inform services critical to safety and traffic management. Videonetics' comprehensive suite of video management and analytics software combines with an open platform and high-performance, reliable, scalable Intel architecture to bring the benefits of connected intelligence to complex urban environments.

About Videonetics

Videonetics, a leading visual computing platform development company, specializes in developing innovative security solutions such as IVMS, deep learning and AI-based video analytics, intelligent traffic management systems, facial detection and recognition, video and analytics on cloud, and many other path-breaking video technologies. Videonetics technology has been granted patents from the US, UK, Israel, Singapore, and Canada.

Videonetics is proud to have secured more than 100 cities, more than 80 airports, and more than 100 large enterprises all over India, as well as in southeast Asia, the Middle East, Africa, the US, and Europe, having integrated more than 100K cameras with its IVMS with more than 7,500 traffic lanes monitored by its Intelligent Traffic Monitoring Platform.

Learn more

For more information about Videonetics, please visit videonetics.com or contact us at info@videonetics.com.

For more information about Intel IoT technology and the Intel® IoT Solutions Alliance, please visit intel.com/iot.



1. Frost & Sullivan, 2014, <http://ww2.frost.com/news/press-releases/frost-sullivan-global-smart-cities-market-reach-us156-trillion-2020>.

Estimated results were obtained prior to implementation of recent software patches and firmware updates intended to address exploits referred to as "Spectre" and "Meltdown". Implementation of these updates may make these results inapplicable to your device or system.

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0419/GR/CMD/PDF 337497-002US

Intel® Distribution of OpenVINO™ toolkit

Videonetics uses Intel Distribution of OpenVINO toolkit to further accelerate AI model training and deep learning inference. This is a free, downloadable toolkit that helps developers and data scientists fast-track the development of high-performance computer vision and deep learning into vision applications. It enables deep learning on hardware accelerators and streamlined heterogeneous execution across multiple types of Intel® platforms. It includes the Intel® Deep Learning Deployment Toolkit with a model optimiser and inference engine, along with optimised computer vision libraries and functions for OpenCV* and OpenVX*. This comprehensive toolkit supports the full range of vision solutions, speeding computer vision workloads, streamlining deep learning deployments, and enabling easy, heterogeneous execution across Intel platforms from device to cloud.