“Intel® processors offer the high performance, reliability, and stability that a2 requires for this mission-critical solution. We are also more than happy to join the Intel partner ecosystem and enjoy the technical and business support associated with the Intel brand.”
—Murat Mutlu, managing partner, a2 Technology

About 1.3 million people die each year as a result of traffic crashes worldwide, according to a report by the World Health Organization.1 Of those fatalities, more than half the victims are pedestrians, bicyclists, or motorcyclists. Traffic accidents are the leading cause of death for children and young adults.

Many of these accidents can be prevented by mitigating or eliminating unpredictable hazards on the road. For example, an animal or pedestrian might dart out into the road, fallen objects or stalled vehicles may block the road, or visibility could be reduced due to weather conditions or smoke. Even a small-scale incident can have serious consequences when it occurs in a tunnel, on a bridge, on a congested highway, or in another area where traffic cannot be diverted to an alternate route.

With a2 Technology’s Video Content Analysis (VCA) solution, transportation authorities and/or first responders are alerted instantly to any risk, enabling them to take prompt action to optimize traffic flow, clear obstructions, or rescue any injured parties. As a preventive measure, a2-VCA can be used to analyze traffic density and predict travel time so authorities can warn drivers, redirect traffic, or take other actions to mitigate risk. It also detects intrusions and related incidents, threats, and vulnerabilities at highly secure facilities and on railways.

**Challenge:** Vehicle accidents and security incidents are complex and difficult to analyze

Many traffic accidents and unwanted intrusions can be prevented or mitigated by analyzing traffic video footage captured at the scene. These incidents are often caused by a combination of unpredictable factors, however, so the road or site must be viewed from many vantage points at once, in high detail, to yield enough information for successful scene intelligence analysis. Those data files are typically so large and complex that they cannot be analyzed in time to trigger a rapid response.

**Solution:** Scenario-based traffic video content analysis from a2 Technology detects multiple incidents in near-real time

A VCA solution from a2 Technology relies on artificial intelligence and machine learning to detect complex scenarios, including near misses and accidents, by processing live images from multiple cameras in near-real time. The a2-VCA system identifies the risks and alerts operators so they can respond promptly. As a follow-up, the video footage and content analysis can contribute to plans for improvement of traffic control mechanisms, sites, or structures to help prevent future accidents or intrusions.
The a2-VCA solution is designed as a master-client infrastructure. As with a server-client design, the master device acts as a hub that manages and monitors the client units, freeing the clients to be fully available.

As an example, a2-VCA can monitor traffic and road conditions in various tunnels across a single city, with multiple cameras in each tunnel. The municipal authority can view the different tunnels from a single interface.

Optimizations reduce upgrade costs
The a2-VCA solution has been available since 2017, but recently an existing customer asked to add new functionality, upgrades, and updates. The customer wanted to improve the system’s accuracy under new conditions that were increasingly complex. However, that customer was reluctant to purchase new hardware or incur the additional costs or effort of a new installation.

The a2 team met the customer’s challenge by optimizing the a2-VCA with the Intel® Distribution of OpenVINO™ toolkit. The optimization improved inference performance by nearly 110 percent for the customer’s DNN models, so the new application could run successfully on the customer’s existing hardware.

Solution summary
The a2-VCA relies on proprietary, highly optimized algorithms and the distributed master-client model to reduce the computational burden on hardware. Those system design choices give a2-VCA users a broad selection of platform and installation options to deliver fast, reliable incident detection and analysis:

- Platform independent, with nine different edge, cloud, and hybrid installation options
- Optimization reduces computation load, leading to significant cost savings on processing power and cloud instances
- Scenario-based analysis describes complex events with more than 20 functions in five application types
- Trusted solution delivers 99% accuracy in incident detection

“The competitive strengths of a2 solutions are our optimized algorithms and unique AI models. We can significantly reduce our customers’ total budget by optimizing with the Intel® Distribution of OpenVINO™ toolkit running on Intel® processors.”
—Özcan Gülderên, cofounder and CTO, a2 Technology

Solution Brief | AI-Based Video Analysis Helps Improve Traffic Safety in Near-Real Time

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Intel® technologies and solution components
- Intel® Core™ processors and Intel® Xeon® processors
- Intel® Distribution of OpenVINO™ toolkit
- Intel® DevCloud for the Edge
- Intel® C++ compiler
- Intel® IPP
- Intel® OpenMP

Configurations deployed and tested in Intel DevCloud for the Edge
- Intel DevCloud for the Edge, nodes idc024 and i5-6500TE
- Intel Distribution of OpenVINO toolkit
- Intel® Core™ i7-10710U processor, 16 GB, Intel® UHD Graphics
- Intel® Core™ i7-1065G7 processor, 16 GB, Intel® Iris® Plus Graphics G7
- Intel® Core™ i7-7700 processor, 16 GB, Intel® HD Graphics 630

How it works
The a2-VCA processes live images from cameras in near-real time, automatically identifies all the features from each viewing angle, and learns the contours and features of the background. The system detects all moving or stationary foreign objects, distinguishes them from the known background, and classifies the objects. Classification is based on predefined scenarios, assisted by artificial intelligence and machine learning.

The master-client architecture and a2-VCA can be implemented in various scenarios and installation options, from edge to cloud. The system can be deployed on its own or in an integrated configuration with supervisory control and data acquisition (SCADA) and closed-circuit television (CCTV) systems from other providers. The a2-VCA solutions are compatible with most popular cameras and video management software (VMS) products.
Potential solution deployments

National and state highway and railway authorities
Regional and local transportation departments
High-security facilities

Intel® DevCloud for the Edge
Intel DevCloud for the Edge gives developers access to the latest Intel® hardware in an online sandbox running the Intel Distribution of OpenVINO toolkit in a Jupyter Notebooks dev environment. Most of Intel's edge software and middleware is online and ready for testing as well. Developers can build with Intel® components, code from scratch, or work with a point-and-click deep learning workbench.

Intel Distribution of OpenVINO toolkit
The Intel Distribution of OpenVINO toolkit is the development environment for deep learning inference on Intel hardware. It optimizes and converts models from all the major frameworks and gives developers a GStreamer-based toolset for creating inference pipelines.

Learn more

Learn more

Get the details on the a2-VCA solution.
Visit the website
Find out how Intel® technologies for smart roads promote safety and help reduce emissions.
Visit intel.com/roadinfra

About a2 Technology
a2 Technology develops state-of-the-art technologies to support the vision of smart cities, a future-focused framework to improve the infrastructure, efficiency, and overall quality of life in urban areas around the world.
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