ADVANCING TRANSIT SYSTEM SECURITY:

IOT ENABLED COTS PLATFORMS FOR INTELLIGENT, DATA DRIVEN VIDEO SURVEILLANCE

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IMPROVING MASS TRANSIT SECURITY THROUGH SMARTER, REAL-TIME VIDEO SURVEILLANCE MONITORING

The increasing threat of security breaches and attacks is making securing public transit systems a high priority and video surveillance a necessity. However, security threats are not the only issues plaguing mass transit agencies and operators where video surveillance can help. Video surveillance can be a highly effective cross-functional tool for improving operator efficiency and costs as well as enhancing the overall passenger experience, reducing delays or disruptions to service from unforeseen mechanical breakdowns, track obstructions or just traffic congestion.

In a recent report by Markets and Markets, the research firm estimates that the video surveillance market is estimated to see rapid growth from $876.6 million in 2015 to $1,456.4 million in 2018 at a double-digit CAGR of 18.5% from 2015 to 2018. According to a 2015 survey by UITP, public transport operators and authorities will make investments in the next several years for Internet protocol cameras (IP cameras), real-time functions and intelligent analytics. Another study by RnR Market Research shows the transportation sector comprises a majority of the video surveillance market and could grow to nearly 35.5 percent of the market by 2019.

There is almost uniform agreement that video surveillance is considered essential to monitor and capture clear incident images that can protect passengers and assets while keeping operations running smoothly. Identifying the expanded requirement for video surveillance in the world's public transit systems has also highlighted the many challenges facing developers.

This white paper will present why current fragmented, proprietary video surveillance technology solutions prevent cost-effective advancements. It will show the advantages of implementing new commercial off the shelf (COTS) open architecture, application-ready computing technologies that allow developers to easily customize and configure intelligent, data driven video surveillance systems targeted to a variety of transit system needs. Also covered are state-of-the-art network video recorders (NVRs) and other transportation-centric platforms that maximize existing infrastructure investments. These same COTS platforms also help prepare operators for future infrastructure needs, such as the Internet of Things (IoT), and are backed by tools that support real-time data analytics and remote system monitoring.

// REDUCING SYSTEM TOTAL COST OF OWNERSHIP WITH COTS OPEN SOLUTION READY PLATFORMS

COTS-BASED TECHNOLOGIES ARE REVOLUTIONIZING VIDEO SURVEILLANCE

A deterrent to growth, the current video surveillance market is fragmented with many existing systems based on proprietary technologies deployed basically as dozens of individual pieces of equipment. Originally popular due to the large market share influence of big developers, these closed legacy proprietary technologies hamper inter-operability with third party components and applications within a video surveillance system preventing operators from maximizing or expanding their infrastructure investments. For instance, migrating to newer technologies or adding the latest available high resolution cameras to the network is more difficult if not impossible. Proprietary solutions also prevent developers from easily customizing designs when capabilities need to change.

The pace of technology innovation is quicker now and proprietary technologies cause organizations to be restricted or held back to only using solutions provided by a particular supplier or hardware format. Streaming video, camera and connectivity technologies have made tremendous leaps in recent years enabling clearer viewing for quicker incident decisions and response, giving transit agencies an urgency to update security equipment. Important to note is that currently-installed video surveillance systems based on multiple independent systems that operate over proprietary networks restrict operators from seeing the whole picture and leveraging technological gains to the fullest.

Advanced design building blocks and tools based on open computing architectures are now available to facilitate cost-effective development and deployment of more flexible and scalable video surveillance solutions. COTS-based solutions help reduce costs and at the same time shorten complex integration times. This avoids the issue of solving similar problems repeatedly as each generation of proprietary hardware solution is evaluated or deployed. It also starts to put an end to the market fragmentation that causes development costs to continually rise and stifle industry growth.

Scalability is inherent in standards-based platforms compared to a system that uses proprietary technologies where there may be an extended time between solution iterations and innovations. Because many companies are responsible for defining the open system standard, developers can be assured of continued advancements in features and capabilities as a central part of the specification along with a reliable degree of backward compatibility. Another important fact why an open standard approach is superior is that there is broad knowledge of the specification, computing architecture and particular form factor from multiple technology suppliers. Plus, using a modular COTS approach enables operators to configure based on their needs -- from lower end single-core systems to integrating multi-core processors for higher performance requirements.

// ADAPTIVE & SMART VIDEO SURVEILLANCE

A proven answer for achieving fast time-to-market with cost-effective, sophisticated designs, select COTS suppliers such as Kontron have specifically optimized their platforms for transportation systems. Kontron, a Premier member of the Intel® Internet of Things Solutions Alliance, makes application-ready solutions designed to solve the compatibility issues experienced with earlier versions of transit video surveillance equipment and video management software. They can also function as system development building blocks capable of overcoming common problems in legacy systems, for example, the ability to monitor large numbers of cameras. Solving these problems allows operators to retain their investments eliminating the need to replace existing hardware solutions, purchase new software, or re-train employees.

HARDWARE AND VMS SOLUTIONS THAT EXPAND SECURITY CAPABILITIES

Mass transit agencies see the potential in using next-generation video surveillance technologies as advanced warning systems that provide 'all seeing' intelligence to avoid unplanned delays, improve reliability, security and safety. Other ways transit operators can leverage more advanced technologies is through their ability to support video analytics and data-based security capabilities to remotely monitor or even outsource security via web-based applications. Higher bandwidth features from IP video brings enhanced image quality benefits so security teams can make more informed decisions about recorded events.

Helping ensure video surveillance technologies are increasingly more effective and interoperable for advanced capabilities such as video analytics, CCTV, real-time passenger information and detection systems are hardware platforms and video management software (VMS) that support the ONVIF global standards for the interface of IP-based security products. Implementing video analytics and other complex functionality is anticipated to be very high amongst public transport organizations in the coming years; however, the integration of these new technologies multiplies the interfaces that operators must manage. This increased interface complexity may make the efficient management of emergencies more difficult if video surveillance systems are not based on standards-based technologies as there are many analyses and tasks that need to take place simultaneously. Adding to the challenge is that currently installed systems are based on multiple independent systems that operate over proprietary networks, therefore, making it impossible to see the whole picture. Implementing ONVIF-supported hardware and VMS solves these issues by ensuring compatibility between them and enabling users to easily identify specific interoperability features.

Video surveillance applications for mass transit systems enable developers to realize multiple benefits in adopting an open systems approach to their designs. Not only are they able to focus on their differentiated and competitive core competencies, standardized computing platforms help to reduce costs by decreasing the need for engineering resources and eliminating many of the computing technology challenges.

A significant COTS-based building block component for video surveillance is the latest selection of network video recorders (NVRs). An NVR is a device that digitally records video data, audio data and the associated metadata. NVRs are essential design elements helping developers easily incorporate technologies that help manage the full range of video equipment, multiple cameras and vehicle activity through a single software solution. The ability to streamline processes and imaging access through a central infrastructure device gives operators a powerful tool to further strengthen security.

Working in conjunction with NVRs are new VMS features that manage video, audio and associated metadata recordings by offering many configurable parameters to dynamically control the behavior of the recorder. VMS allows operators to view live and recorded audio and video sequences, provides alarm monitoring and post-event analysis while also supporting encryption of the audio and video data at the time of recording. IP based, today's advanced VMS offer ONVIF-supported interoperability making them compatible with a diverse range of cameras and the latest generation of network video encoding and streaming protocols.

BENEFITS OF THE INTERNET OF THINGS EVOLUTION

Mass transit agencies are realizing the value of video surveillance systems not only from expanding deployments but a widening of the range of possibilities that connected devices that make up IoT can provide. Following the IP (Internet Protocol) on train system evolution, next generation COTS platforms bring together the convergence of digital technology and faster Ethernet and wireless networks powerfully combined with new IoT-enabled transit system architectures. A move away from propriety software, too, streamlines the implementation of massively-connected, real-time information systems that provide more functionality and at far less cost than ever before.

By integrating video surveillance systems across a highly-leveraged wired and wireless network infrastructure, operators gain an improved comprehensive real-time view of trains, tracks, depots and stations. Monitoring these assets through video management systems at the control center or by staff operating in the field, connected IoT-enabled video surveillance systems can see the entire network of cameras. Then, critical video analytics are possible so public transport agencies can better identify, locate and record issues. This can be accomplished using IoT-enabled gateways that provide remote server backhaul capabilities using 4G LTE connectivity and/or Wi-Fi so that event-based information can be accessed by the central control center in near real-time enhancing security.
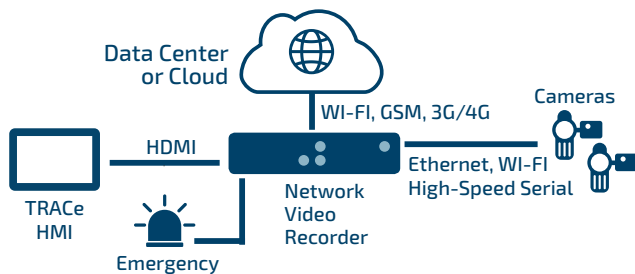
// VIDEO SURVEILLANCE USAGE MODEL

The importance for operators is that they are now able to take full advantage of the IoT by securely capturing and analyzing unprecedented volumes of data from each and every vehicle. Control centers have the ability to stay in constant real-time communication with their entire fleet to conduct remote monitoring and diagnostics of vehicle 'vital signs', ensuring smoother, safer, more reliable and cost-effective operation.

As the mass transit market rapidly adopts a new data-driven, connected systems approach, Kontron's focus on providing IoT enabled COTs platforms that deliver superior engineering quality and innovation ensures that customers have the right technology to make this evolution possible. IoT technology promises the capability to improve transit operations directly -- whether locating faults before they become problematic, improving the passenger experience or enabling train management system to be more efficient. As IoT rolls out in systems globally, there will be even greater potential to see how it positively effects transit operations in the future.

FUTURE-PROOF LARGE NETWORK MANAGEMENT

Offering all the advantages of standards-based COTS computing solution for transportation video surveillance is the Kontron TRACe V304-TR. The TRACe V304-TR is designed to be compatible with all ONVIF-supported VMS solutions such as Genetec's Security Center unified security platform as well as many others. It uses a proven COM Express® Computer-on-Module (COM) based on the Intel® Atom™ processor E3845. With its quad core, 1.91 GHz performance and an industrial temperature range, this powerful, low-power-consuming processor is well-suited to processing IP video streams in constrained environments. In addition, its included Intel® AES New Instructions help enable fast and secure data encryption for enhanced security.

Delivering the high performance, high reliability and IP50 dust and water protection needed for rough public transportation environments, this small form factor modular platform permits an entire network to be mobile. It also facilitates future upgrades to the latest processor technology, thereby, future-proofing a transit operator's investment when they need to increase computing performance.

To meet the need for video surveillance increased storage capacity, the Kontron TRACe V304-TR provides outstanding storage capabilities and can support from 25-64 IP camera HD video streams on selected VMS SW. It includes soldered eMMC flash (8 GByte up to 64 GByte) for OS and application, optional mSATA and 2x SATA removable 2.5'' disk trays ,that can accommodate higher-volume bulk data allowing operators improved ease of maintenance and use.

// IDEALLY SUITED FOR IP VIDEO SURVEILLANCE, THE TRACe V304-TR IS AN EN50155-CERTIFIED AND TESTED (CLASS TX -40°C TO +70°C / 10 MIN @ +85°C) FANLESS NVR DESIGNED TO DELIVER EXCELLENT HIGH CONNECTIVITY AND STREAMING VIDEO PERFORMANCE FROM ITS RECORD AND TRANSMIT H.264 VIDEO STREAM AND 2X LAN STREAMING CAPABILITIES.

The TRACe NVR and all of Kontron's TRACe transportation computing platforms integrate advanced health management tools. Modular, scalable and independent from the main CPU, these uniform test routines help operators to permanently, continuously and independently monitor and report the health status and configuration of the video surveillance system. Meeting one of the highest needs of video surveillance systems today, health management allows the TRACe NVR to be used to manage a large network of video surveillance units. Health management capabilities also provide the resource allowing system operators to go from simply reactive to positively proactive in managing application functionality and uptime. Significant efficiencies and benefits from remote monitoring, fleet availability, serviceability and anticipated maintenance can be achieved now that were not available previously. The result is twofold -- improved overall security supported by better diagnostics and maintenance that minimize the need for system debugging.

▶ Find out more in Kontron's health management white paper: **http://www.kontron.com/wp_health_management**
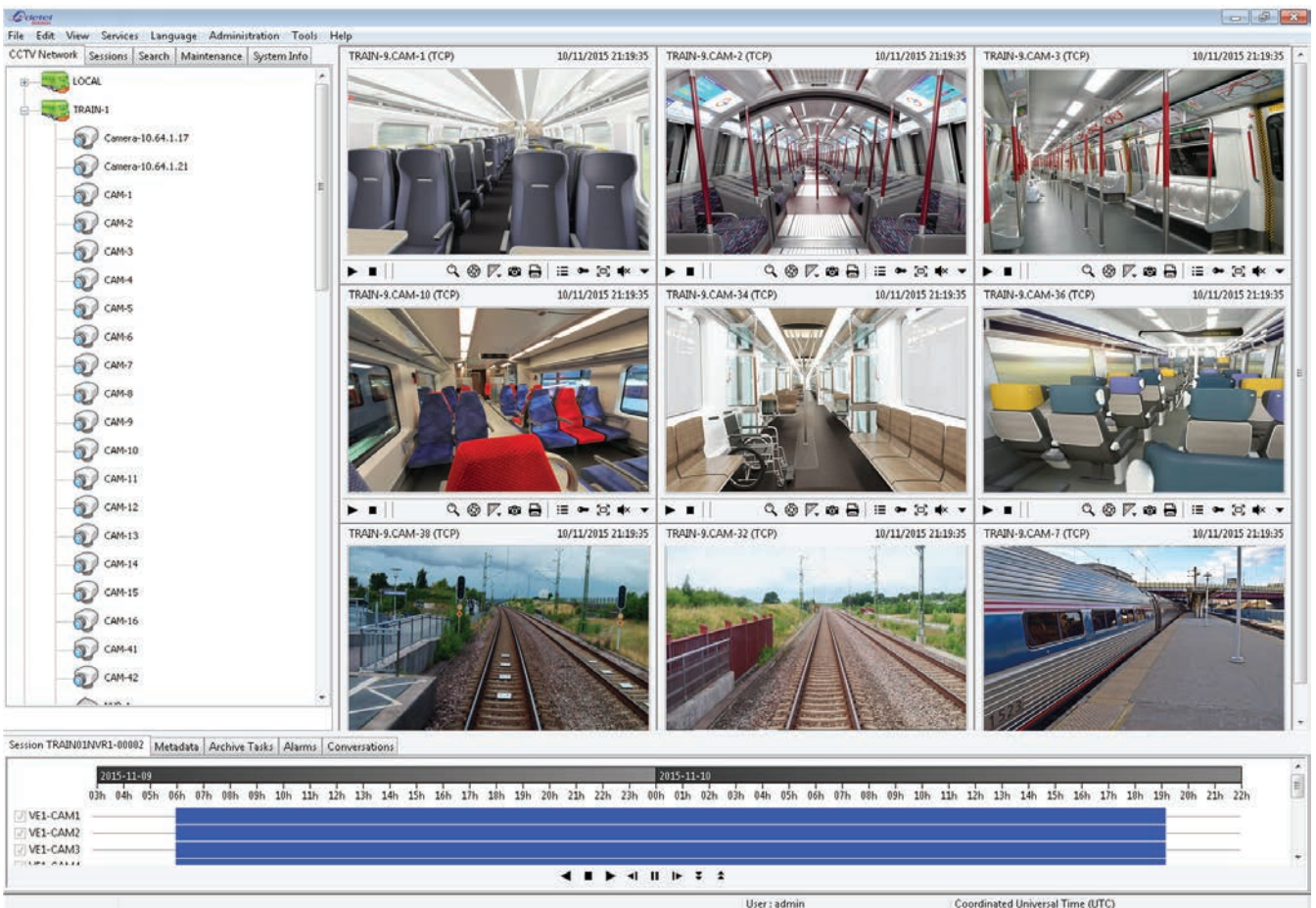
// MONITOR MULTIPLE CAMERAS IN REAL TIME

TECHNOLOGY IN ACTION

A prime example of how Kontron is working with developers of on-board video surveillance systems is a use case in collaboration with Adetel Solution. This real-world example of a video surveillance system is entirely IP-based, supports a wide variety of cameras and utilizes the latest generations of network video encoding and streaming protocols. The solution incorporates Adetel Solution's video management software and integrates with multiple high-resolution cameras including the Samsung Security SNV-6012MN 2MP 1080p Full HD Vandal-Resistant Network Mobile Flat Camera, runs on a TRACe network video recorder (NVR) and enables central management through a TRACe HMI, an EN50155-certified fanless operational panel PC display. Specifically designed for transportation systems, Kontron's advanced touch-screen HMI delivers a unified architecture approach with the complete line of TRACe products, enabling maximum interoperability.

This example enables captured video images and audio signals to be digitized, compressed and streamed over the Ethernet network by different cameras using industry standard real-time streaming protocols such as RTP and RTSP. The video management solution offers the ability to record captured video images, audio sound and its associated metadata while supporting encryption of the audio and video data at the time of their recording. Using ONVIF-compliant IP cameras and based on the ONVIF Profile S for IP-based video systems to ensure compatibility and interoperability, the combined solution from Kontron and Adetel Solution supports multiple simultaneous audio and video streams to be transmitted simultaneously as well as standard encoding formats such as H.264 and MJPEG. The captured streams can be either transmitted to an onboard network video recorder for long-term storage, to a train driver console or to a wayside operations control center (OCC) live video monitoring station.

Designed as an on-board video surveillance system, the same solution can be extended to a wayside station or depot where it can interface to a third party video management system if needed. These flexible hardware and software options are independent of the train to wayside link so they can be tailored to a specific operator's control center system architecture for maximum usage and compatibility.

APPLICATION-READY AND PREPARED FOR FUTURE NEEDS

As an established global provider of rail, road, wayside and station platform systems, Kontron designed the TRACe family to help system integrators and solution providers meet evolving IoT and ITS (Intelligent Transportation System) infrastructure needs for smarter, more connected solutions. With our extensive and proven history of successful embedded computing deployments, Kontron understands the need to provide technology that enables continued innovation, expansion and long-term value.

Kontron developed the TRACe line to provide proven, advanced technology building blocks and 'plug and play' middleware that facilitates design flexibility and is able to address any train program profile. The family's rugged design ensures virtually maintenance-free operation in harsh environments, and is based on interoperable standardized COTS technologies for easier migration and upgradability. In addition, these solutions meet the needs of transit agency business models that include upfront payments for hardware installations, VMS pay-per-camera license fees and annual VMS maintenance fees. By delivering a standards-based foundation, Kontron and its VMS solution partners give video surveillance developers the interoperable, IoT-enabled solutions they need to make intelligent, data driven video surveillance systems possible. Kontron's feature-rich and application ready platforms accelerate more cost-effective real-time surveillance and analytics system deployments that match transit agency goals to keep passengers safe, secure valuable assets and enable increasingly efficient operations.

TRACe™ FAMILY FOR ON-BOARD CCTV

Network Video Recorder
TRACe V304-TR

Railway M12 Switch

Gateway, T2G communication
TRACe G304-TR

Monitoring / Live
TRACe HMID104

// VALIDATED PLATFORMS OFFER APPLICATION-READY SOLUTIONS FOR ON-BOARD IP VIDEO SURVEILLANCE

ADETEL Solution offers electronic equipment designed in-house or following specifications for embedded deployments. Available as individual equipment or complete systems (hardware and software) for new designs or upgrade programs, our products are designed for the stringent requirements of the embedded world.

Our activities consist of developing and realizing next generation products offering a unique cutting edge approach to innovation, full scalability to accommodate growth, while supporting a highly consolidated and efficient integration footprint.

For more information, please visit:
www.adetelsolution.com

kontron

About Kontron

Kontron, a global leader in embedded computing technology and trusted advisor in IoT, provides a complete and integrated portfolio of hardware, software and services. Kontron creates many of the standards that drive the world's embedded computing platforms, bringing to life numerous technologies and applications. The result is an accelerated time-to-market, reduced total-cost-of-ownership, product longevity and the best possible overall application with leading-edge, highest reliability embedded technology.

Kontron is a listed company. Its shares are traded in the Prime Standard segment of the Frankfurt Stock Exchange and on other exchanges under the symbol "KBC".

For more information, please visit: **www.kontron.com**

About the Intel® Internet of Things Solutions Alliance

From modular components to market-ready systems, Intel and the 400+ global member companies of the Intel® Internet of Things Solutions Alliance provide scalable, interoperable solutions that accelerate deployment of intelligent devices and end-to-end analytics. Close collaboration with Intel and each other enables Alliance members to innovate with the latest IoT technologies, helping developers deliver first-in-market solutions.

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