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White Paper

Getting the Most Out of Your Next Generation Digital Security Surveillance System

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Getting the Most Out of Your Next Generation Digital Security Surveillance System

In the wake of security threats and the technological evolution, the worldwide video surveillance equipment market has grown rapidly in recent years. According to market surveys and predictions from IHS Technology, the video surveillance equipment market has expanded at a double-digit rate in most years during the past decade and will continue to grow by more than 12 percent this year (2014) from $14.1 billion in 2013 to $15.9 billion.

One of the factors driving the surveillance market is the entrance of Intelligent Video Analytics (IVA). MarketsandMarkets predicted in its Worldwide Market Forecasts & Analysis (2012-2017) that IVA would be the fastest growing technology segment of the surveillance (IT) sector in the next three to five years. The report expects the IVA market to reach $867.8 million by 2017, up from $180 million in 2011, with an increasing CAGR of 30.4% from 2012 to 2017.

Way to Go: Intelligent Digital Security Surveillance

Intelligent Video Analytics automatically identifies and tracks objects from video streams, analyzes motion, and can coordinate with the database to extract video intelligence pertinent to specific purposes. This allows intermediate intervention or action in cases involving, for example, criminal investigation or traffic management by law enforcement agencies, and increases efficiency and effectiveness of video surveillance systems to a great extent.

Accordingly, the vertical market of video surveillance is experiencing a "paradigm shift", from that of traditional video recording and playback to intelligent Digital Security Surveillance (DSS) based on IP networking.

Intelligent DSS captures, processes, analyzes and transmits video data to a control center in real time, with all cameras and other field devices connected to a network platform associated, in turn, with databases. Controllers at the field end, needing to carry out multiple analytic and statistical tasks, require, as a result, more computing power.

User Requirements

In addition to real-time analytics, current user demand is for higher definition video output in uncompressed form. HD quality is no longer sufficient to meet market standards, as surveillance operations benefit greatly from clearer, more information-rich video images. Uncompressed full HD content at 1080p is becoming the norm, demanding significantly increased computing power.

To enable real time analytics, remote management over network is needed. At the hardware level this means status of all devices is remotely monitored and controlled in real time from a back-end server, with system administrators executing basic trouble shooting over the network, to prevent system shutdowns and associated cost and manpower expenditures.

As well, at the application level, remote management allows data captured by field-end devices to be processed and analyzed by field-end controllers and forwarded to the control center in real time, which allows immediate response to events from the control center. Data gathered can then be further analyzed from historical, geographical or statistical perspectives to provide valuable information supporting policy making and other high level tasks.

As many DSS field-end devices are deployed in outdoor or semi-outdoor environments, embedded devices used require robust and ruggedized construction, equal to the harsh conditions of use. To succeed in such 24/7 mission-critical environments, a reliable, secure infrastructure is crucial, providing efficient management while circumventing the liabilities of unplanned downtime. A zero-downtime platform such as this is likely to comprise imperviousness to moisture and contaminants, shock-and-vibration-resistance, wide operating temperature range, and surge protection are all cited as priorities.

Limitations of Conventional ARM-based and x86 systems

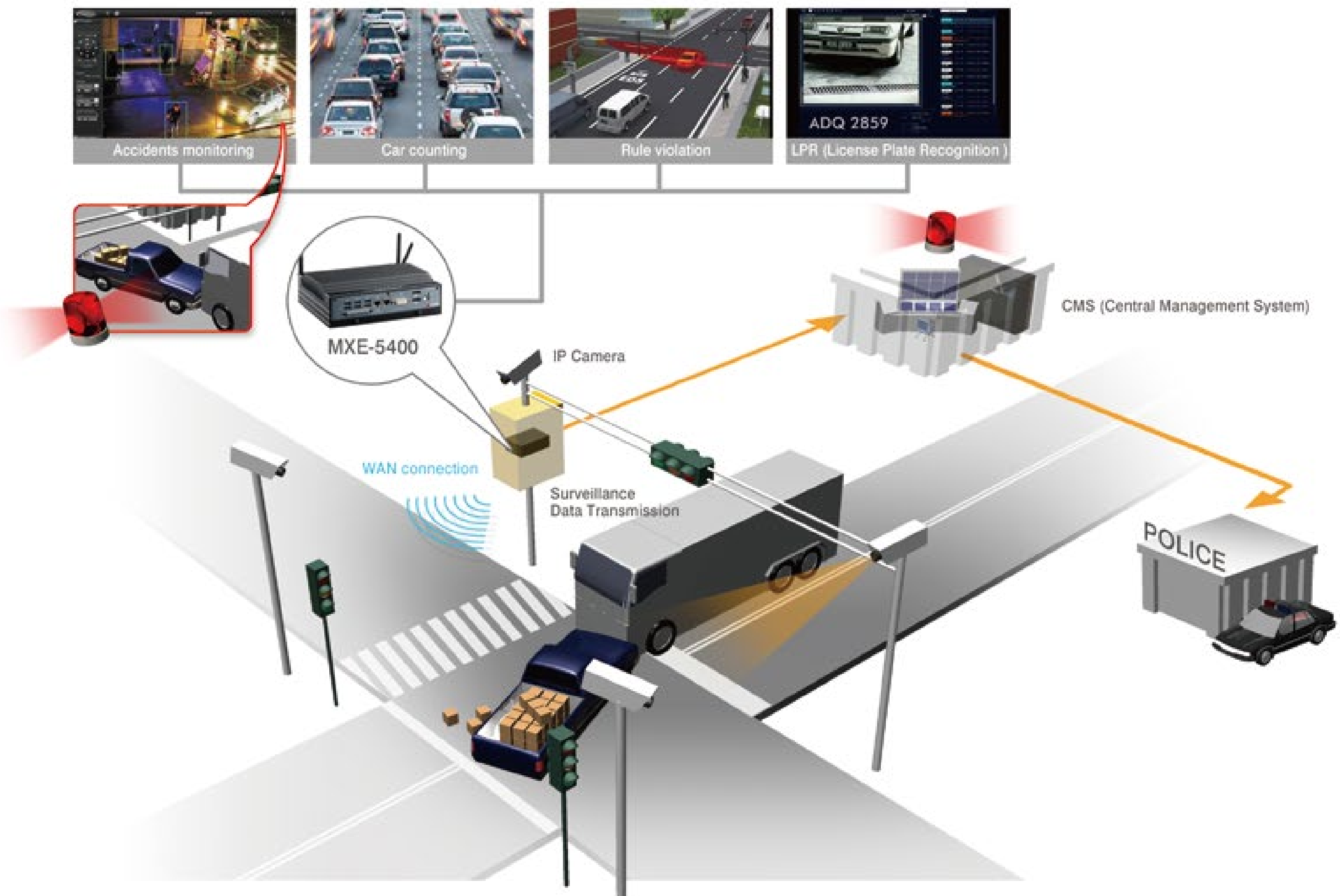
For large surveillance systems, such as those utilized for purposes of monitoring urban activity or road/traffic, field deployment is costly due to the need for large numbers of cameras, embedded systems, and other peripherals.

For years, ARM-based controllers have been widely used in field deployment of large-scale video surveillance applications due to their simplified CPU architecture and lower power consumption and pricing-- compared with Intel® x86 systems.

However, with limited computing power, an ARM-based controller is usually focused on a single task—more than often to merely record and playback video data. When the application requires more increased functionality—to detect specific occurrences such as traffic infractions, for example, the number of controllers and cameras required increases.

Though ARM-based solutions are making great progress in computing and graphic performance, they still fall short of demands from more advanced applications such as Intelligent Video Analytics.

ARM-based architecture also limits flexibility in system design due to hardware/OS/software compatibility issues, for instance, when hardware or OS is upgraded all application programs need to be rewritten, a costly and inconvenient prospect for system integrators.



In comparison, Intel x86 architecture-based systems excel in computing power, richer I/O and multitasking capabilities, as well as offering richer software resources and backward compatibility. Even these advantages, however, have not been able to offset price issues in large-scale field deployment. The emergence of Intel® Media SDK (MSDK) technology though, has begun to turn things around, as will be addressed later in this document.

Hints for Choosing the Right DSS Field-end System

Every security surveillance system requires considerable capital investment. When the market is experiencing a paradigm shift, decision-makers involved in surveillance system deployment will have to consider whether the system they are choosing will cater to their future needs, whether the system can be easily upgraded and expanded, and what the costs are for upgrading.

What follows are some ideas to assist in selection of a field-end system to meet the needs of next-generation DSS solutions:

Choose the system with maximum flexibility

Single-purpose systems with limited CPU resource, while less costly, may fail to efficiently provide the variety of functionality required of next generation surveillance systems.

The possible choice of a more high–powered computing platform with increased CPU resources supporting multitasking is one key factor to be considered.

In addition, interconnection of all devices is necessary in intelligent systems. An embedded system with diversified I/O capability can provide the reliability and convenience of inter-device connection the system demands, such as lighting control through RS-232 ports, WiFi connection to a backup server, and sufficient GbE ports for multiple IP cameras are all possible benefits provided by flexible I/O design.

System scalability for easy upgrades

As the costs of processors, storage, and internet connection decrease, and new technologies quickly increase single system channel capability and quality,high definition surveillance systems are rapidly becoming more easily realized. Number of channels, image resolution and signal quality, and additional functionality such as real-time image monitoring and analytics for various circumstances, all dictate the maximum system scalability possible to ease the burdens of system upgrade.

TCO is the key

In choosing computer systems, DSS system integrators will have to consider software compatibility issues between different OS versions and programming languages to ensure higher flexibility in software use. Backward and forward compatibility is important for conserving system development costs.

In terms of TCO, maintenance costs present as hidden expenditures of which customers may not necessarily be aware. The number of embedded device sites in a DSS system must normally exceed a hundred. With such numbers, if maintenance and management require too much on-site attention, costs quickly add up. One solution is effective employment of easily executed remote control, reducing or eliminating the need for individual attention to system status.

In addition, a reliable system should be able to withstand harsh environmental conditions such as extreme temperatures, surge impossibility in cabling, and vibration and shock, to further conserve maintenance costs.

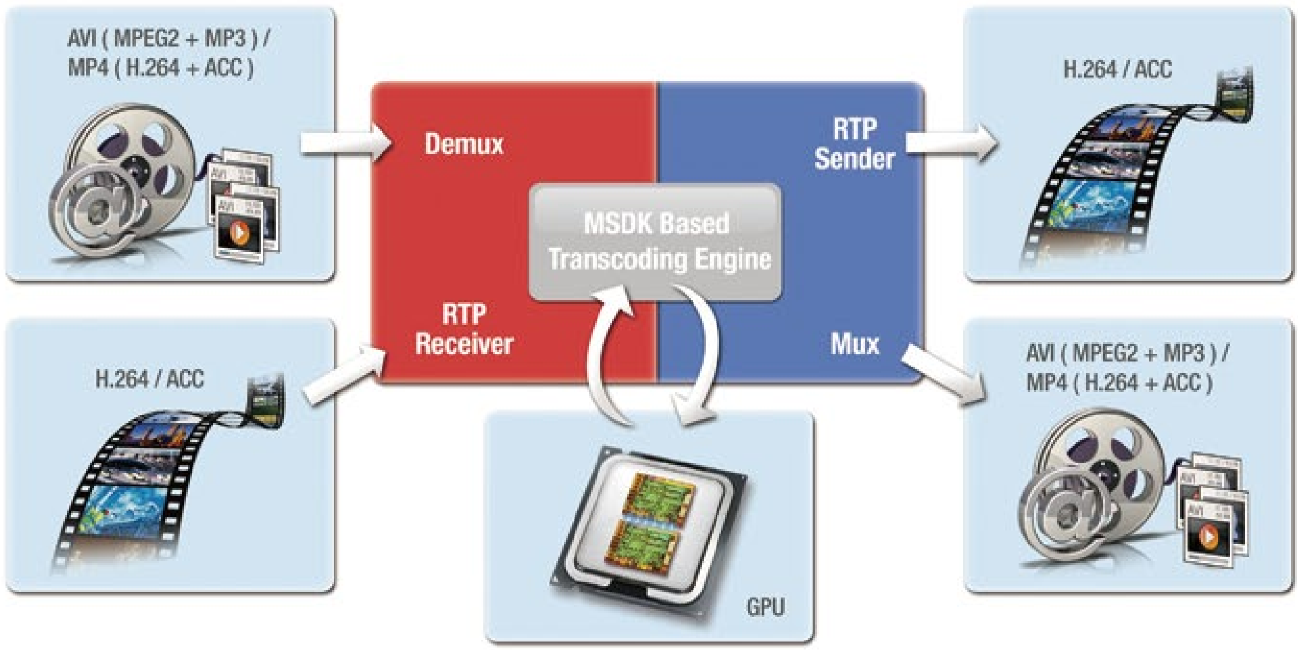
The ADLINK MSDK+ Difference

x86 systems, notable for high computing power, rich I/O and abundant software resources, presents a favorable choice for developing next-generation intelligent DSS solutions if price is not an issue. Even so, emergence of Intel® Media SDK (MSDK) technology continues to make x86 systems more price-competitive.

The Intel® MSDK provides the fastest performance possible for Intel® CPUs equipped with Intel® Quick Sync Video hardware. The Intel® MSDK provides a driver to offload transcoding tasks (decoding, processing and encoding) from CPU to GPU, increasing speeds and reducing CPU loading. When video transcoding tasks are carried out by GPU, the bulk of CPU resources are made available for other operations such as data and peripheral control, improving overall computing response and performance.

As Intel's premier partner in developing Intel-based intelligent platforms, ADLINK Technology leverages the benefits of the Intel® MSDK and contributes home-grown innovation to further enrich the technology.

ADLINK MSDK+ refers to a CPU offload solution developed by ADLINK and based on Intel® MSDK technology. As shown in Figure 1. ADLINK MSDK+ provides additional means to handle operations beyond those supported by Intel® Media SDK, including mux/demux of media container files, and RTP receiving and streaming.



[Figure 1. Functions provided by ADLINK Media SDK Plus]

ADLINK MSDK+ can assist in demuxing video and audio elements from a container file, allowing the Intel® MSDK engine to focus on processing the video elementary stream, extracting video data pertinent to application purposes, and then remux extracted video with audio into a container file.

RTP facilities expedite the streaming of video and audio elements over the network by not focusing on overhead information.

Embedded systems with ADLINK MSDK+ support enhanced graphic performance, boosting media streaming and reducing CPU loading. As shown in Figure 2, if a 10 second 1080p video is to be transcoded to 480p via CPU, only 2 transmissions can be managed simultaneously before CPU resources are used up. In a system featuring ADLINK MSDK+ support, as shown in Figure 3, however, the system utilizes GPU to offload transcoding tasks from the CPU, transcoding a 10 second 1080p video to 480p with more than 12 flows supported simultaneously, with only 11% of the CPU resources occupied. This represents a significant reduction, up to 80%, of CPU loading, with an impressive 250% increase in transcoding speed.

	Source	Output		Source	Output
Format version	H.264	H.264	Width	1920 pixels	848 pixels
Format profile	High@L4.0	High@L3.1	Height	1080 pixels	480 pixels
Duration	10s	10s	Frame rate	30.000 fps	30.000 fps

H264.1080P to H264.480P via CPU			
Flows	CPU Usage	GPU Usage	Transcode Time
1	60%	0%	4.40s
2	96%	0%	7.52s
3	97%	0%	13.56s

[Figure 2. Transcoding 1080p to 480p video via CPU]

H264.1080P to H264.480P via GPU			
Flows	CPU Usage	GPU Usage	Transcode Time
1	7%	50%	1.09s
2	7%	73%	1.88s
3	9%	90%	2.58s
4	9%	96%	3.06s
5	11%	96%	3.72s
6	11%	96%	4.47s
7	11%	98%	5.20s
8	11%	99%	5.96s
9	11%	99%	6.61s
10	11%	99%	7.34s
11	11%	99%	8.06s
12	11%	99%	8.71s

[Figure 3. Transcoding 1080p to 480p video via GPU]

When applied to video surveillance, the liberated CPU resources can control more peripherals, providing analytic services to more video channels.

For example, in the past, each x86 computer could support only two digital cameras because most CPU resources were occupied dealing with graphics processing tasks. Currently, however, an embedded x86 computer featuring ADLINK MSDK+ can offer connection of up to 12 cameras (depending on network bandwidth), with even faster video streaming at each channel.

With ADLINK MSDK+ technology, field deployed platforms for video surveillance experience increased performance of video process and significantly reduced CPU utilization, freeing the processor for other tasks. Total costs for x86-based field deployment are reduced, and a competitive alternative provided to conventional approaches.

Choosing the Best Solution

ADLINK's MXE-5400 with ADLINK MSDK+ support presents an extremely effective answer to challenges facing deployment of next-generation DSS applications.

The ADLINK MXE-5400 is the industry's first fanless embedded system running on 4th Generation Intel® Core™ i7 processor with support for ADLINK MSDK+, empowering outdoor/semi-outdoor intelligent surveillance deployment solutions, especially suitable for road/traffic surveillance applications.

The latest 4th Generation Intel® Core™ i processor delivers a 20% increase in performance from the previous generation, and with CPU offloading provided by ADLINK MSDK+, the ADLINK MXE-5400 offers 250% increase in video transcoding speed.

Specifically designed and constructed with focus on ruggedization and reliability, showcasing fanless operation with passive heat ventilation, cable-free carrier board, surge protection for GbE and COM, 100G anti-shock and 5G vibration resistance, and wide ranging operating temperature tolerance from -20°C to 60°C.

As well, with hardware ready for Intel® iAMT 9.0 and ADLINK's Smart Embedded Management Agent (SEMA) software, the ADLINK MXE-5400 realizes real time remote monitoring and control, while delivering superior manageability.

These features all come together to make the ADLINK MXE-5400 an ideal choice for video-intensive applications in outdoor environments such as road/traffic surveillance with a competitive cost-structure.

Conclusion

Facing the rising demands of the video surveillance market for more intelligent features and function, system developers and integrators must discern how to balance performance and cost, meeting customers' needs while satisfying their own budgetary concerns.

ADLINK MSDK+ technology helps to reduce the total cost of deploying intelligent DSS based on x86 architecture, with new products like the ADLINK MXE-5400 further driving evolution of the technology such that the x86 system assumes its place as a serious competitor for ARM-based systems at the field-end.

[Figure 4. ADLINK MXE-5400 DSS-ready platforms]

About ADLINK Technology

ADLINK Technology is enabling the Internet of Things (IoT) with innovative embedded computing solutions for edge devices, intelligent gateways and cloud services. ADLINK's products are application-ready for industrial automation, communications, medical, defense, transportation, and infotainment industries. Our product range includes motherboards, blades, chassis, modules, and systems based on industry standard form factors, as well as an extensive line of test & measurement products and smart touch computers, displays and handhelds that support the global transition to always connected systems. Many products are Extreme Rugged™, supporting extended temperature ranges, shock and vibration.

ADLINK is a Premier Member of the Intel® Internet of Things Solutions Alliance and is active in several standards organizations, including PCI Industrial Computer Manufacturers Group (PICMG), PXI Systems Alliance (PXISA), and Standardization Group for Embedded Technologies (SGeT).

ADLINK is a global company with headquarters in Taiwan and manufacturing in Taiwan and China; R&D and integration in Taiwan, China, the US, and Germany; and an extensive network of worldwide sales and support offices. ADLINK is ISO-9001, ISO-14001, ISO-13485 and TL9000 certified and is publicly traded on the TAIEX Taiwan Stock Exchange (stock code: 6166).

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