Solution Brief

Intel Builders
Media Analytics

Intel® Select Solutions for Media Analytics

The Intel Select Solutions for Media Analytics provide a head start for the development of solutions in the areas of media/entertainment and smart cities. Pre-verified hardware and software configurations eliminate the need for solution providers to select and tune those stacks, reducing costs and risk, and accelerating time to market for new services.

Introduction

The ability to perform real-time, high-throughput analytics on streaming data is a fundamental prerequisite to unlocking its full value. Because video is the largest and fastest-growing component of the global data universe, real-time analytics on video streams has become vital to a growing variety of use cases. With the addition of AI, machine processes can potentially handle the bulk of interpreting information from video content, without human involvement.

The Intel Select Solutions for Media Analytics are designed to accelerate and simplify implementations that can unlock insight from video data, streaming or otherwise. Focused on the media/entertainment and smart cities verticals, these pre-verified hardware and software stacks provide the foundations for market-ready solutions. Building on top of the Intel Select Solutions for Media Analytics, Intel's ecosystem partners can deliver optimized server solutions to their customers.

Thorough testing of the hardware and software components of the reference design helps reduce the time, effort, and expense associated with developing solutions. It is based on a robust set of hardware components that include second-generation Intel® Xeon® Scalable processors, Intel QuickAssist Technology (Intel QAT), and the Visual Cloud Accelerator Card—Analytics (VCAC-A).

Intel Select Solutions for Media Analytics: Use Cases

The combinations of hardware and software in the Intel Select Solutions for Media Analytics enable solution makers such as original equipment manufacturers (OEMs), independent software vendors (ISVs), and communication service providers (CommSPs) to streamline development of solutions. The Intel Select Solutions for Media Analytics feature two use cases and include several example pipelines, as shown in Figure 1, with more to be introduced in the future.

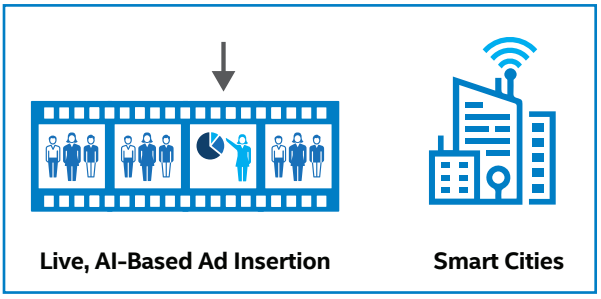
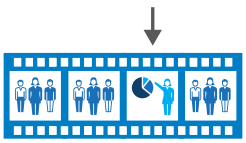


Figure 1. Key use cases addressed by Intel Select Solutions for Media Analytics.



Live, AI-Based Ad Insertion

The growing sophistication of ad placement includes guided ad selection that is well matched to the content. Rather than just choosing an ad based on conventional audience demographics, this new set of capabilities seeks to analyze content and choose ads specifically on that basis. Because tailoring ads in this way tends to make them more effective, advertising providers can charge a premium cost for the ad, compared to conventional approaches.

Growth in the market for digital video advertising is being driven by increasing consumption using digital platforms, including connected TV (CTV). CTV ad spending in the US is projected to reach $10.81 billion by 2021,[1] with 44 percent growth year-over-year,[2] as shown in Figure 2. Sales and marketing organizations use audience analytics to target their messages more effectively in the face of an increasingly fractured audience and complex multichannel distribution of content.

Figure 2. Connected TV (CTV) ad spending.[1,2]

What Are Intel Select Solutions?

Intel Select Solutions are pre-defined, workload-optimized solutions designed to minimize the challenges of infrastructure evaluation and deployment. Solutions are validated by OEMs/original design manufacturers (ODMs), certified by ISVs, and verified by Intel. Intel develops these solutions in extensive collaboration with hardware, software, and operating system vendor partners and with the world's leading data center and service providers. Every Intel Select Solution is a tailored combination of Intel data center compute, memory, storage, and network technologies that delivers predictable, trusted, and compelling performance.

To refer to a solution as an Intel Select Solution, a vendor must:

1. Meet or exceed the software and hardware stack requirements outlined by the solution's reference-design specifications.
2. Replicate or exceed established reference-benchmark test results.
3. Publish a solution brief and an optional detailed implementation guide to facilitate customer deployment.

Solution providers can also develop their own optimizations in order to give end customers a simpler, more consistent deployment experience.

To put such analytics and insertion capabilities more easily within reach, the Intel Select Solutions for Media Analytics include a sample ad-insertion pipeline that content delivery networks (CDNs) and other service providers can customize to achieve greater visibility into content, analyzing it in real time to more effectively match ads to the audience. As a simple example, performing facial recognition to identify actors in a video stream can be the basis of pushing ads for new releases that feature that same actor. Likewise, identifying logos on the advertisements surrounding an athletic field provides insights about the desire of those companies specifically to reach that event's audience.

Smart Cities

The smart city vision puts data collected from distributed sensors to work, interconnected by communications networks to analytics back ends, improving the quality of life for citizens by intelligently managing resources and systems. For example, real-time data collected about vehicle traffic can be analyzed to alter traffic signaling patterns to optimize flow. More broadly, interactions between people and smart city systems enable those systems to be increasingly responsive to citizen needs.

Globally, the smart cities market segment is on the rise, growing to over US$545.7B by 2027 with a projected CAGR of 22.9 percent, as shown in Figure 3.[3] One key factor driving this trend is the demand for enhanced public safety in light of growing population densities in the world's largest cities, at the same time that ubiquitous high-speed connectivity, low-cost sensor hardware, and mainstream big-data analytics are becoming generally available.

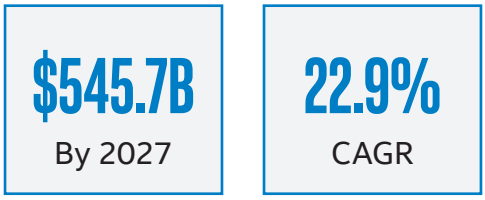


Figure 3. Smart Cities market growth.[3]

The Intel Select Solutions for Media Analytics enable service providers to provide smart city-related offerings to public safety and other government entities. This set of capabilities is chiefly related to data monitoring in public places. For example, this solution can be implemented for traffic safety monitoring, such as looking for incidents where vehicles are encroaching on pedestrian crossings and potentially issuing automatic fines as a preventative measure.

As the basis for end applications, the Intel Select Solutions for Media Analytics include an example pipeline to support traffic counting at a public street corner. The pipeline is robust enough to use as the basis for production applications and flexible enough to be extended for other purposes, such as a transportation center.

Intel Select Solutions for Media Analytics: Hardware Configurations

Intel has drawn extensively on its relationships with industry partners to refine hardware requirements for the reference architectures offered through the Intel Select Solutions for Media Analytics. There are two primary configurations—Base and Plus—with some additional options within each configuration to help fine-tune the stack for individual solution needs. The Base configuration is a value/performance optimized offering, while the Plus configuration is designed for high-performance and high-density implementations.

The reference architectures offered through the Intel Select Solutions for Media Analytics are built from components chosen to deliver high throughput across a wide variety of **visual workloads**. A range of Intel platform ingredients are used in the reference architectures to enable cost-effective flexibility and performance.

Table 1. Intel Select Solutions for Media Analytics Base and Plus hardware configurations.

Ingredient	Intel Select Solutions for Media Analytics Base Configuration Hardware	Intel Select Solutions for Media Analytics Plus Configuration Hardware
Processors	2x Intel Xeon Gold 6230 processor @ 2.1 GHz or Intel Xeon Gold 6230N processor @ 2.3 GHz, 20C/40T or higher	
Intel QuickAssist Technology	Intel QuickAssist Adapter 8960 (PCIe) or Intel C627 Chipset	Intel QuickAssist Adapter 8970 (PCIe) or Intel C627 Chipset
Visual Cloud Acceleration Card	—	High-density hardware acceleration with Visual Cloud Accelerator Card—Analytics: four cards required, six recommended
SSDs	2x Intel SSD Data Center Family for SATA 480 GB (for OS and primary data) and 2x Intel SSD Data Center P4510 Series (NVMe) 4.0 TB NUMA aligned	
Memory	384 GB (12 x 32 GB DDR4-2666)	192 GB (12 x 16 GB DDR4-2666)

Second-generation Intel Xeon Gold processors are the basis of all configurations offered through the Intel Select Solutions for Media Analytics, consisting of two-socket servers that satisfy rigorous performance requirements while also delivering high efficiency and low total cost of ownership (TCO). The processors used in the reference architectures feature at least 20 cores per socket and deliver high performance for demanding media analytics workloads. Important platform technologies that contribute to the performance and efficiency of the solution include the following:

- **Intel Advanced Vector Extensions 512 (Intel AVX-512)** optimizes the performance and throughput of floating-point-intensive media analytics workloads by handling twice as much data per instruction as previous-generation Intel Advanced Vector Extensions 2 (Intel AVX2) instructions.
- **Intel Speed Shift Technology** allows the processor to tune its operating frequency and voltage for optimal performance and power efficiency.
- **Intel Ultra Path Interconnect (Intel UPI)** provides a high-bandwidth interconnect between processor sockets that also offers high energy efficiency.
- **Intel Deep Learning Boost (Intel DL Boost)** allows acceleration of inference models using Integer 8-bit (INT8) precision data, using Vector Neural Network Instructions (VNNI). This instruction set is an extension of the Intel AVX-512 instruction set, allowing lower precision INT8 multiplies with higher precision accumulates. Intel DL Boost significantly improves inference performance for deep learning workloads by optimizing the use of compute resources and cache utilization. The Intel Select Solutions for Media Analytics supports INT8 precision, optimized by Intel DL Boost for inference of convolutional neural network models, increasing overall stream density by up to 2.5x compared to using Floating Point 32 (FP32) precision.

Second-generation Intel Xeon Scalable processors:

- Offer high scalability that is cost-efficient and flexible, from the multicloud to the intelligent edge
- Establish a seamless performance foundation to help accelerate data's transformative impact
- Support breakthrough Intel Optane persistent memory technology
- Accelerate AI performance and help deliver AI readiness across the data center
- Provide hardware-enhanced platform protection and threat monitoring

Intel QuickAssist Technology (Intel QAT) increases the efficiency and performance of encryption and compression algorithms, accelerating functions such as symmetric encryption and authentication, asymmetric encryption, digital signatures, and lossless data compression. By providing lookaside co-processing for those workloads, Intel QAT frees resources on the main processors for demanding media and analytics processing work. Platform support for Intel QAT in the reference architectures is provided either by the Intel C627 Chipset or by a discrete PCI Express (PCIe) adapter.

Visual Cloud Accelerator Card—Analytics (VCAC-A) provided by Celestica is a discrete add-in card that combines the benefits of Intel HD Graphics and the Intel Movidius Myriad X vision processing unit (VPU) to provide real-time video and Deep Learning processing. It is available in a full-height, three-quarter length PCIe Gen3 x4 hardware accelerator card, consuming less than 75 watts, and can perform real-time processing on up to 24 video streams.

Software and Firmware Stack

The design of the Intel Select Solutions for Media Analytics includes a comprehensive, workload-optimized software and firmware stack, as shown in Table 2, which is common to both the Base and Plus configurations.

Table 2. Example software and firmware stack for the Intel Select Solutions for Media Analytics.

		Ingredient	Software Version Details
Firmware		BIOS	SE5C620.86B.02.01.0009.092820190230
		MCU	0x400002c
		Firmware for Intel® Ethernet Controller XXV710	FVL25GFW V7.0 or later
		Firmware for Intel SSD Data Center P4510 Series	VDV10152
Host	**OS for Base**	CentOS	CentOS8.0-kernel-5.3.7-1.el8.elrepo.x86_64
	OS for Plus Config	CentOS	CentOS 8.0 kernel-3.10.0-1.1f3.10.0-1.1f1553c. VCA+
	APPs	DPDK	19.11-rc1
		SPDK	18.11.1
		OpenVINO	2019 R2 or later; 2020.1 for Intel DL Boost optimization
		FFmpeg	4.2_va release
		GStreamer	package 0.6.1
		Docker	19.03.5 build 633a0ea
	Drivers	Intel QAT	QAT L4.7.0 pkg#6
VCAC-A (not applicable to Base Config)	**OS**	Ubuntu	Ubuntu 16.04 LTS
	Driver	System Image	vca_disk48_reference_k4.19_ ubuntu_16.04_1.0.88

Conclusion

The Intel Select Solutions for Media Analytics give OEMs, ISVs, and CommSPs the means to accelerate delivery of products and services based on powerful insights into the contents of video streams. Pre-validated stacks of hardware and software provide a head start for solution providers, enabling them to forgo complex platform questions so they can focus on value-added IP. The future of media analytics has arrived, and it is easier than you thought.

Learn More

Intel Select Solutions: **intel.com/selectsolutions**

Second-generation Intel Xeon Scalable processors: **intel.com/xeonscalable**

Intel Select Solutions are supported by the Intel Builders program: **builders.intel.com**

Learn about Intel's Visual Cloud solutions, including white papers, blogs, case studies, and videos: **intel.com/visualcloud**

[1] eMarketer, "eMarketer Roundup: Connected TV Trends 2020." https://on.emarketer.com/Roundup-20200113-ConnectedTV-Tatari-_Roundup.html. Retrieved June 8, 2020.

[2] Forbes, June 5, 2020. "The Big Shift In Digital Video Ad Impressions." https://www.forbes.com/sites/paultalbot/2020/06/05/the-big-shift-in-digital-video-ad-impressions/#141974ce6297. Retrieved June 8, 2020.

[3] ResearchAndMarkets.com, via PRNewswire, May 11, 2020. "Smart Cities Market Insight and Outlook, 2019-2027 Featuring Case Studies - City of Seoul, Smart City London, and Singapore's Intelligent Transport System." https://www.prnewswire.com/news-releases/smart-cities-market-insight-and-outlook-2019-2027-featuring-case-studies---city-of-seoul-smart-city-london-and-singapores-intelligent-transport-system-301056703.html. Retrieved June 8, 2020.

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more complete information visit https://www.intel.com/benchmarks.

Performance and cost per stream results are based on testing as of Jan 9, 2020 and may not reflect all publicly available security updates. Configurations and benchmark details are at https://builders.intel.com/docs/networkbuilders/media-analytics-solution-brief.pdf. For more complete information about performance and benchmark results, visit https://www.intel.com/benchmarks.

All data points are using the FFMPEG software framework. Inference Models are available from the Open Model Zoo project at https://github.com/opencv/open_model_zoo.git, checkout OpenVINO 2019_R3, 2020.1. Input videos are available on request.

- Object Detection: Mobilenet-SSD, video: person-bicycle-car-detection_1920_1080_2min.mp4, 24fps @2Mbps
- Face Recognition: face-detection-adas-0001 and face-reidentification-retail-0095, video: face-demographics-walking_2min.mp4, 50fps @ 10Mbps
- Car Classification: vehicle-detection-adas-0002 and vehicle- attributes-recognition-barrier-0039, video: car-detection_1920_1080_2min.mp4, 30fps @12Mbps

Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software or service activation. Performance varies depending on system configuration. No computer system can be absolutely secure. Check with your system manufacturer or retailer or learn more at intel.com.

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