ADLINK TECHNOLOGY INC.

White Paper

ADLINK's MSDK Plus Enhances Intel® Media SDK to Provide End-to-End Functionality

Platform Integration & Validation (PIV)
Embedded Computing Product Segment
ADLINK Technology, Inc.

Flether Zhang, System Architect
Xiang Li, System Engineer
Jack Lin, PIV Manager

Introduction

Telecommunications providers are rapidly transforming their networks to support new and innovative IP-enabled communications services. The ever-growing popularity of Over-The-Top (OTT) video content and communications services such as YouTube, Netflix and Skype and rapid adoption rates of new 4G mobile video-enabled smartphones are increasing demand for media delivered over the Internet. In addition, the volume of media streams — particularly video streams in 4G/LTE mobile and OTT services network — continues to grow exponentially.

Mobile, wireless, and broadband network operators increasingly need flexible and efficient video/media processing and communications capabilities (i.e., IP stream-to-IP stream, IP stream-to-file and visa versa) in their networks. These solutions need to economically deliver application scalability and network simplicity for next-generation IP video and communications services by enabling Internet Multimedia Subsystem (IMS) architectures using Video Services Gateways, Media Resource Function Processor (MRFP) and/or Session Border Controller (SBC) nodes.

Video (and complimentary audio) transcoding represents a practical content- adaptation solution that enables real-time media conversion in heterogeneous IP-enabled mobile environments. Intelligent design of the transcoding system can maximize the use of reusable information for the input content. This design approach enables high-performance Telco-ready, server-based solutions (e.g., ATCA) for these computing-intensive tasks that would otherwise seem prohibitive. In addition, flexible and performance-optimized toolkits, such as the Intel® Media Software Development Kit (Intel® Media SDK), can accelerate video applications delivered across Video Services Gateway network equipment by enabling scalability and the economical execution of common tasks, such as video transcoding.

The Intel Media SDK is a cross-platform (Windows and Linux) application programming interface (API) for developing professional media applications, including video editing and processing, media conversion, streaming and playback, and video conferencing. The main functions of Intel Media SDK are listed below.

- Decoding from video elementary stream formats (H.264, MPEG-2, VC-1, and JPEG/Motion JPEG) to uncompressed frames
- Selected video frame processing operations
- Video pre-encode processing
- Encoding uncompressed frames to elementary stream formats (H.264 and MPEG-2)

Intel Media SDK supports current Intel processors as well as those that will be available in the future. Applications will not need to be redesigned to take advantage of new processor features as they emerge.

Why ADLINK MSDK Plus

With the assistance of ADLINK MSDK Plus, Intel Media SDK, already a flexible solution for many media workloads, becomes a comprehensive end-to-end solution for media processing tasks. ADLINK MSDK Plus helps customers perform container file operations (mux and demux), Real-Time Transport Protocol (RTP) receiving/streaming, and audio processing. Customers developing fully functional media applications will no longer need to deal with these operations themselves. For example, ADLINK MSDK Plus allows customers decode a container file without additional software to separate the video elementary data from the container file.

ADLINK MSDK Plus expands on the functionality of Intel Media SDK by providing additional modules to handle common media processing tasks not natively supported by the Intel API, including mux/demux of media container files, RTP receiving and RTP streaming (see Figure 1). By utilizing ADLINK MSDK Plus, customers can easily build an end-to-end solution around the Intel Media SDK to meet their media processing and communications needs.

In this whitepaper, the Intel Media SDK benchmark results for ADLINK products are presented, followed by an overview of ADLINK MSDK Plus modules and their applications.

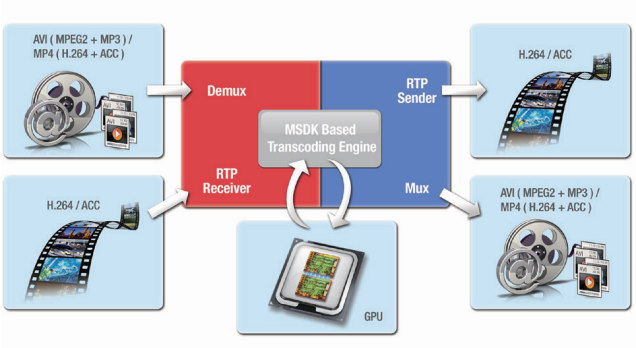

Figure 1 ADLINK MSDK Plus Modules

Intel® Media SDK Benchmarks

The ADLINK MSDK Plus software package is validated on the following ADLINK products, available in three form factors to meet the requirements of various application domains.

- aTCA-9300: AdvancedTCA processor blade with quad-core Intel® Xeon® processor E3 family and 10 Gigabit Ethernet
- cPCI-3510: CompactPCI 3U processor blade with 4th generation Intel® Core™ i7 processor
- MXE-5401: Fanless embedded computer with 4th generation Intel Core i7 processor

The following table illustrates the Intel Media SDK benchmark results for the above ADLINK products. The benchmark criterion is to find the maximum number of flows that can be supported while maintaining real-time transcoding for different transcoding tasks.

Please refer to ADLINK white paper "Increasing the Video Transcoding Performance of the ADLINK aTCA-9300 Blade using the Intel Media SDK" [1] for more details about the benchmark method.

Test Method \ ADLINK Product		aTCA-9300 (Intel® Xeon® processor E3 family)	cPCI-3510, MXE-5401 (Intel® Core™ i7 processor)
Using GPU on Windows (CPU only)	MPEG2 to H.264 1080P	8 (1)	11 (3)
	H.264 1080p to H.264 480p	16(3)	16 (5)
	H.264 D1 to H.264 CIF	50 (19)	50 (20)
Using GPU on Linux	MPEG2 to H.264 1080P	7	11
	H.264 1080p to H.264 480p	17	18
	H.264 D1 to H.264 CIF	45	55

Table 1. Intel® Media SDK Benchmarks for ADLINK Platforms

In the test method "Using GPU on Windows", transcoding was performed using the Windows version of Intel Media SDK with Intel® Quick Sync Video hardware acceleration enabled. In the test method "Using CPU only on Windows", transcoding was performed with the Windows version of Intel Media SDK using only the CPU. For Windows platforms, Intel Media SDK provides both software and hardware implementations of media APIs. The software implementation is only available for Windows platforms and is designed to fill in when Quick Sync hardware acceleration is not available.

In the test method "Using GPU over Linux" transcoding was performed using the Linux version of Intel Media SDK with Intel Quick Sync Video hardware acceleration enabled.

ADLINK MSDK Plus Modules

ADLINK MSDK Plus provides four input/output modules to handle common media processing tasks as shown in Figure 2.

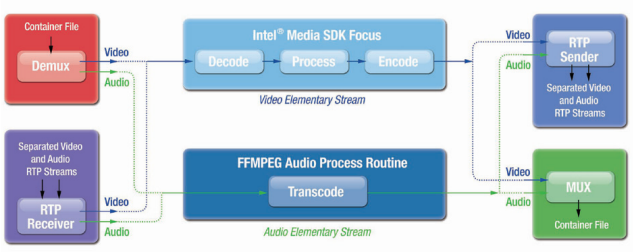

Figure 2. ADLINK MSDK Plus Modules Overview

- Demux Module: Demuxes the video and audio elements from a container file.
- Mux Module: Muxes video and audio elements into a container file. The common video formats H.264 /MPEG2 and audio formats AAC/MP3 are supported.
- RTP Receiver Module: Receives video and audio elements from separate RTP streams. When testing the function, the source RTP streams can be generated by an RTP Sender or with open source media processing software such as VLC and FFMPEG. By using VLC/FFMPEG's streaming function, a webcam input can also be transformed into an RTP stream and processed by ADLINK MSDK Plus.
- RTP Sender Module: Streams video and audio elements with respective RTP streams to a destination over the network. The streaming format for video and audio are H.264 and AAC, respectively. VLC can be used to play the RTP streams at the destination.

ADLINK MSDK Plus Functions

ADLINK MSDK Plus supports four different topologies for media flows to and from files and IP locations, which are summarized in Table 2. Multiple threads are used to handle media flow processing from source to destination. Processing of an individual media flow is handled by a single thread, and the task handled in a given thread is independent of tasks in other threads. This means that multiple media flow tasks can be handled concurrently, whether they are File-to-IP, IP-to-IP, File-to-File or IP-to-File.

Input	Source Format	Output	Destination Format	Applications
File	Video: H.264/MPEG2 Audio: AAC/MP3 Container: MP4/AVI/TS/ PS…	IP	Video: H.264 @RTP Audio: AAC@RTP	Video on demand (VOD) server
IP	Video: H.264 @RTP Audio: AAC@RTP	IP	Video: H.264 @RTP Audio: AAC@RTP	Video conferencing system
File	Video: H.264/MPEG2 Audio: AAC/MP3 Container: MP4/AVI/TS/ PS…	File	Video: H.264/ MPEG2 Audio: AAC/ MP3 Container: MP4/AVI/TS/ PS…	Transcoding server Transsizing server
IP	Video: H.264 @RTP Audio: AAC@RTP	File	Video: H.264/ MPEG2 Audio: AAC/ MP3 Container: MP4/AVI/TS/ PS…	Video surveillance system Video analysis

Table 2. Media Flows Handled by ADLINK MSDK Plus

The rightmost column of Table 2 describes the possible application areas of ADLINK MSDK Plus depending on the source and destination of a media flow. More application examples are presented in the following subsections.

File to RTP Streaming

As shown in Figure 2, ADLINK MSDK Plus can use the Demux Module to demux an MPEG2/H.264 container file, perform the required video transcoding, and stream the video and audio over a network using the RTP Sender Module.

The file-to-RTP streaming function can be used to accelerate the development of VOD (video on demand) or AVOD (audio and video on demand) systems, which allow users to select and watch/listen to video or audio content on demand. By taking advantage of Intel Media SDK's media acceleration capabilities, the VOD/AVOD server can optimize the media resolution based on the target device's capability in real-time before stream the contents to the end user.

RTP Stream Forwarding

As shown in Figure 2, the ADLINK MSDK Plus can use the RTP Receiver Module to receive H.264/AAC RTP streams from an IP source, perform the required the video transcoding, and stream the video and audio over a network using the RTP Sender Module.

The RTP stream-to-stream function can be used to accelerate the development of an HD video conferencing system. Since the video conferencing terminals on either side usually have different capabilities, the conferencing server needs to optimize the visual qualities and the bit rates before forwarding the RTP streams from one terminal to another. By taking advantage of the media acceleration capabilities of the Intel GPU, the conferencing server can handle multiple flows of media transsizing in real-time, offloading processing tasks from the CPU to allow it to handle other conference duties more effectively.

File Transcoding and Saving

As shown in Figure 2, the ADLINK MSDK can use the Demux Module to demux an MPEG2/H.264 container file, perform the required the video transcoding, and use the Mux Module to re-mux the video and audio into a container file.

The file–to-file function can be used to accelerate the development of common transcoding servers, which are used to change the video format and bit rate, or perform transsizing on a large number of media files concurrently. Intel Media SDK can support a maximum of 8 flows of 1080P MPEG2 to H.264 transcoding in real-time on an Intel Xeon processor E3 family-based platform, and a maximum 16 flows of 1080P MPEG2 to H.264 transcoding in real-time on a 4th Gen Intel Core i7 processor-based platform. For tasks that do not require a change of video format, Intel Media SDK can handle even more media files concurrently, for example, up to 18 flows of real time transsizing from 1080P to 480P in H.264 format on a 4th Gen Intel Core i7 processor-based platform.

RTP Stream Transcoding and Saving

As shown in Figure 2, ADLINK MSDK Plus can use the RTP Receiver Module to receive H.264/AAC RTP streams from an IP source, perform the required video transcoding, and then mux the video and audio into a container file.

The RTP stream–to-file function can be used to accelerate the development of video surveillance systems, which monitor activities in public areas, businesses or commercial buildings for real-time or delayed viewing. It can be used in applications that perform video analysis by inserting a step after decoding the RTP stream that samples a picture element for later analysis before saving it to file. All these tasks take advantage of Intel Media SDK's acceleration capabilities.

Conclusion

The Intel Media SDK is designed to provide the fastest possible performance on Intel hardware supporting Intel Quick Sync Video. Intel Media SDK effectively uses the GPU to offload transcoding tasks from the CPU, making transcoding much faster and also resulting in reduced CPU resource loading. Intel Media SDK has extensive video processing functionality, but does not provide a comprehensive end-to-end solution for media processing tasks.

ADLINK MSDK Plus provides fundamental media processing functions missing from Intel Media SDK, including container muxing/demuxing, RTP receiving/streaming, and audio processing, offering users end-to-end functionality. The source code for ADLINK MSDK Plus is provided to customers, allowing them to easily kick off their media application development process.

References

1. Increasing the Video Transcoding Performance of the ADLINK aTCA-9300 Blade using the Intel® Media SDK, http://www.adlinktech.com/solution/Video-Transcoding-Performanc_ADLINK-aTCA9300blade_Intel-Media-SDK.php?source=WP_MSDK

2. Intel® Media SDK 2013 Developer's Guide, https://prD1idz.cps.intel.com/sites/default/files/article/265550/intel-mediasdk-2013-developers-guide.pdf

3. Intel® Media SDK 2013 for Linux Servers Product Brief, http://software.intel.com/sites/products/vcsource/files/Intel_Media_SDK_2013_for_Linux_Servers_ProductBrief.pdf

About ADLINK Technology

ADLINK Technology provides a wide range of embedded computing products and services to the test & measurement, automation & process control, gaming, communications, medical, network security, and transportation industries. ADLINK products include PCI Express-based data acquisition and I/O; vision and motion control; and AdvancedTCA, CompactPCI, and computer-on-modules (COMs) for industrial computing. With the acquisition of Ampro Computers, Inc. and LiPPERT Embedded Computers GmbH, ADLINK also provides a wide range of rugged by design Extreme Rugged™ and Rugged product lines including single board computers, COMs and systems.

ADLINK strives to minimize the total cost of ownership (TCO) of its customers by providing customization and system integration services, maintaining low manufacturing costs, and extending the lifecycle of its products. ADLINK is a global company with headquarters and manufacturing in Taiwan; 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, is an Associate Member of the Intel® Intelligent System Alliance, an Executive Member of PICMG, a Sponsor Member of the PXI Systems Alliance, an Executive Member of PC/104 Consortium, and a Strategic Member of the AXIe Consortium, a member of VMEbus International Trade Association (VITA). ADLINK is a publicly traded company listed on the TAIEX Taiwan Stock Exchange (stock code: 6166).

ADLINK TECHNOLOGY INC.

Tel: +886-2-8226-5877
Fax: +886-2-8226-5717
Email: service@adlinktech.com
www.adlinktech.com