ENHANCE VIDEO PERFORMANCE USING INTEL HARDWARE AND SOFTWARE
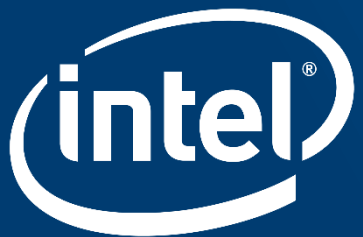
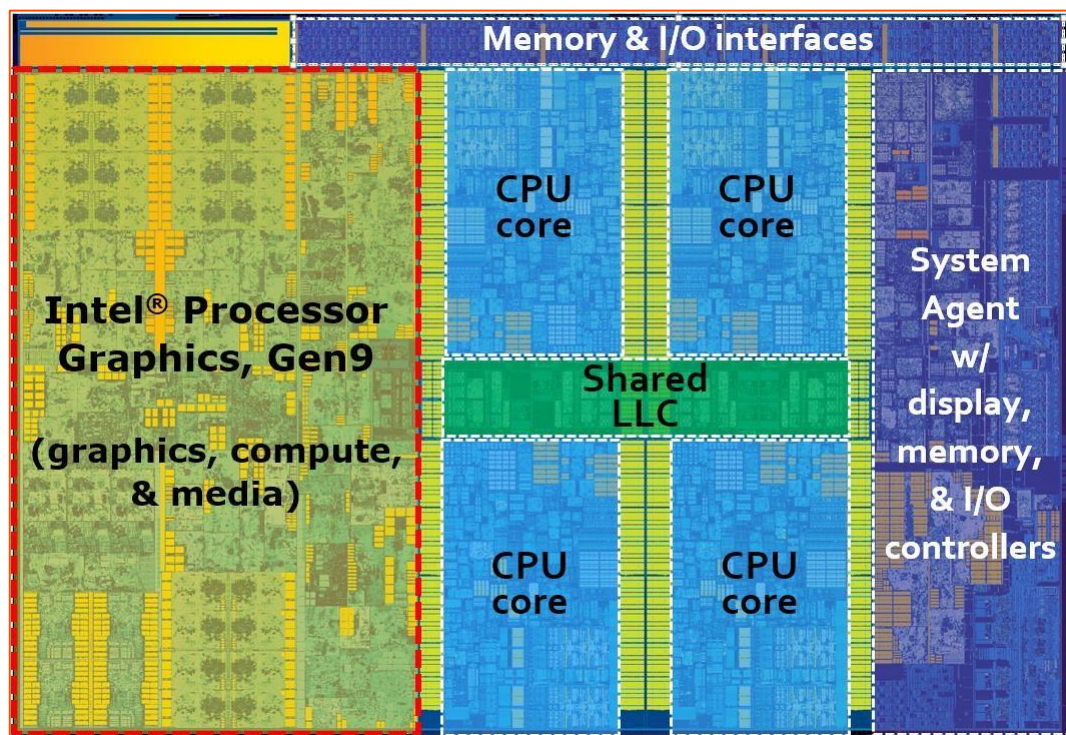# Agenda

✓ Intel® Media SDK/Media Server Studio Overview

✓ Intel® Media Accelerator Reference Software Overview

✓ Lab Overview

CPU vs GPU

Intel Hardware is Heterogeneous

CPUs

- Awesome general purpose performance
- Large software ecosystem

Other Programmable Intel Hardware

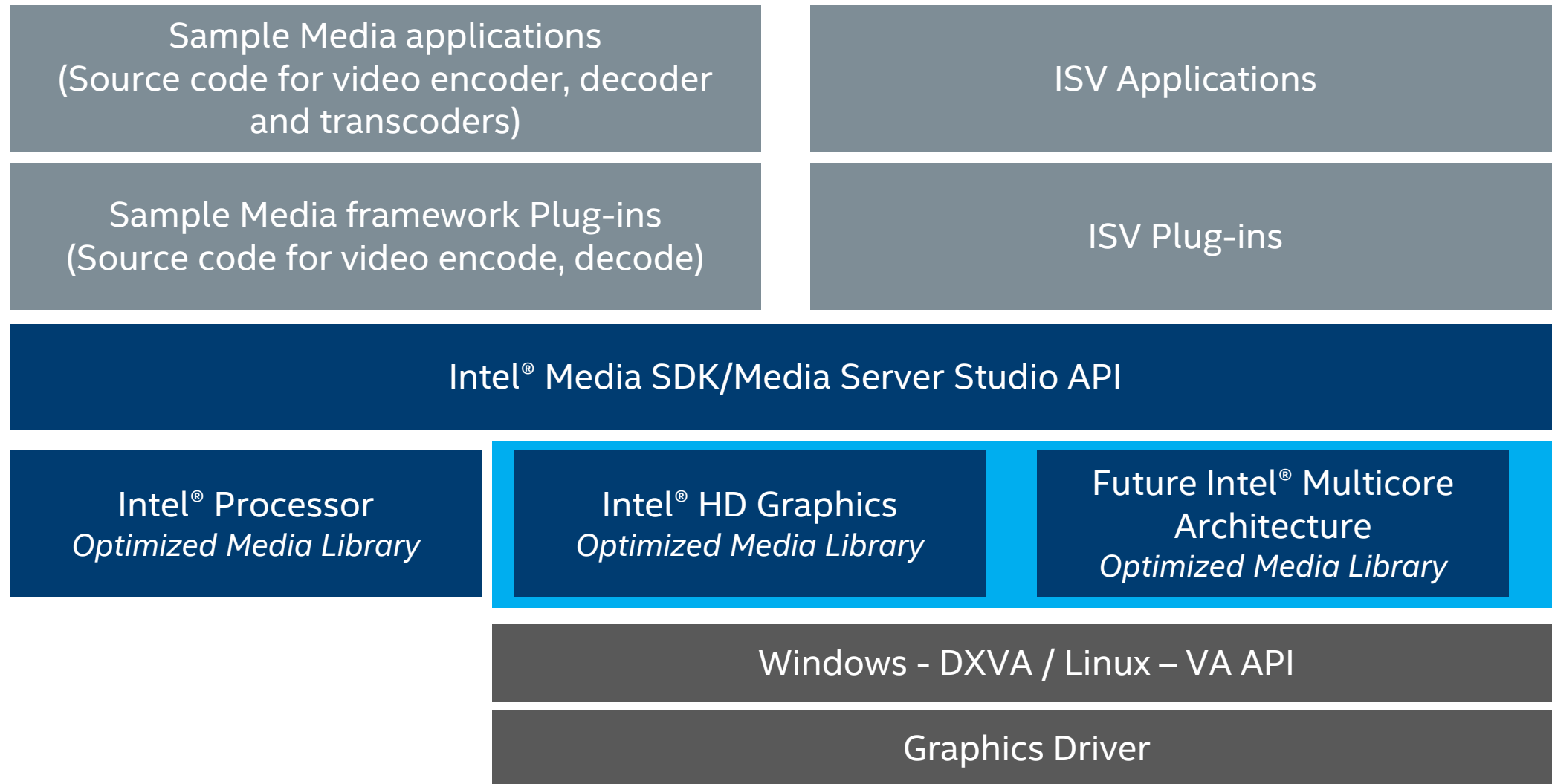- GPU (shown here)
- IPU
- FPGA

Intel® Media SDK Overview

- Intel® Media SDK equips developers with a standard API to create high-performance video solutions for consumer and professional uses.

- Intel® Media SDK provides easy access to hardware acceleration with Intel-optimized software fallback.

- Developers can also use their own software codecs as needed

- Development teams can shift resources from performance optimization for each individual hardware platform to focusing on feature innovation and application capabilities in their video solutions.

Intel® Media SDK Developer value proposition

- **Optimized routines** for delivering maximum video performance on a variety of platforms

- **Improved productivity** for development teams through greater efficiency

- **Built-in future proofing** of video applications with support for upcoming platforms

Intel® Media SDK/Server Studio Architecture

Sample Media applications
(Source code for video encoder, decoder and transcoders)

ISV Applications

Sample Media framework Plug-ins
(Source code for video encode, decode)

ISV Plug-ins

Intel® Media SDK/Media Server Studio API

Intel® Processor
Optimized Media Library

Intel® HD Graphics
Optimized Media Library

Future Intel® Multicore Architecture
Optimized Media Library

Windows - DXVA / Linux – VA API

Graphics Driver

Intel® Media SDK 2017 Supported Codecs

Standard	Encode	Decode
HEVC (main profile) (High Efficiency Video Coding)	HW	HW
AVC (Advanced Video Coding)	SW/HW/ low power	SW/HW
MPEG-2	SW/HW	SW/HW
MJPEG	SW/ HW	SW/ HW
MVC	SW/HW	SW/HW
VC-1	-	SW/HW

green=new in Intel® Media Server Studio for Gen9

Intel® Media SDK 2017
Supported Video Processing Features
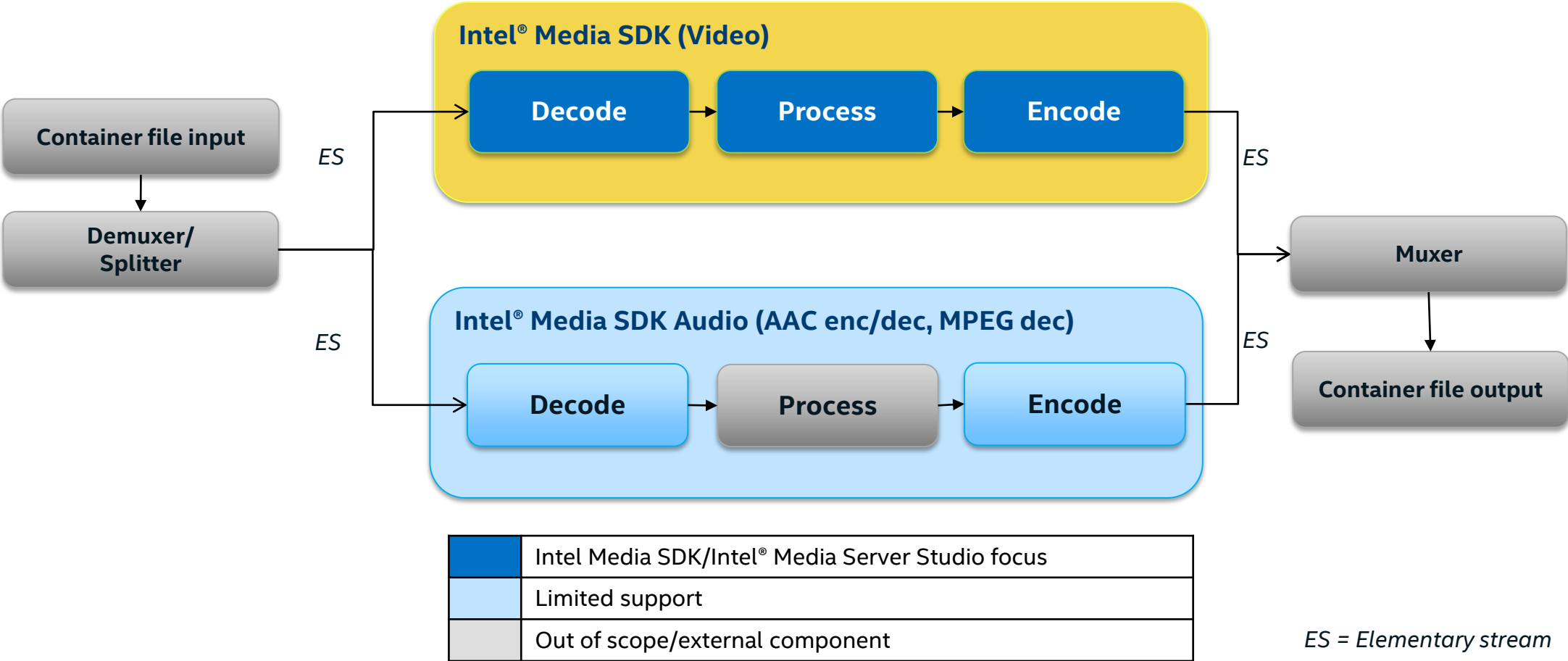
N:1 Frame Composition

Resizing

Color Conversion

Deinterlacing

Denoising

Frame Rate Conversion

Brightness/Contrast/Saturation

Sharpening

Media Software Scope Diagram

ES = Elementary stream

Intel® Media SDK / Intel® Media Server Studio
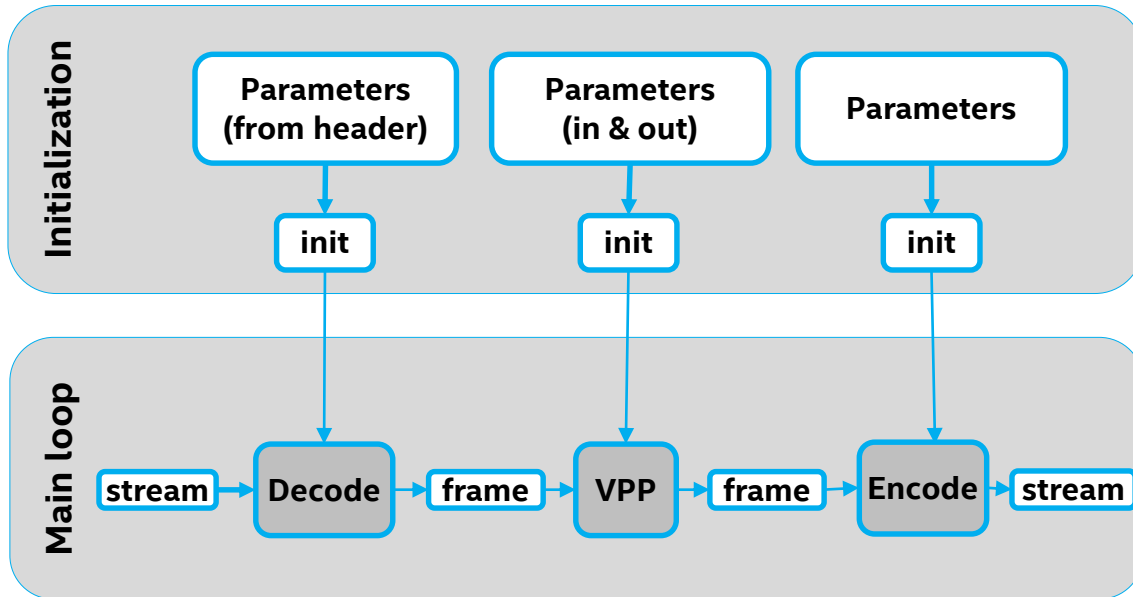
Media accelerator framework
Codec based
High level/parameter interface
3 operations

Links to More Information
- Media Server Studio
- Media SDK
- Intel Media Code Samples

Simple Encoding and Decoding

The following two pseudo-code examples illustrate the simplicity and efficiency of the Intel® Media SDK.

Decoding Procedures

```
Create SDK session
Initialize DECODE
Allocate I/O buffers
While (!EOF || FramesRemaining) do
        If !EOF, read bitstream from file
        Locate available frame buffers

                DECODE::DecoderFrameAsync
                CORE::SyncOperation

        Write output frames to file
Done
De-allocate I/O buffers
Close DECODE
Close SDK session
```

Encoding Procedures

```
Create SDK session
Initialize ENCODE
Allocate I/O buffers
For each frame do
        Locate available frame buffers
        Read raw frames from file

                ENCODE::EncodeFrameAsync
                CORE::SyncOperation

        If output bitstream available, then
                Write bitstream to file
        Endif
Done
De-allocate I/O buffers
Close ENCODE
Close SDK session
```

Decoding sample code

```
MFXVideoDECODE_DecodeHeader(session, bitstream, &init_param);
MFXVideoDECODE_QueryIOSurf(session, &init_param, &request);
allocate_pool_of_frame_surfaces(request.NumFrameSuggested);
MFXVideoDECODE_Init(session, &init_param);
sts=MFX_ERR_MORE_DATA;
for (;;) {
    if (sts==MFX_ERR_MORE_DATA && !end_of_stream())
        append_more_bitstream(bitstream);
    find_unlocked_surface_from_the_pool(&work);
    bits=(end_of_stream())?NULL:bitstream;
    sts=MFXVideoDECODE_DecodeFrameAsync(session,bits,work,&disp,&syncp);
    if (sts==MFX_ERR_MORE_SURFACE) continue;
    if (end_of_bitstream() && sts==MFX_ERR_MORE_DATA) break;
    … // other error handling
    if (sts==MFX_ERR_NONE) {
        MFXVideoCORE_SyncOperation(session, syncp, INFINITE);
        do_something_with_decoded_frame(disp);
    }
}
MFXVideoDECODE_Close();
free_pool_of_frame_surfaces();
```

```
mfxVersion ver = { {1, 1 }}; // minimum API version which supports multiple de
MFXInit(MFX_IMPL_HARDWARE_ANY, &ver, &auxSession);
```

Program Files (x86) > IntelSWTools > Intel(R)_Media_SDK_2016.0.2 > doc

	Name	Date modified
📌	media-raw-accelerator-man.pdf	6/1/2016 4:15 PM
📌	mediasdkaudio-man.pdf	6/2/2016 5:20 PM
📌	mediasdk-distrib.pdf	2/1/2016 4:03 PM
📌	mediasdkjpeg-man.pdf	6/1/2016 4:15 PM
📌	mediasdk-man.pdf	6/1/2016 4:15 PM
	mediasdkmvc-man.pdf	6/1/2016 4:15 PM
	mediasdkscreencap-man.pdf	6/1/2016 4:15 PM
	mediasdkusr-man.pdf	6/1/2016 4:15 PM

Encode sample code

```
MFXVideoENCODE_QueryIOSurf(session, &init_param, &request);
allocate_pool_of_frame_surfaces(request.NumFrameSuggested);
MFXVideoENCODE_Init(session, &init_param);
sts=MFX_ERR_MORE_DATA;
for (;;) {
    if (sts==MFX_ERR_MORE_DATA && !end_of_stream()) {
        find_unlocked_surface_from_the_pool(&surface);
        fill_content_for_encoding(surface);
    }
    surface2=end_of_stream()?NULL:surface;
    sts=MFXVideoENCODE_EncodeFrameAsync(session,NULL,surface2,bits,&syncp);
    if (end_of_stream() && sts==MFX_ERR_MORE_DATA) break;
    … // other error handling
    if (sts==MFX_ERR_NONE) {
        MFXVideoCORE_SyncOperation(session, syncp, INFINITE);
        do_something_with_encoded_bits(bits);
    }
}
MFXVideoENCODE_Close();
free_pool_of_frame_surfaces();
```
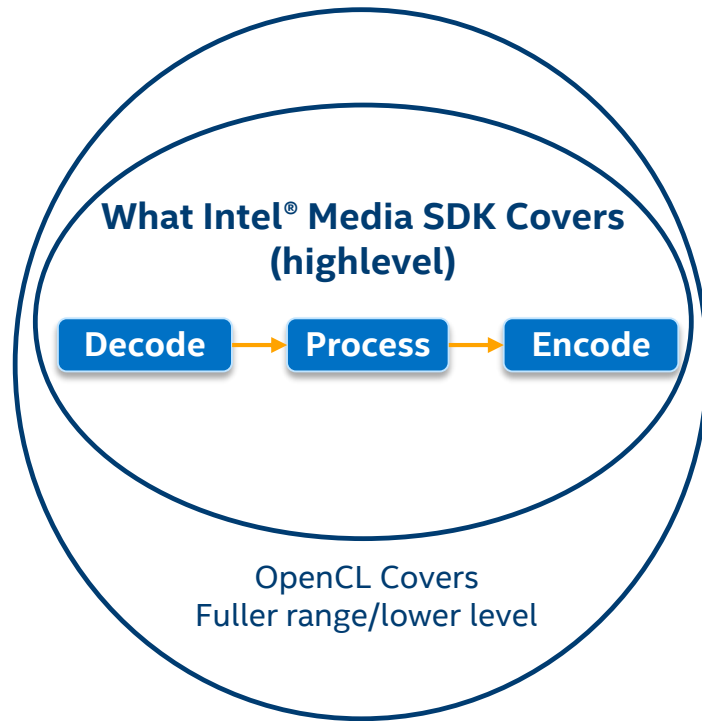
Program Files (x86) > IntelSWTools > Intel(R)_Media_SDK_2016.0.2 > doc

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	mediasdkjpeg-man.pdf	6/1/2016 4:15 PM
	mediasdk-man.pdf	6/1/2016 4:15 PM
	mediasdkmvc-man.pdf	6/1/2016 4:15 PM
	mediasdkscreencap-man.pdf	6/1/2016 4:15 PM
	mediasdkusr-man.pdf	6/1/2016 4:15 PM

OpenCL + Intel® Media SDK?

What Intel® Media SDK Covers (highlevel)

Decode → Process → Encode

OpenCL Covers
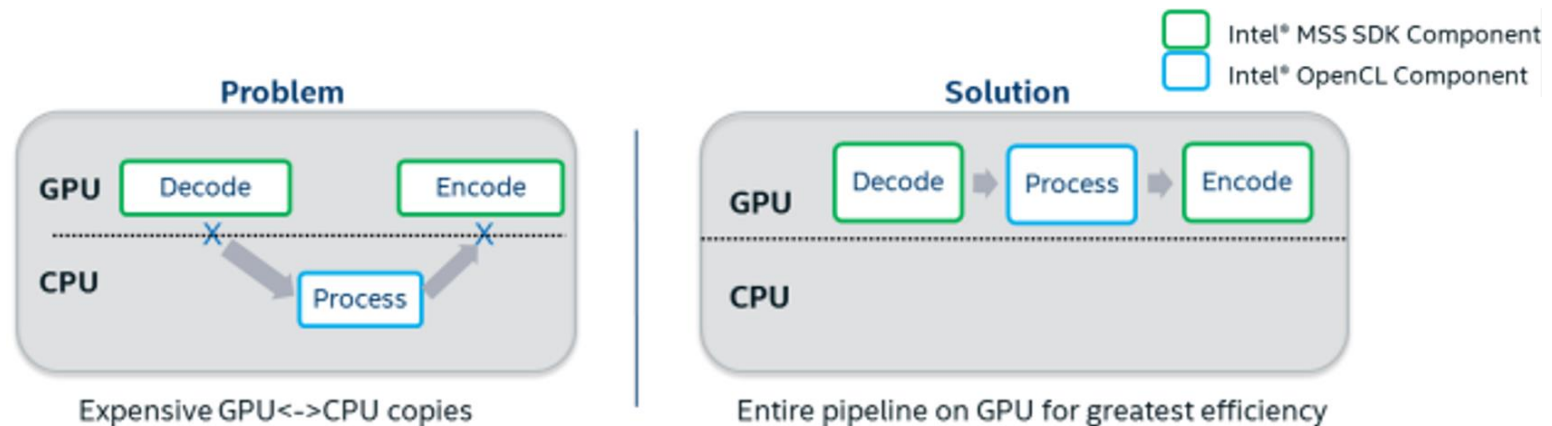Fuller range/lower level

Media SDK provides optimized implementations for:
- Codecs
- Frame Processing Operations

For video processing tasks not in Media SDK's scope, extend with OpenCL
- Make use of growing GPU capabilities
- Keep pipelines on GPU

Example uses: color conversions, custom bit rate control

Intel® MSS SDK Component
Intel® OpenCL Component

Problem

GPU: Decode   Encode
CPU: Process

Expensive GPU<->CPU copies

Solution

GPU: Decode ⇒ Process ⇒ Encode
CPU:

Entire pipeline on GPU for greatest efficiency

Media SDK Products

- Media SDK/Media Server Studio—The software API to the hardware codec on GPU.

- Hardware support: Xeon, 3G Core(GEN 7), 4G Core(GEN 7.5), 5G Core(GEN 8), 6G Core(GEN 9) see the details

- OS Support: Windows 7/8/10, CentOS, Yocto, Android, Ubuntu.

- Application: Digital Signage, Set Top Box, FFMpeg, G-Streamer, Media Server, IVI, Surveillance

How to get the Intel® Media SDK/Media Server Studio

Intel® Media Server Studio – 3 Editions
(includes Free Community)

Platform / Device Targets
- Select SKUs of Intel® Xeon® & Core™ processor-based platforms
- Applications for media, communications infrastructure, video processing/conferencing, digital surveillance, video cloud & data center
- For HEVC, AVC, MPEG-2, MPEG-Audio

See Technical Specifications for System Requirements

Download
software.intel.com/intel-media-server-studio

Intel® Media SDK - FREE

Platform / Device Targets
- Intel® Core™ or Core™ M processors
- Select SKUs of Intel® Celeron™, Pentium™ & Atom™ processors with Intel® HD Graphics supporting Intel® Quick Sync Video
- Client devices – Desktop/mobile applications

See Technical Specifications for System Requirements

Download
software.intel.com/media-sdk

Intel® Media Server Studio – 3 Editions

	Community Edition	Essentials Edition	Professional Edition
FREE 30-DAY EVALUATION	NA	No trail needed	Windows/Linux
Buying	Free	From $499	From $3999
Intel® Premier Support	No	Yes	Yes
HEVC software & CPU-accelerated Decoder & Encoder	No	No	Yes
Audio Decoder & Encoder	No	No	Yes
Video Quality Caliper	No	No	Yes
Intel® VTune™ Amplifier	No	No	Yes
Premium Telecine Interlace Reverser	No	No	No

Download
software.intel.com/intel-media-server-studio

LAB OVERVIEW

What are we trying to solve?

Customer Requirement

- Need HD quality digital signage in our Airport for various marketing activities

- Need faster service and lower downtime

- Real-time analytics on number of people looking at my signage

ISV/SI Business Requirement

- Reduced TCO

  - Lower service visit

  - Lower network bandwidth usage

  - Easy maintenance and Centralized control

  - Easy system upgrade

- Lower development time and faster time to market

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Workshop Inventory

Intel® NUC Kit

Intel® vPro Technology

Python–OpenCV and Camera

Intel Media SDK

Intel® Media SDK
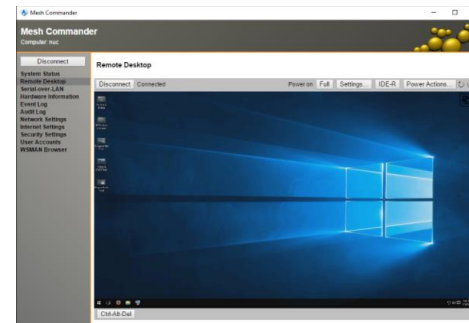
Mesh Commander

Intel® AMT, Mesh Commander and Mesh Central

[1] The edge device, gateway and sensors could change to a new technology or vendor

Developer kit is certified for the US, CAN, and EU and can be purchased under a single SKU. In other regions, components can be purchased separately

Code samples can be downloaded from GitHub

In some countries due to import/exports laws, the attendees may not be able to receive certain/all components of the kit

Workshop Flow

Video Performance
- Intel® Media SDK/MSS
- Intel® Media Accelerator reference Software

Remote Management
- Intel® AMT Configuration
- Mesh commander
- Mesh Central

Video Analytics using OpenCv
- Motion detection using OpenCV
- Face Detection
- Cloud Integration
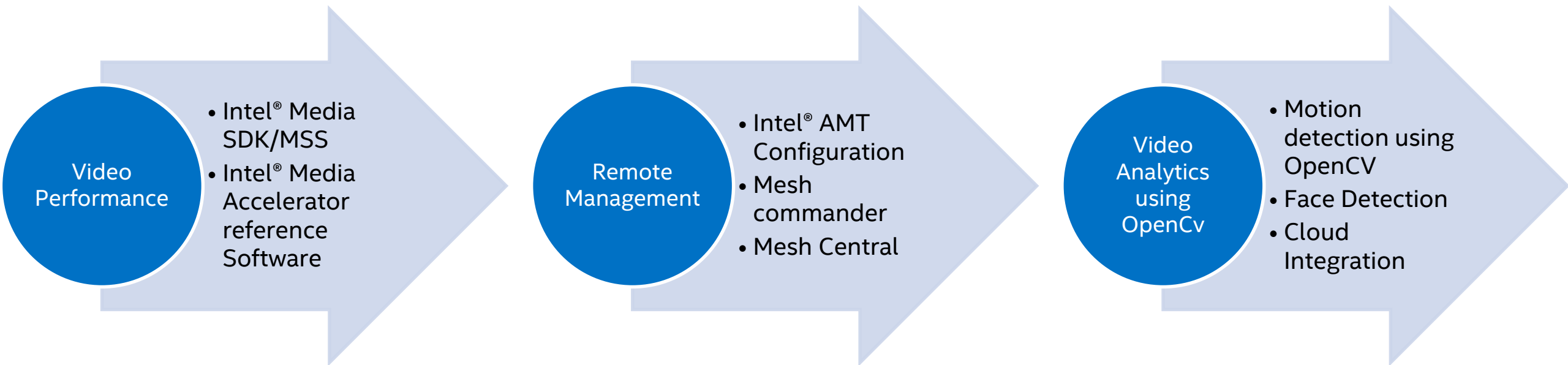
Workshop Setup

Wifi:

SSID = Intel_Retail

Password: intel@123

Documentation and Cloud

Documentation URL: http://192.168.11.100:9000

Cloud Server URL: http://192.168.11.100:9002

Mesh Central URL: **https**://192.168.11.100

What is Intel® Media Accelerator Reference Software?

Intel licensed reference code for Digital Signage that uses the <u>best practices</u> for <u>video decode</u>, <u>transcode</u>, <u>playback</u>, <u>compositing</u>, <u>blending</u>, <u>streaming</u> and <u>rendering</u> by using a combination of Intel and other SDKs on Intel platforms

- Target Platforms – Intel Sky Lake/Kaby Lake Core & Braswell, Apollo Lake Atom Platforms

- OS supported – Windows 10

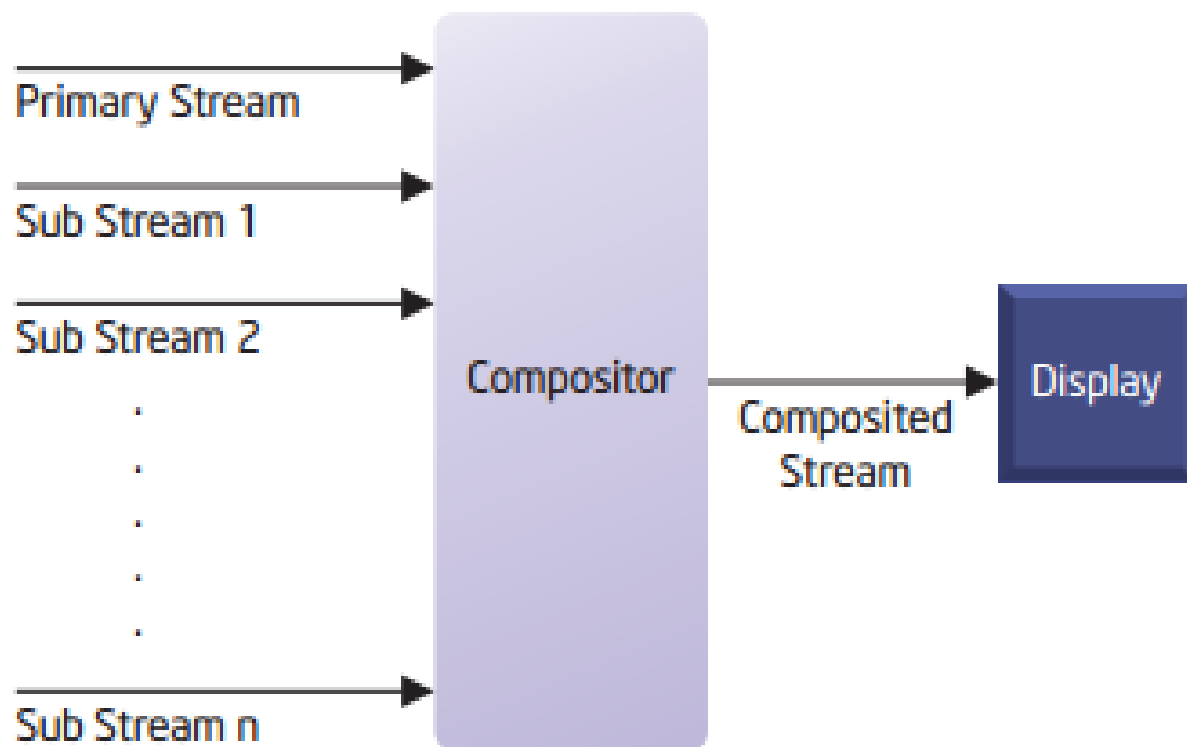- SDK – FFMPEG, Media Foundation, Media SDK 2016, DirectX 11 (DXVA2.0+)

Architecture
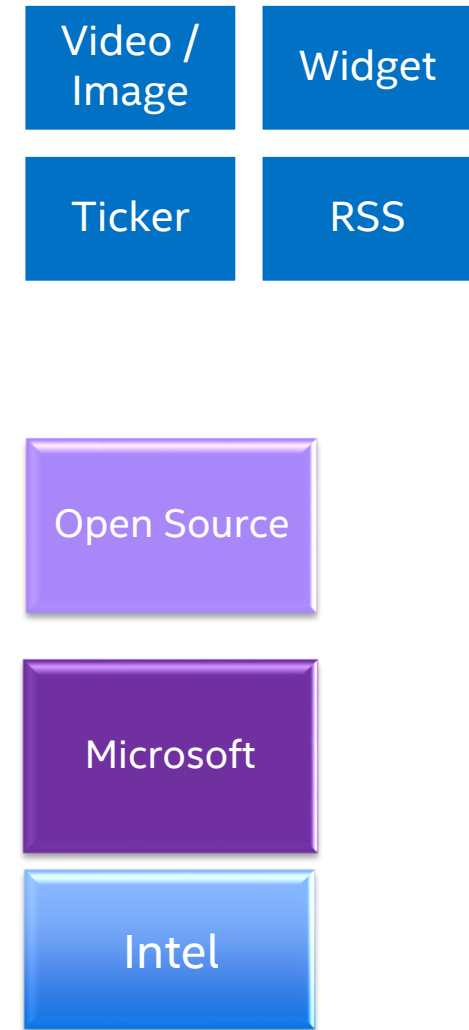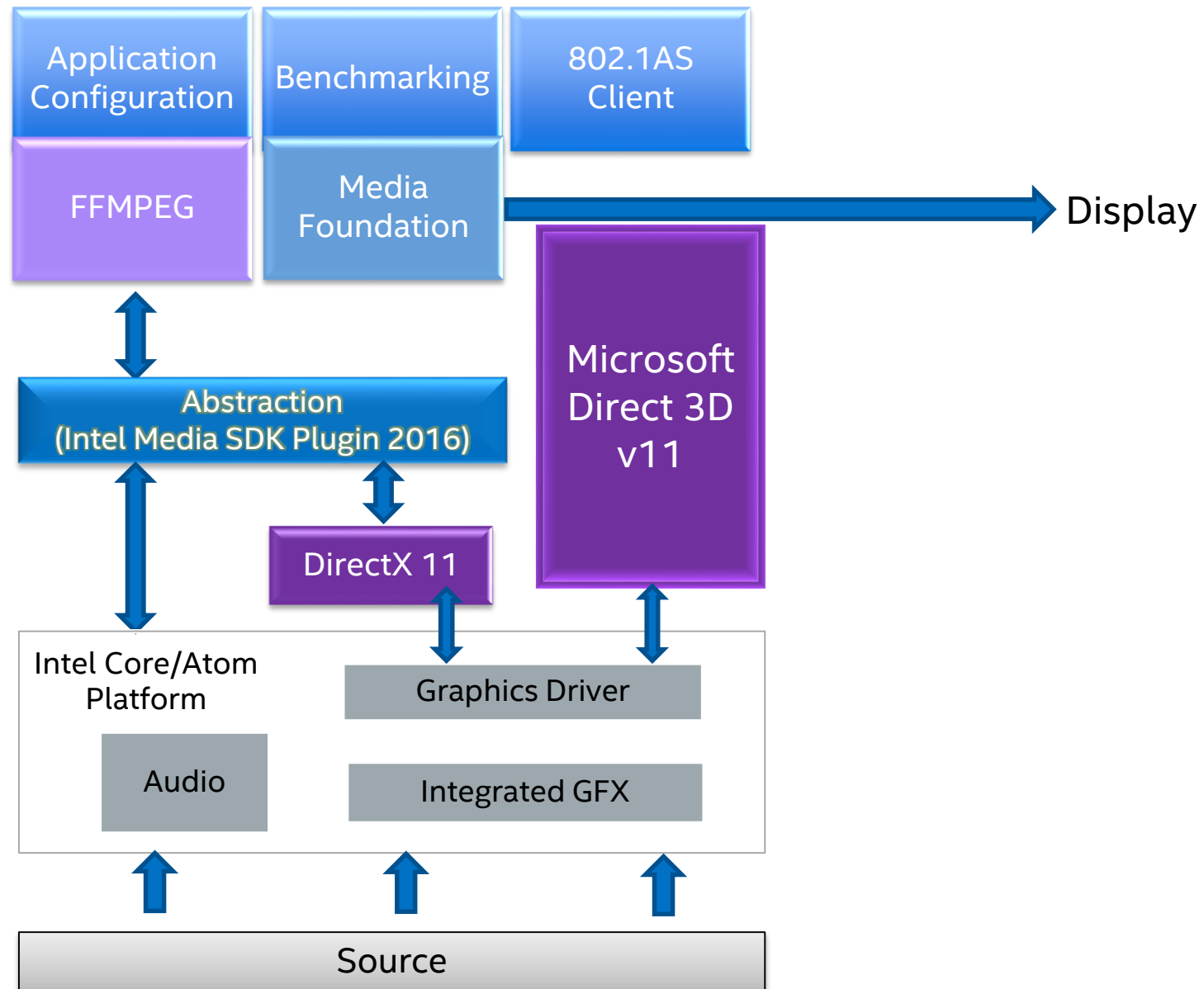
Process flow

- Compositing is a technique of combining visual elements from separate sources into a single frame to create an illusion that all the elements are part of the same scene.

- This process involves a primary stream and multiple secondary streams

- The secondary streams are mixed together with the primary stream to form a single frame that gets rendered to the display

Process flow

DEMO