

# **Displaying Stereoscopic 3D (S3D) with Intel<sup>®</sup> HD Graphics**

**Software Developers Guide**



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# ***1 Introduction***

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The purpose of this document is to give an overview and description of the Stereoscopic 3D (S3D) Application Programming Interface (API) for Intel® HD Graphics hardware.

The target audience of this document is software developers wanting to utilize S3D in their Microsoft\* Windows\* 7 and Microsoft Windows 8 applications.

The S3D API for Intel graphics hardware is implemented in a static C++ library, included in the Intel® Media SDK package.

This document does **not** describe how to encode, or decode video (movie) data that contains two images (left & right eyes). This document simply describes a method to get the S3D-capable monitor or TV to “display” the two images needed to present a perceived 3D image.



## 2 *S3D Overview*

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### 2.1 Stereoscopic Display

Stereoscopic 3D (S3D) imagery (a.k.a. Stereoscopy) is, of course, two (2) 2D images (one for each eye) giving the illusion of depth.

PCs have a long history of displaying S3D images. This has generally been achieved by various proprietary methods.

The following is a few legacy solutions used in the past, and some problems/side-effects of those solutions:

- The PC can use a normal 2D display and directly control a pair of glasses (a.k.a. "Active Glasses"), which can block one eye from seeing an image, then alternate to block the other eye for the next image.

#### **Problems:**

- Each eye only sees half of the images it would normally see. If the display is presenting 60 frames-per-second, each eye only sees 30 frames per second. (*This can increase headaches, etc.*)
- Users cannot connect multiple S3D sources (*game consoles, Blu-ray\* players, cameras, etc.*) to their display.
- The PC can rely on a proprietary display that controls what the user sees. There are many types of these displays. One popular type is a polarized display that uses passive "polarized glasses". Others require no glasses by projecting two images, (requiring the user to place their eyes in exactly the right spot).

#### **Problems:**

- Dozens of types of displays.
- Users must manually switch their display between normal "2D" and one of several possible "3D" modes.
- Users cannot connect multiple S3D sources (*game consoles, Blu-ray\* players, cameras, etc.*) to their display.

With newer display link technologies (like HDMI\* 1.4 or Embedded Display Port\* (eDP\*) 1.1, etc.), devices (*PCs, Blu-ray players, game consoles, etc.*) can now **automatically** switch the display between normal "2D" and "3D".



This document describes a software interface that developers can use to utilize the newer “**automatic**” switching to/from 3D modes when displaying with Intel® HD Graphics processors.

Once the display is in 3D, an application can utilize the powerful Intel® Media SDK to prepare the left & right images or it can directly utilize Microsoft\* DirectX\* Video Acceleration (DXVA) APIs to generate the two images. An application could also generate its own left & right images (for example a ‘game’).

## 2.2 Scope & Assumptions

The following is a list of limitations and restrictions to consider for S3D support.

1. Microsoft\* Windows\* 7 and Microsoft Windows 8 only. Supports windowed or full screen usage models.
2. Direct3D9\* Overlay swap chain usage is required.
3. HDMI\* 1.4, special eDP\*, or similar based monitor/TV (as primary display).
4. The host application should not send S3D content when the display is set to 2D mode or vice versa. Changing between 2D/S3D display mode involves an OS mode set operation.
5. The cursor will only display in left image.
6. Requires creation and use of a DXVA video processing device, even if DXVA decoding is not used.



## **3      *Setting an S3D mode***

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### **3.1      Display**

#### **Summary**

Only HDMI\* 1.4 based monitors or special Embedded Display Port\* (eDP\*) 1.1a displays are supported.

#### **Details**

An API to allow an application to set a S3D display mode is included in the Intel® Media SDK. However, it can be used by itself as a standalone library. The library is a static library.





## 3.2 IGFXS3DControl Class

### Summary

The IGFXS3DControl C++ class contains the methods and structures needed to control S3D display modes.

C++ Header File:

**<MSDKInstallPath>\igfx\_s3dcontrol\include\igfx\_s3dcontrol.h**

Library File <32-bit or 64-bit>:

**<MSDKInstallPath>\igfx\_s3dcontrol\lib\win32\igfx\_s3dcontrol.lib**  
or **<MSDKInstallPath>\igfx\_s3dcontrol\lib\x64\igfx\_s3dcontrol.lib**

Typical steps to use this class are as follows:

An application:

1. Creates an instance of **IGFXS3DControl::**
2. Determines what screen resolutions and refresh rates are currently possible by calling **->GetS3DCaps()**
3. Switches the TV/Monitor to 3D via **->SwitchTo3D()**
4. Creates a Direct3D9 device (with **D3DSWAPEFFECT\_OVERLAY**)
5. Calls **DXVA2CreateDirect3DDeviceManager9()**
  - a. Calls **->SetDevice()**
6. Calls **DXVA2CreateVideoService**
  - a. Calls **->SelectLeftView()** then **CreateVideoProcessor()**
  - b. Calls **->SelectRightView()** then **CreateVideoProcessor()**
7. Acquires the render target via target **GetBackBuffer()**
8. Renders left eye
  - a. Using the left VideoProcessor, calls **->VideoProcessBlit()**
9. Renders right eye
  - a. Using the right VideoProcessor, calls **->VideoProcessBlit()**
  - b. Calls **->Present()**
10. Repeats steps 10 & 11 as appropriate
11. Calls **->SwitchTo2D()**
12. Deletes instance of **IGFXS3DControl::**

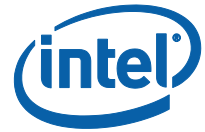
## 3.3 Typical modes returned by driver

Table below shows the typical modes supported by the display driver for switching to automatic S3D.



	Mode
<b>HDMI* 1.4a S3D display</b>	1080p24 1080p23 720p50 720p59 720p60
<b>eDP* 120Hz</b>	All modes**

\*\*Note: For non-native modes default S3D behavior is to scale OS mode to native mode of panel.



## **4      *Reference Documents / Links***

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- Intel Graphics Developer's Guides: <http://software.intel.com/en-us/articles/intel-graphics-developers-guides/>
- Intel® Media SDK: <http://software.intel.com/en-us/vcsource/tools/media-sdk>
- Intel® Media SDK Features in Microsoft\* Windows 7\* Multi-Monitor Configurations on 2<sup>nd</sup> Generation Intel® Core™ Processor-Based Platforms :  
[http://www.intel.com/support/graphics/intelhdgraphics3000\\_2000/sb/cs032112.pdf](http://www.intel.com/support/graphics/intelhdgraphics3000_2000/sb/cs032112.pdf)
- Enabling High-Performance Video Encoding, Decoding, and Preprocessing:  
<http://software.intel.com/en-us/articles/enabling-high-performance-video-encoding-decoding-and-preprocessing/>