Advanced Micro Devices

Advanced Media Framework – Display Capture

Programming Guide

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1 Introduction

The AMD Advanced Media Framework (AMF) includes functionality for display capture to facilitate various streaming solutions in remote display, network game streaming and other applications. The display capture function is designed to work in conjunction with other AMF components, such as H.264 and H.265 encoders and color space converter.

AMF currently offers two components to perform display capture. One legacy component is using the Microsoft DXGI Desktop Duplication API (DD), while the new component utilizes an AMD's proprietary API to perform screen capture. The new display capture API is not available in legacy drivers, however it provides a more efficient way to perform display capture with lower latency and lower impact on the CPU and GPU performance. It is therefore recommended to use the new API for solutions where compatibility with legacy drivers is not required.

Functionally both methods are equivalent and implement the same API. The legacy DD component is available in the source code form as a sample.

Note: The Display Capture API requires root or super user privileges when running on Linux systems.

2 Display Capture Programming Model

AMF provides a standard component implementing the *AMFComponent* interface to perform display capture. For more information about the *AMFComponent* interface please refer to Section 2.6.1 of the AMF API Reference.

The Display Capture component is a source and does not take any input.

2.1 Creating the Display Capture Component

To create an instance of the Display Capture component, call the *AMFFactory::CreateComponent()* method passing *AMFDisplayCapture* as parameter. Include the *public/include/components/DisplayCapture.h* header.

The open source legacy Display Capture component based on the Microsoft DXGI Desktop Duplication API is included in the AMF samples in form of source code. It can be created by calling the *AMFCreateComponentDisplayCapture* function defined in *public/src/components/DisplayCapture/DisplayCaptureImpl.cpp*. Refer to the public DVR sample for details.

2.2 Initializing the Display Capture Component

The Display Capture component is initialized by calling the *AMFComponent::Init* method. Prior to calling *AMFComponent::Init* a number of properties must be set on the component object using the *AMFPropertyStorage::SetProperty* method:

Property	**Type**	**Description**
AMF_DISPLAYCAPTURE_MONITOR_INDEX	uint32_t	A monitor index to capture, determined by calling *IDXGIFactory::EnumAdapters*, 0 specifies the default monitor
AMF_DISPLAYCAPTURE_FRAMERATE	AMFRate	Frame rate to perform the capture at. Setting the numerator to 0 causes the capture to be performed at the rate defined by either the application's flip frequency (for full-screen applications) or by DWM (for windows applications)

You can implement custom control of timestamps on each captured frame by providing a custom implementation of the *AMFCurrentTime* interface defined in *public/include/core/CurrentTime.h* and assigning it to the *AMF_DISPLAYCAPTURE_CURRENT_TIME_INTERFACE* property. By default, when the *AMF_DISPLAYCAPTURE_CURRENT_TIME_INTERFACE* property is not set, timestamps are assigned the value returned by *amf_high_precision_clock()* function at the time when a frame is captured.

Once the properties are set, call the *AMFComponent::Init* method. Pass *AMF_SURFACE_UNKNOWN* for *format* and zeros for *width* and *height*.

Once successfully initialized, the Display Capture component can be queried for output.

Upon initialization, the following properties can be read using the *AMFPropertyStorage::GetProperty* method:

Property	Type	Description
AMF_DISPLAYCAPTURE_FORMAT	int64_t	Capture format (AMF_SURFACE_FORMAT)
AMF_DISPLAYCAPTURE_RESOLUTION	AMFSize	Captured image resolution

2.3 Querying for Output

The output of the Display Capture component can be obtained by calling the *AMFComponent::QueryOutput* method in a loop. The loop needs to run fast enough to sustain the frame rate set during initialization using the *AMF_DISPLAYCAPTURE_FRAMERATE* property. When a frame is available, *AMFComponent::QueryOutput* places a pointer to the *AMFSurface* object at the location pointed to by the *ppData* parameter. When no new frame is available yet, **ppData* is set to *NULL* and *AMFComponent::QueryOutput* returns *AMF_REPEAT*.

As with any other AMF component, it is recommended to run the polling loop in a separate thread. Whenever *AMFComponent::QueryOutput* returns *AMF_REPEAT*, the polling thread should be put to sleep for at least 1 ms to avoid high CPU utilization.

The *AMFSurface* object containing a captured frame that was obtained from *AMFComponent::QueryOutput* can be used as input for the next component in the pipeline.

2.4 Shutting Down Display Capture

To stop display capture, call *AMFComponent::Drain*. You can exit the polling loop and terminate the polling thread once *AMFComponent::QueryOutput* returns *AMF_EOF*.

Call *AMFComponent::Terminate* and release the pointer to the Display Capture component.

2.5 Capture modes

Application can select three capture modes by setting AMF_DISPLAYCAPTURE_MODE into one of tree modes:

Value	Description
AMF_DISPLAYCAPTURE_MODE_KEEP_FRAMERATE	Component will keep requested framerate, repeating frame if new present didn't happen
AMF_DISPLAYCAPTURE_MODE_WAIT_FOR_PRESENT	Component returns captured frame with presentation rate: DWM or full screen app
AMF_DISPLAYCAPTURE_MODE_GET_CURRENT_SURFACE	Component returns current frame immediately

If available, output surface will have two properties:

AMF_DISPLAYCAPTURE_FRAME_INDEX – amf_int64 – index of present call for the current captured frame starting from beginning of capture

AMF_DISPLAYCAPTURE_FRAME_FLIP_TIMESTAMP amf_int64 - flip timestamp of the presented frame acquired by QueryPerformanceCounter().