



EDIUS GPU Pipeline

March 2024

Introduction

In the 11th generation of EDIUS®, the video processing pipeline, which is a core component of the software, has undergone significant architectural improvements while maintaining the traditional functionality and performance. The purpose of this improvement is to increase the agility of EDIUS software development and to quickly deliver valuable functions to users. Specifically, in EDIUS 11.10, the video processing pipeline supports the GPU, and all video processing can be run on the GPU. In addition to multicore CPUs, the scalability of EDIUS software is increased by efficiently utilizing GPUs.

At the moment, only certain features are optimized for the GPU pipeline,

and there are only a limited number of scenarios where GPU acceleration can be leveraged, but this is an important milestone. In order to clarify the value that the GPU pipeline will provide to users in the future, second and third milestones have been established and development is ongoing. The features included in these milestones are quickly released in order of completion according to EDIUS's agile release cycle. Continuously updating milestones based on user feedback increases the value of the GPU pipeline.

In EDIUS 11.10, the AVC/HEVC importer supports NVIDIA NVDEC in addition to Intel Quick Sync

Video, along with GPU support for the video processing pipeline. As a result, GPU acceleration for AVC/HEVC decoding is now available in more environments. In addition, the NVDEC decoder is optimized for the GPU pipeline, which significantly improves the performance of the video processing pipeline.

By unlocking the performance of the GPU in this way, users will be able to use EDIUS software more comfortably in a variety of environments, from high-end desktops to laptops for business use. This document provides an overview of the video processing pipeline and how to use GPU acceleration effectively.

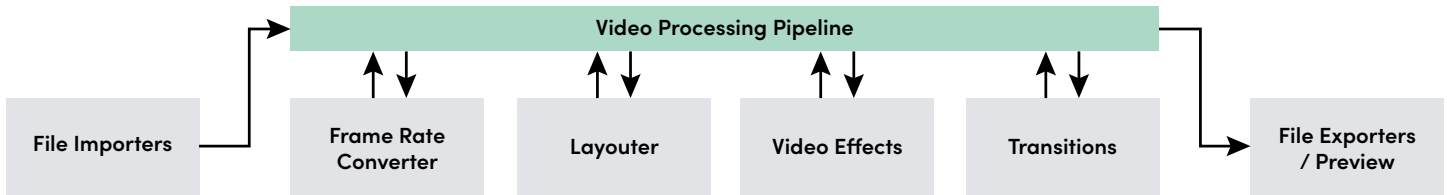
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Note: The forward-looking statements contained in this document are plans as of the date of writing and do not constitute a commitment to future implementation.

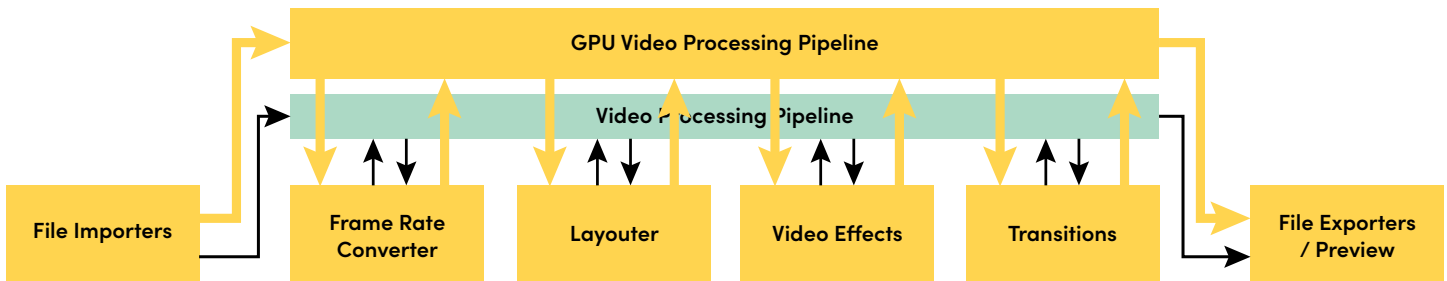
GPU Pipeline

EDIUS software has long supported GPU hardware acceleration, focusing on intensive video processing such as AVC/HEVC decoding/encoding, RAW format development, and Primary Color Correction. However, prior to EDIUS 11.10, the video processing pipeline, which passes video frames between video processing components – such as importers and video effects – did not directly support the GPU and had to pass video frames through system memory.



The video processing pipeline is the core component for generating each video frame in the timeline. Video processing such as frame rate conversion, frame size conversion, alpha compositing and video effects is applied to the video frame received from the importer to create a video frame for preview and output to the exporter.

The video processing pipeline for GPUs added in EDIUS 11.10 allows video frames on GPU memory to be passed directly between video processing components. This means that if you use a component that supports the new GPU pipeline, processing can be completed on the GPU. The GPU pipeline has a much wider memory bandwidth and parallelism than the conventional CPU pipeline, and can be expected to dramatically improve performance. For more information on GPU pipeline performance, please refer to the [Performance Comparison](#) in the next section.



In EDIUS 11.10, the NVIDIA NVDEC decoder and some video effects support the new GPU video processing pipeline, but other video processing components, including the layouter and exporters, do not. If an unsupported video processing component is used, it automatically falls back to the legacy CPU pipeline to achieve the same quality and performance as before. Whether or not to fall back to the CPU is automatically determined and switched according to the content of the video processing for each frame position in the timeline.

For more information on which specific video processing components are supported by the GPU pipeline, see the [GPU-enabled feature list](#).



As for the importer, it can work in combination with both GPU and CPU pipelines, regardless of whether it supports GPU acceleration.

Ex. 1: GPU hardware-accelerated importers such as Intel Quick Sync Video/NVIDIA NVDEC can be operated in conjunction with the CPU pipeline.

Ex. 2: CPU-driven importers such as HQX can be operated in combination with the GPU pipeline.



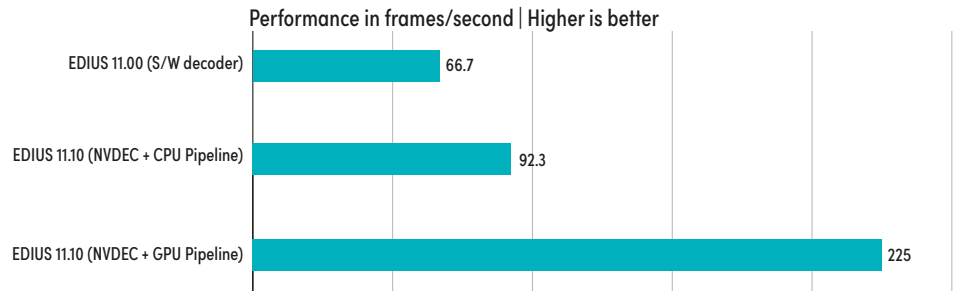
In EDIUS 11.10, the GPU pipeline only works during preview. When exporting files, it falls back to the CPU pipeline.

Performance Comparison

To illustrate the effects of the GPU pipeline, we measured the playback performance of a 3840x2160/59.94p/10-bit H.265 clip with Primary Color Correction and Median. For detailed instructions, see [An example of how the GPU pipeline works effectively](#).

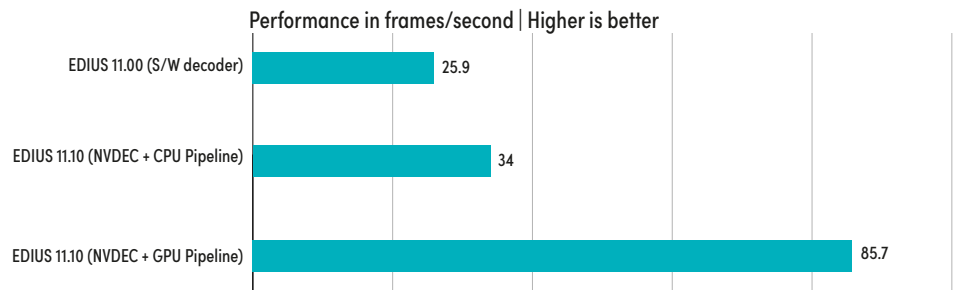
Measurement results on a desktop PC:

- Intel Core i7-13700K
- NVIDIA RTX 6000 Ada Generation



Measurement results on a laptop PC:

- Intel Core i9-9880H
- NVIDIA Quadro T1000



Both systems offer exponential performance improvements when combined with NVDEC and the GPU pipeline. NVDEC also improves performance when combined with the CPU pipeline, indicating that NVDEC can also improve performance when GPU pipelining is disabled or when falling back to the CPU pipeline using video processing that does not support GPU pipelining.

GPU-enabled feature list

Currently, we have defined three development milestones for the EDIUS GPU pipeline (see [Introduction](#)). The milestones and their key features are as follows:

Milestone 1: Focus on specific features and release them as soon as possible (already released as EDIUS 11.10)

- NVDEC decoder
- Primary Color Correction with GPU pipelining

Milestone 2: End-to-end GPU support from importer to exporter

- Optimize AVC/HEVC exporters for the GPU pipeline
- Optimize the preview window for the GPU pipeline
- Optimize QSV and some RAW importers for the GPU pipeline

Milestone 3: All basic functions of editing software are GPU-enabled

- Multicam Edit
- Alpha Composition, Dissolve
- Frame rate conversion (nearest neighbor and frame blending)
- Video Layouter (2D Conversion)
- All Color Correction

The features included in the milestone are summarized in the table below. From Milestone 1 onwards, features will be added incrementally through agile releases. In addition, the feature list will be updated continuously.

Category	Function	Milestone		
		1	2	3
File Import	AVC (Intel Quick Sync Video)	✓*	✓	✓
	AVC (NVIDIA NVDEC)	✓	✓	✓
	HEVC (Intel Quick Sync Video)	✓*	✓	✓
	HEVC (NVIDIA NVDEC)	✓	✓	✓
	Blackmagic RAW		✓	✓
	ProRes RAW	✓*	✓	✓
	Sony RAW	✓*	✓*	✓*
	Canon Cinema RAW	✓*	✓*	✓*
	RED RAW	✓*	✓*	✓*
	other			
Frame Rate Conversion	Nearest Neighbor			✓
	Frame Blending			✓
	Optical Flow			
Frame Size Conversion/Layouter	2D Transformation (Scale/Scale/Move/Crop)			✓
	3D Conversion			
	Borders, drop shadows, etc.			
Effect	Monotone	✓	✓	✓
	Median	✓	✓	✓
	Primary Color Correction	✓	✓	✓
	Other Color Correction			✓
	OFX Bridge			
	Other Effects			
Clip-to-clip/track-to-track compositing	Alpha Composition			✓
	Dissolve			✓
	OFX Bridge			
	Other Transitions			
	Keyer			
	Title Mixer			
File Export	Export Transform			
	AVC (Intel Quick Sync Video)		✓	✓
	AVC (NVIDIA NVENC)		✓	✓
	HEVC (Intel Quick Sync Video)		✓	✓
	HEVC (NVIDIA NVENC)		✓	✓
	Other			
Preview	Preview Window	✓*	✓	✓
	Multicam Edit			✓

* Performance may be degraded because it is not optimized for the GPU pipeline.

Operating environment

The environment in which the GPU pipeline operates is as follows:

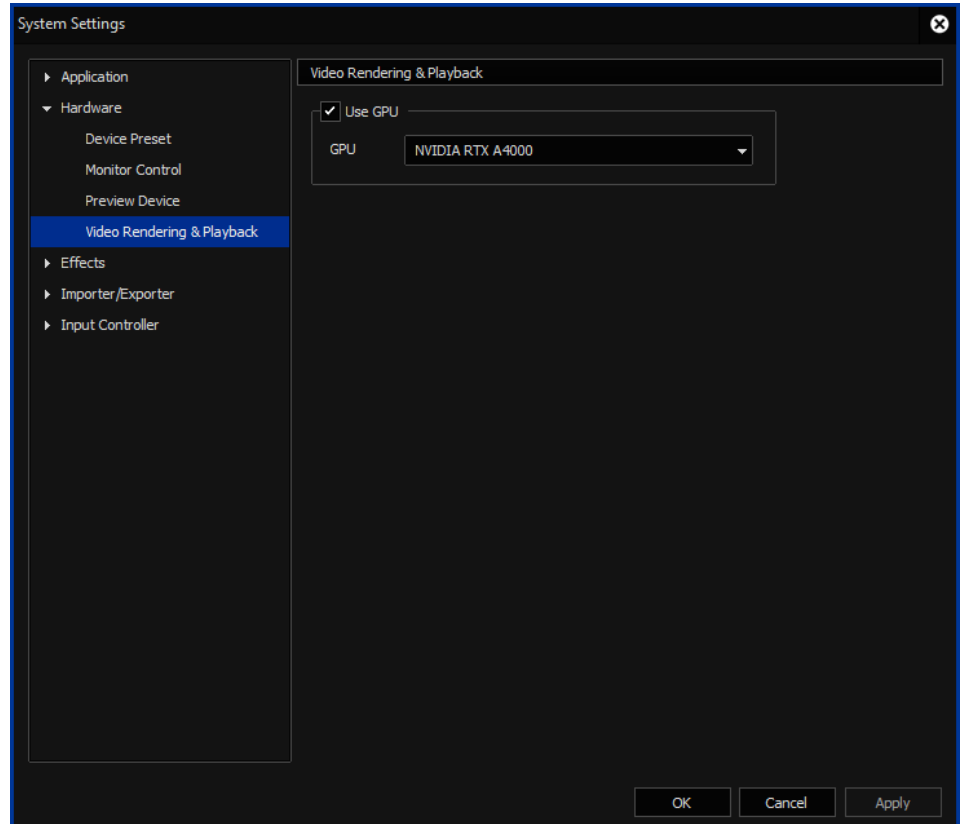
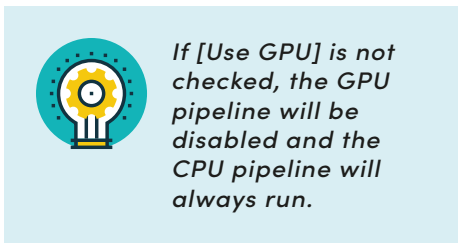
- Intel/NVIDIA/AMD GPUs that support Direct3D Feature Level 11_1 or higher
- PCIe Gen4 or higher and 8GB memory or higher recommended

How to set it up

GPU Pipeline

The GPU pipeline is disabled by default. Follow these steps to enable the GPU pipeline:

1. [System Settings] - [Hardware] - [Video Rendering & Playback]
2. Check [Use GPU] and select [GPU]
3. Click [OK] to apply the settings



NVDEC

Follow these steps to enable NVDEC hardware acceleration for the importer: (The settings are the same as Intel Quick Sync Video.)

AVC (H.264)

1. [System Settings] - [Importer/Exporter] - [AVCHD]
2. Check [Use Hardware decoder]
3. Click [OK] to apply the settings

HEVC (H.265)

1. [System Settings] - [Importer/Exporter] - [HEVC]
2. Check [Use Hardware decoder]
3. Click [OK] to apply the settings



If your system can use both Intel Quick Sync Video and NVIDIA NVDEC, EDIUS will use both – for example, when playing back multiple streams at the same time. On systems where Intel Quick Sync Video is available, Intel Quick Sync Video is preferred. However, if the GPU you are assigning to the GPU pipeline supports NVDEC, NVDEC will be used in preference. For details on how to set up the GPU pipeline, refer to [How to set it up – GPU Pipeline](#).

Primary Color Correction

The GPU acceleration feature for Primary Color Correction now works in conjunction with the GPU settings in the video processing pipeline.



The [System Settings] - [Effects] - [Primary Color Correction] setting screen has been removed.

An example of how the GPU pipeline works effectively

As an example of how you can see the benefits of the GPU pipeline in EDIUS 11.10, we will show the specific steps to apply Primary Color Correction and Median to AVC (H.264) and HEVC (H.265) clips. **Please try this on a system running NVIDIA NVDEC.**

1. Prepare AVC (H.264) or HEVC (H.265) material files supported by NVIDIA NVDEC
 - Please refer to the following for the formats supported by NVDEC.
[Video Encode and Decode GPU Support Matrix]
<https://developer.nvidia.com/video-encode-and-decode-gpu-support-matrix-new>
2. Create a project
 - You need to match the frame size, aspect ratio, frame rate and field order of the project settings to the material files.
3. Open [System Settings]-[Hardware]-[Video Rendering & Playback], check [Use GPU], select the NVIDIA device, and press [OK] to close [System Settings]
4. Add the material files in (1) to the bin
5. Place clips added to bins in the timeline
6. Apply Primary Color Correction and Median to clips placed in the timeline
7. Open the settings window of the applied effects, change the settings as desired, and close the settings window.
8. Play the timeline
 - In EDIUS 11.10, the GPU pipeline does not work for the file export function

For more information about performance, see [Performance Comparison](#).

FAQ

? *Is there a way to check if the GPU pipeline is working?*

- There is no way to check this in the EDIUS software. However, you can check the operation by using the GPU usage in the Performance tab of the Task Manager.

? *Can I use multiple GPUs in the GPU pipeline?*

- Only one device is used in the GPU pipeline. However, for importers, devices according to their settings can be used.

? *Can I use Intel Quick Sync Video and NVIDIA NVDEC at the same time?*

- You can use Intel Quick Sync Video and NVIDIA NVDEC at the same time – for example, during multistream playback. How to set it up – Refer to the [NVDEC](#) supplementary instructions.

? *What formats does NVDEC support?*

- Refer to [Video Encode and Decode GPU Support Matrix]
<https://developer.nvidia.com/video-encode-and-decode-gpu-support-matrix-new>
EDIUS only supports AVC (H.264) and HEVC (H.265).

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