

11th and 12th Gen Intel® Core™ Processors Enable Flexible 4x 4K Video Wall Solutions

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Introduction: Intel® integrated graphics support advanced video wall designs

Video walls are large display surfaces that consolidate disparate video feeds into a centralized, single-pane view. They're used in an ever-increasing range of applications and settings, including stores, hotels, hospitals, factories, and transportation hubs. These and other solutions rely on real-time processing and the display of extremely detailed images. By placing many video streams within the same viewing area, video walls provide highly informational, consolidated views into current conditions. Armed with a comprehensive, real-time picture of their environment and operations, video wall users can make faster, more informed decisions.

As demand increases, video wall developers, builders, and integrators seek powerful new video controller solutions to enable their video wall offerings. And with constant advances in display and connectivity technologies, the developers prefer versatile, flexible hardware platforms that can be delivered in a range of configurations and form factors.

Challenge: Enabling low-cost, high-quality video walls

The burden of data processing grows with every improvement in image resolution and frame rate. As a result, video wall designers and builders are constantly looking to incorporate advanced, high-resolution display technology without adding to system costs. Intel is working to help ensure that designers and builders can deliver standout video wall performance while minimizing system costs and overall footprint.

Until now, controllers for video walls have typically included a discrete graphics processing unit (GPU) or proprietary display hub that is packaged as a plugin circuit board or card. These cards can add significant costs and impose design and reusability limitations. Plus, while a few graphics cards offer up to four display ports for a four-display video wall, incorporating them in system designs significantly impacts bill of materials (BOM) cost, power consumption, thermal design, and form factors.

Solution: Enable cost-effective video walls via Intel® Core™ processors with integrated graphics

The introduction of 11th and 12th Gen Intel® Core™ processors allows video wall manufacturers and system designers to create solutions without requiring an external graphics card or any type of discrete GPU. Instead, the Intel® Iris® Xe graphics engine that is built into the latest Intel Core processors accommodates up to four monitors, each displaying at 4K resolution.



Powering 4K-capable video walls without discrete graphics

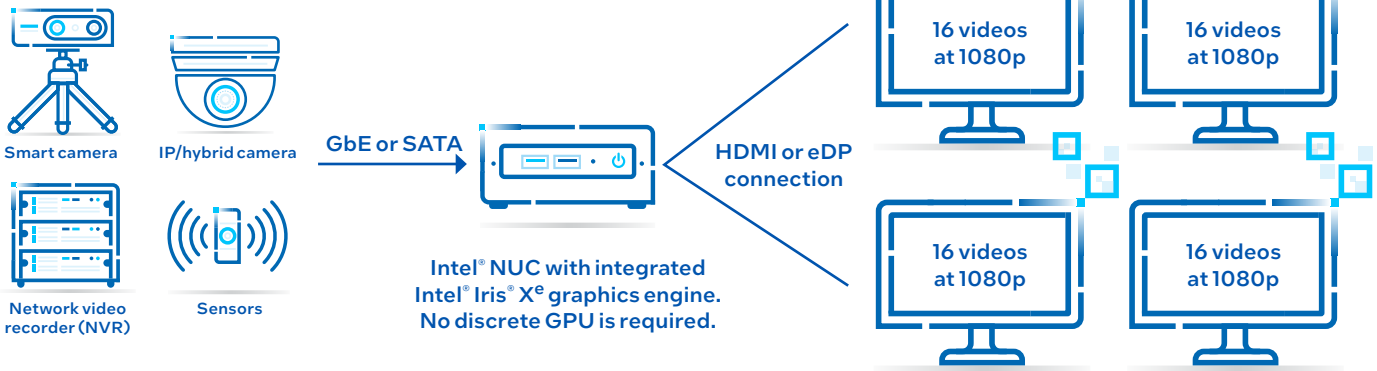


Figure 1: An Intel-enabled video box/controller, such as an Intel® NUC, provides the processing power and integrated graphics to support high-fidelity 4x4 video walls without a discrete GPU.

Supporting high resolution and high frame rates

Video content and video wall fidelity are evolving rapidly. As new video use cases emerge, support for 4K display is critical to video wall solutions—allowing developers to increase video quality for each stream displayed within the video wall. With Intel® technologies, you can meet user expectations without the added cost and footprint of a discrete GPU.

For example, with a 4K monitor, 16 video streams can be displayed in a 4x4 configuration at a relatively high 960x540 resolution. Since a single Intel Core processor can drive up to 4x 4K monitors, a total of 64 video streams can be simultaneously displayed.

Video-enabling features of 11th and 12th Gen Intel Core processors

11th and 12th Gen Intel Core processors are designed for high-quality video and other low-latency applications. Built-in Intel Iris Xe graphics and high-speed connectivity support multiple video streams with near-real-time encoding and decoding for high-resolution images and high frame rates. With our CPU-based solution, users can change content input, rearrange video composition, and add AI-based video analytics functions into the video wall software.

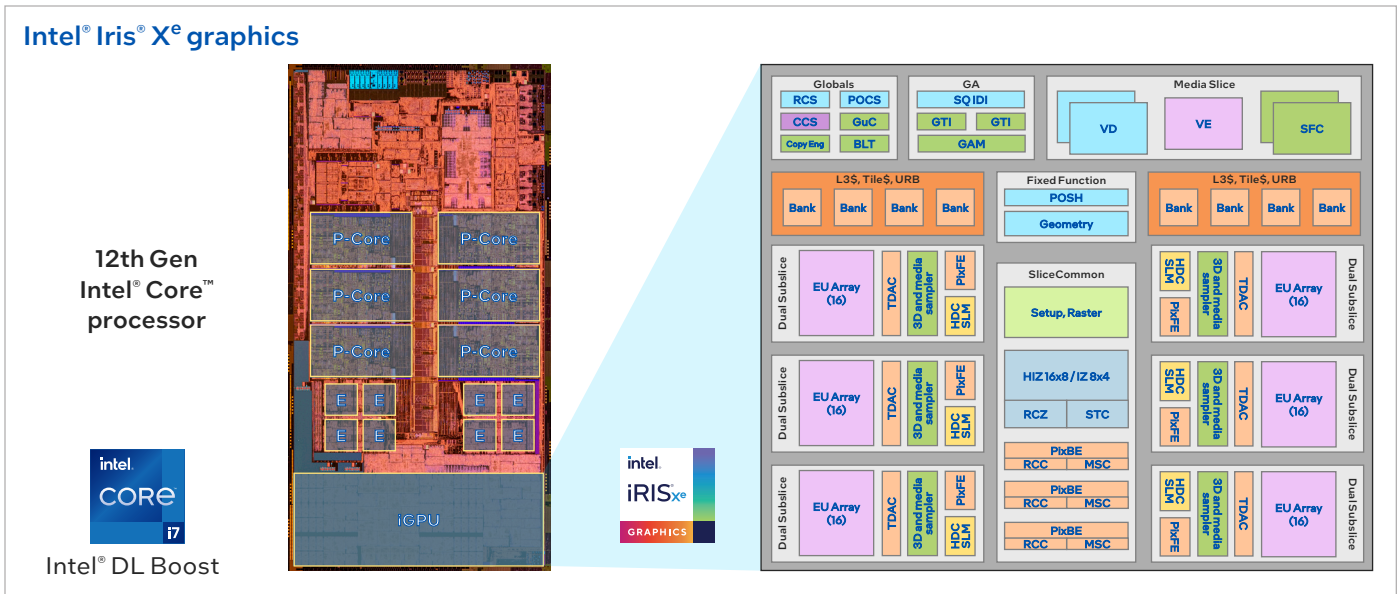


Figure 2: Intel® Core™ processors with built-in Intel® Iris® Xe graphics architecture feature up to 96 graphics execution units for highly parallel video data processing.

Intel Iris Xe graphics (Gen 12) in 11th and 12th Gen Intel Core processors doubles the number of video decode boxes (VDboxes) and other fixed function media processing blocks—including Scaler Format Converter (SFC), Video Motion Estimation (VME), and AVS sampler—compared

to the previous-generation graphics engine found in the 9th and/or 10th Gen Intel® Core™ processors. The new 12th Gen graphics engine also supports 12-bit HEVC and VP9 decoding and supports four times the number of execution units (EUs).

	Intel® UHD Graphics 630 ¹	Intel® Iris® Xe Graphics ²
Graphics	Gen 9.5	Gen 12
Simultaneous display	Three independent 4K displays	Up to four independent 4K displays or two independent 8K displays
Configuration	VDBox:1 VEBox:1 SFC:1 VME/AVS:3/3 EUs: 24	VDBox: 2 VEBox: 1 SFC: 2 VME/AVS: 6/6 EUs: 96
Media decode ^{1,2}	MPEG-2 (H.262) MPEG-4 AVC (H.264) 8-bit 4K MVC (H.265) HEVC(H.265) 8-bit 4:2:0 HEVC (H.265) 10-bit 4:2:0 VC1 VP8 VP9 8-bit 4:2:0 VP9 10-bit 4:2:0	MPEG-2 (H.262) MPEG-4 AVC (H.264) 8-bit 4K MVC (H.265) HEVC(H.265) 8-bit 4:2:0 HEVC (H.265) 10-bit 4:2:0 HEVC (H.265) 12-bit VC1 VP8 VP9 8-bit 4:2:0 VP9 10-bit 4:2:0 VP9 12-bit AV1

Intel® NUC for video wall solutions

Intel offers a range of Intel NUCs that make ideal platforms for 4K video wall solutions. These integrated edge devices pack the power of the latest-generation, full-size desktop PCs into a form factor small enough to hold in your hand.

These Intel NUCs support a strong, flexible foundation for multiscreen, high-impact installations. A single Intel® NUC Pro Mini PC has multiple 4K video display outputs through HDMI and Thunderbolt™ technology. Just one device can drive multiple displays as a unified monitor or feed each screen a different stream.

Intel® NUC Mini PCs are built on the Intel vPro® platform, which enables powerful, hardware-based capabilities for remote management. IT administrators can easily update, manage, and troubleshoot remotely without making a trip to the video wall site.

Video wall performance: Intel Core processors with integrated graphics³

Video Compositions	Total Streams at Display Resolution	Average Frame Rate of Video Tiles Rendering (FPS)			
		Input: 1920x1080	Input: 1280x720	Input: 960x540	Input: 768x432
3 x 3	36 at 1280x720	29	44	*	*
4 x 4	64 at 960x540	22	30	44	*
5 x 5	100 at 768x432	14	22	31	43

*Use case invalid because the resolution of the display tile is higher than that of the input videos.

Video wall configuration options

Intel-based video wall solutions can take compressed video streams as input and render them after several media processing steps, providing capabilities far beyond what a typical video wall controller or video splitter can do. The sample pipeline shown in Figure 3 demonstrates the most common video wall use cases, including video ingestion, decoding, resizing, compositing, and rendering.

Example of Intel-based video wall configuration

Each stream is H.264 encoded at 1080p



Figure 3: Using Intel® Core™ processors with integrated graphics, our example pipeline can support 64 streams being simultaneously decoded, resized, and composited into a video wall, playing at 22 FPS.

The Intel® NUC 11 Pro and Intel® NUC 12 Pro series, which are based on Intel® Core™ i7 processors, offer excellent performance for multiple displays.

Intel NUCs provide a three-year product life cycle and three-year warranty,⁴ making an ideal foundation for video wall solutions.

Conclusion: Build high-performance 4x 4K video walls without a discrete GPU

With the 11th and 12th Gen Intel Core processors and built-in Intel Iris X^e graphics, developers and integrators can build high-performance 4x 4K video walls without the added cost and complexity of a discrete GPU or video card.

These advanced, innovative Intel Core processors are designed to support real-time decoding for up to 100 concurrent video streams with high frame rates. High-speed connectivity is also built into the processor to help prevent bottlenecks and reduce latency that might interfere with video image quality. Intel has made all these features accessible via the Intel NUC—a small form factor compute device that gives developers a flexible architecture for strong computing and rendering capabilities.

Start building your video wall solution today

Intel collaborates with many companies that provide ideal starting points for your video wall solution. Check out this non-exhaustive list of a few ecosystem partner offerings to help accelerate your efforts:

[ASRock NUC BOX-I165G7 >](#)

[NexAIoT NISE 70 >](#)

[GIGAIPC QBiX-Lite-TGLA1135G7-A1 >](#)

[ASUS PL63 >](#)

[Seavo ADI-V51 AIoT Developer Kit >](#)

[AAEON UP Xtreme i12 >](#)

[SimplyNUC Topaz i7 >](#)

Market-ready solutions

[YUAN High-Tech Intelligent Video Processing Platform >](#)

[iBase Digital Signage Player SI-654 >](#)

[iBase Digital Signage Player SI-654-N >](#)

Learn more

Intel NUC for video walls

The Intel NUC platform supports powerful Intel Core i7 processors with integrated Intel Iris X^e graphics and Intel vPro manageability in a fits-anywhere form factor. Intel NUCs are available as a complete out-of-the-box solution, as kits that allow for deeper customization or as assembly-ready compute elements that help maximize platform modularity.

[Visit the product page >](#)

12th Gen Intel Core processors (Alder Lake)

12th Gen Intel Core processors are based on performance hybrid architecture that brings together two types of specialized cores to deliver state-of-the-art performance and responsiveness. The latest platform technologies—including DDR5 memory support, Thunderbolt™ 4 connectivity, and Intel® Wi-Fi 6E (Gig+)—support high-performance, high-resolution streaming video.

[Download the data sheet >](#)

11th Gen Intel Core processors (Tiger Lake)

11th Gen Intel Core processors deliver a balance of performance and responsiveness in a low-power platform. The 11th Gen Intel Core processor can support low-latency and time-sensitive applications, including high-resolution video encoding and decoding, with the power to run multiple workloads on a single platform.

[Read the product description >](#)



Notices and disclaimers

1. "Intel® UHD Graphics Open Source Programmer's Reference Manual," Intel, April 2020, 01.org/sites/default/files/documentation/intel-gfx-bspec-osrc-cml-configurations_2.pdf.
2. "Intel® Iris® X^e and UHD Graphics Open Source Programmer's Reference Manual," Intel, December 2021, 01.org/sites/default/files/documentation/intel-gfx-prm-osrc-tgl-vol04-configurations_0.pdf.
3. Testing performed using a 96EU based 11th Gen Intel® Core™ i7-1165G7 processor-based device. Frame rates are measured using an Intel-modified version of GStreamer with KMS direct frame buffer access. The necessary software updates to enable this capability/performance were merged into the GStreamer repository via commit ID 135edee4.
Testing information: Tested on July 29, 2022. Hardware used: ASRock NUC Box-I165G7, Intel Core i7-1165G7, 2x 16 GB DDR4-3200, 120 GB M.2 NVMe, 120 GB M2 NVMe; software stack: Ubuntu 20.04.4 LTS with 5.15.0-46-generic kernel; GStreamer version 1.21.01; Libva version 2.14.0.2-29; intel-media-va-driver-non-free version: 22.4.3.
4. Not all features may be available on all SKUs. Dates are subject to change. For more information, visit intel.com/content/www/us/en/support/articles/000005679/intel-nuc.html. Performance varies by use, configuration, and other factors. Learn more at intel.com/PerformanceIndex.

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