8 Intel® Arc™ A380 Graphics Specifications

	Intel® Arc™ A380
SoC	ACM-G11
Architecture	Xᵉ HPG
Render Slices	2
Xᵉ-cores	8
Ray Tracing Units	8
Xᵉ Vector Engines	128
Intel® XMX Matrix Engines	128
Graphics Clock	2000 / 2300*
Total Board Power (TBP)	75 / 87 W*
Memory Size	6GB
Memory Type	GDDR6
Memory Interface	96-bit
Memory Bandwidth	Up to 192 GB/s
Memory Speed	Up to 16 Gbps
PCI Express® Interface	PCI Express® 4.0 x8
Lithography	TSMC N6
Intel® Deep Link Dynamic Power Share	-
Intel® Deep Link Hyper Encode	Supported
Intel® Deep Link Hyper Compute	Supported
OpenGL® Support	4.6
Vulkan® Support	1.3
DirectX® Support	DirectX 12 Ultimate
Intel® Adaptive Sync	Yes
HDMI® Support	2.0b
eDP Support	1.4
DisplayPort™ Support	1.4a 2.0 UHBR10
Maximum Resolution (HDMI)	4096x2160 @ 60Hz
Maximum Resolution (DP)	7680x4320 @ 60Hz
Maximum Resolution (eDP)	-
Number of displays	4
H.264 Encode/Decode	Yes
H.265 Encode/Decode	Yes
AV1 Encode/Decode	Yes
VP9 Encode/Decode	Yes

*see chapter 9.

2 Intel® Arc™ A380 Graphics

Intel® Arc™ A380 graphics is designed to empower users to create faster than ever and enjoy fluid gaming on popular titles from esports classics to real-time strategy hits.

Small but mighty – Intel ® Arc™ A380 graphics brings next-generation technologies to mainstream gamers and creators with the most complete technology feature set and capabilities in this market segment, ready for next-generation workloads:

- **New Xᵉ HPG architecture and driver stack highly optimized for modern APIs such as DirectX* 12 Ultimate and Vulkan***
    - Forward-looking technologies such as dedicated Intel® Xᵉ Matrix Extensions (Intel® XMX) AI accelerators and Ray Tracing Units
    - Top tier capabilities with 4 TFLOPs of vector compute (FP32), 64 TOPs of matrix compute (XMX INT8) and 192 GB/s of memory bandwidth
    - Continuous driver optimizations and deep ISV engagements to fully leverage the feature set and compute capabilities
- **Enhanced mainstream gaming for eSports games and modern titles at 1080p Medium**
    - Up level Quality and Performance with Intel's AI-powered XeSS technology which arrives this summer
    - 6GB of high-speed GDDR6 framebuffer to support a broader selection of modern titles
- **Comprehensive creation feature set, including the industry's first GPU with AV1 hardware encode capability, and comprehensive display support**
    - Powerful Xᵉ Media Engine to accelerate H.264, HEVC and AV1 codecs with support for 8K HDR media processing
    - Support up to 4 display outs including DisplayPort 2.0 UHBR10 capable displays
- **Harness synergies between Intel® Arc™ A380 and 12th Generation Intel® Core™ CPUs with Integrated Graphics to unleash next-level performance**
    - Intel® Deep Link Hyper Encode accelerates popular Media Encoding and Transcoding applications
    - Intel® Deep Link Hyper Compute boosts AI-accelerated content creation

3 Xᵉ HPG Microarchitecture

The Xᵉ HPG microarchitecture is engineered from the ground up to deliver breakthrough performance, efficiency, and scalability for gamers and creators.

Xᵉ -cores are the new foundational compute building blocks within Intel's portfolio of GPUs. They implement the Xᵉ instruction set architecture (ISA) with optimizations for specific market segments and workloads such as graphics and gaming.

Each Xᵉ -core found in Xᵉ HPG GPUs is configured with a set of 256-bit Vector Engines designed to accelerate traditional graphics and compute workloads and new 1024-bit Intel® Xᵉ Matrix Extensions (Intel® XMX) engines built to accelerate AI workloads.

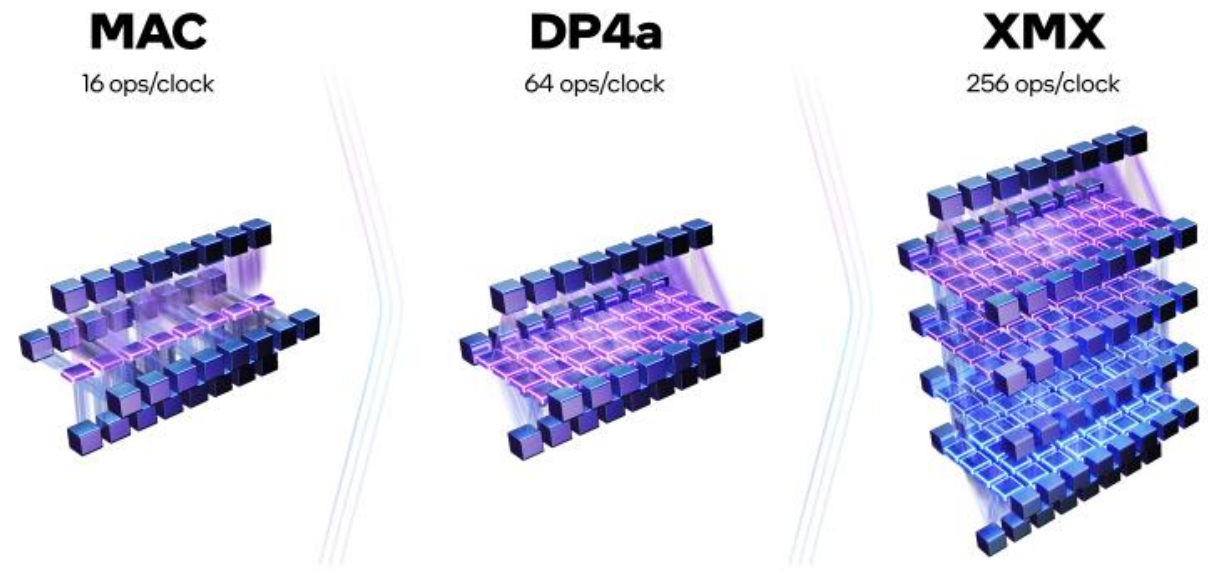
The Render Slice is how configurations of Xᵉ HPG GPUs scale from low power solutions to enthusiast-class gaming powerhouses. A high-bandwidth memory fabric with a L2 cache connecting each slice has the flexibility to scale up to powerful multi-slice configurations and joins these components to the larger discrete GPU infrastructure.

Rasterization and now ray tracing are fundamental to real-time graphics and will power the future of gaming. Xᵉ HPG Render Slices integrate a full set of graphics acceleration hardware engineered to accelerate both rasterization and ray-tracing workloads. This acceleration hardware is optimized for DirectX® 12 Ultimate with support for:

- DirectX Raytracing (DXR 1.0 and 1.1)
- Variable Rate Shading (VRS Tier 2)
- Mesh Shading
- Sampler Feedback

Intel® Xᵉ Matrix Extensions (Intel® XMX)

From creation to gaming, AI-enhanced workloads are redefining the way we process real-time rendering, enhance images, and more. To accelerate these workloads and many more to come, Xᵉ HPG GPUs include dedicated AI hardware or matrix engines that we call Intel® XMX.

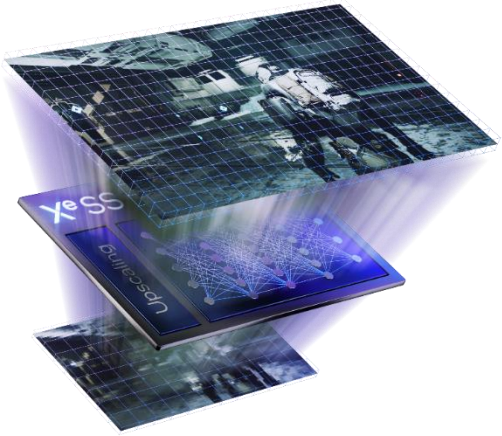


INT8 inferencing

The new Intel® XMX AI acceleration hardware in Xᵉ HPG GPUs delivers up to 16x the compute capabilities for INT8 inferencing when compared to traditional multiply-accumulate (MAC) instructions and up to 4x when compared to the DP4a instruction. Intel® XMX also includes support for multiple other AI optimized datatypes: FP16, BF16, INT4 and INT2.

Intel® Xᵉ Super Sampling

The new Intel® XᵉSS technology uses an AI-based algorithm and Intel® XMX hardware acceleration to deliver ultra-high-definition visuals at the performance levels of lower resolution rendering, to enable immersive and high-performance gaming.



Machine learning helps synthesize images that are very close to the quality of native ultra-high-res rendering by reconstructing subpixel details from neighboring pixels, as well as motion-compensated previous frames. This reconstruction is performed by a neural network trained to deliver high performance and exceptional quality.

4 Xᵉ Media Engine

Intel® Arc™ A-series GPUs feature the industry's first media engine with hardware-accelerated encode and decode support for the next-generation AV1 codec, as well as current AVC, HEVC and VP9 codecs. The Xᵉ Media Engine builds upon the foundation created by Intel® Quick Sync Video technology and delivers an unmatched experience for creators, streamers, and media consumers.

The Xᵉ Media Engine consists of two multi-format codec (MFX) units, which can handle both encode and decode functions. The MFX units are supported by dual video scalers, color space converters, video enhancers, HDR tone mappers and Bayer processors.

Both MFX units and their accompanying scalers, converters and enhancers can operate independently to play back multiple video streams simultaneously or to work together to achieve higher encoding throughput. Alternatively, when processing large workloads such as 8K video, the Xᵉ Media Engine can choose to utilize both units concurrently to increase performance or to improve battery life with reduced clock frequencies.

AV1 encode and decode support

AV1 is the first technology created by the Alliance of Open Media, or AOM, a technology consortium led by Amazon, Cisco, Google, Microsoft, Mozilla, Netflix, and Intel. Other notable members of the AOM include NVIDIA, Samsung Electronics, IBM, Facebook, ARM, Apple, AMD, VideoLAN (VLC), Realtek, Vimeo, and Broadcom. These tech companies span hardware, software, and delivery platforms, or the entire cloud-to-client path for streaming video. The goal of the AOM is to develop open and royalty-free video technology engineered for our streaming video world.

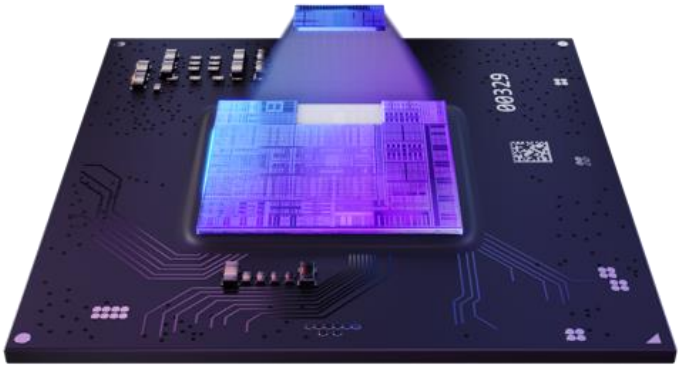
Built upon Google's VP9 codec, AV1 features improvements that result in higher data compression rates for higher quality video at lower bitrates: up to 50% greater efficiency than AVC and 20% greater efficiency than HEVC.[2] In addition to greater efficiency, AV1 was designed to better handle computer-generated content for superior image quality in animated videos and gaming content, making it ideal for streaming.

The Intel® Arc™ A-series family of GPUs support both hardware-accelerated encoding and decoding of AV1. This capability enables the Intel® Arc™ A380 to play AV1 content efficiently using pure hardware acceleration, resulting in smoother playback and better battery life, and to encode AV1 videos at a high level of performance, enabling creators to transition to a more efficient video codec technology.

Hardware-accelerated AV1 encode on the Intel® Arc™ A-series family of GPUs paves the way for broader adoption by bringing real-time AV1 broadcasting capabilities to end-user systems.

[2] H.264/AVC claim based on https://engineering.fb.com/2018/04/10/video-engineering/av1-beats-x264-and-libvpx-vp9-in-practical-use-case/
H.265/HEVC claim based on https://www.winxdvd.com/convert-hevc-video/av1-vs-hevc.htm
Intel does not control or audit third-party data. You should consult other sources to evaluate accuracy.

5 Xᵉ Display Engine



Gamers and creators today are using a wide variety of displays. These might include various compact and performance-oriented embedded panels on mobile systems; conventional and high-end gaming desktop monitors with high refresh rates, high resolutions, HDR support, and new aspect ratios; or large-format displays in the living room that must accurately reproduce a wide variety of color space conventions, like HDR10 and Dolby Vision.

The Xᵉ Display Engine in the Intel® Arc™ A-series GPU family is designed to power that wide variety of displays with low latency and high efficiency. The Xᵉ Display Engine supports up to 4 display pipelines to seamlessly drive multi-display setups. It supports the latest standards with HDMI 2.0b, DisplayPort 1.4a and the recent DisplayPort 2.0 UHBR10.

The Intel® Arc™ A380 fully leverages the Xᵉ Display Engine and offers a rich connectivity with different possible configurations such as 2x HDMI and 2x DisplayPort or 1x HDMI and 3x DisplayPort.

A typical implementation of the display outputs available on an Intel® Arc™ A380 graphics card

The rich potential display connectivity available from the Intel® Arc™ A380 is uncommon for a graphics card of its class. Display setups supported include:

- Up to 2x 8k60 HDR
- Up to 4x 4k120 HDR
- Up to 1080p360 and 1440p360 HDR

The new DisplayPort 2.0 UHBR10 standard enables new possibilities such as:

- Uncompressed 4k120 HDR
- Docks with 3x 4k60 HDR outputs

Display and Gaming Technologies

Intel® Adaptive Sync

The Xe Display Engine supports the VESA Adaptive-Sync standard for variable refresh rate (VRR) displays. This allows dynamic synchronization of the display refresh rate to match the output of the GPU. This technology reduces frame output delay, judder and frame tearing for a more fluid and immersive gaming experience.

Speed Sync

Available in Intel® Arc™ Control, Speed Sync helps gamers experience tear-free gameplay when the frame rate exceeds the display refresh rate. Speed Sync displays the latest rendered frame to maintain low latency without introducing screen tearing and stutter.

Smooth Sync

Smooth Sync is a software and hardware solution currently only available for Intel® Arc™ GPU users that blends screen-tears to improve visual fidelity, enabling a more immersive gaming experience when the monitor is not VRR capable.

Smooth Sync leverages advancements in our display engine. When the display engine is aware of an imminent switch to the next frame, it briefly preserves both frames and applies a dithering algorithm. This adds a blurred effect to the area around the screen tear, thus reducing its visual impact.

6 ACM-G11 SoC

The Intel® Arc™ A380 GPU is built atop the fully featured ACM-G11 SoC.

It implements the Xe HPG microarchitecture configured with:

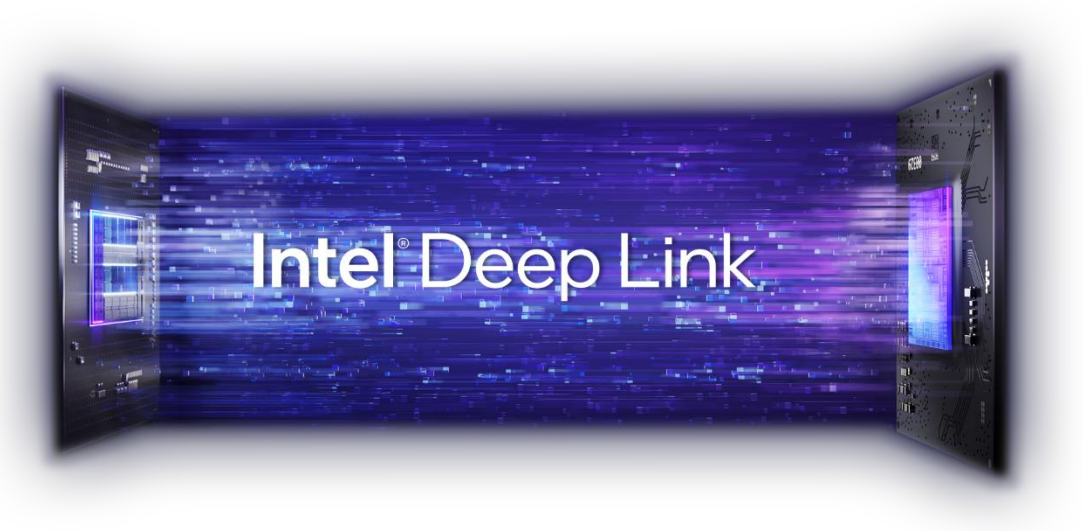
- 2 Render Slices optimized for DirectX* 12 Ultimate
- 8 Xe-cores with Intel® XMX
- 8 Ray Tracing Units
- 4 MB L2 Cache

The Xe Media Engine comes with 2 MFXs and the Xe Display Engine with 4 display pipes.

As a discrete GPU, it implements a dedicated graphics infrastructure with a PCI Express Gen 4 x8 interface, and a new memory controller optimized for fast GDDR6 memory. The memory controller has been optimized for a modern memory management architecture with Resizable BAR in mind, a feature allowing the GPU's entire on-board memory to be efficiently accessed at once.

7 Second Generation Intel® Deep Link

Intel® Deep Link builds upon our expertise in building world-class PC platforms to unlock new levels of performance and drive even better user experiences. Deep Link unifies the CPU and GPU engines of Intel® Core™ processors with Intel® Iris® Xe graphics and dedicated graphics processors such as Intel® Iris® Xe MAX graphics or the new Intel® Arc™ GPUs under a common software framework. This unification paves the way for an increasingly rich set of creation and gaming features that can leverage that software framework.



For this second generation of Intel® Deep Link, we've built several enhancements to existing features as well as exciting new capabilities. When combined with 12th Gen Intel® Core® Processor, the Intel® Arc™ A380 GPU supports the following features:

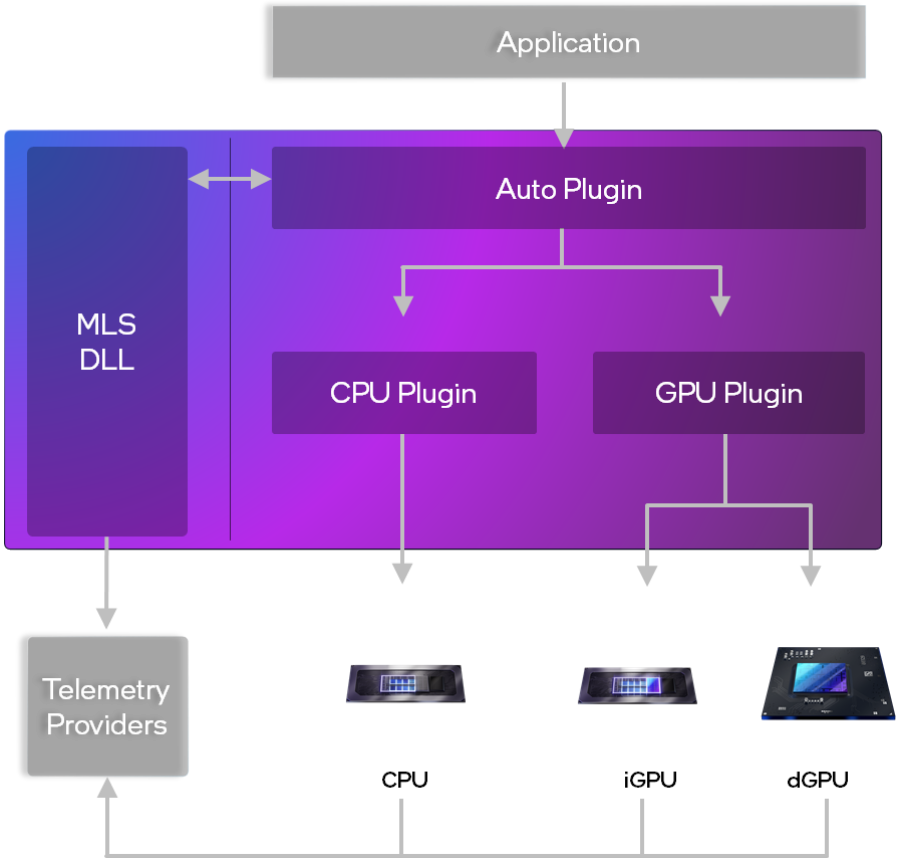
Intel® Deep Link Hyper Compute

Intel® Deep Link also accelerates compute and AI-based workloads with Intel® Deep Link Hyper Compute. This allows applications to leverage the combined vector and matrix compute capabilities that reside in both 12th Gen Intel® Core™ CPUs with Iris® Xe graphics and Intel® Arc™ graphics for greater performance. Intel® Deep Link Hyper Compute can be leveraged by a variety of content creation and 3D rendering applications.

Machine Learning Service

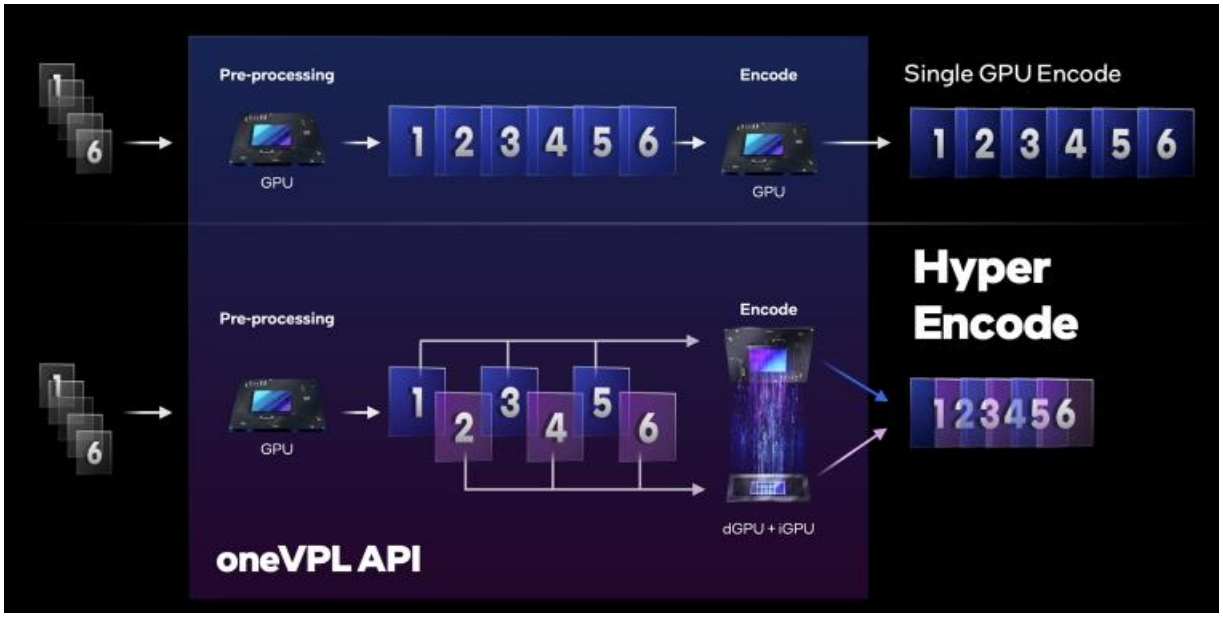
Machine Learning Service (MLS) is a library integrated with OpenVINO™ through the newly implemented 'Auto' plug-in. MLS supports inference scheduling with dynamic IP selection. This service performs selections based on application hints, computed AI/ML processing cost per device (iGPU or dGPU), as well as real-time telemetry used to estimate available

compute resources per device. Based on these characteristics, the appropriate device(s) will be selected and assigned to relevant AI/ML worker threads.



Intel® Deep Link Hyper Encode

Both Intel® Arc™ GPUs and 12th Gen Intel® Core™ processors each incorporate an Xᵉ Media Engine with up to two media encoders (or MFX engines) for excellent hardware-accelerated encode performance. With the Intel® Deep Link Hyper Encode capability, applications can take advantage of a platform's combined media capabilities for an increase in media encode performance. Intel® Deep Link Hyper Encode can accelerate media encode performance in two ways. The first is by leveraging both Xᵉ Media Engines to accelerate multiple file batch transcoding by processing two streams in parallel.



Additionally, Intel® Deep Link Hyper Encode can accelerate single stream encoding by leveraging multiple Xe Media Engines. The video file is decoded by an MFX unit, then broken up into logical partitions known as a Group of Pictures (GOP), which are short segments of video. These GOPs are split between two MFX units – one in the iGPU and one in the dGPU. As the encoded frames are processed, they are recombined into a single output stream.