

# Hardware and Software Specifications

Minimum and recommended hardware specifications and necessary software for developing with Unreal Engine.



Choose your operating system


-  Windows

 macOS

 Linux

This page covers the hardware and software requirements for Unreal Engine. It also describes what is installed by the pre-requisites installer included in the Unreal Engine installer.

## Recommended Hardware

Operating System	Windows 10 64-bit version 1909 revision .1350 or higher, or versions 2004 and 20H2 revision .789 or higher <div><div></div><div>Windows 11 is compatible with UE5 and fits in the recommended specs.</div></div>
Processor	Quad-core Intel or AMD, 2.5 GHz or faster
Memory	32 GB RAM
Graphics RAM	8 GB or more
Graphics Card	DirectX 11 or 12 compatible graphics card with the latest drivers

Although some features have a minimum requirement of DirectX 11, we recommend DirectX 12 for most games.



DirectX11 is better for older PCs, especially laptops with integrated graphics. However, DirectX12 provides a higher frame rate, multi-core processing support, and parallel and asynchronous computing.

Recommended Operating System	Latest MacOS 13 Ventura
Minimum Operating System	MacOS 13 Ventura
Recommended Processor	Apple Silicon M3
Minimum Processor	M1 or M2 depending on rendering features
Recommended Memory	32 GB or more
Minimum Memory	16 GB
Video Card	Metal 1.2 Compatible Graphics Card

Operating System	Ubuntu 22.04
Processor	Quad-core Intel or AMD, 2.5 GHz or faster
Memory	32 GB RAM
Graphics Card	GeForce 2080
Graphics RAM	8 GB or more
RHI Version	<b>Vulkan:</b> AMD (RADV 23.2.1+) and NVIDIA (535.86+)



To get the most out of rendering features of Unreal Engine 5, such as Nanite and Lumen, see the [Requirements for UE5 Rendering Features](#) section of this page.

# Minimum Software Requirements

Minimum requirements for running the engine or editor are listed below.

## Running the Engine

Operating System	Windows 10 version 1703 (Creators Update)
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Running the Engine


DirectX Runtime	<a href="#">DirectX End-User Runtimes (June 2010)</a>
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Running the Engine

Recommended Operating System	Latest MacOS 13 Ventura
Minimum Operating System	macOS 13 Ventura

Running the Engine

Operating System	Any reasonable new Linux distro from CentOS 7.x and up
Linux Kernel Version	kernel 3.x or newer
Additional Dependencies	glibc 2.17 or newer




If either Unreal Editor or installations of UE games take a very long time on startup, check that your `glibc` is version 2.35 or newer, as earlier versions have a slow implementation of `dlopen`.

The requirements for programmers developing with the engine are listed below.

Developing with the Engine


All 'Running the Engine' requirements (automatically installed)	
Visual Studio Version	Visual Studio 2022
iOS App Development	
iTunes Version	<a href="#">iTunes 12 or higher</a>



Although Visual Studio is recommended for Windows development, Unreal Engine also supports VS Code and Rider.

Developing with the Engine

Recommended Xcode Version	14.1 or newer
Minimum Xcode Version	Xcode 14.1

 Although Xcode is preferred for macOS development, Unreal Engine also supports VS Code and Rider.


Developing with the Engine

Operating System	Ubuntu 22.04, CentOS 7
Compiler	clang 16.0.6
Optional	
IDE	Visual Studio Code, Rider

## Software Installed by the Prerequisite Installer

The Unreal Engine includes a prerequisite installer that installs everything needed to run the editor and engine, including several DirectX components and Visual C++ redistributables. When you install Unreal Engine through the Epic Games Launcher, the Launcher automatically installs these prerequisites for you. However, you may need to run the prerequisite installer yourself if you build Unreal Engine from source, or if you need to prepare a computer with all the Unreal Engine prerequisites for a specific purpose—for example, if you are setting up a fresh computer to act as a [Swarm Agent](#).

You can find the installer in the `Engine/Extras/Redist/en-us` folder under your Unreal Engine installation location.

 Support for 32-bit platforms has been removed in Unreal Engine 5.

If you use Perforce to get the Unreal Engine source code, you'll also find precompiled binaries in the same `Engine/Extras/Redist/en-us` folder of the Perforce repository. The source for the installer is under `Engine/Source/Programs/PrereqInstaller`.

The following table lists the software that is installed by the prerequisite installer.

DirectX Components	Visual C++ Redists
XInput 1.3 (April 2007)	Visual C++ 2010 CRT
X3DAudio 1.7 (February 2010)	Visual C++ 2010 OpenMP library
XAudio 2.7 (June 2010)	Visual C++ 2012 CRT
D3D Compiler 4.3 (June 2010)	Visual C++ 2013 CRT

D3DCSX 4.3 (June 2010)	Visual C++ 2015 CRT
D3DX9 4.3 (June 2010)	Microsoft Visual C++ 2015-2022 Redistributable
D3DX10 4.3 (June 2010)	
D3DX11 4.3 (June 2010)	



The most important DirectX components from that list are the XInput, X3DAudio, and XAudio dependencies. These aren't included in standard installations of DirectX (and aren't distributed with Windows by default), so they have to be installed manually or distributed with the application.

## Graphics Card Drivers

We currently recommend using the latest stable releases from each card manufacturer:

- [Download NVIDIA drivers here](#)
- [Download AMD drivers here](#)
- [Download Intel drivers here](#)

## Performance Notes

The spec below represents a typical system used at Epic (a Lenovo P620 Content Creation Workstation, standard version). This provides a reasonable guideline for developing games with Unreal Engine 5:

- Operating System: Windows 10 22H2
- Power Supply: 1000W power supply unit
- RAM: 128GB DDR4-3200
- Processor: AMD Ryzen Threadripper Pro 3975WX Processor - 128MB Cache, 3.5 GHz base / 4.2 GHz turbo, 32 Cores / 64 Threads, 280w TDP
- OS Drive 1 TB M.2 NVMe3 ×4 PCI-e SSD
- DATA Drive 4 TB Raid Array - 2 × 2TB NVMe3 ×4 PCI-e SSD in Raid 0
- GPU: Nvidia RTX 3080 - 10GB
- NIC 1GBPS on-board + Intel X550-T1 10G PCI-e Ethernet adapter
- TPM Compliant

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- TPM Compliant



If you don't have access to Xoreax Incredibuild (Dev Tools Package), we recommend compiling with a machine having 12 to 16 cores.

# Requirements for UE5 Rendering Features

Some rendering features of Unreal Engine have different requirements than the minimum specifications.

UE5 Feature	System Requirements
Lumen Global Illumination and Reflections	<div><p>Software Ray Tracing:</p><ul style="list-style-type: none"><li>• Video cards using DirectX 11 with support for Shader Model 5</li></ul><p>Hardware Ray Tracing:</p><ul style="list-style-type: none"><li>• Windows 10 build 1909.1350 and newer with DirectX 12 support<ul style="list-style-type: none"><li>◦ <b>SM6</b> must be enabled in the Project Settings.</li></ul></li><li>• One of the following graphics cards:<ul style="list-style-type: none"><li>◦ NVIDIA RTX-2000 series or newer</li><li>◦ AMD RX-6000 series or newer</li><li>◦ Intel® Arc™ A-Series Graphics Cards or newer</li></ul></li></ul></div> <div><p> Lumen Hardware Ray Tracing now requires SM6 to be set in Project Settings.</p></div> <p>To learn more see, <a href="#">Lumen Technical Details</a>.</p>
Nanite Virtualized Geometry	<ul style="list-style-type: none"><li>• All versions of Windows 10 build 1909.1350 and newer, and Windows 11 with support for <a href="#">DirectX 12 Agility SDK</a> are supported.<ul style="list-style-type: none"><li>◦ Windows 10 version 1909 — The revision number should exceed or be equal to .1350.</li><li>◦ Windows 10 version 2004 and 20H2 — The revision number should exceed or be equal to</li></ul></li></ul>

UE5 Feature	System Requirements
	<p>.789.</p> <ul style="list-style-type: none"> <li>◦ DirectX 12 (with Shader Model 6.6 atomics), or Vulkan (VK_KHR_shader_atomic_int64)</li> <li>◦ <b>SM6</b> must be enabled in the Project Settings. (On by default in new projects.)</li> <li>• Latest Graphics Drivers</li> </ul> <p>To learn more see, <a href="#">Nanite Virtualized Geometry</a>.</p>
<b>Virtual Shadow Maps</b>	<ul style="list-style-type: none"> <li>• All versions of Windows 10 build 1909.1350 and newer, and Windows 11 with support for <a href="#">DirectX 12 Agility SDK</a> are supported. <ul style="list-style-type: none"> <li>◦ Windows 10 version 1909 — The revision number should exceed or be equal to .1350.</li> <li>◦ Windows 10 version 2004 and 20H2 — The revision number should exceed or be equal to .789.</li> <li>◦ DirectX 12 (with Shader Model 6.6 atomics), or Vulkan (VK_KHR_shader_atomic_int64)</li> <li>◦ <b>SM6</b> must be enabled in the Project Settings. (On by default in new projects.)</li> </ul> </li> <li>• Latest Graphics Drivers</li> </ul> <p>To learn more see, <a href="#">Virtual Shadow Maps</a>.</p>
<b>Temporal Super Resolution</b>	<p>Runs on any video card that supports Shader Model 5, but the limit of 8UAVs per shader has performance implications. Temporal Super Resolution shaders compile with 16bit types enabled on D3D12 that supports Shader Model 6.</p> <p>To learn more see, <a href="#">Temporal Super Resolution</a>.</p>

UE5 Feature	System Requirements
<b>Lumen Global Illumination and Reflections</b>	<p>Software Ray Tracing:</p> <ul style="list-style-type: none"> <li>• Apple computers with an Intel and AMD Based GPU and/or Apple Silicon M1+</li> </ul> <p>Hardware Ray Tracing:</p> <ul style="list-style-type: none"> <li>• Not currently supported</li> </ul> <p>To learn more see, <a href="#">Lumen Technical Details</a>.</p>
<b>Nanite Virtualized Geometry</b>	<ul style="list-style-type: none"> <li>• Apple Silicon M2+ (beta support)</li> </ul> <p>To learn more see, <a href="#">Nanite Virtualized Geometry</a>.</p>
<b>Virtual Shadow Maps</b>	<ul style="list-style-type: none"> <li>• Apple Silicon M2+ (beta support)</li> </ul> <p>To learn more see, <a href="#">Virtual Shadow Maps</a>.</p>

Temporal Super Resolution

- Apple computers with an Intel and AMD Based GPU and/or Apple Silicon M1+

To learn more see, [Temporal Super Resolution](#).



There are some runtime costs to be aware of. To learn more see the [Anti-aliasing Performance](#) section of our tech blog.

Lumen Global Illumination and Reflections

Software Ray Tracing:

- Any GPU which supports Shader Model 5.

Hardware Ray Tracing:

- **SM6** must be enabled in the Project Settings.
- One of the following graphics cards:
  - NVIDIA RTX-2000 series or newer
  - AMD RX-6000 series or newer
  - Intel® Arc™ A-Series Graphics Cards or newer



Lumen Hardware Ray Tracing now requires SM6 to be set in Project Settings.

To learn more see, [Lumen Technical Details](#).

Nanite Virtualized Geometry

- GPU which supports the VK\_KHR\_shader\_atomic\_int64 Vulkan extension
  - **SM6** must be enabled in the Project Settings. (On by default in new projects.)
- Latest Graphics Drivers

To learn more see, [Nanite Virtualized Geometry](#).

Virtual Shadow Maps

- GPU which supports the VK\_KHR\_shader\_atomic\_int64 Vulkan extension
  - **SM6** must be enabled in the Project Settings. (On by default in new projects.)
- Latest Graphics Drivers

To learn more see, [Virtual Shadow Maps](#).