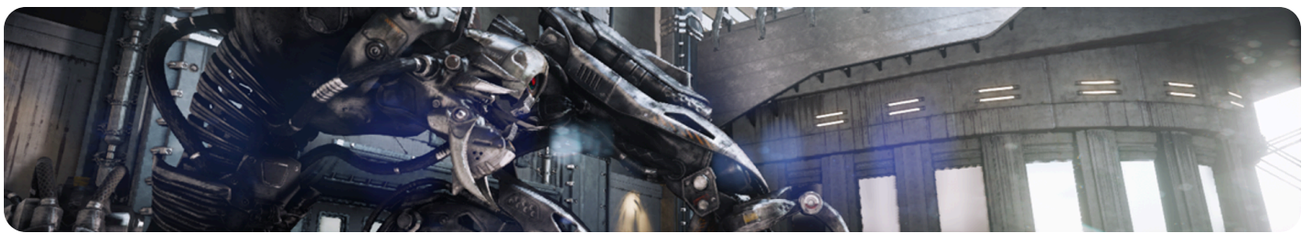
Onboarding Guide for Games Licensees

Steps to getting started with Unreal Engine.



Hardware and Software Requirements

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 Windows 11 is compatible with UE5 and fits in the recommended specs.
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	**Vulkan:** 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)
DirectX Runtime	DirectX End-User Runtimes (June 2010)

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	iTunes 12 or higher

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.

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

DirectX Components	Visual C++ Redists
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

Performance Notes

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- NIC 1GBPS on-board + Intel X550-T1 10G PCI-e Ethernet adapter
- 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	Software Ray Tracing:
	• Video cards using DirectX 11 with support for Shader Model 5
	
	Hardware Ray Tracing:
	• Windows 10 build 1909.1350 and newer with DirectX 12 support
	  ◦ **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	• All versions of Windows 10 build 1909.1350 and newer, and Windows 11 with support for DirectX 12 Agility SDK are supported.
	  ◦ Windows 10 version 1909 — The revision number should exceed or be equal to .1350.
	  ◦ Windows 10 version 2004 and 20H2 — The revision number should exceed or be equal to .789.
	  ◦ DirectX 12 (with Shader Model 6.6 atomics), or Vulkan (VK_KHR_shader_atomic_int64)

UE5 Feature	System Requirements
	◦ **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	• All versions of Windows 10 build 1909.1350 and newer, and Windows 11 with support for DirectX 12 Agility SDK are supported. ◦ Windows 10 version 1909 — The revision number should exceed or be equal to .1350. ◦ Windows 10 version 2004 and 20H2 — The revision number should exceed or be equal to .789. ◦ DirectX 12 (with Shader Model 6.6 atomics), or Vulkan (VK_KHR_shader_atomic_int64) ◦ **SM6** must be enabled in the Project Settings. (On by default in new projects.) • Latest Graphics Drivers To learn more see, Virtual Shadow Maps.
Temporal Super Resolution	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. To learn more see, Temporal Super Resolution.

UE5 Feature	System Requirements
Lumen Global Illumination and Reflections	Software Ray Tracing: • Apple computers with an Intel and AMD Based GPU and/or Apple Silicon M1+ Hardware Ray Tracing: • Not currently supported To learn more see, Lumen Technical Details.
Nanite Virtualized Geometry	• Apple Silicon M2+ (beta support) To learn more see, Nanite Virtualized Geometry.
Virtual Shadow Maps	• Apple Silicon M2+ (beta support) To learn more see, Virtual Shadow Maps.
Temporal Super Resolution	• Apple computers with an Intel and AMD Based GPU and/or Apple Silicon M1+

UE5 Feature	System Requirements
	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.

UE5 Feature	System Requirements

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.

Acquiring Unreal Engine

Unreal Engine can be downloaded by licensees from Epic's Perforce (P4V) proxy server. The login credentials for the Perforce server are provided to your team's technical lead by Epic Games in your Epic Pro Support welcome email. Only one set of login credentials is provided to each team.

Accessing Unreal Engine Source Code on GitHub

Unreal Engine includes full access to the complete C++ source code, so you can study, customize, extend, and debug the entire Unreal Engine, and complete your project without obstruction.

Our source code repository on GitHub is continually updated as we develop features in our own mainline, so you don't even have to wait for the next product release to get your hands on the very latest code.

To access Unreal Engine source code, do the following:

1. Navigate to GitHub and sign up for an account.
2. Sign in to UnrealEngine.com with your verified Epic Games account. To open your account dashboard, hover over your **username**, and select **Personal** from the drop-down menu.
3. With your account dashboard open, select the **Connections** tab from the sidebar. Select the **Accounts** tab, and then select the **Connect** button below the GitHub icon.
4. If you have not already signed the Unreal Engine End User License Agreement, you will need to read through its terms and select the check box, then select **Link Account**. If you are signed out of your GitHub account, you will be directed to GitHub to sign in after clicking the Link Account button.
5. To complete the OAuth App Authorization process, click the **Authorize EpicGames** button. You can learn more about this process in GitHub's overview on Authorizing OAuth Apps.
6. GitHub will send an email inviting you to join the @EpicGames organization on GitHub. You must select the **Join @EpicGames** button in this email within seven days to complete the GitHub and Epic Games account linking process.

Upon completion, you will receive an email from Epic Games verifying that your GitHub and Epic Games accounts were successfully linked. If you don't receive a confirmation email, or if your account is experiencing problems, get help from Customer Service. You are now ready to get started by going to our GitHub page (login required) to download the full source code.

Source Code Branches

You'll notice that we've published UE's source code in several branches.

Branches whose names contain dev, staging, and test are typically for internal Epic processes, and are rarely useful for end-users Other short-lived branches may appear from time to time as we stabilize new releases or hotfixes.

Release Branch

The **Release** branch always reflects the current official release. These are extensively tested by our QA team, so they make a great starting point for learning Unreal Engine and for making your own projects. We work hard to make releases stable and reliable, and aim to publish a new release every few months.

Main Branch

Most active development on UE happens in the ue5-main branch. This branch reflects the latest release of the engine and may be buggy or it may not compile. We make it available for developers who are eager to test new features or work in lock-step development with us.

> If you choose to work in this branch, be aware that it is likely to be ahead of the branches for the current official release and the next upcoming release. Therefore, content and code that you create to work with the ue5-main branch may not be compatible with public releases until we create a new branch directly from ue5-main for a future official release.

Setting up a Perforce Server on your Local Machine

> To avoid potential integration issues with our tools, such as UnrealGameSync, we recommend running a **case-insensitive** Perforce server.

There are two ways of running the Perforce server, **P4D** and **P4S**. P4D runs while an instance of the command line is running, so it is usually only used for spot-maintenance tasks. P4S is the service-based equivalent of P4D as it allows you to run the server in the background. The service is usually installed and started when you install the Perforce server tools.

> Sometimes the service does not get run automatically. To turn the service on in Windows, first go into the **Control Panel → Administrative Tools →Services applet**. Then find the Perforce service in the list and start it:

Once the service is running, you can connect to your server using **P4Admin**. If this is the first connection to your server, then you can make a new user in the initial connection dialog:

Fill in the connection information for your Perforce server and press okay. Once you have connected to the server in P4Admin, you can make new depots, users, and groups pretty easily. Use P4V and the Unreal Editor to connect to the server with the credentials you supplied in the initial connection dialog.

Check out the P4Admin Documentation for more in-depth information on the ins and outs of Perforce.

P4 Typemap

Before you start adding files to your depot, you should set up your **P4 Typemap** so Perforce knows how to treat Unreal file types. Setting the typemap will affect how files get set to read only or writable inside of Perforce. However to do this, you will need to open a new command prompt and set up some p4 environment variables.

```
p4 set P4USER=your.username
p4 set P4PORT=localhost:1666
```

Copy full snippet

Replace the values above with your respective username and connection address. Open the typemap by entering the following in the command prompt.

```
p4 -P <PASSWORD> typemap
```

Copy full snippet

You will then see a text window open; this is your server's typemap. The typemap below is an example that we have used in the past:

```
# Perforce File Type Mapping Specifications.
#
# TypeMap: a list of filetype mappings; one per line.
# Each line has two elements:
#
# Filetype: The filetype to use on 'p4 add'.
#
# Path: File pattern which will use this filetype.
#
# See 'p4 help typemap' for more information.

TypeMap:
binary+w //depot/....exe
binary+w //depot/....dll
binary+w //depot/....lib
binary+w //depot/....app
binary+w //depot/....dylib
binary+w //depot/....stub
binary+w //depot/....ipa
binary //depot/....bmp
text //depot/....ini
text //depot/....config
text //depot/....cpp
```

```
text //depot/....h
text //depot/....c
text //depot/....cs
text //depot/....m
text //depot/....mm
text //depot/....py
binary+l //depot/....uasset
binary+l //depot/....umap
binary+l //depot/....upk
binary+l //depot/....udk
binary+l //depot/....ubulk
```

Copy full snippet

Once edited, save the file by pressing **Ctrl+S** on your keyboard and then exit. The command prompt should then show **Typemap saved**.

P4 Ignore

There might be files that you want ignored when addign client files to the depot or when reconciling client workspaces. To help with this, you can specify a **P4 Ignore** file. The default name for this file is `.p4ignore`.

The following is an example of Epic's `.p4ignore` file:

```
# Here you can specify files to ignore when adding files to the depot.
#
# The syntax for P4IGNORE files is not the same as Perforce syntax.
# Instead, it is similar to that used by other versioning systems:
#
# - Files are specified in local syntax
# - a # character at the beginning of a line denotes a comment
# - a ! character at the beginning of a line excludes the file specification
# - a * wildcard matches substrings.
#
# For example:
#
# foo.txt Ignore files called "foo.txt"
# *.exe Ignore all executables
# !bar.exe Exclude bar.exe from being ignored
#
################################################################################
# Epic's P4IGNORE.
# P4IGNORE doesn't work like GITIGNORE:
# http://stackoverflow.com/questions/18240084/how-does-perforce-ignore-file-s
from-gitignore-syntax
################################################################################
# Ignore root Visual Studio solution files. We do check in some sln files in
subdirectories, so only ignore
# the ones found in the root.
/*.sln
/.p4sync.txt
```

```
26
27 # Ignore all Visual Studio temp files.
28 *.suo
29 *.opensdf
30 *.sdf
31 /Engine/DerivedDataCache/*
32 **/DerivedDataCache/Boot.ddc
33 **/DerivedDataCache/**/*.udd
34
35 # Ignore all Intermediate and Saved directories
36 */Intermediate/*
37 */Saved/*
38 # Ignore UBT's configuration.xml
39 Engine/Programs/UnrealBuildTool/*
40 *.uatbuildrecord
41 *.tmp
42
43 # Ignore built binaries and temporary build files
44 */obj/*
45 *.csprojAssemblyReference.cache
46
47 # Ignore UBT's log output files
48 /Engine/Programs/UnrealBuildTool/*.txt
49
50 # Ignore Python cached files
51 *.pyc
52
53 # Ignore JetBrain's IDE folders
54 .idea/
55 !.idea/runConfigurations
56 .gradle/
57
58 # Ignore autogenerated files from HoloLens WMRInterop
59 /Engine/Source/ThirdParty/WindowsMixedRealityInterop/packages/*
60 /Engine/Source/ThirdParty/WindowsMixedRealityInterop/MixedRealityInteropHoloL
   Files/*
61 /Engine/Source/ThirdParty/WindowsMixedRealityInterop/MixedRealityInteropHoloL
62 /Engine/Source/ThirdParty/WindowsMixedRealityInterop/MixedRealityInteropHoloL
63 /Engine/Source/ThirdParty/WindowsMixedRealityInterop/MixedRealityInterop/x64/
64 /Engine/Source/ThirdParty/WindowsMixedRealityInterop/MixedRealityInterop/ARM6
65
66 # Ignore files added by Finder on Mac
67 .DS_Store
68
69 # Ignore all .code-workspace files
70 *.code-workspace
71
```

Copy full snippet

For more information about ignore files, see the P4IGNORE documentation page on Perforce's documentation site.

Server on your Local Network

You can set up a server on your local network for people to use to collaborate with one another. To do this, follow the steps above on the server and connect using the server's name or IP from your clients.

Cloud Provider

There are various cloud providers that allow you to host Perforce servers off-site and to collaborate remotely. A quick search online for **Perforce Hosting** should turn up a few results. Each hosting provider is different, but all should end up with a set of credentials that you can use to connect. See also **Connecting from Unreal Editor** below for a note about connecting to Perforce cloud providers.

Setting up a Local Workspace

To work with files that are under Perforce control, you will need to set up a Workspace so that the files can be managed on your local machine. You can do this via P4V by opening up the **Workspaces** tab in the **View** dropdown:

To create a new workspace, right-click in the Workspace window and select the **New Workspace** option. Then enter a name for your workspace and a location where you want the files to be on your local machine, the Workspace Root.

Once you have a server and a workspace, you will want to start adding files to it. For the moment, this needs to be done initially outside the Editor via P4V. If you already have a workspace that someone else has set up with some files already, you can skip ahead. When you create a new project, you can choose whether it incorporates C++ code and Blueprint elements. If you are using C++ code in your project, you will see a **Source/** directory as well. You should initially add only the following directories of your project:

Folders and files highlighted in **Green** should be added to your depot. The Binaries folder in **Yellow** is optional, depending on how your team wants to work together. It is not required if every team member is going to compile their editor/game themselves, but should be included in the **initial add** if any team members will just be grabbing a version from the depot to create content. Note that the server typemap setup above should mean that coders can compile their binaries without them being set to be **Read-Only** by Perforce.

Adding Files to Perforce

Adding files to Perforce is something that can be accomplished in the few following steps.

1. To add files/folders to Perforce, first select the files/folders in P4V and then right-click and select the **Mark For Add** option.

2. This will add the files to your default change list. All files that you add can be seen in the Pending change lists tab:

3. To submit something, first right-click on the change list and then select **Submit**. Then enter a change list description and click the Submit button.

If you want to start work on a project that someone else has already started, you will need to get the latest revision from Perforce using P4V. To do this, find the project in the Depot View in P4V and then **Right-click** on the project you want to get and select **Get Latest Revision**. This will download all the files to the location you specified for your Workspace Root above.

Connecting from Unreal Editor

You can connect to your Perforce server right from the Editor by clicking on the **Source Control** icon on the **Toolbar**:

Once open, choose Perforce as the provider from the Source Control Login dialog and enter your login credentials. If you have a workspace already set up (that the current project is inside of), your login credentials should be populated automatically.

> When using some servers, including many cloud providers - you may need to enter the Host and Password to access your depot from the Editor. You can do this by opening the advanced field at the bottom of the Perforce login dialog:

Downloading the Source Code

Please follow these instructions to download the Unreal Engine source code.

> Refer to our Setting Up Visual Studio to ensure that you have a version of Visual Studio that is compatible with your desired version of Unreal Engine.

1. Install GitHub for Windows then fork and clone our repository.

   To use Git from the command line, see the Setting up Git and Fork a Repo articles.

   If you'd prefer not to use Git, you can get the source with the 'Download ZIP' button on the right. The built-in Windows zip utility will mark the contents of zip files downloaded

from the Internet as unsafe to execute, so right-click the zip file and select 'Properties...' and 'Unblock' before decompressing it. Third-party zip utilities don't normally do this.

2. Install **Visual Studio**.

   All desktop editions of Visual Studio can build UE, including Visual Studio Community, which is free for small teams and individual developers. Refer to the Setting Up Visual Studio page to ensure that you have downloaded all of the necessary VS components for working with UE.

3. Open your source folder in Explorer and run `Setup.bat`.

   This will download binary content for the engine, as well as installing prerequisites and setting up Unreal file associations. On Windows, a warning from SmartScreen may appear. Click **More info**, then **Run anyway** to continue.

   A clean download of the engine binaries may take some time to complete. Subsequent checkouts only require incremental downloads and will be much quicker.

4. Run `GenerateProjectFiles.bat` to create project files for the engine. It should take less than a minute to complete.

5. Load the project into Visual Studio by double-clicking on the `UE5.sln` file. Set your solution configuration to **Development Editor** and your solution platform to **Win64**, then right click on the **UE** target and select **Build**. It may take anywhere between 10 and 40 minutes to finish compiling, depending on your system specs.

6. After compiling finishes, you can load the editor from Visual Studio by setting your startup project to **UE5** and pressing **F5** to debug.

1. Install a Git client like GitHub for Mac, then fork and clone our repository.

   To use Git from the Terminal, see the Setting up Git and Fork a Repo articles. If you'd rather not use Git, use the 'Download ZIP' button on the right to get the source directly.

2. Install the latest version of Xcode.

3. Open your source folder in Finder and double-click on **Setup.command** to download binary content for the engine. You can close the Terminal window afterwards.

   If you downloaded the source as a .zip file, you may see a warning about it being from an unidentified developer (because .zip files on GitHub aren't digitally signed). To work around it, right-click on Setup.command, select **Open**, then click the **Open** button.

4. In the same folder, double-click **GenerateProjectFiles.command**. It should take less than a minute to complete.

5. Load the project into Xcode by double-clicking on the **UE5.xcworkspace** file. Select the **ShaderCompileWorker** for **My Mac** target in the title bar, then select the 'Product > Build' menu item. When Xcode finishes building, do the same for the **UE5** for **My Mac** target. Compiling may take anywhere between 15 and 40 minutes, depending on your system specs.

6. After compiling finishes, select the 'Product > Run' menu item to load the editor.

> Our developers and support teams currently use the latest version of Ubuntu; as a result, we may not be able to provide support for other Linux distributions (including other versions of Ubuntu).

1. Install a visual Git client and fork our repository. If you'd prefer not to use Git, use the **Download ZIP** button on the right to get the source as a zip file.
2. Open your source folder and run **Setup.sh** to download binary content for the engine.
3. Both cross-compiling and native builds are supported.

   Cross-compiling is handy when you are a Windows (Mac support planned too) developer who wants to package your game for Linux with minimal hassle, and it requires a cross-compiler toolchain to be installed (refer to the Linux cross-compiling page).

   Native compilation is discussed in a separate README.

> This page shows Licensees how to download and build Unreal Engine from our source code repository on GitHub. If you'd like to download the binary version of Unreal Engine, read our Installing Unreal Engine documentation to learn how to Get Unreal.

Additional target platforms

- **Android** support will be downloaded by the setup script if you have the Android NDK installed. See the Android Quick Start guide.
- **iOS** development requires a Mac. Instructions are in the iOS Quick Start guide.
- Development for consoles and other platforms with restricted access, like Sony PlayStation, Microsoft Xbox, and Nintendo Switch, is only possible if you have a registered developer account with those third-party vendors.

Depending on the platform, additional documentation or guidance may be available in the Epic Pro Support site, or as a downloadable archive in the section of the Unreal Engine Forums that is dedicated to your platform.

If you don't have access to these resources, first register a developer account with the third party vendor. Then contact your Epic Games account manager if you have one, or fill out and submit the Console Development Request form for Unreal Engine if you don't. Epic will contact you with a formal agreement to digitally sign. Once this is approved, you will receive instructions on how to access source code, binaries, and additional instructions for your platform.

Licensing and Contribution

Your access to and use of Unreal Engine on GitHub is governed by the Unreal Engine End User License Agreement. If you don't agree to those terms, as amended from time to time, you are not permitted to access or use Unreal Engine.

We welcome any contributions to Unreal Engine development through pull requests on GitHub. Most of our active development is in the **master** branch, so we prefer to take pull requests there (particularly for new features). We try to make sure that all new code adheres to the Epic coding standards. All contributions are governed by the terms of the EULA.

Next Steps

Now that you've downloaded and set-up Unreal Engine, you're ready to build the engine from source.

Footnotes

The first time you start the editor from a fresh source build, you may experience long load times. The engine is optimizing content for your platform to the *derived data cache*, and it should only happen once.

Your private forks of the Unreal Engine code are associated with your GitHub account permissions. If you unsubscribe or switch GitHub user names, you'll need to re-fork and upload your changes from a local copy.

Building Unreal Engine from Source

Read about Hardware and Software Specifications, and make sure that **Microsoft Visual Studio** is installed prior to building **Unreal Engine (UE)** from source. Also, depending on your system's specifications, it may take between 10 and 40 minutes to compile the Engine.

1. Inside the root directory, where you downloaded and adjusted the UE Source Code run `GenerateProjectFiles.bat` to set-up your project files.

   > All project files are intermediate (`[UERoot]\Engine\Intermediate\ProjectFiles`). You must generate project files each time you sync a new build to ensure they are up to date. If you delete your `Intermediate` folder, you must regenerate project files using the `GenerateProjectFiles` batch file.

2. Load the project into Visual Studio by double-clicking `UE5.sln`.

3. Set your solution configuration to **Development Editor**.

4. Set your solution platform to **Win64**.

5. Right-click the **UE5** target and select **Build**.

For instructions on building the engine and creating executables on platforms other than Windows, please see Building Unreal Engine from Source.

Connecting to Perforce

Connect to Epic's Perforce Server

Connecting to the Epic Games Perforce server requires using the SSL feature, and you must be running a 2017.2 or later version of a Perforce client (P4V, p4, or API). You can take advantage of latency based routing to automatically connect to the closest Perforce regional proxy by using the global DNS name. Alternatively, you can connect directly to a regional proxy to ensure you always connect to the closest one.

> If you are running a local proxy, you must connect through a broker instead of using the region proxy servers. You can connect to the global broker using the address below:
>
> `ssl:p4-licensee.epicgames.com:1666`

1. Install the **P4V Perforce client for Windows**. The client can be downloaded from the Perforce Downloads page.
2. In the **Open Connection** dialog, enter the following connection info:
   - **Server**: ssl:p4-licensee.epicgames.com:1666

     > The address above should automatically direct you to a regional proxy with the best latency based on your geographic location. If, for some reason, you need to connect to a specific regional proxy, you can connect to them using the addresses below:
     >
     > - **United States East (Virginia)**: ssl:p4-licensee-east.us.epicgames.com:1666
     > - **United States West (Oregon)**: ssl:p4-licensee-west.us.epicgames.com:1666
     > - **Asia Pacific Northeast (Tokyo)**: ssl:p4-licensee-northeast.ap.epicgames.com:1666
     > - **Europe Central (Frankfurt)**: ssl:p4-licensee-central.eu.epicgames.com:1666

   - **User**: Perforce username provided by Epic Games.
   - **Password**: Perforce password provided by Epic Games.
3. Click **OK** to connect to the Perforce Server.

Click the image for full size.

4. When connecting to an endpoint for the first time, you must explicitly trust that endpoint.
   - The Epic SSL fingerprint is `45:0D:78:E2:0E:9E:E4:82:45:80:16:36:29:5E:54:4D:66:31:6C:43`.
   - P4V will prompt you to trust the new endpoint.
   - Command line p4 uses the p4 trust command: `$ p4 trust -y`.

5. In P4V, choose **Connection > New Workspace** to create a new workspace for the engine. Enter the information below and click **OK** to create the workspace:
    - **Workspace name**: Give your new workspace a name.
    - **Stream**: Click **Browse** and select `//UE5/Release-Latest` from the list of available streams.

6. In the **Depot** pane, expand the **Filter Depot** menu and select **Tree Restricted to Workspace View**.

Download Unreal Engine

Epic Games distributes Unreal Engine to licensees via the `//UE5/Release-Latest` stream in the Perforce depot. This contains the entire engine along with several additional projects in the form of example games, samples, and demos. You have the option of downloading everything or picking and choosing only the parts you want or need.

To get set up as quickly as possible, we recommend you only download the bare minimum to start with and then download other parts on an as-needed basis. This can dramatically reduce idle time spent waiting for the download to finish. We also provide a `//UE5/Release-Latest-Minimal` stream to help with this.

> Because there are a large number of files in the `//UE5/Release-Latest` stream and the total download size is many gigabytes, the download can take a long time when syncing the entire branch.

1. Right-click on the stream you want to download and choose **Get Latest Revision**.

2. The latest version of all files will be downloaded.

Launching the Editor

The process of running the editor requires passing the name of the project to run as an argument to the executable.

> You can add the `-debug` switch to force the executable to load the debug version of the modules for your project, which contain all of the debugging symbols. This is necessary even when debugging through Xcode with the configuration set to **Debug** because the main executable is always compiled using the **Development** configuration. Of course, you must first compile your modules using the Debug configuration so they exist for the executable to load.

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Running the Editor from the Command Line

1. From a command prompt, navigate to your `[LauncherInstall]/[VersionNumber]/Engine/Binaries/Mac` directory.
2. Run the `UEEditor.app` passing it the path to your project:

```
open UEEditor.app --args "[ProjectPath]/[ProjectName].uproject"

```

Copy full snippet

1. From a command prompt, navigate to your `[LauncherInstall]\[VersionNumber]\Engine\Binaries\Win64` directory.
2. Run the `UEEditor.exe,` passing it the path to your project.

```
UEEditor.exe "[ProjectPath][ProjectName].uproject"

```

Copy full snippet

Running the Editor from the Executable

1. Navigate to your `[LauncherInstall][VersionNumber]\Engine\Binaries\Win64` directory.
2. Right-click on the `UEEditor.exe` executable and choose **Create shortcut**.
3. Rename the shortcut to something like **MyProject - Editor.exe** as this reflect that this shortcut runs the MyProject game editor.
4. Right-click on the newly created shortcut and choose **Properties**.
5. Add the name of the game to run as an argument at the end of the **Target** property:

```
[LauncherInstall][VersionNumber]\Engine\Binaries\Win64\UEEditor.exe "
[ProjectPath][ProjectName].uproject"

```

Copy full snippet

6. Press **OK** to save the changes.
7. Double-click the shortcut to launch the editor.

The editor must be run from the command prompt to load a specific project directly or with no arguments to access the Project Browser.

Running the Editor with No Arguments (Stand-alone)

If the editor is not set to open the most recent project at startup, running the editor executable without any arguments will launch the Project Browser. From here, you can create a new project , open your existing projects , or open content examples and sample games .

Creating Your First Project

When you open Unreal Editor, the Project Browser will appear. The Project Browser provides a jumping off point from which you can create projects, open your existing projects, or open sample content like sample games and Showcases.

When you launch **Unreal Engine**, the **Unreal Project Browser** opens automatically. This is where you can:

- Create a new project.
- Open an existing project.
- Manage existing projects.

The diagram below illustrates the steps to create a new project in Unreal Engine.

Creating a new project in Unreal Engine from the Project Browser window.

To create a new project, follow these steps:

1. Select the **development category** (1) that best matches your industry and project goals.

   You can select from the following categories:
   - Games
   - Film, Television, and Live Events
   - Architecture, Engineering, and Construction (AEC)
   - Automotive, Product Design, and Manufacturing (APM)
2. Select a **template** (2) for your project. The templates you can choose from are based on the category you selected in step 1.

   > Unreal Engine contains a number of **project templates** you can use as a starting point for your own projects. To learn more about the different project templates available, refer to the Templates Reference page.

3. Configure the **Project Defaults** (3). In this section, you can select your target platform (that is, the hardware where your game or application will run, like a computer or a mobile device), configure quality and ray tracing settings, and more.

Some of the settings below may not be available for certain templates. For example, the Handheld AR template can only use Blueprint implementation.

You can configure the following settings:

Setting	Description
Implementation	Select how you want to implement your project's logic, such as character movement, level transitions, and so on. You can choose from the following options: • **Blueprint**, if you want to build your project in the Unreal Editor, and use the Blueprint Visual Scripting system to create interactions and behavior. • **C++**, if you want to build your project by programming with C++ in Visual Studio. For more information about these implementation methods, refer to the following pages: • Blueprint Visual Scripting • Programming with C++
Target Platform	Select the kind of platform your project is intended for: • **Desktop** • **Mobile**
Quality Preset	Select the maximum quality level, based on which platform your project targets. We recommend that you choose: • **Maximum**, if you are developing your project for a computer or game console. • **Scalable**, if you are developing your project for mobile devices.
Starter Content	Select whether you want your new project to include **starter content**. Starter content includes some simple Static Meshes with basic textures and Materials. It is useful if you want to start learning and experimenting straight away, without worrying about sourcing and importing custom content.
Ray Tracing	Select whether to enable or disable **ray tracing** for your project. For more information about ray tracing in Unreal Engine, refer to the Hardware Ray Tracing and Path Tracing Features page.

4. Select where you want to store your project, and give your project a name (4).
5. Click **Create** (5) to finish creating your new project.

Result

Unreal Engine creates a new project with the settings you configured, and then automatically opens the project.

Compiling Code Projects

If you create a project with the Blank template, or any of the Blueprints Only templates, you can immediately begin working with your project in Unreal Editor. When working with any game or engine C++ code, however, you will need to compile your code in order to see any changes reflected in the game.

Unreal Engine (UE) uses a custom building method using the **UnrealBuildTool (UBT)** which handles all the complex aspects of compiling the project and linking it with the engine. This process occurs transparently allowing you to simply build the project through the standard **Visual Studio** build workflow.

UnrealBuildTool uses the `*.build.cs` and `*.target.cs` files to build the game project. These are automatically generated when a project is created using a C++ template, or when the CPP Class Wizard is used to add code to a project created from a Blueprints Only template.

Build Configuration

Unreal projects have multiple targets, including **Editor**, **Client**, **Game**, and **Server**, described by `*.target.cs` files. Furthermore, each of these can be built to different configurations. In Visual Studio, this manifests as a Visual Studio `*.vcxproj` file with different configurations for each target. The solution configurations are named as **[Configuration][Target Type]** (for example, "DevelopmentEditor" for the default editor target, and "Development" for the default standalone game target). The configuration you use will be determined by the purposes of the build you want to create.

Every build configuration contains two keywords. The first keyword indicates the state of the engine and your game project. For instance, if you compile using a **Debug** configuration, the build process forgoes optimization making it easer to debug. To be clear, every configuration, even Shipping builds, produce symbols for debugging if built form Visual Studio or if **Project Settings > Project > Packaging > Project > Include Debug Files** is turned on in the Unreal Editor. This means that you can still debug Development and Shipping configurations, they just may not be as easy to debug as the Debug configuration. The second keyword indicates the target you are building for. For example, if you want to open a project in Unreal, you need to build with the **Editor** target keyword.

Build Configuration - State	Description
Debug	This configuration builds both engine and game code in debug configuration without optimizations. This makes things slower, but is easier to debug. If you compile your project using the **Debug**

Build Configuration - State	Description
	configuration and want to open the project with the Unreal Editor, you must use the `-debug` flag in order to see your code changes reflected in your project.
DebugGame	This configuration builds game code without optimizations. This configuration is ideal for debugging only game modules.
Development	This configuration enables all but the most time-consuming engine and game code optimizations, which makes it ideal for development and performance reasons. Unreal Editor uses the **Development** configuration by default. Compiling your project using the **Development** configuration enables you to see code changes made to your project reflected in the editor.
Shipping	This is the configuration for optimal performance and shipping your game. This configuration strips out console commands, stats, and profiling tools.
Test	This configuration is the **Shipping** configuration, but with some console commands, stats, and profiling tools enabled.

Build Configuration - Target	Description
Game	This configuration builds a stand-alone executable version of your project, but requires cooked content specific to the platform. Please refer to the Packaging Projects Reference page to learn more about cooked content.
Editor	To open a project in Unreal Editor and see all code changes reflected, the project must be built in an **Editor** configuration.
Client	If you are working on a multiplayer project using UE networking features, this target designates the specified project as being a Client in UE's client-server model for multiplayer games. If there is a `<GAME_NAME>Client.Target.cs` file, the **Client** build configurations will be valid.
Server	If you are working on a multiplayer project using UE networking features, this target designates the specified project as being a Server in UE's client-server model for multiplayer games. If there is a `<GAME_NAME>Server.Target.cs` file, the **Server** build configurations will be valid.