3D Data Hack Dublin

Unreal Engine Starter Guide

Building City Dashboards

3D DATA HACK DUBLIN

NCG National Centre for Geocomputation An tIonad Náisiúnta Geoiriomhaireachta

Maynooth University Social Sciences Institute

Maynooth University National University of Ireland Maynooth

Science Foundation Ireland sfi For what's next

dashboards.maynoothuniversity.ie
dashboards@mu.ie
@dashbuild

3D Data Hack Dublin

- The following guide has been prepared as part of the Building City Dashboard project, a Science Foundation Ireland initiative based at Maynooth University, Ireland.
- The guide outlines how the resources provided for the 3D Data Hack Dublin can be used with a game engine to facilitate real-time interaction and visualization.
- Following the guide is expected to take between 45 minutes and 1 hour to complete.
- This guide is not intended as a comprehensive instruction manual.
- It has been provided to help those who are new to real-time, interactive visualisation to get up and running quickly so that they can start exploring their own ideas.
- Suggestions for next steps are provided toward the end of the guide.

NOTE: This guide was tested with Unreal Engine version 4.22.0. As functionality and menu options can change between versions, please be prepared to refer to online help:

- Documentation: https://docs.unrealengine.com/en-us/
- Forums: https://forums.unrealengine.com/

Download the 3D Data Hack Dublin Resources

3D Data Hack Dublin Resources are available in the following location:
https://data.smartdublin.ie/dataset/3d-data-hack-dublin-resources

3D Data Hack Dublin Resources

- Contents
  - **SDZ_Model_ITM_20190424.FBX** – The 3D model we will be using in this guide. This file it suitable for use in many 3D modelling packages such as 3ds Max or Blender, but also in game engines like Unity or Unreal Engine.
  - **SDZ_Model_ITM_Textures_20190424.zip** – A folder containing textures that can be used to enhance the FBX model's appearance.
  - **SDZ_Model_ITM_24.max** (Not used in this guide) – The original Autodesk 3ds Max project used to assemble the 3D data in the FBX file.
  - **Move_File_ITM.txt** (Not used in this guide) – A file describing the spatial offset (in metres) which has used in the 3ds Max project to bring original survey data in the Irish Transverse Mercator (EPSG:2157) coordinate projection system to the world origin in 3ds Max for modelling.

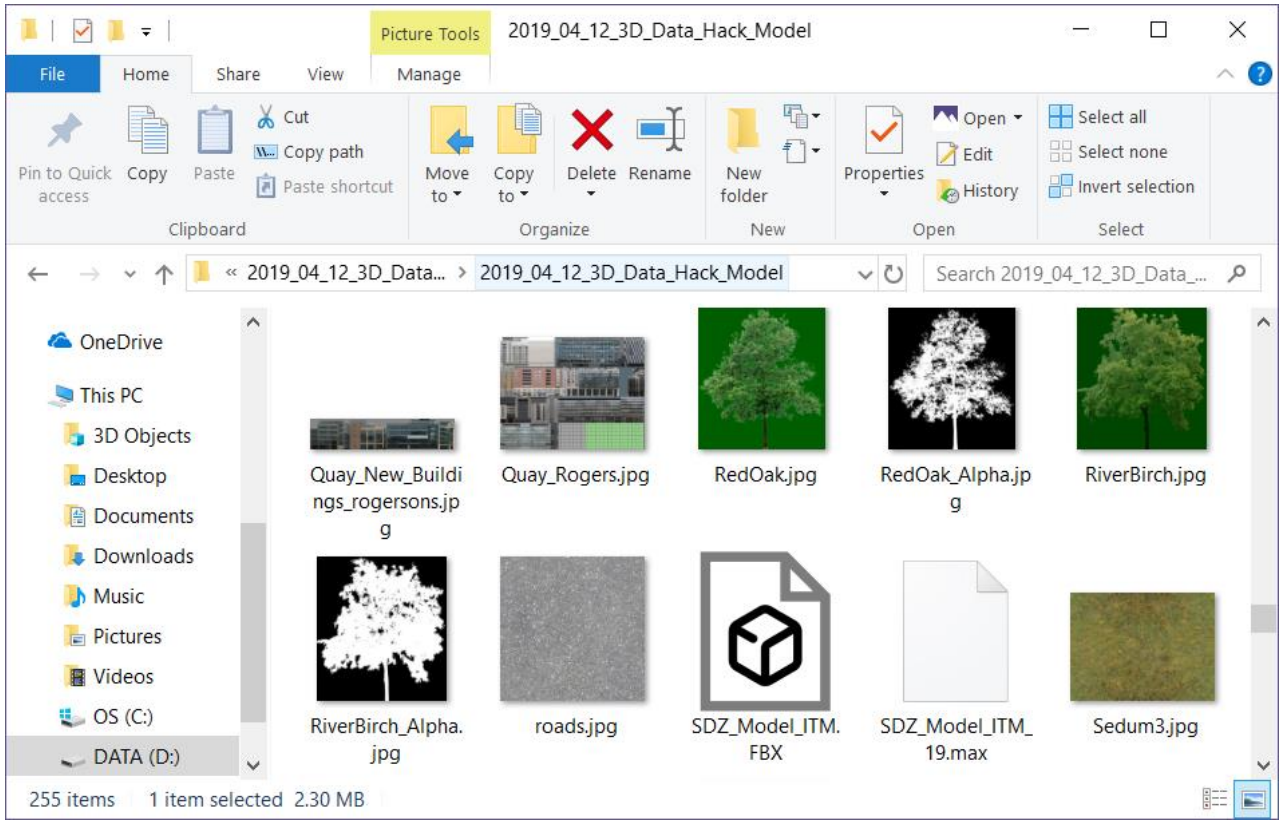
Technical Note:

The spatial offset described by the move file can be used to determine the real world coordinates of objects that have been placed in the 3ds Max project. The offset is required because 3D modelling and visualisation software has tended to use a single precision floating point number format to describe spatial location: https://en.wikipedia.org/wiki/Single-precision_floating-point_format. This is commonly done to help improve computational performance, but entails a tradeoff in loss of spatial precision as objects move further away from the world origin (0,0,0). Simply put, single precision floating points do not provide sufficient precision over great enough distances to describe real world geographic coordinates. Attempting to do so can result in visible jitter of objects due to spatial uncertainty, or else their failure to render, resulting in a blank screen. One solution to enable rendering of objects with positions described in a real word geographic coordinate system is to apply an offset to their coordinate position that brings them back toward the world origin.

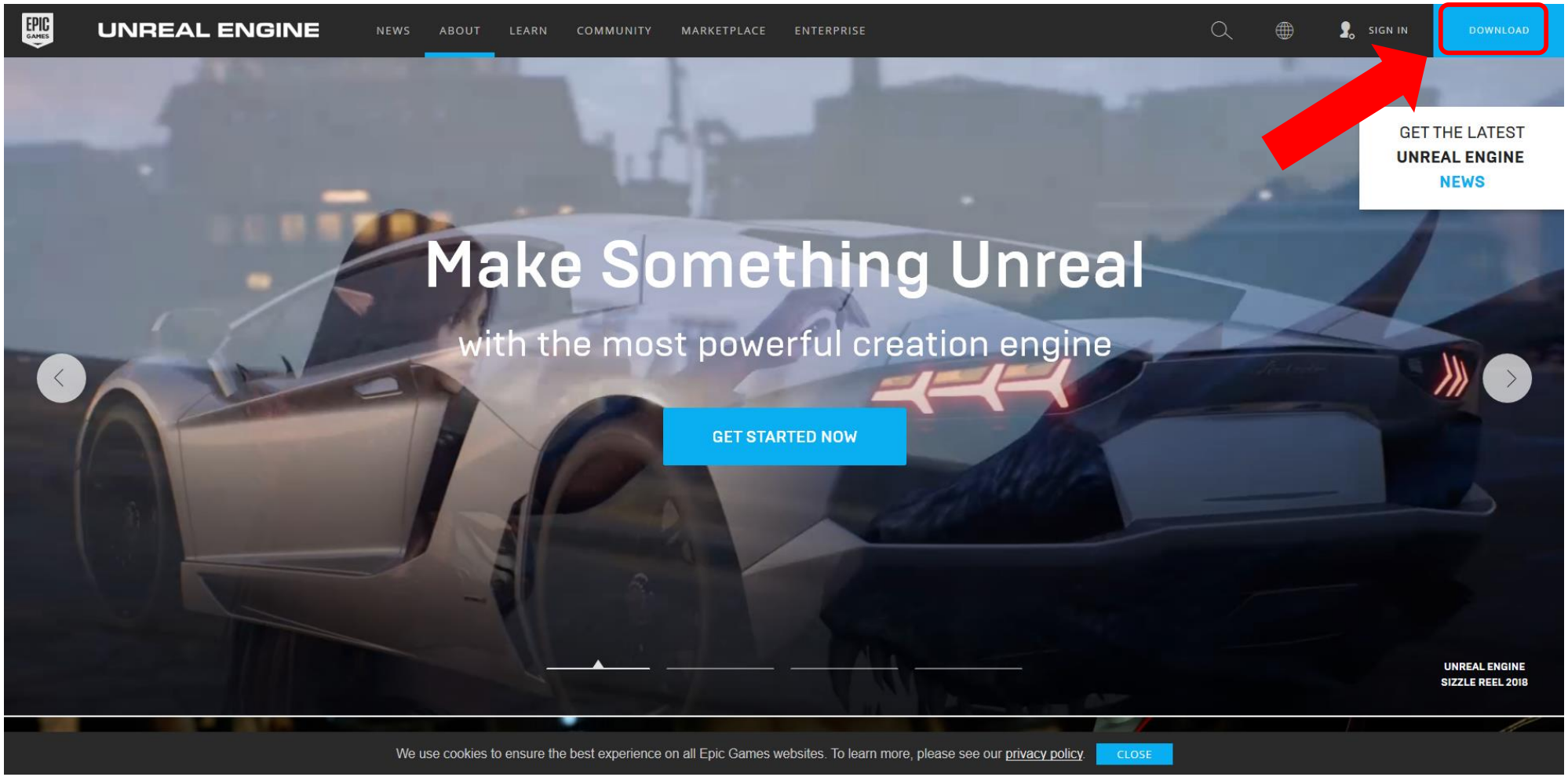
Preparing your files for this tutorial

- Download the FBX file and the zip file containing the textures.
- Unzip the textures.
- Place the FBX and textures together in the same folder on your computer (any location of your choice is fine).
- Remember the location of the folder as you will need to access it later to import the 3D model into Unreal Engine.

NOTE: You can download the other resources but they will not be used in this guide.

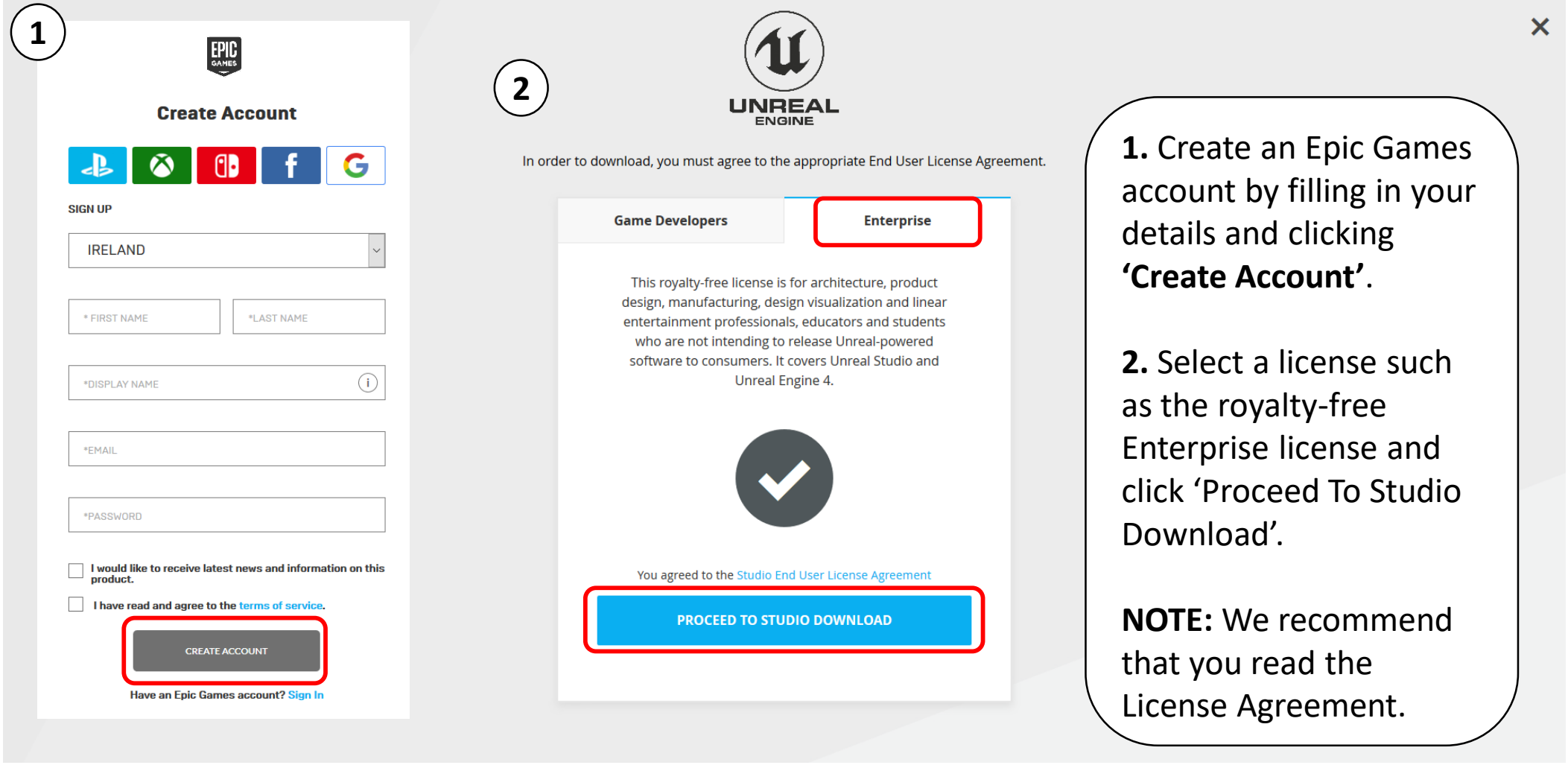


How to get Unreal Engine



Unreal Engine: https://www.unrealengine.com/

Create an Account and Select a Licence



1. Create an Epic Games account by filling in your details and clicking **'Create Account'**.

2. Select a license such as the royalty-free Enterprise license and click 'Proceed To Studio Download'.

NOTE: We recommend that you read the License Agreement.

Download Unreal Engine

Watch this video for detailed instructions on how to set up and install Unreal Studio, then simply follow the steps below.

Watch the online tutorial on setting up Unreal Engine

Here are some next steps:

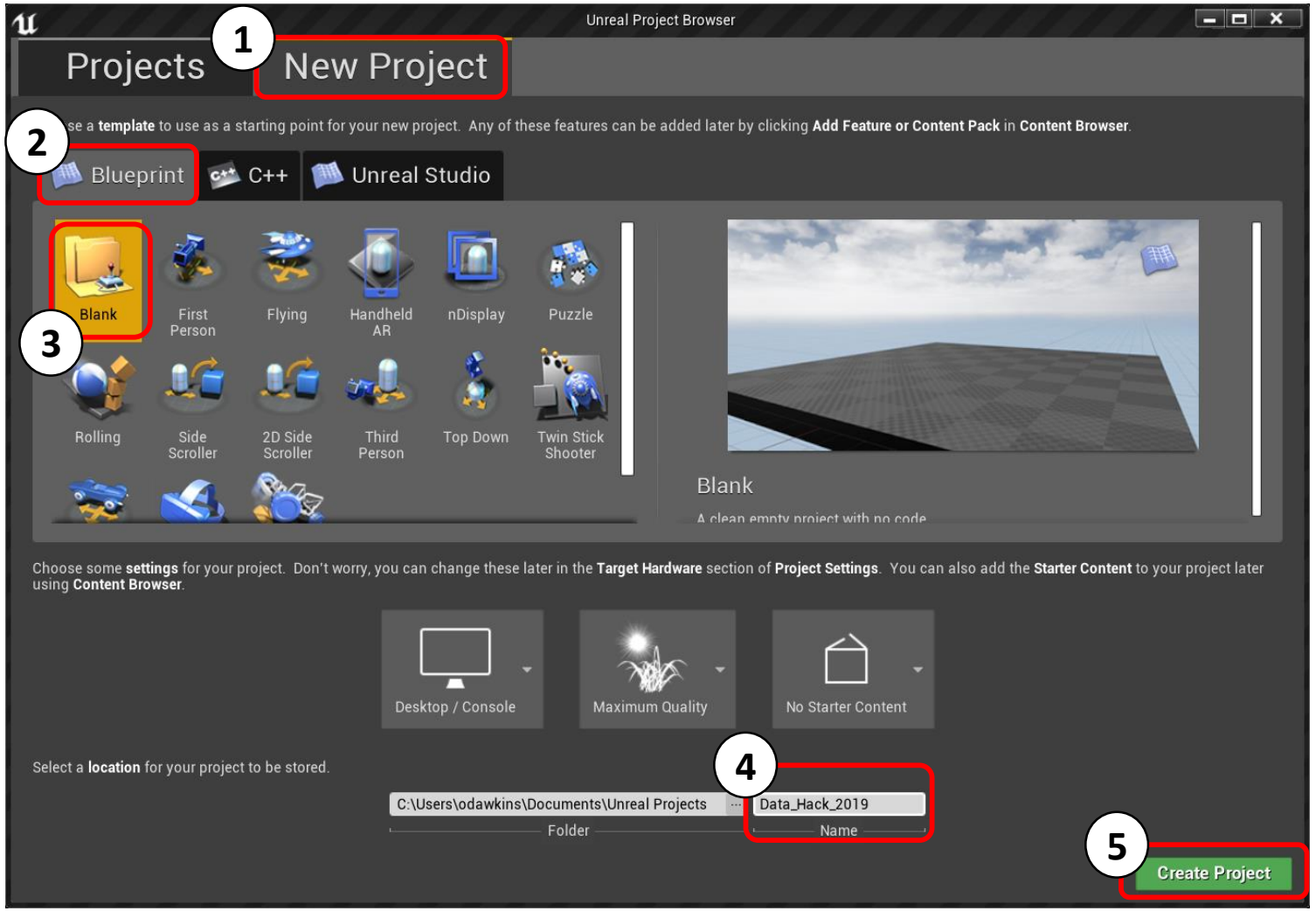
- **Download and install the launcher (can be skipped if launcher already installed)**
  Download and install the launcher to gain access to Unreal Studio. Datasmith is available on Windows 7, 8 and 10.
  DOWNLOAD UNREAL STUDIO

Download

- **Documentation & installation guide**
  View our documentation to get up and running with Unreal Studio.
  > VIEW DOCUMENTATION
- **Get the exporter plugins for 3ds Max and SketchUp Pro**
  > DOWNLOAD THE EXPORTER PLUGINS
- **Video tutorials**
  Watch our training series to jump-start your workflows with Unreal Studio.
  > WATCH VIDEO TUTORIALS

Open Unreal Engine

1. Start a ‘New Project’
2. Assume we want to use ‘Blueprint’ visual scripting at some point
3. Choose a suitable project template or ‘Blank’
4. Give the project a name
5. Click ‘Create Project’

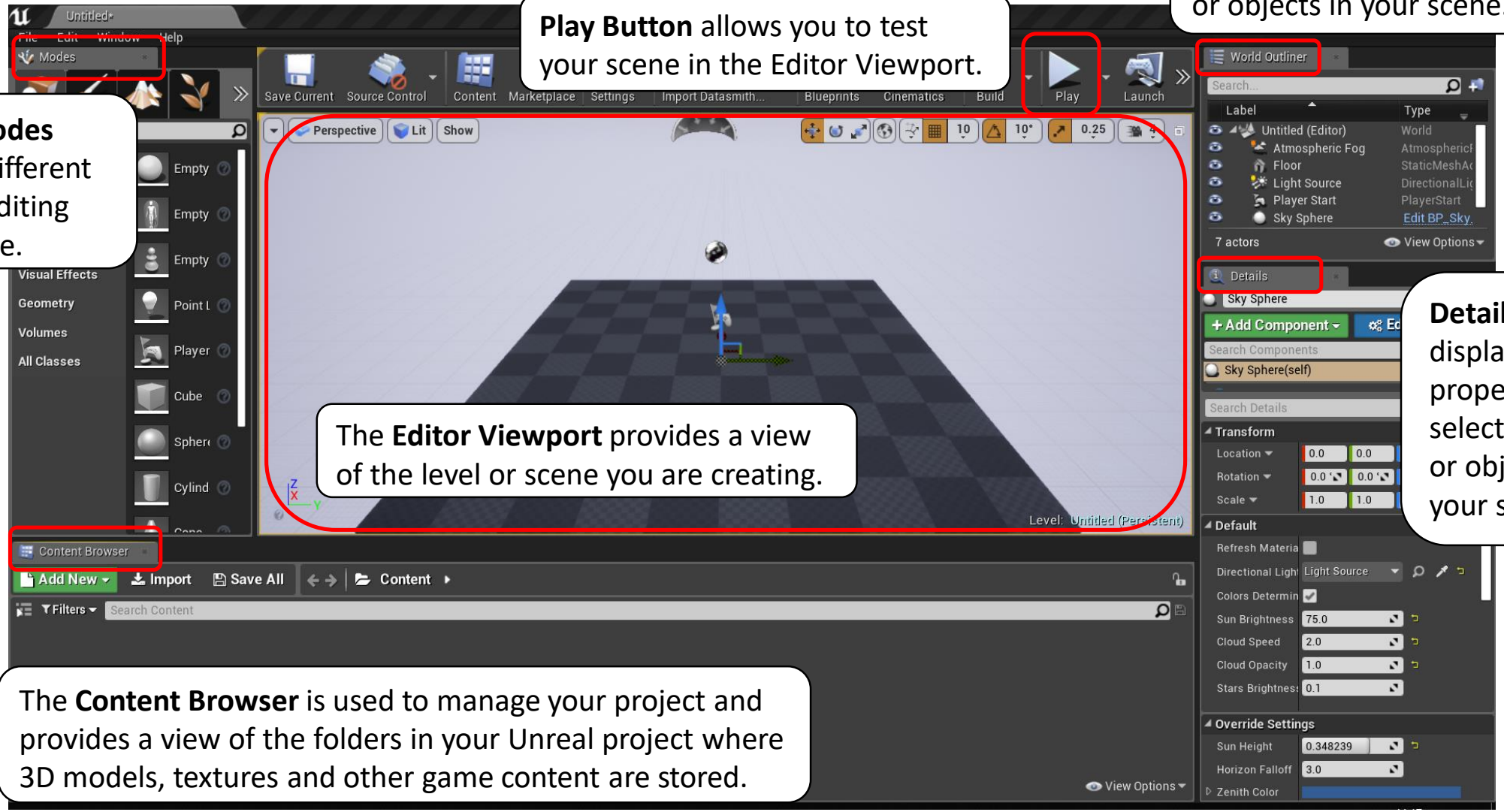


Unreal Engine User Interface

The **World Outliner** provides a hierarchical list of all the **Actors** or objects in your scene.

Play Button allows you to test your scene in the Editor Viewport.

Editor Modes provide different ways of editing your scene.

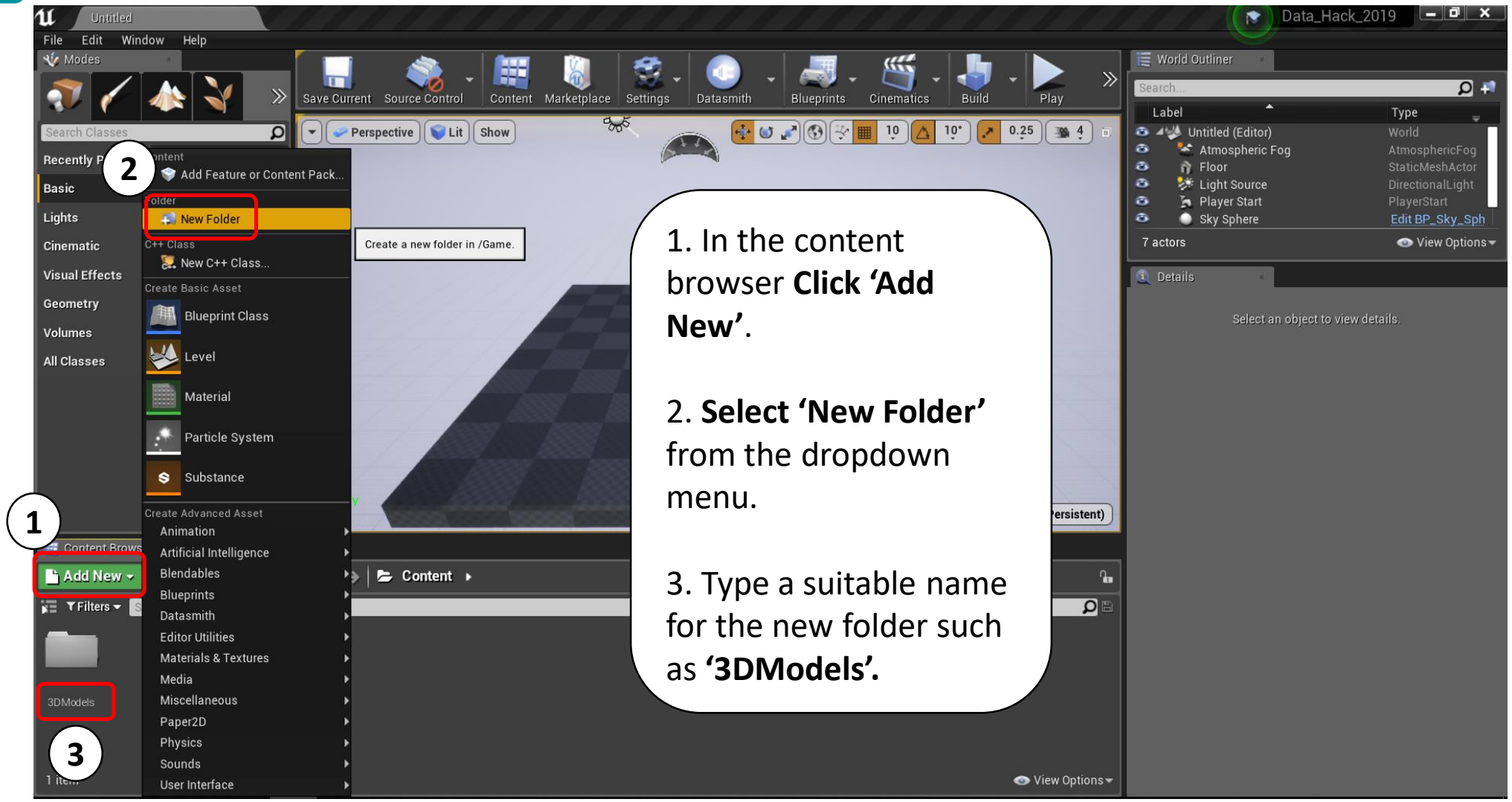


The **Editor Viewport** provides a view of the level or scene you are creating.

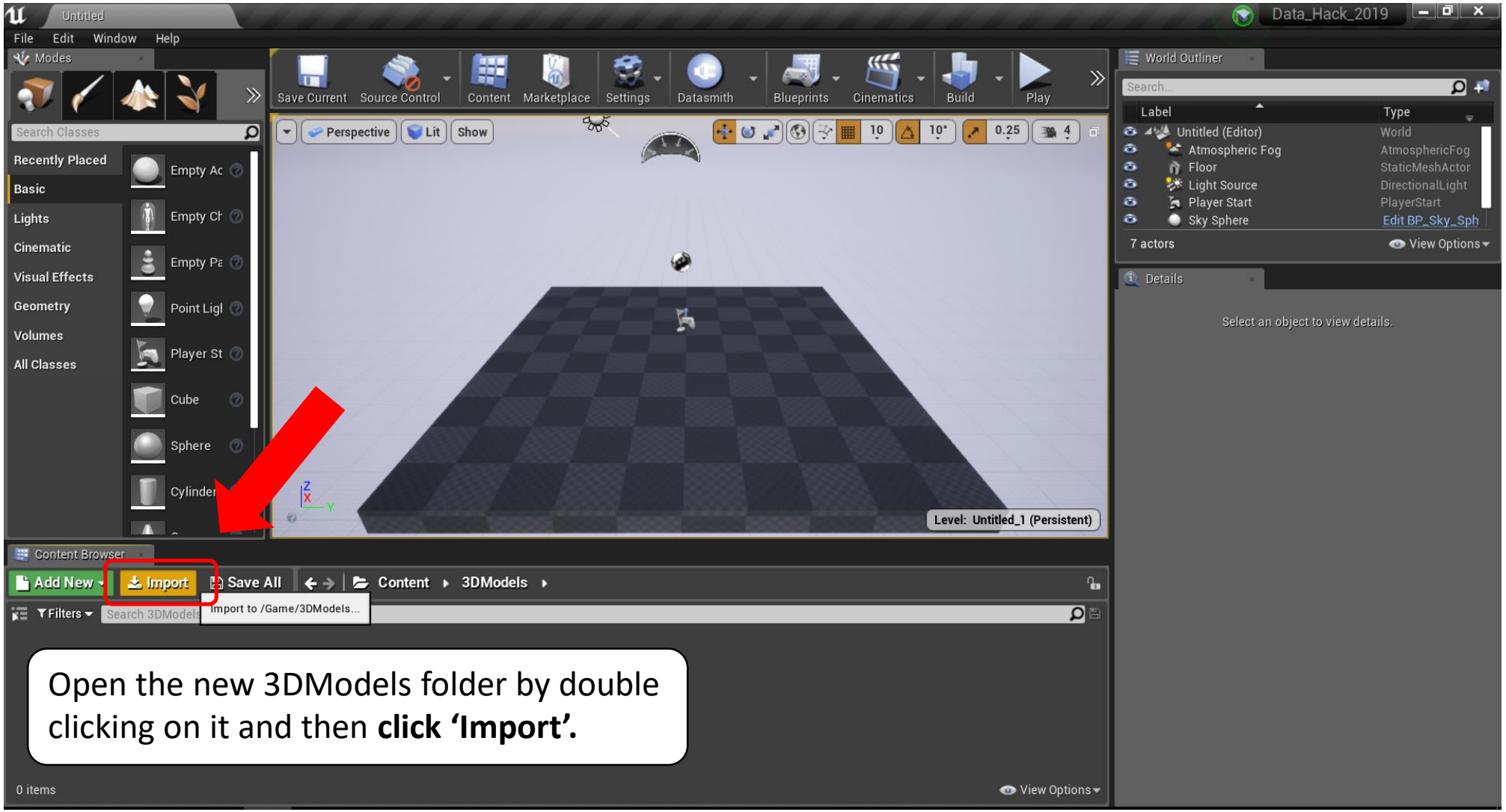
Details Panel displays the properties of selected Actors or objects in your scene.

The **Content Browser** is used to manage your project and provides a view of the folders in your Unreal project where 3D models, textures and other game content are stored.

Create a new 3DModels folder



Import 3D Model

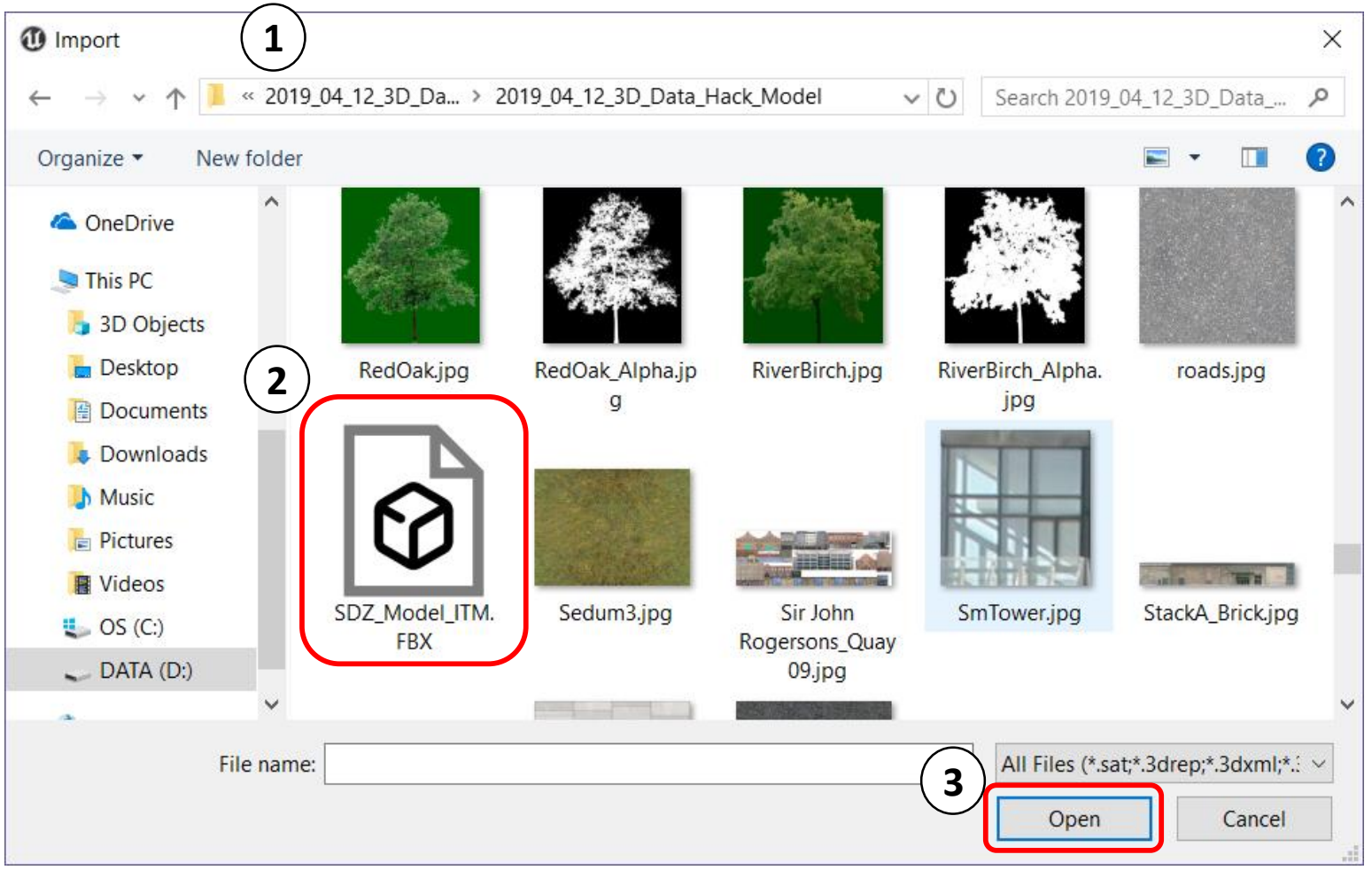


Open the new 3DModels folder by double clicking on it and then **click 'Import'.**

Select FBX file

1. Navigate to the location where you stored the Docklands 3D Model.
2. Select the file with the .FBX extension.
3. Click ‘Open’.

NOTE: The .FBX file that you download may have a different name to that pictured.

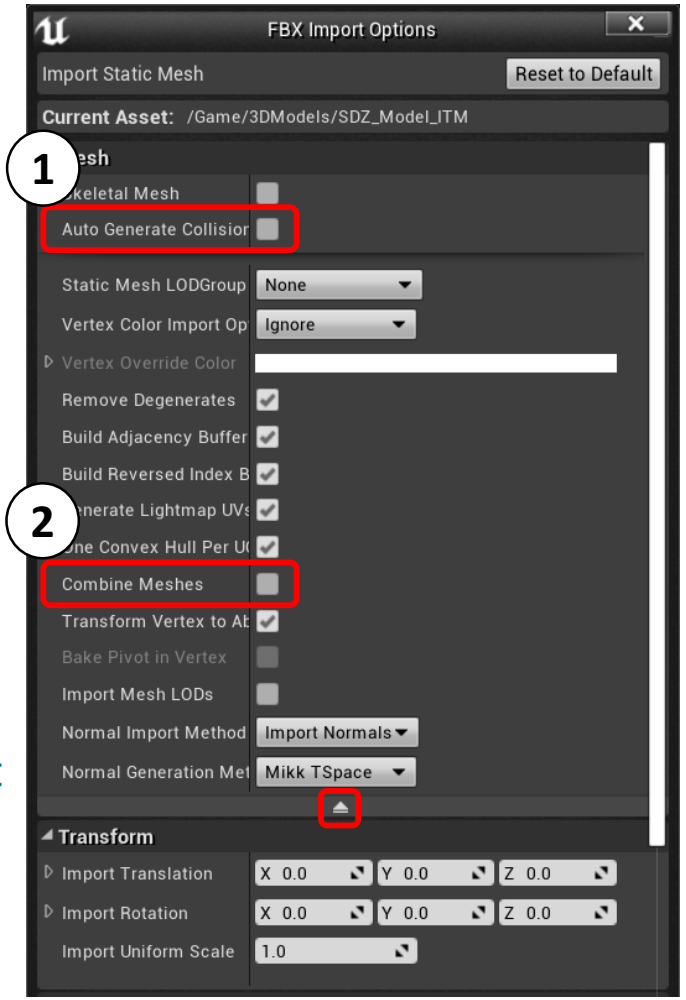


Import Settings

1. **Uncheck ‘Auto Generate Collision’** as we’ll add colliders later.

2. Expand the submenu dropdown and **Uncheck ‘Combine Meshes’** to ensure separate layers for buildings and other features are retained.

NOTE: Available import options may differ depending on the version of Unreal Engine you are using.



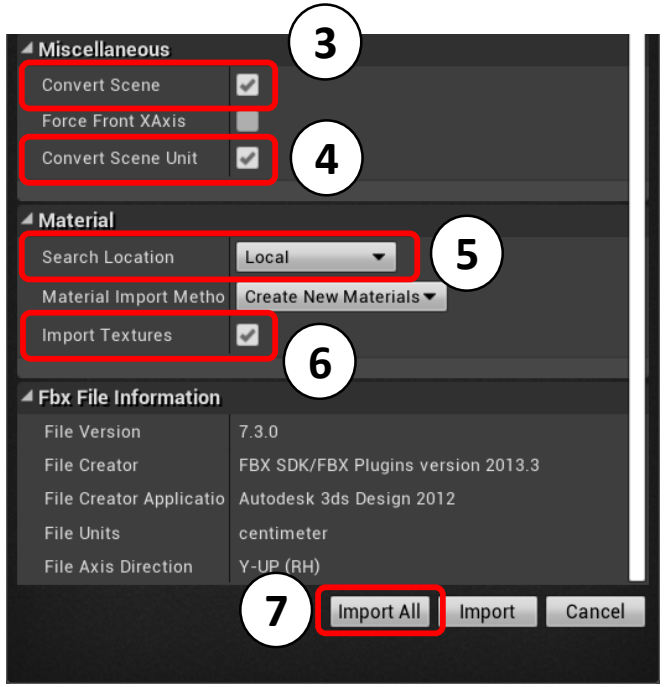
3. **Check ‘Convert Scene’** to use the UE4 coordinate system.

4. **Check ‘Convert Scene Unit’** to ensure the scale of the imported model is correct.

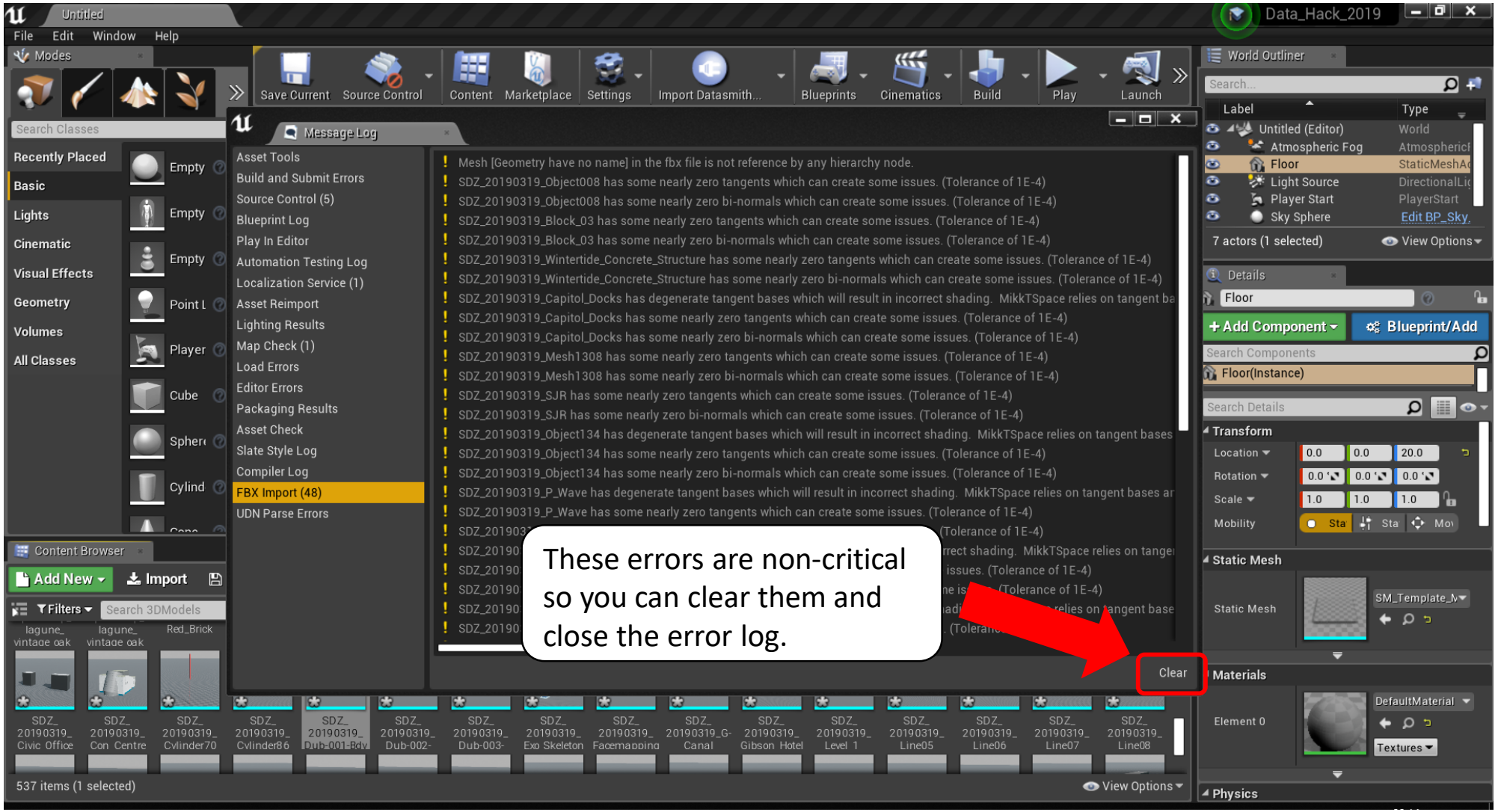
5. **Select ‘Local’** for the texture search location as the model textures are stored in the same folder as the .FBX.

6. **Check ‘Import Textures’**.

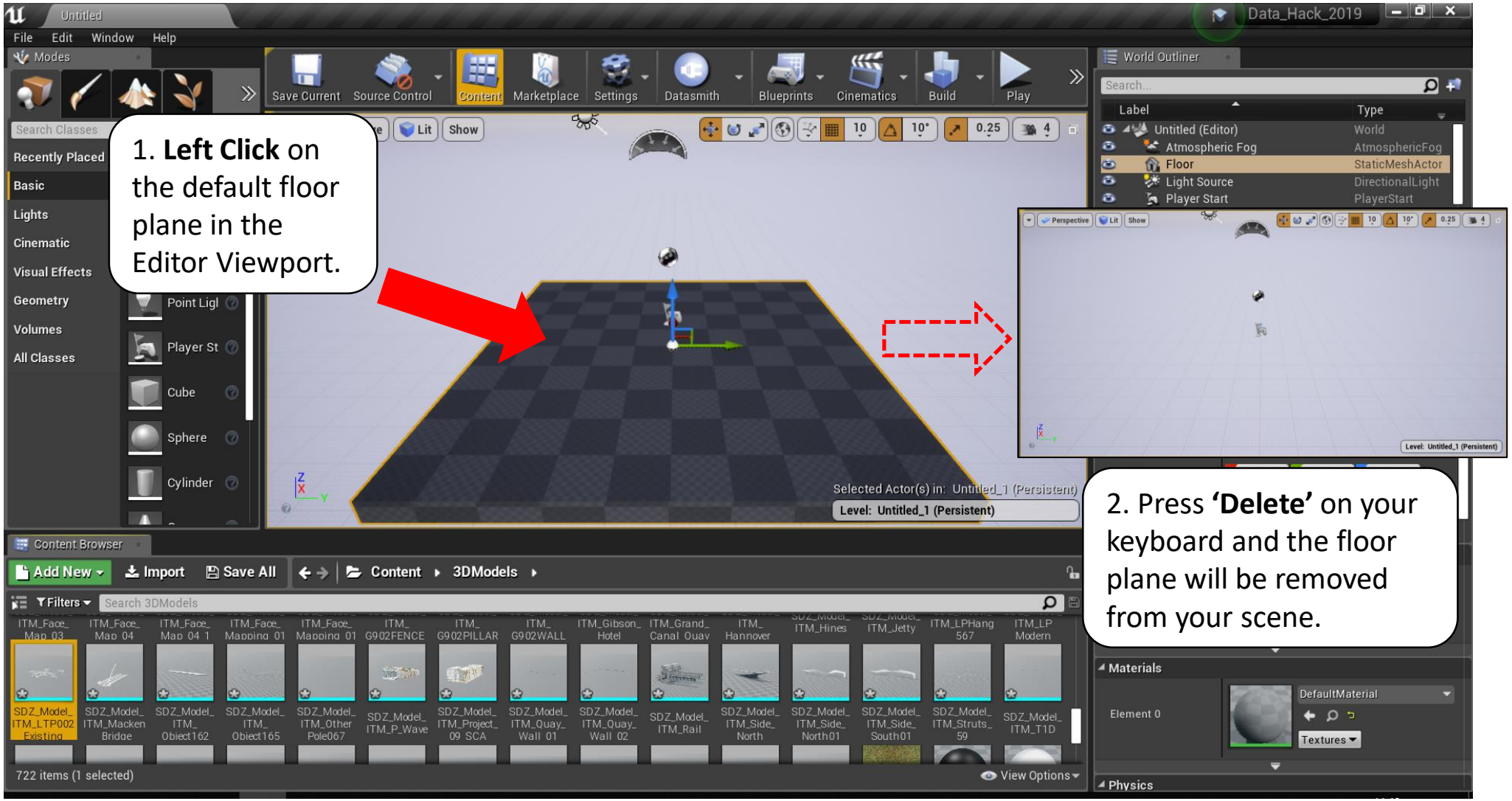
7. **Click ‘Import All’**.



Clear any Errors to Accept Import

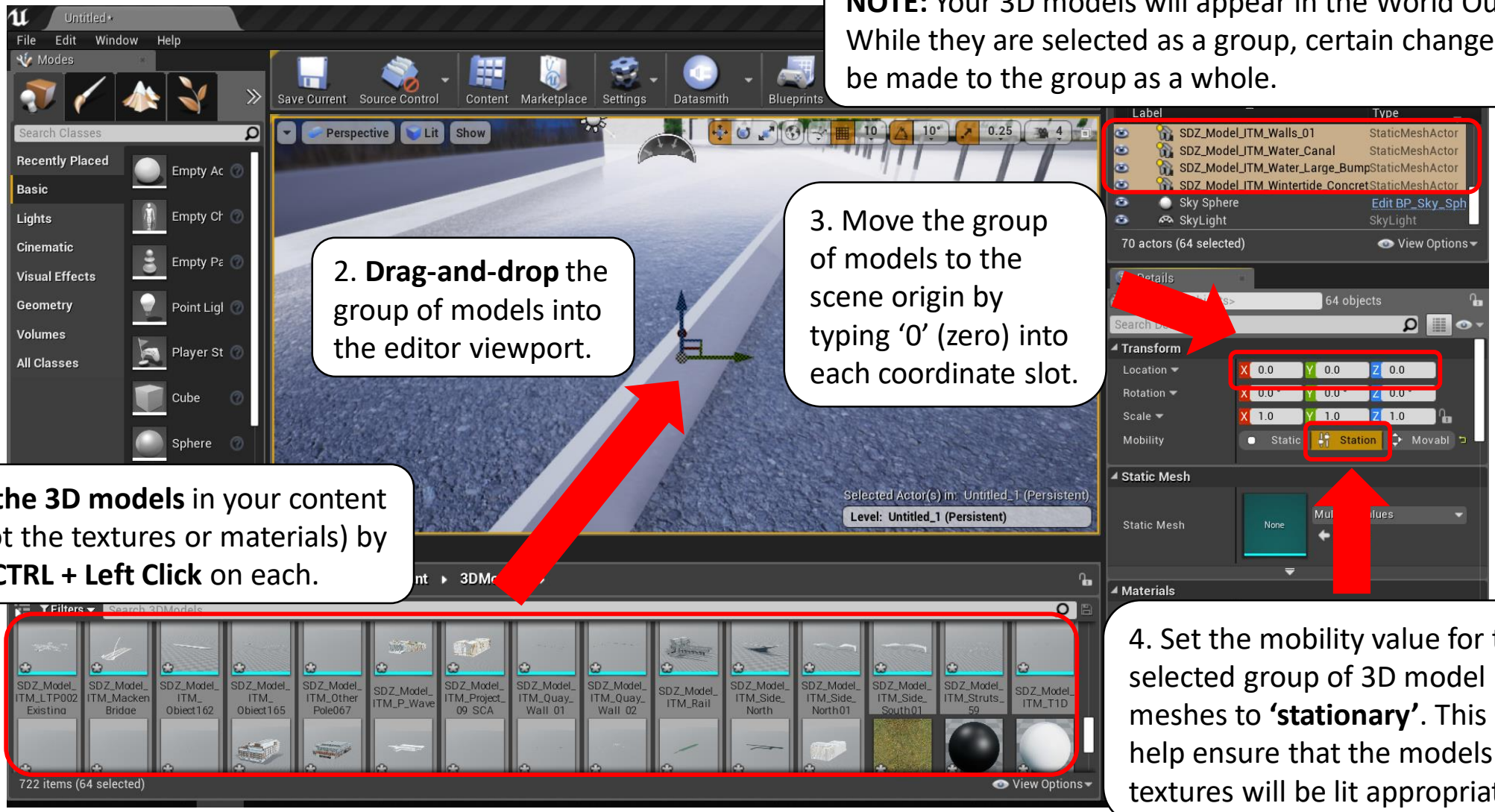


Delete Default Floor Plane



Select all of the 3D Models and drag them into your scene as a group

NOTE: Your 3D models will appear in the World Outliner. While they are selected as a group, certain changes can be made to the group as a whole.



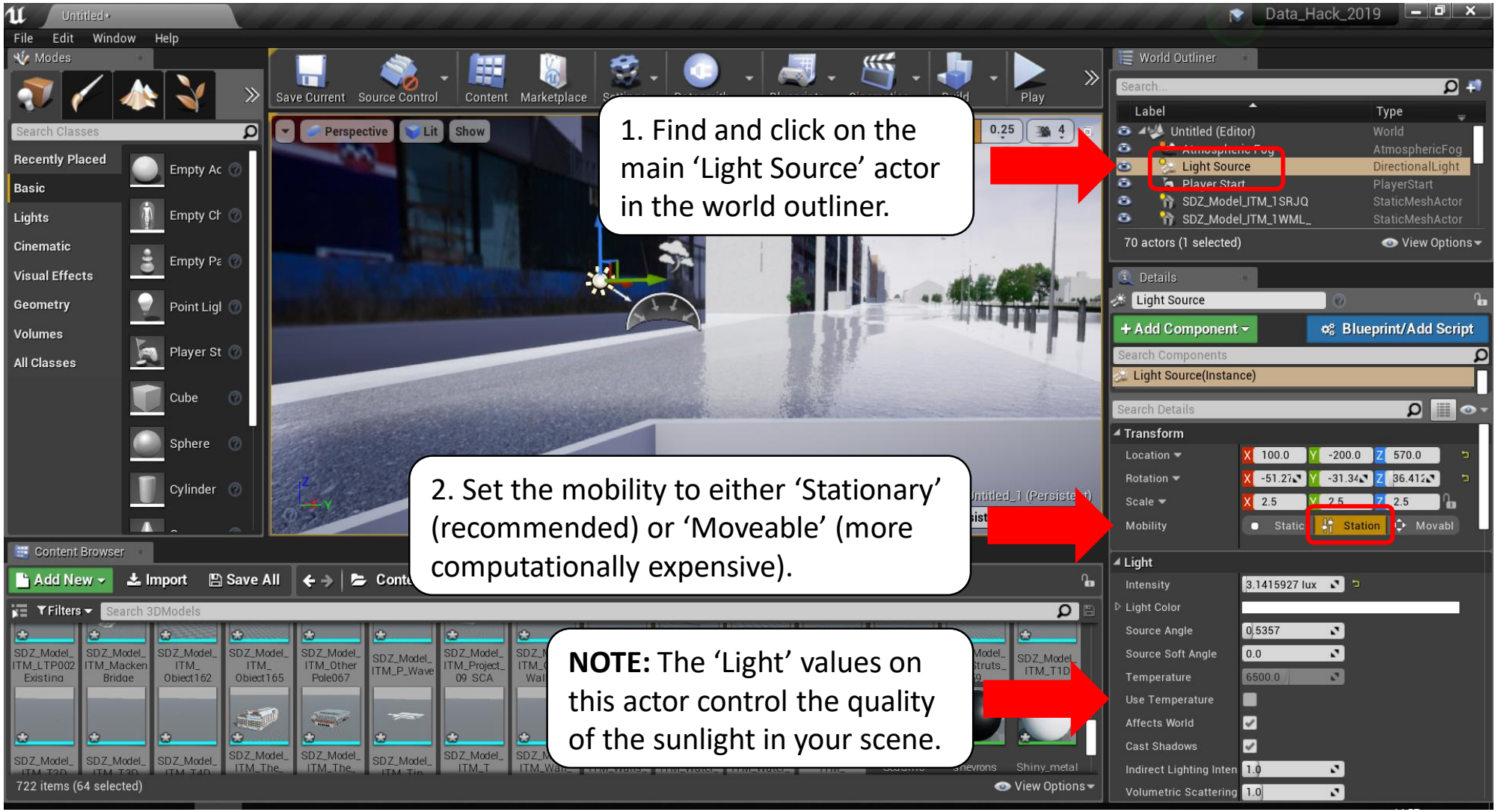
1. **Select the 3D models** in your content folder (not the textures or materials) by pressing **CTRL + Left Click** on each.

2. **Drag-and-drop** the group of models into the editor viewport.

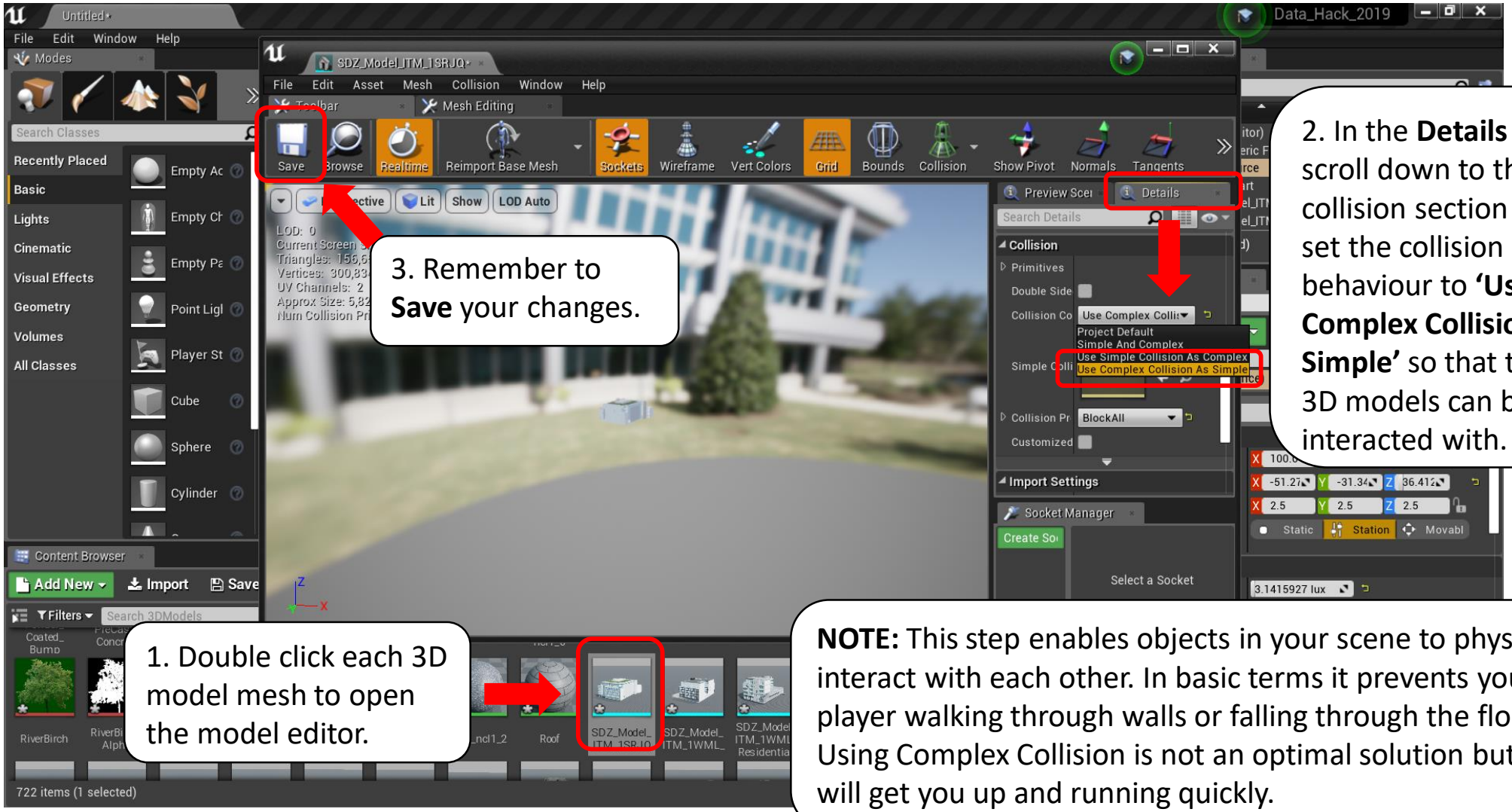
3. Move the group of models to the scene origin by typing ‘0’ (zero) into each coordinate slot.

4. Set the mobility value for the selected group of 3D model meshes to **‘stationary’**. This can help ensure that the models and textures will be lit appropriately.

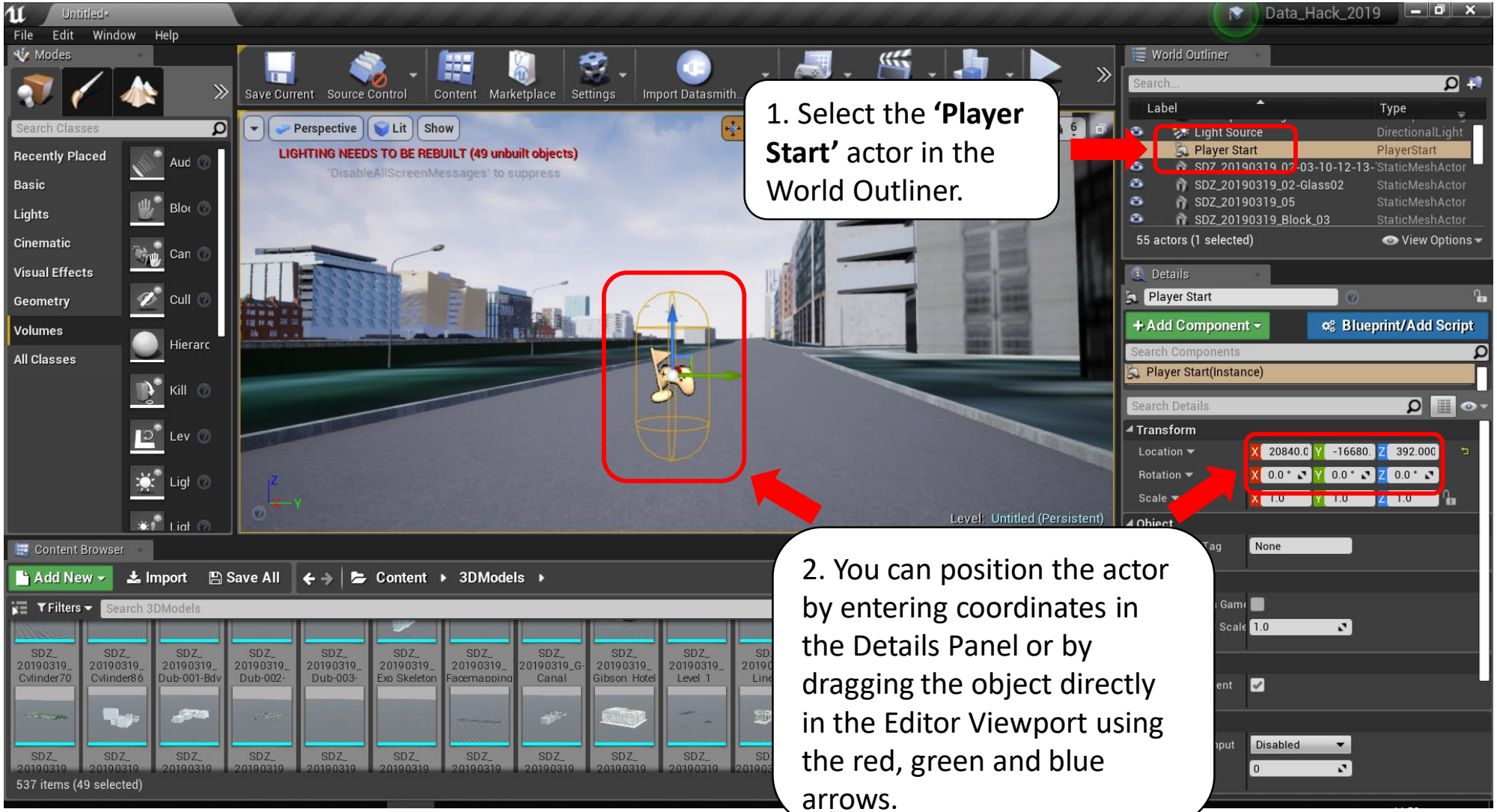
Set Sun to ‘Stationery/Dynamic’



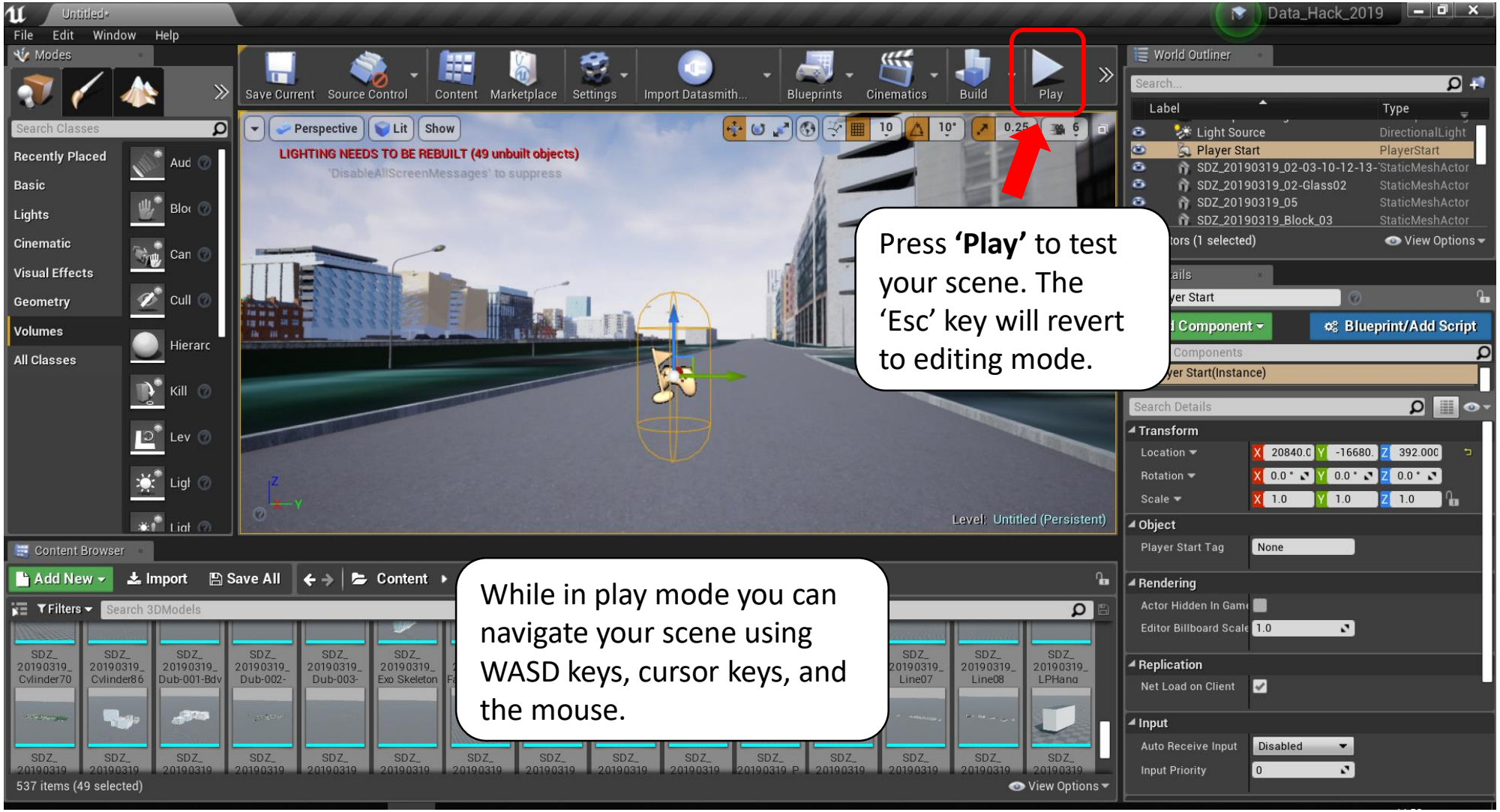
Set Complex Collision As Simple (each mesh)



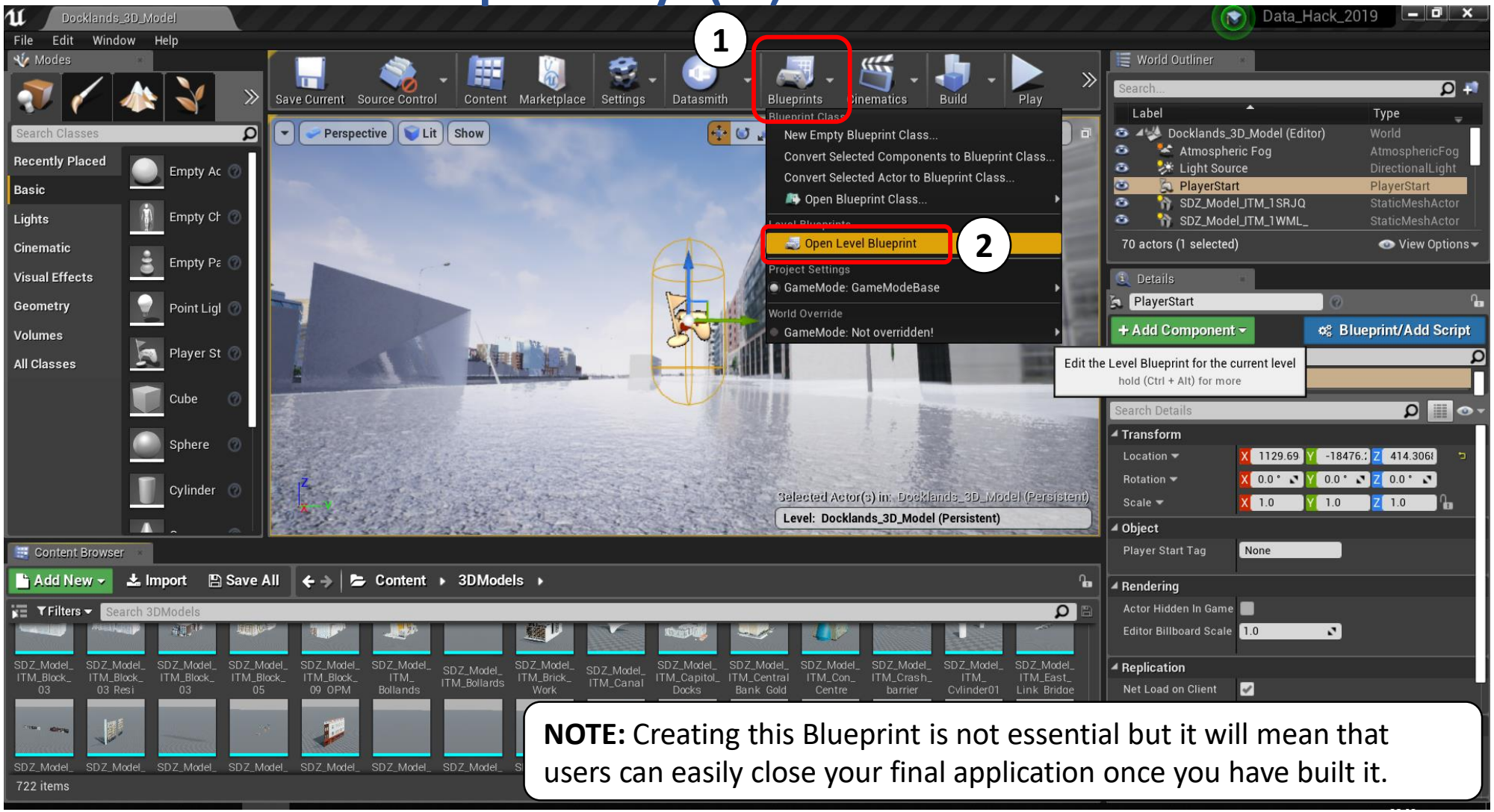
Move Player to your preferred start location



Press Play to test your scene

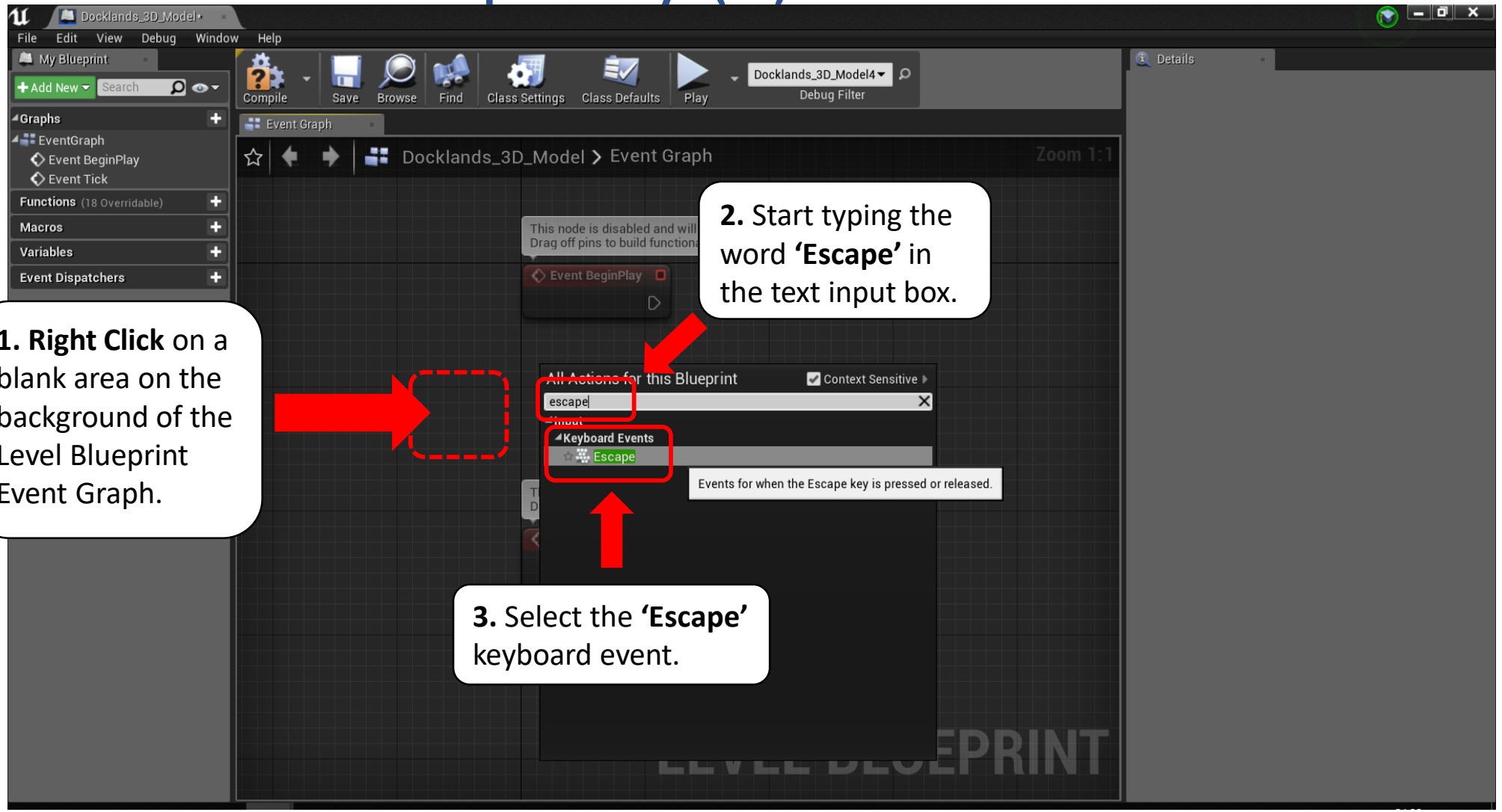


Creating a Blueprint to close your application with the Escape key (1)

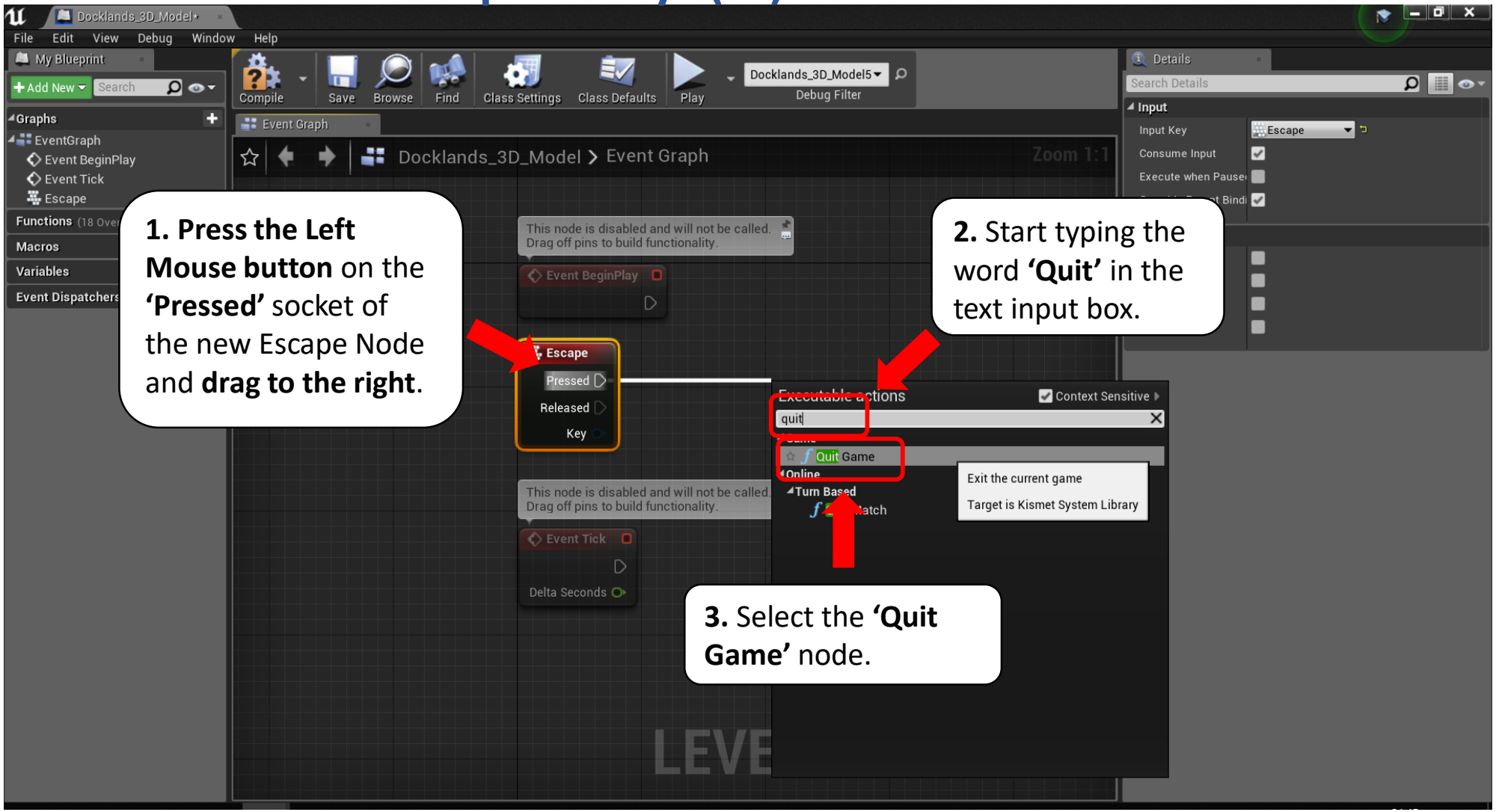


NOTE: Creating this Blueprint is not essential but it will mean that users can easily close your final application once you have built it.

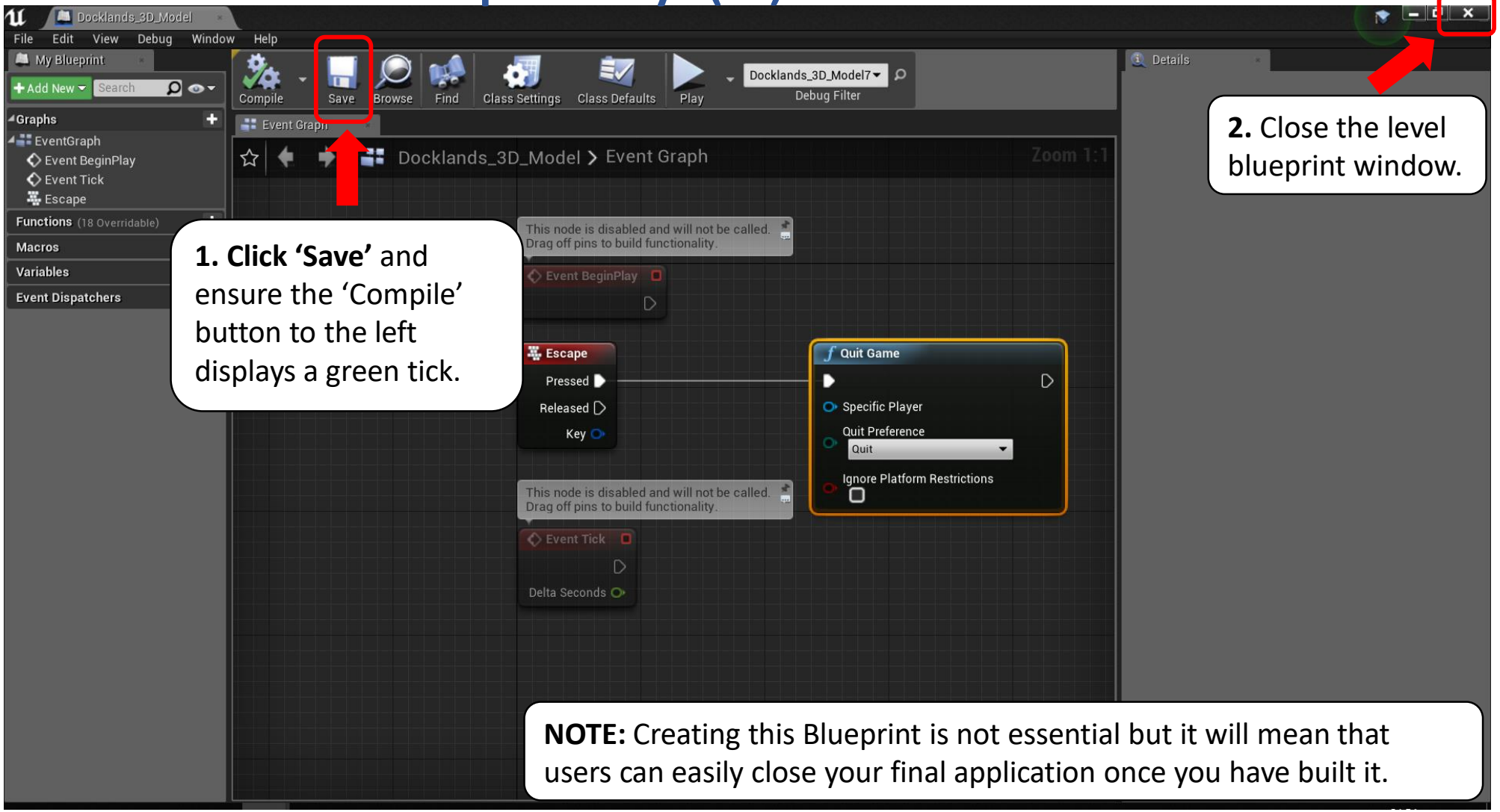
Creating a Blueprint to close your application with the Escape key (2)



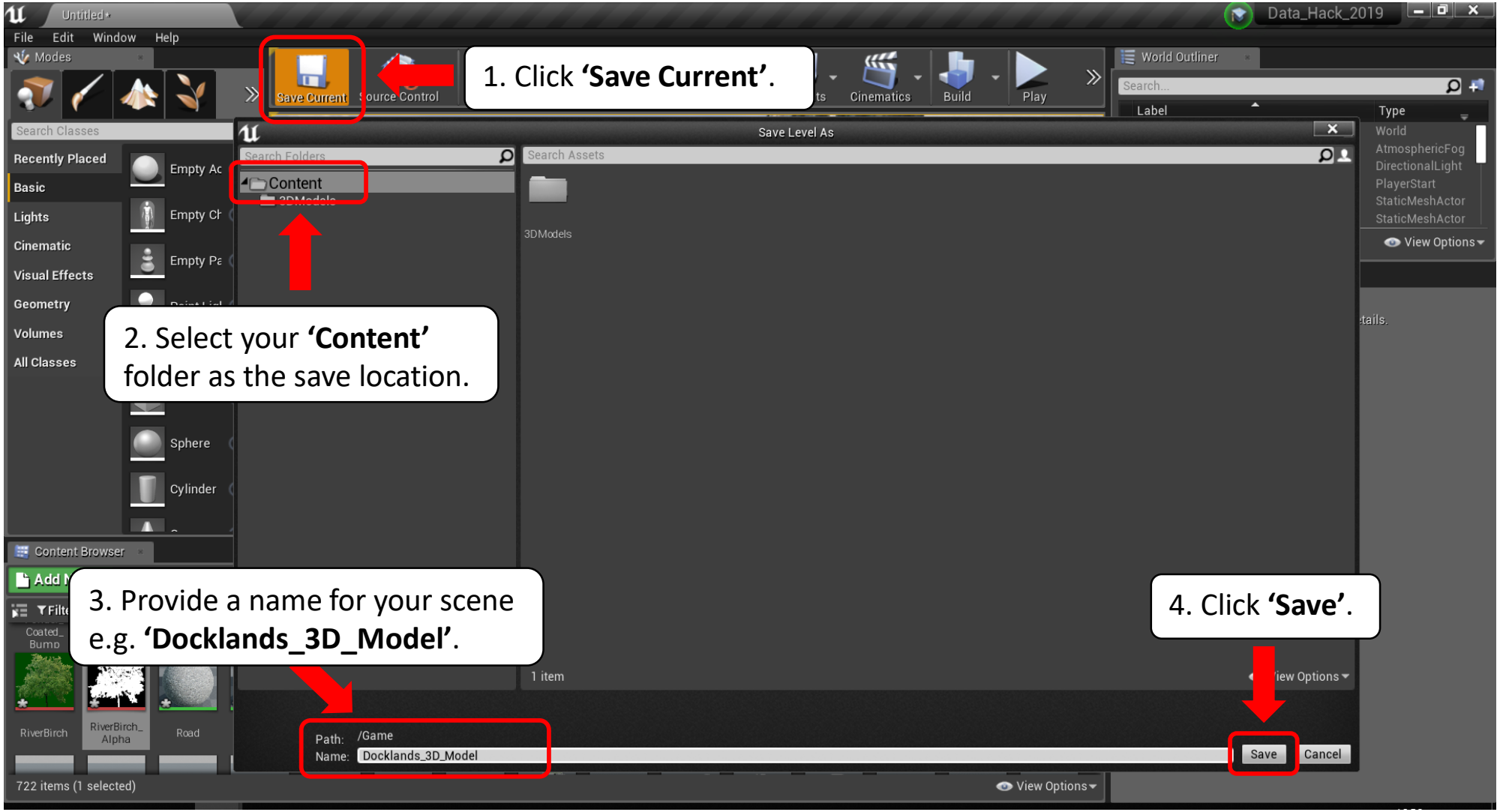
Creating a Blueprint to close your application with the Escape key (3)



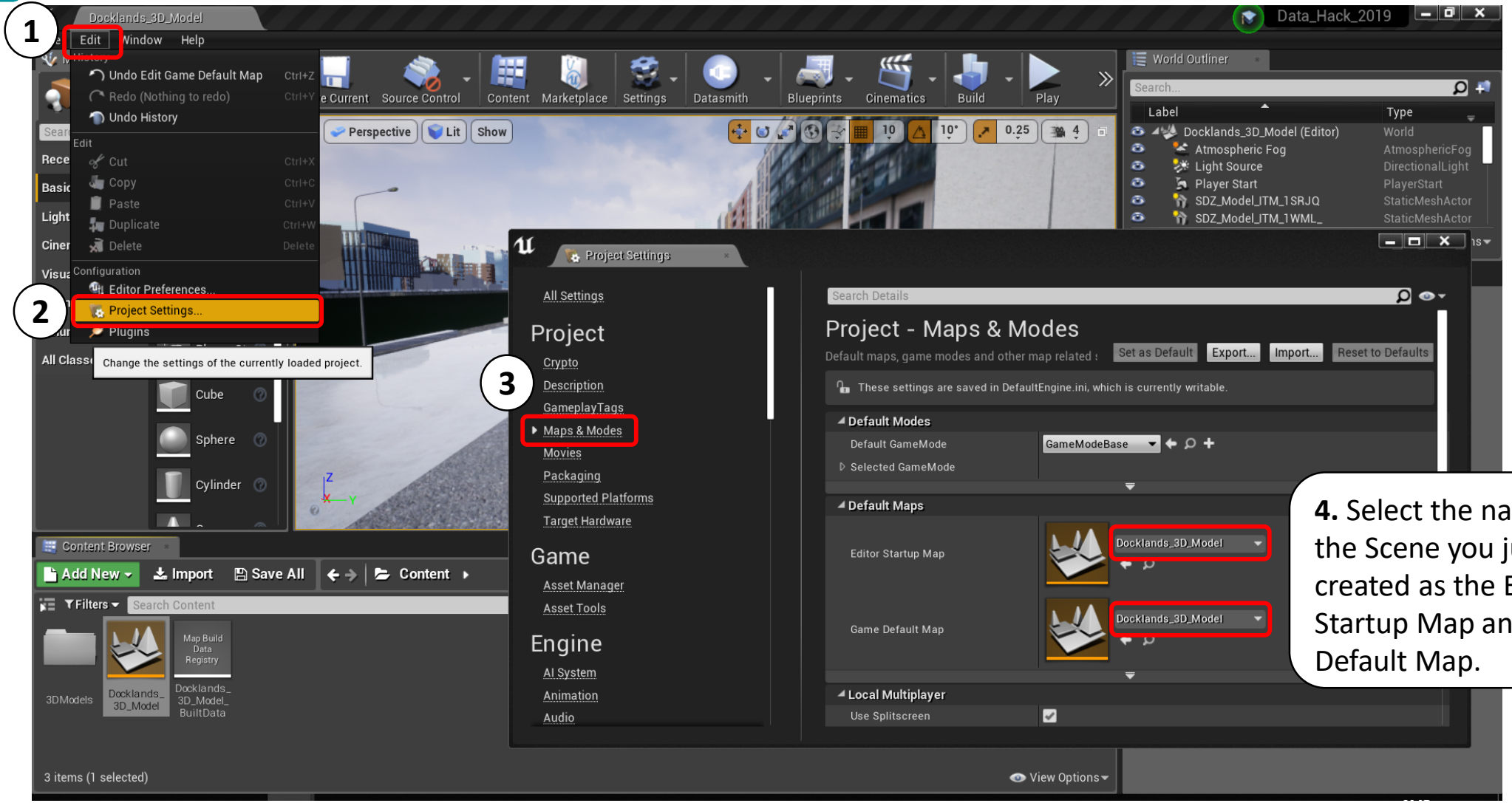
Creating a Blueprint to close your application with the Escape key (4)



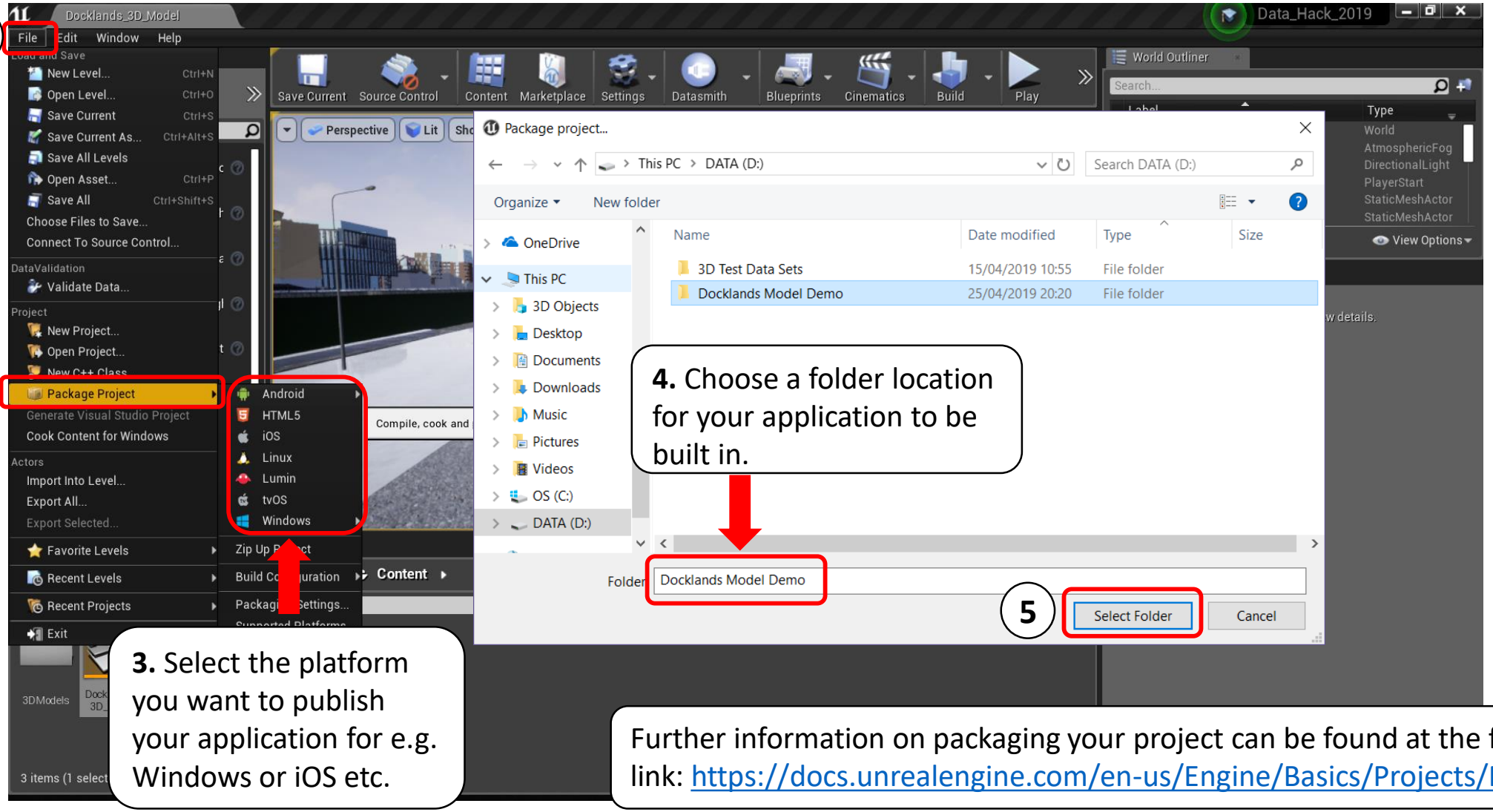
Save your scene



Package your project for distribution (1)

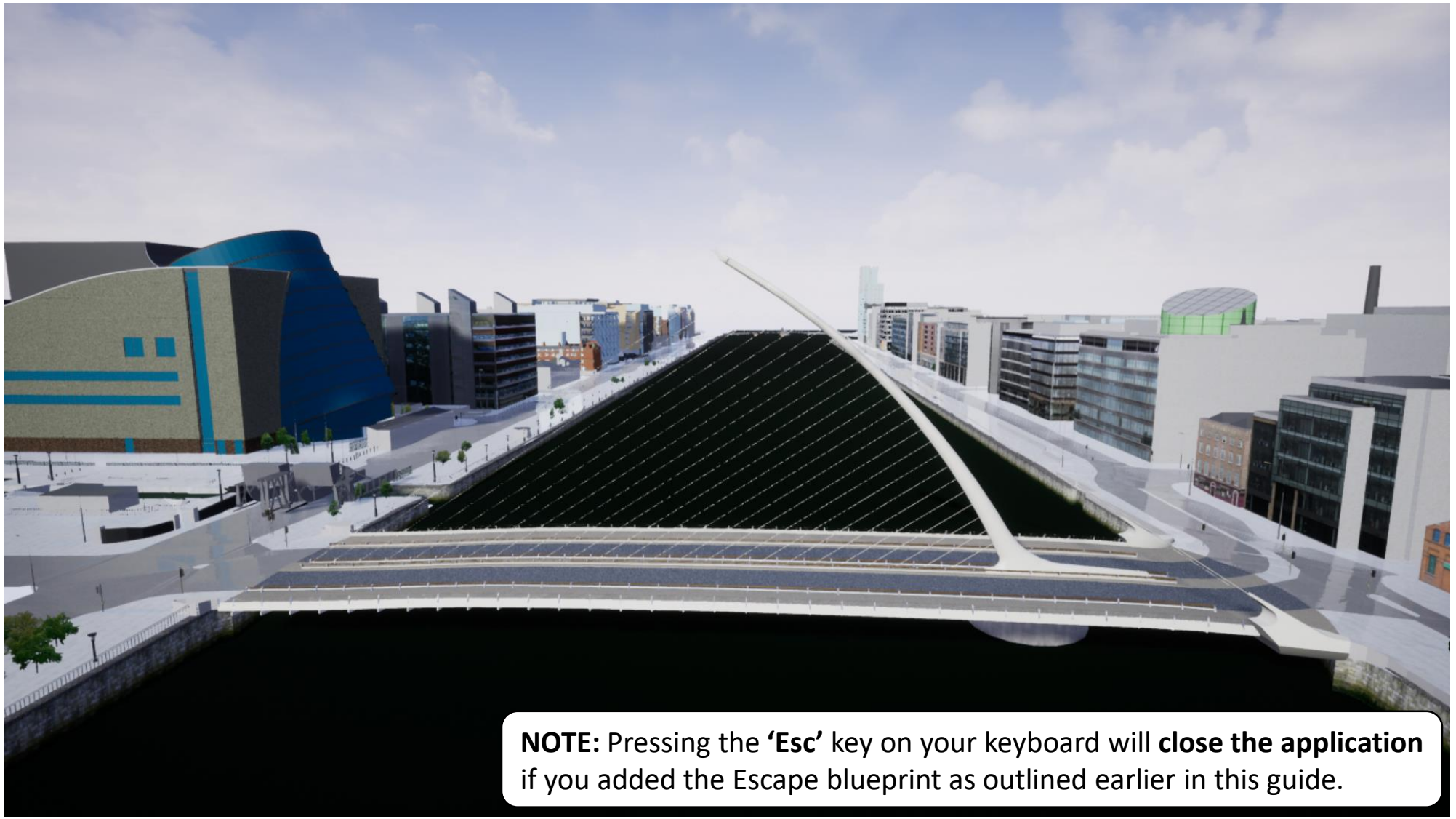


Package your project for distribution (2)

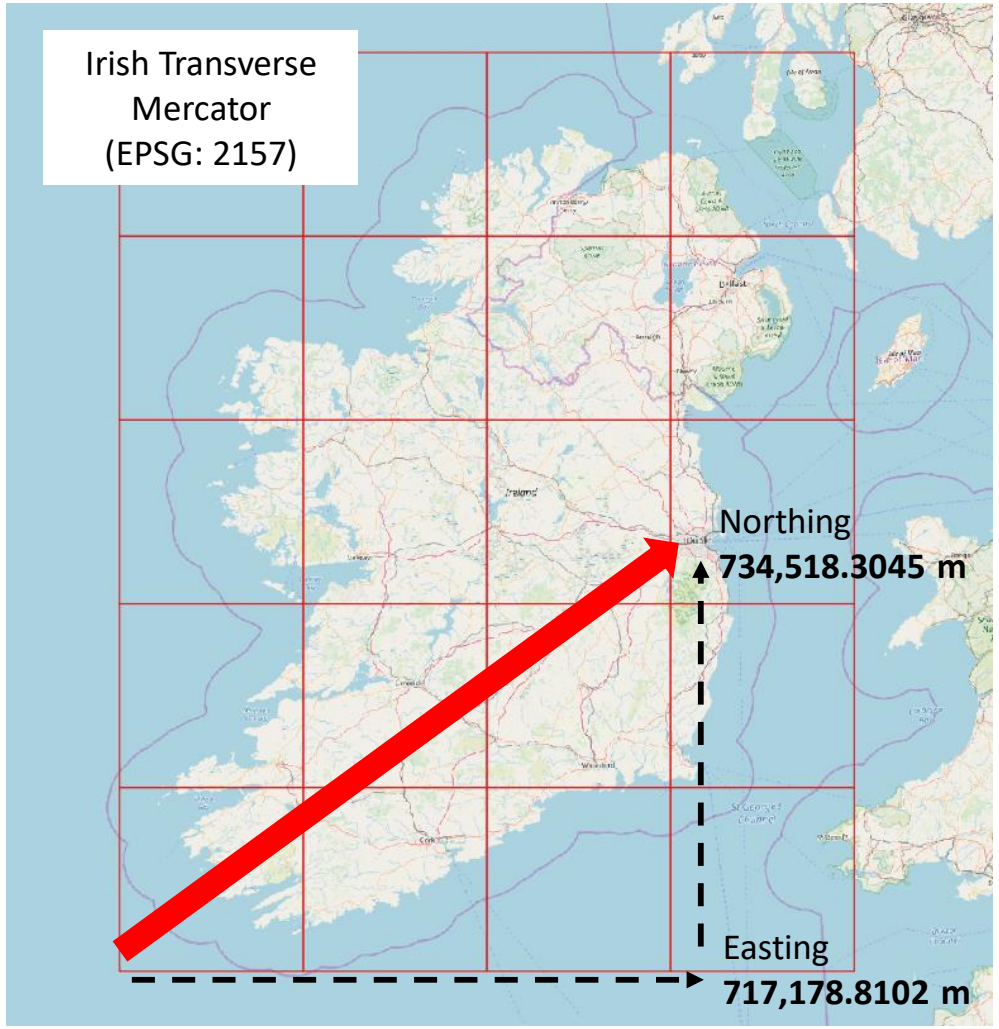


Further information on packaging your project can be found at the following link: https://docs.unrealengine.com/en-us/Engine/Basics/Projects/Packaging

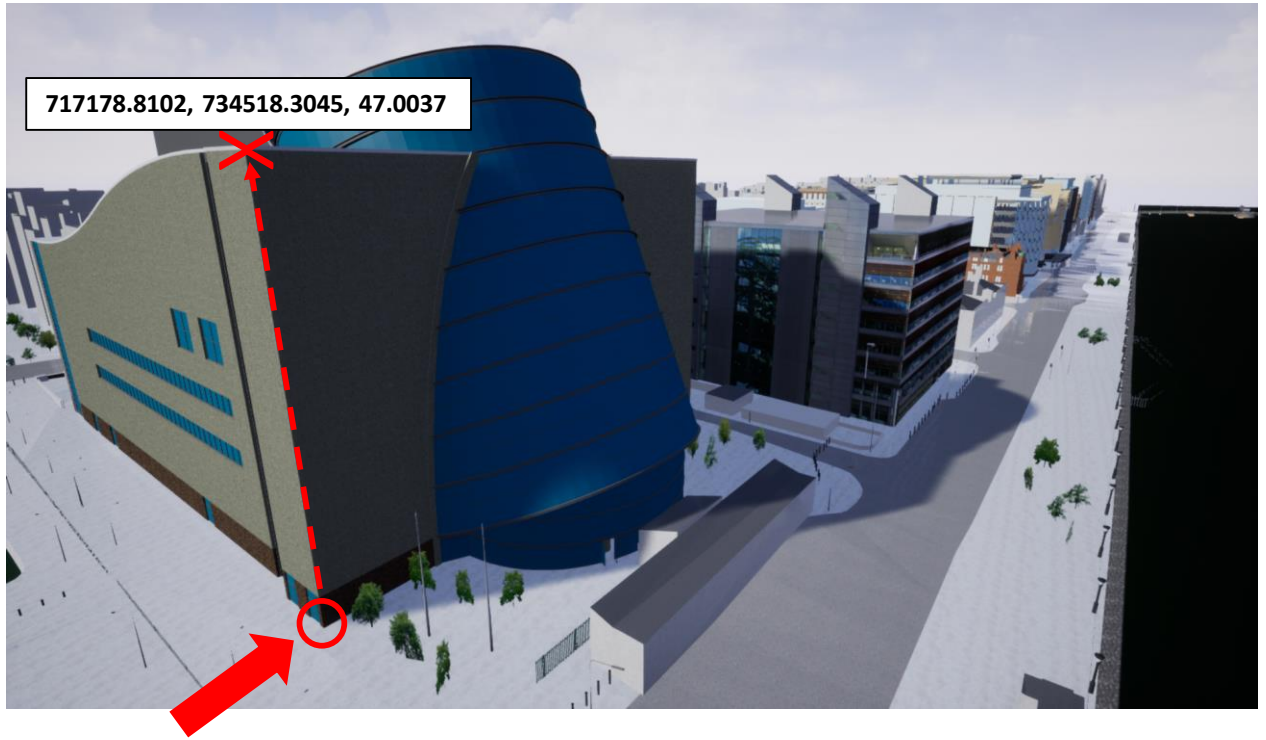
Run your application .exe to test



A spatial reference for geolocating data



©OpenStreetMap Contributors



Coordinates for the roofline on the south east corner of the Convention Centre Dublin (CCD) in ITM (EPSG: 2157) are:

E: 717178.8102 m / N: 734518.3045 m / Alt: 47.0037 m

See: https://en.wikipedia.org/wiki/Irish_Transverse_Mercator

Further ways to enhance your scene

- Import Starter Content and use the sample props and materials like ‘Glass’ to enhance your scene: https://docs.unrealengine.com/en-us/Engine/Content/Packs
- Use free assets from the UE4 Marketplace: https://www.unrealengine.com/marketplace/
- Use Datasmith to help you work with your own architectural models and data sets: https://docs.unrealengine.com/en-US/Studio/Datasmith
- Explore the different Blueprint and Unreal Studio project templates which can give you a head start in building different types of applications e.g. VR and AR.
- Add interactivity and other functionality without coding using Blueprints: https://docs.unrealengine.com/en-US/Engine/Blueprints/GettingStarted
- Make use of the extensive learning materials and tutorials provided by the Unreal Academy: https://academy.unrealengine.com/

Trouble Shooting

- My model textures look stretched
  - After importing models, saving your scene and restarting Unreal Engine can resolve issues with textures
  - You can also edit materials to correct problems with textures and enhance their look: https://docs.unrealengine.com/en-US/Engine/Rendering/Materials/IntroductionToMaterials
- My player has a label 'BADSize' and floats in the air or beneath the ground when I press play
  - Check that you have set 'Complex Collision as Simple' on each of your 3D models: https://docs.unrealengine.com/en-us/Engine/Physics/SimpleVsComplex
- My player passes through the floor or walls
  - Check that you have set 'Complex Collision as Simple' on each of your 3D models: https://docs.unrealengine.com/en-us/Engine/Physics/SimpleVsComplex

  NOTE: Simple colliders aren't sufficiently detailed for our complex building models. Be aware that even with complex Collision enabled, the player can pass through back faces of geometry.
- My 3D models have turned black
  - Check that you have set the model's mobility setting to 'Stationary'
  - Check that the mobility of your main Light Source is set to 'Stationary' or 'Dynamic'
  - Try rebuilding your lighting: https://wiki.unrealengine.com/LightingTroubleshootingGuide

Building City Dashboards

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