



**Building
City
Dashboards**



National Centre for Geocomputation
An tionad Náisiúnta Georíomháireachta



**Social
Sciences
Institute**



**Maynooth
University**
National University
of Ireland Maynooth



3D Data Hack Dublin

Unreal Engine Starter Guide



dashboards.maynoothuniversity.ie
[@dashbuild](mailto:dashboards@mu.ie)



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

Organisation

Transport and Infrastructure

Manage

PRIVATE Give feedback on dataset

3D Data Hack Dublin Resources

Resources for the 3D Data Hack Dublin Updated Mapping and Modelling of environment from stereoscopic aerial photography dated 2018 to LOD 2. Plus buildings added to LOD3 level from various planning data sets 2015 / 2018.

Data and Resources

Move_File_ITM.txt	Preview	Download	Edit
SDZ_Model_ITM_20190424.FBX	More information	Go to resource	Edit
SDZ_Model_ITM_24.max	More information	Go to resource	Edit
SDZ_Model_ITM_Textures_20190424.zip	More information	Go to resource	Edit

3D Data Hack Dublin

What is it? Locational Data are a vitally important components of applications across the fields of Planning, Transportation, Logistics, Healthcare, Financial Services and... [read more](#)

Openness

Social

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 is 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 been 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:

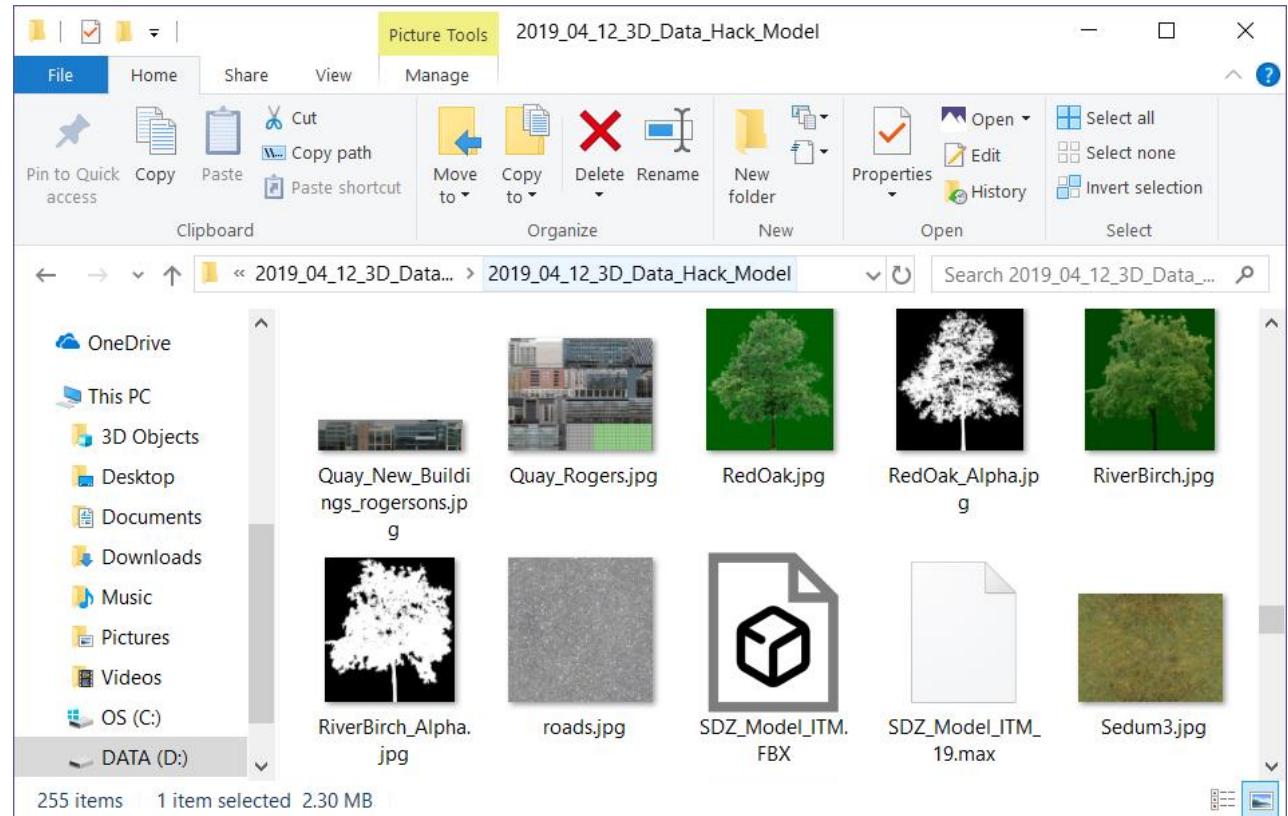
The spatial offset described by the move file can be used to determine the real world coordinates of objects that have been placed in the 3ds Max project. The offset is required because 3D modelling and visualisation software has tended to use a single precision floating point number format to describe 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 world 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

The screenshot shows the official Unreal Engine website. At the top, there's a navigation bar with links for EPIC GAMES, UNREAL ENGINE, NEWS, ABOUT, LEARN, COMMUNITY, MARKETPLACE, and ENTERPRISE. To the right of the navigation are icons for search, globe, user sign-in, and a prominent blue 'DOWNLOAD' button, which is highlighted with a red arrow. Below the navigation is a large banner image of a sleek sports car at night. Overlaid on the banner is the text 'Make Something Unreal' in large white letters, followed by 'with the most powerful creation engine' in smaller white letters. A blue 'GET STARTED NOW' button is centered in the banner. In the bottom right corner of the banner, it says 'UNREAL ENGINE SIZZLE REEL 2018'. At the very bottom of the page, there's a dark footer bar with the text 'We use cookies to ensure the best experience on all Epic Games websites. To learn more, please see our [privacy policy](#)' and a 'CLOSE' button.

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



Create an Account and Select a Licence

1

Epic Games

Create Account

SIGN UP

IRELAND

* FIRST NAME *LAST NAME

*DISPLAY NAME

*EMAIL

*PASSWORD

I would like to receive latest news and information on this product.

I have read and agree to the [terms of service](#).

CREATE ACCOUNT

Have an Epic Games account? [Sign In](#)

2

UNREAL ENGINE

In order to download, you must agree to the appropriate End User License Agreement.

Game Developers Enterprise

This royalty-free license is for architecture, product design, manufacturing, design visualization and linear entertainment professionals, educators and students who are not intending to release Unreal-powered software to consumers. It covers Unreal Studio and Unreal Engine 4.

You agreed to the [Studio End User License Agreement](#)

PROCEED TO STUDIO DOWNLOAD

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.

Getting Started with Unreal Studio

TUTORIAL SERIES



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

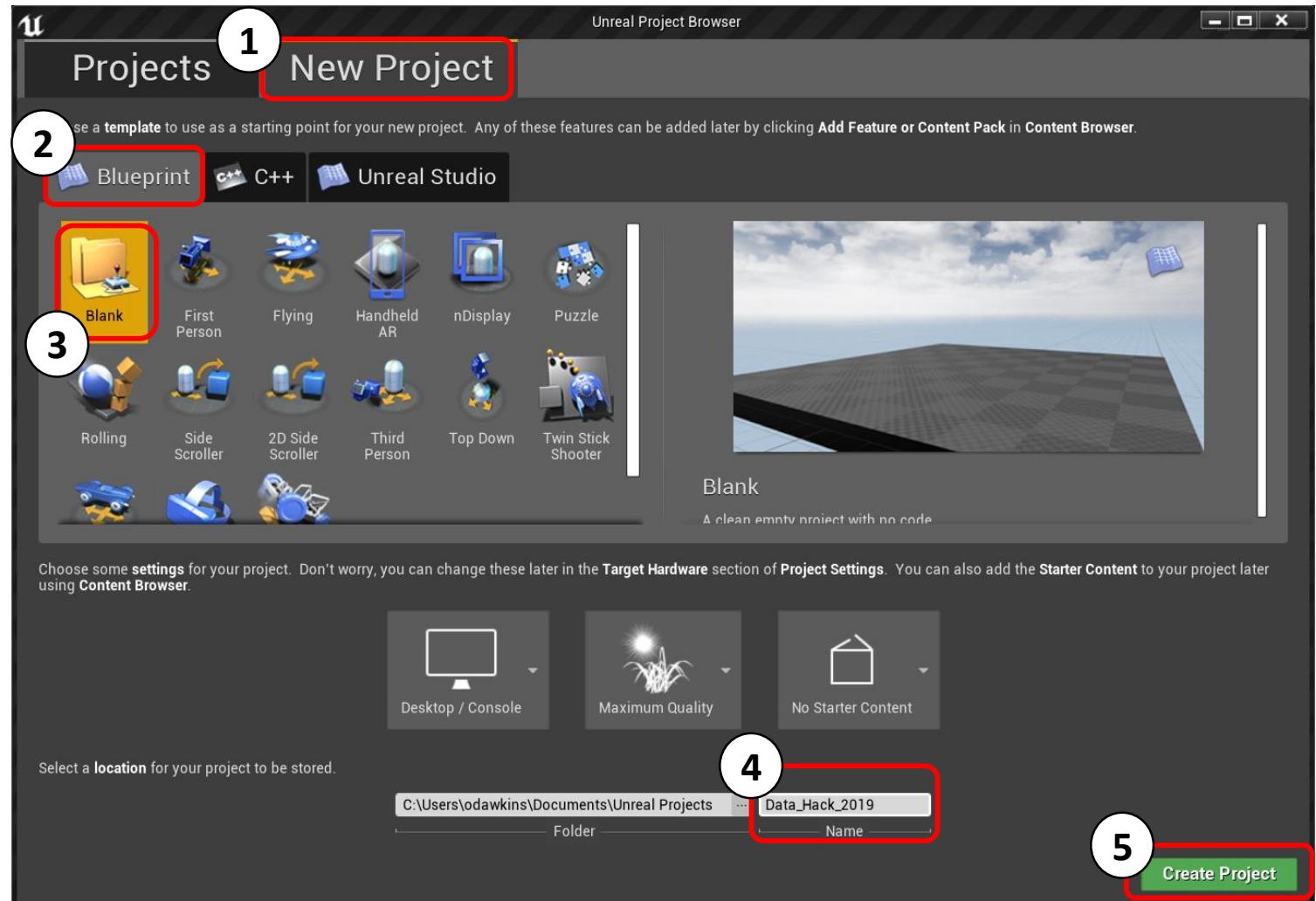
Watch our training series to jump-start your workflows with Unreal Studio.

[> 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’





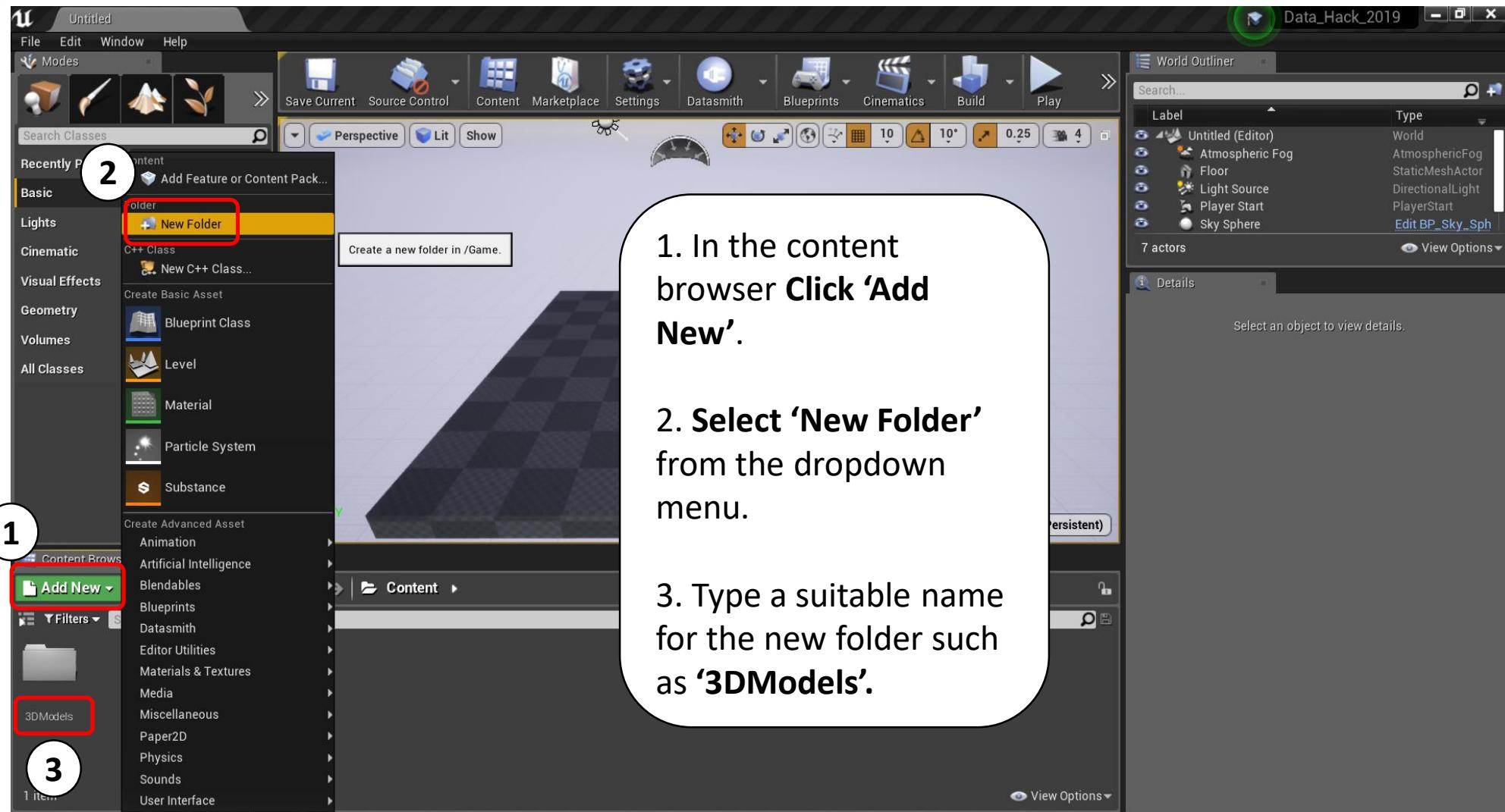
Unreal Engine User Interface

The screenshot shows the Unreal Engine Editor interface with several callout boxes highlighting specific features:

- Editor Modes**: A callout box points to the "Modes" dropdown in the top menu bar, which is highlighted with a red box.
- Content Browser**: A callout box points to the "Content Browser" tab at the bottom left of the interface, which is highlighted with a red box.
- Play Button**: A callout box points to the "Play" button in the top right toolbar, which is highlighted with a red box.
- Editor Viewport**: A large callout box surrounds the central 3D Editor Viewport, which is highlighted with a red box. Inside this box, text states: "The Editor Viewport provides a view of the level or scene you are creating."
- World Outliner**: A callout box points to the "World Outliner" panel on the right side, which is highlighted with a red box. Inside this box, text states: "The World Outliner provides a hierarchical list of all the Actors or objects in your scene."
- Details Panel**: A callout box points to the "Details" panel at the bottom right, which is highlighted with a red box. Inside this box, text states: "Details Panel displays the properties of selected Actors or objects in your scene."
- Text at Bottom**: A callout box at the bottom left contains the text: "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."

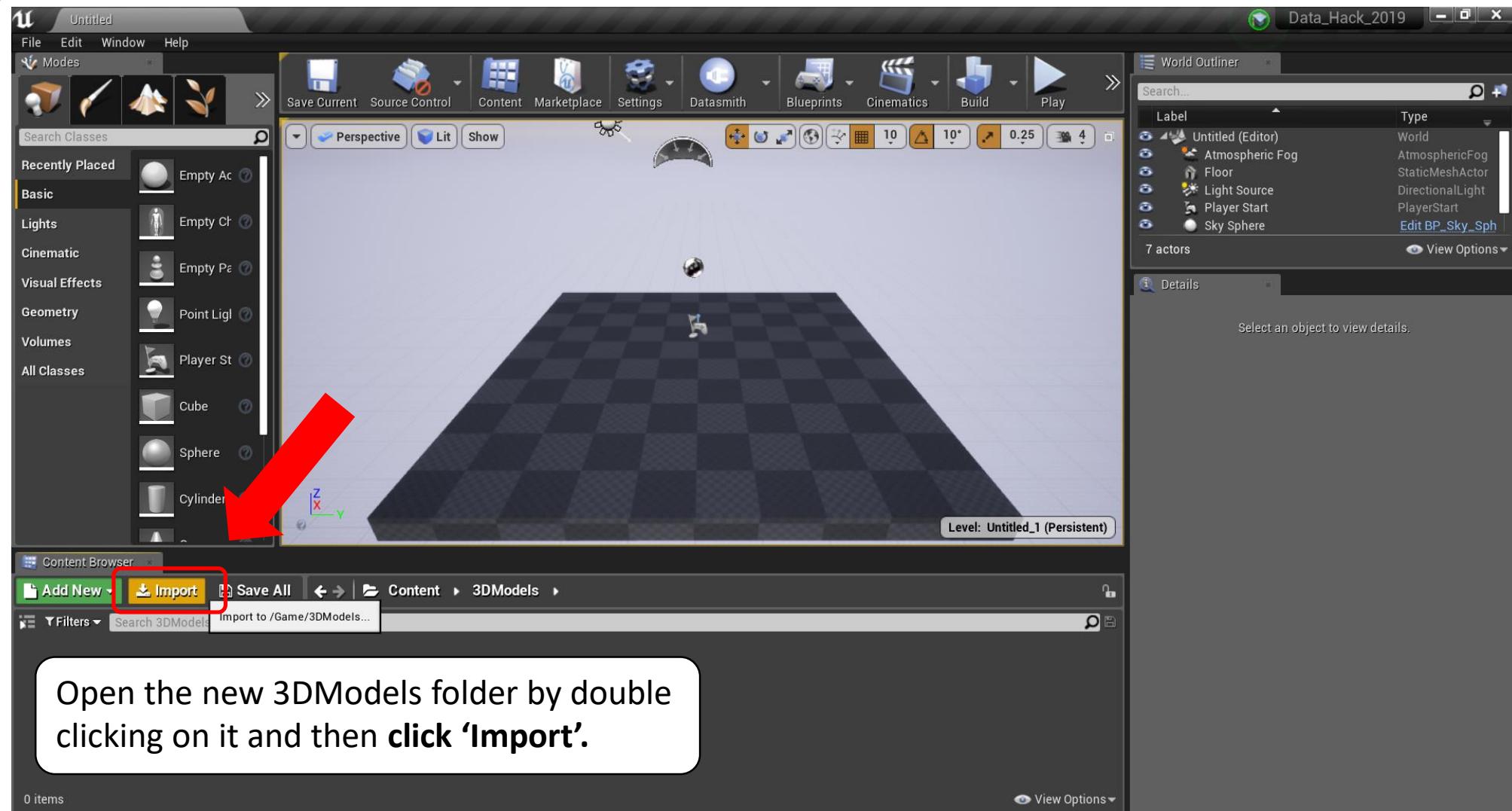


Create a new 3DModels folder





Import 3D Model

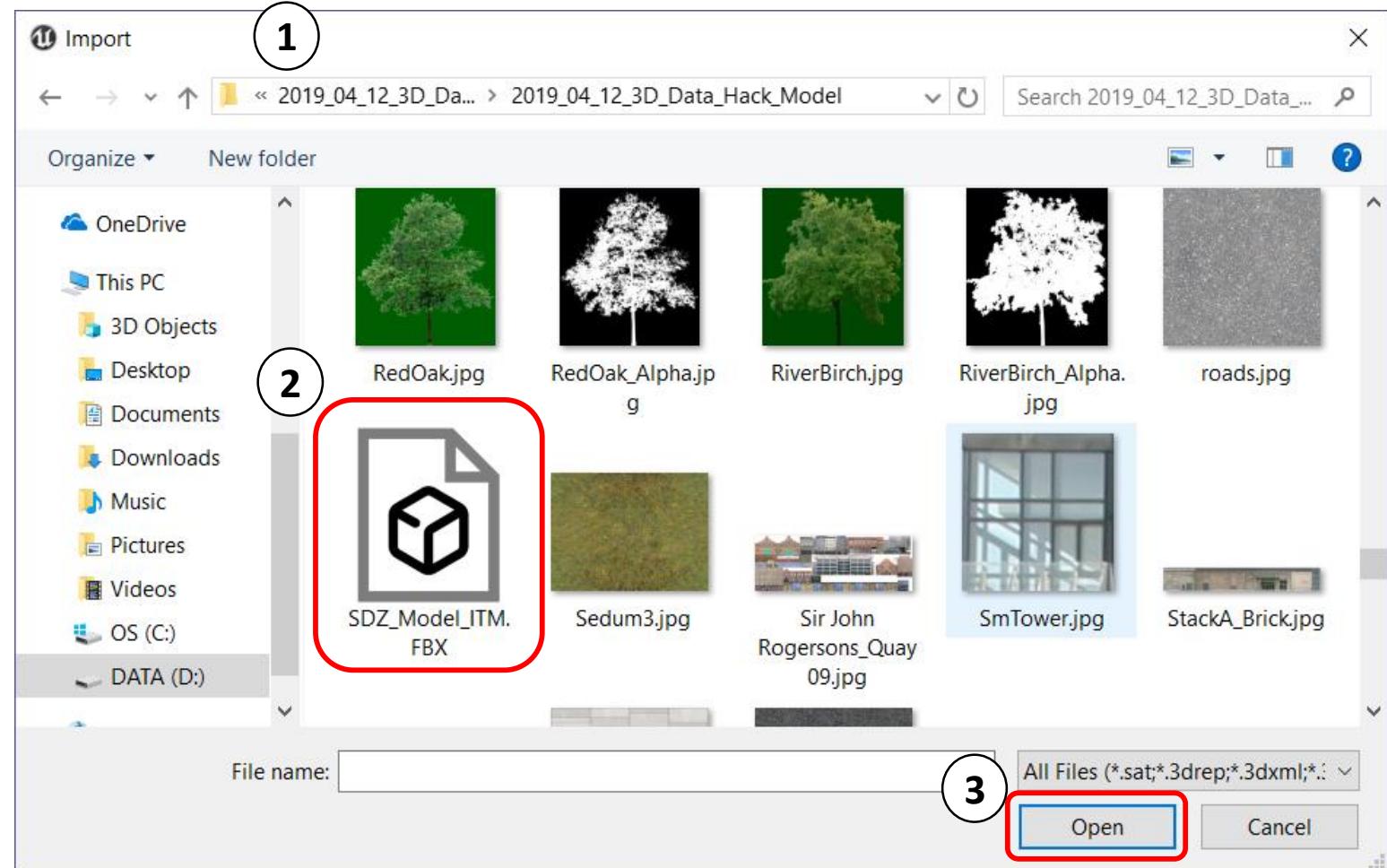




Select FBX file

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.



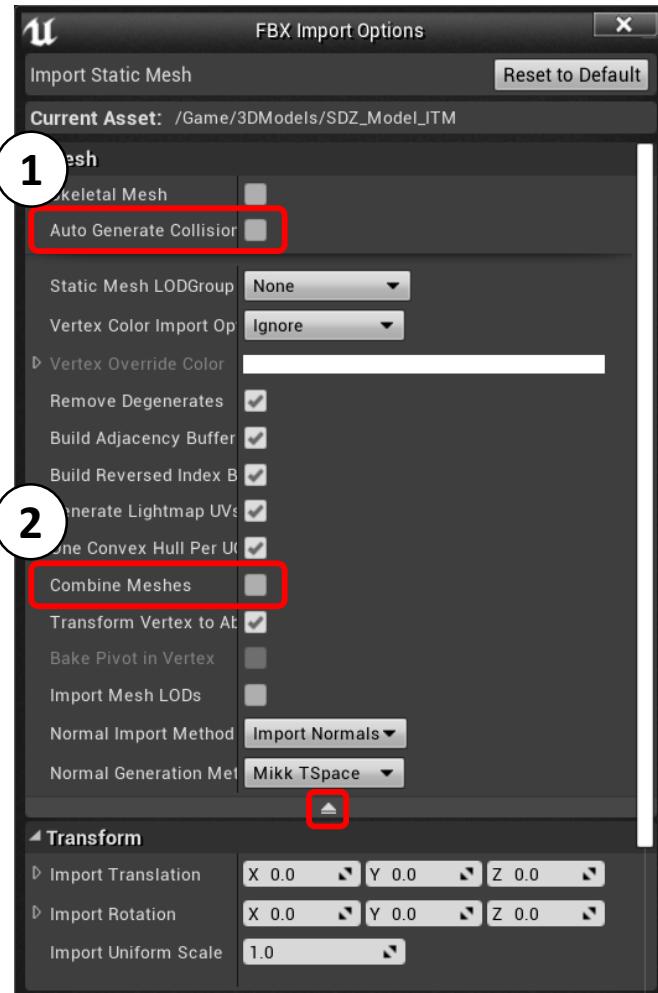


Import Settings

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.



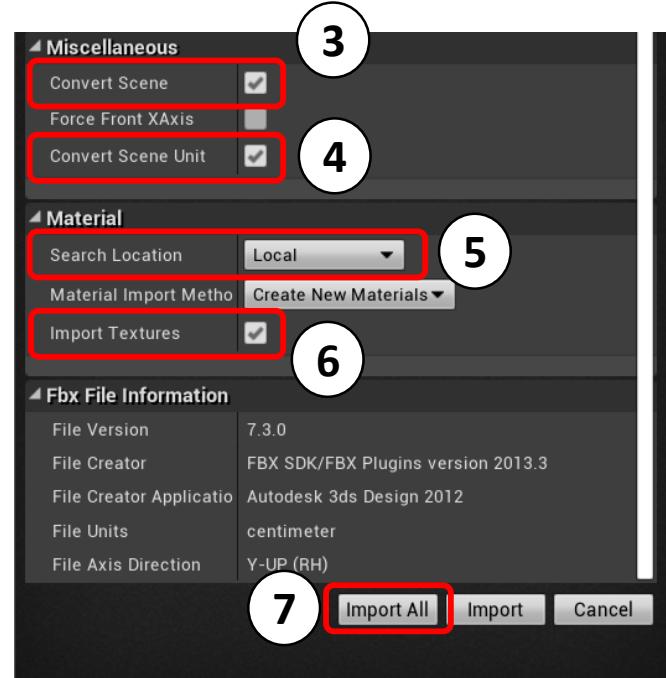
3. Check ‘Convert Scene’ to use the UE4 coordinate system.

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

The screenshot shows the Unreal Engine Editor interface with the following panels visible:

- Message Log:** Displays a list of errors from the FBX Import process. A callout bubble points to the errors with the text: "These errors are non-critical so you can clear them and close the error log."
- World Outliner:** Shows a tree view of the project's assets, including a "Floor" asset selected.
- Content Browser:** Shows a list of imported 3D models, including "lagune_vintage oak" and "Red_Brick".
- Details:** Provides detailed settings for the selected "Floor" asset, including Transform, Static Mesh, Materials, and Physics.

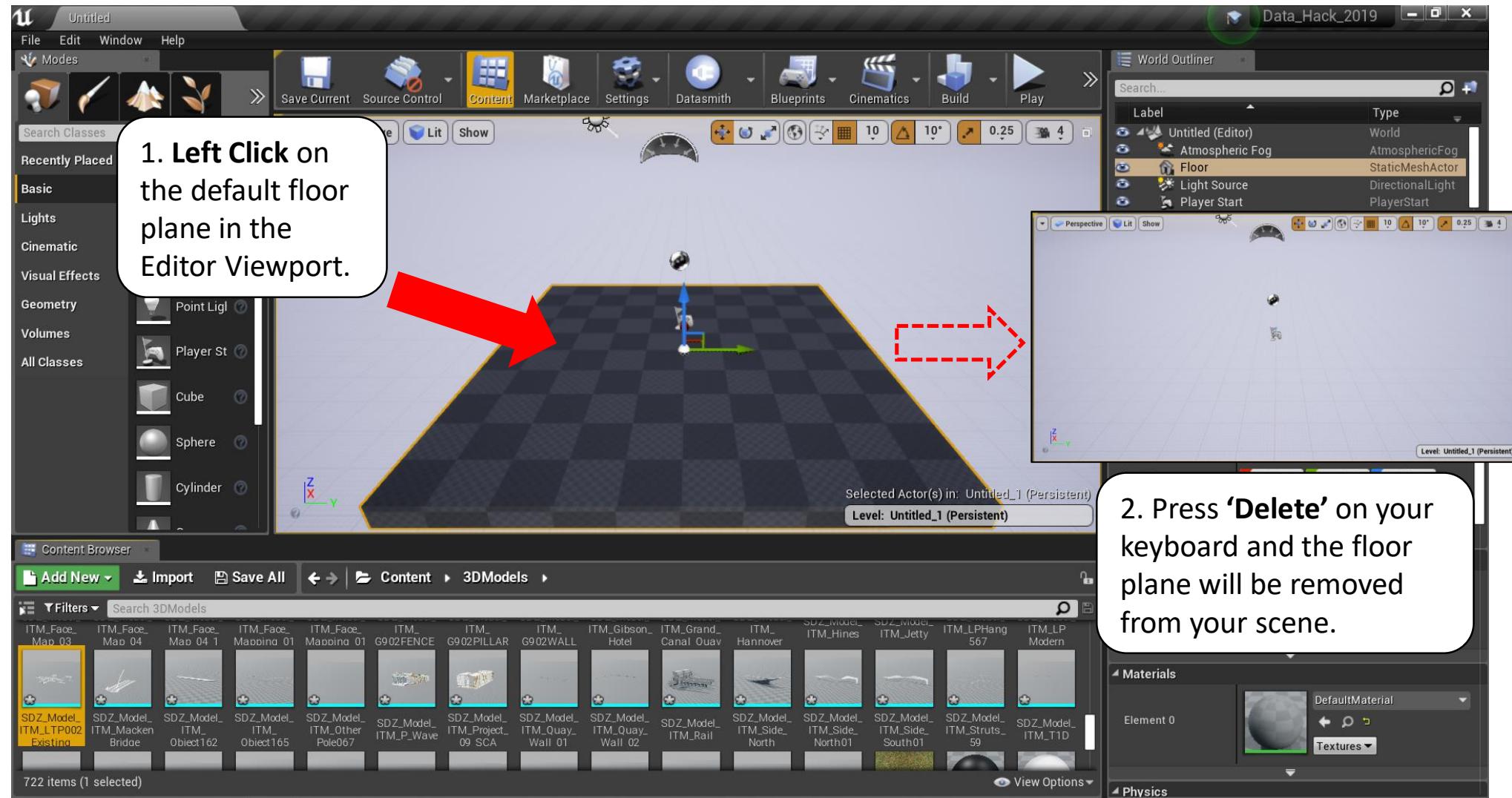
A red arrow points to the "Clear" button at the bottom right of the Message Log panel, which is highlighted with a red border.

Message Log Content (Partial List):

- ! Mesh [Geometry have no name] in the fbx file is not reference by any hierarchy node.
- ! SDZ_20190319_Object008 has some nearly zero tangents which can create some issues. (Tolerance of 1E-4)
- ! SDZ_20190319_Object008 has some nearly zero bi-normals which can create some issues. (Tolerance of 1E-4)
- ! SDZ_20190319_Block_03 has some nearly zero tangents which can create some issues. (Tolerance of 1E-4)
- ! SDZ_20190319_Block_03 has some nearly zero bi-normals which can create some issues. (Tolerance of 1E-4)
- ! SDZ_20190319_Wintertide_Concrete_Structure has some nearly zero tangents which can create some issues. (Tolerance of 1E-4)
- ! SDZ_20190319_Wintertide_Concrete_Structure has some nearly zero bi-normals which can create some issues. (Tolerance of 1E-4)
- ! SDZ_20190319_Capitol_Docks has degenerate tangent bases which will result in incorrect shading. MikkTSspace relies on tangent bases
- ! SDZ_20190319_Capitol_Docks has some nearly zero tangents which can create some issues. (Tolerance of 1E-4)
- ! SDZ_20190319_Capitol_Docks has some nearly zero bi-normals which can create some issues. (Tolerance of 1E-4)
- ! SDZ_20190319_Mesh1308 has some nearly zero tangents which can create some issues. (Tolerance of 1E-4)
- ! SDZ_20190319_Mesh1308 has some nearly zero bi-normals which can create some issues. (Tolerance of 1E-4)
- ! SDZ_20190319_SJR has some nearly zero tangents which can create some issues. (Tolerance of 1E-4)
- ! SDZ_20190319_SJR has some nearly zero bi-normals which can create some issues. (Tolerance of 1E-4)
- ! SDZ_20190319_Object134 has degenerate tangent bases which will result in incorrect shading. MikkTSspace relies on tangent bases
- ! SDZ_20190319_Object134 has some nearly zero tangents which can create some issues. (Tolerance of 1E-4)
- ! SDZ_20190319_P_Wave has degenerate tangent bases which will result in incorrect shading. MikkTSspace relies on tangent bases
- ! SDZ_20190319_P_Wave has some nearly zero tangents which can create some issues. (Tolerance of 1E-4)
- ! SDZ_20190319_P_Wave has some nearly zero bi-normals which can create some issues. (Tolerance of 1E-4)
- ! SDZ_20190319_G_Canal
- ! SDZ_20190319_Exo_Skeleton
- ! SDZ_20190319_Facemapping
- ! SDZ_20190319_Gibson_Hotel
- ! SDZ_20190319_Level_1
- ! SDZ_20190319_Line05
- ! SDZ_20190319_Line06
- ! SDZ_20190319_Line07
- ! SDZ_20190319_Line08

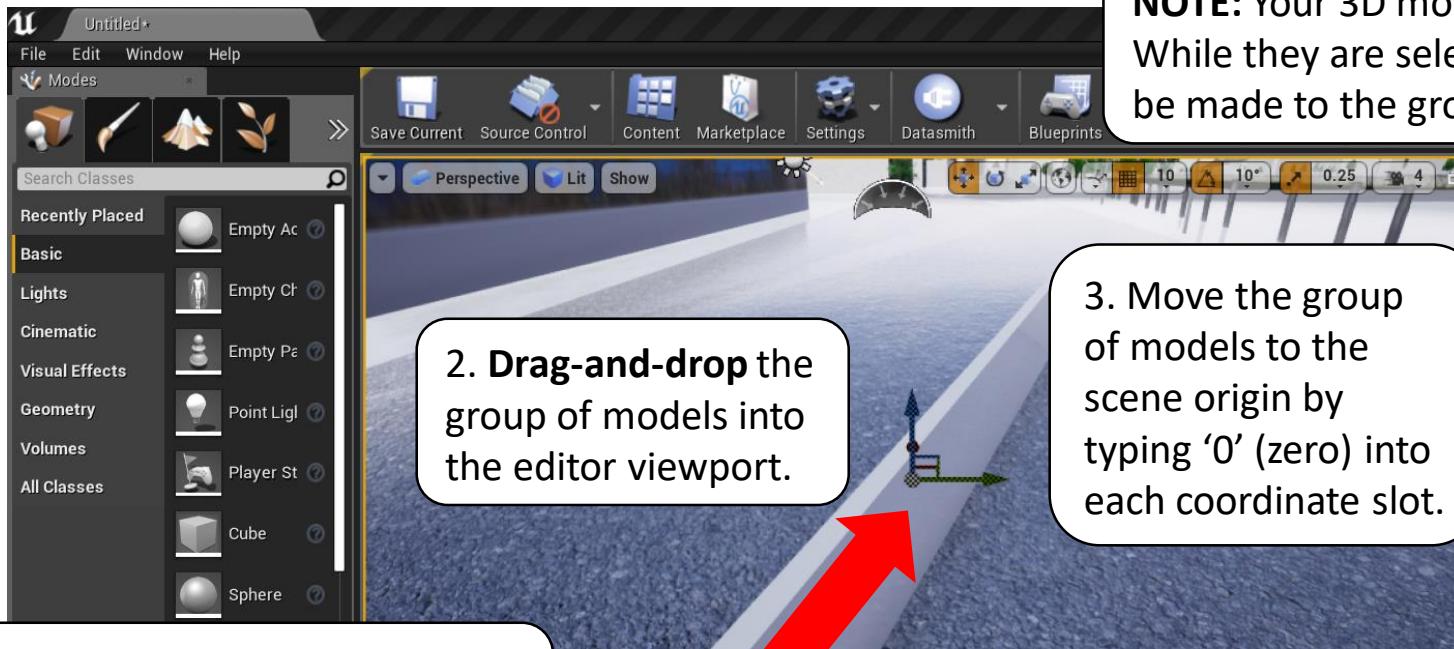


Delete Default Floor Plane





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

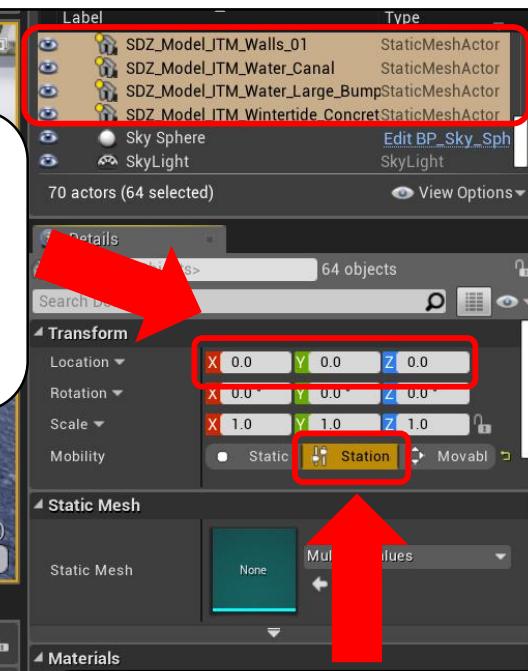


1. Select the 3D models in your content folder (not the textures or materials) by pressing **CTRL + Left Click** on each.

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

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.

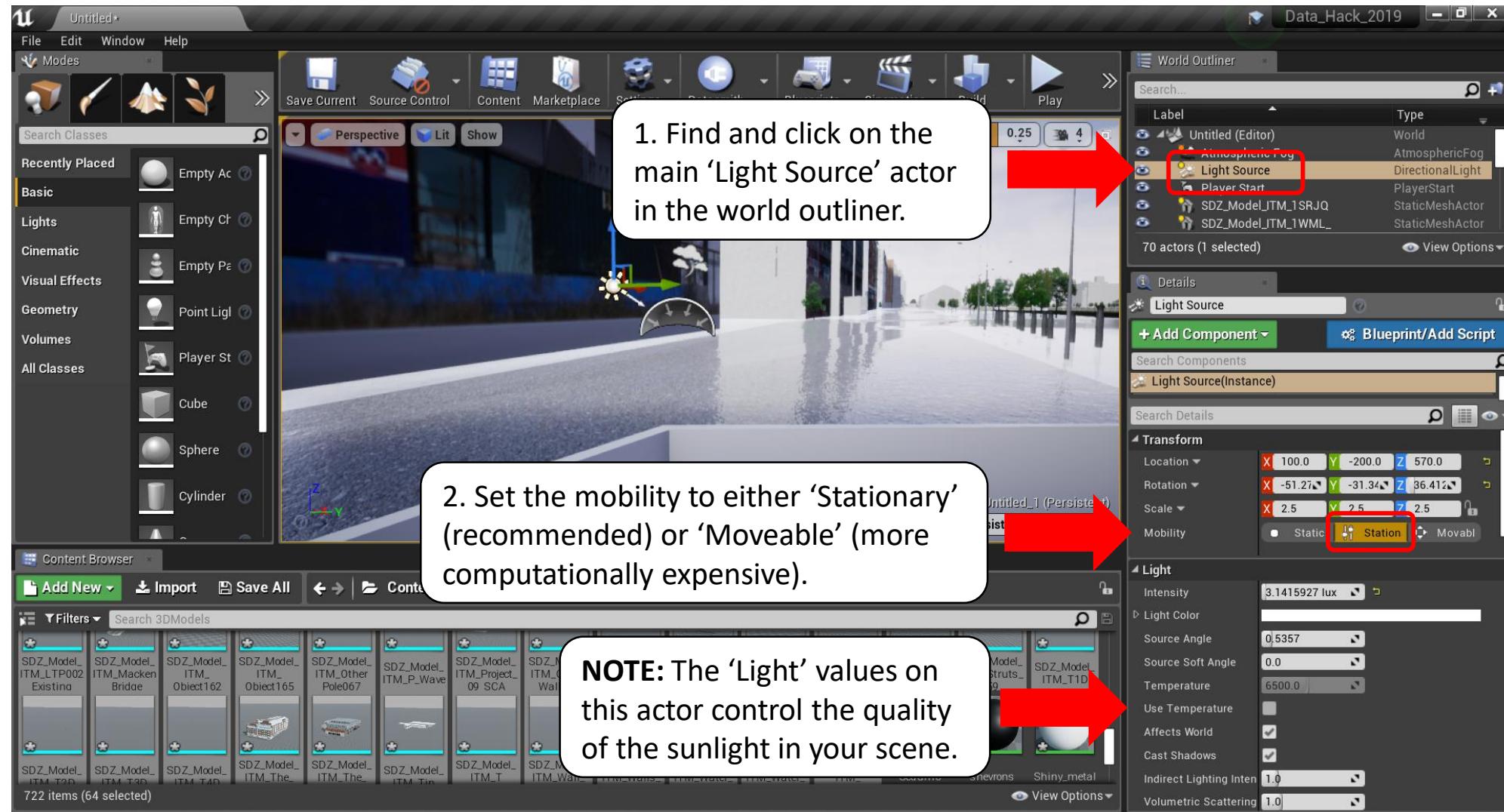
3. Move the group of models to the scene origin by typing '0' (zero) into each coordinate slot.



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.

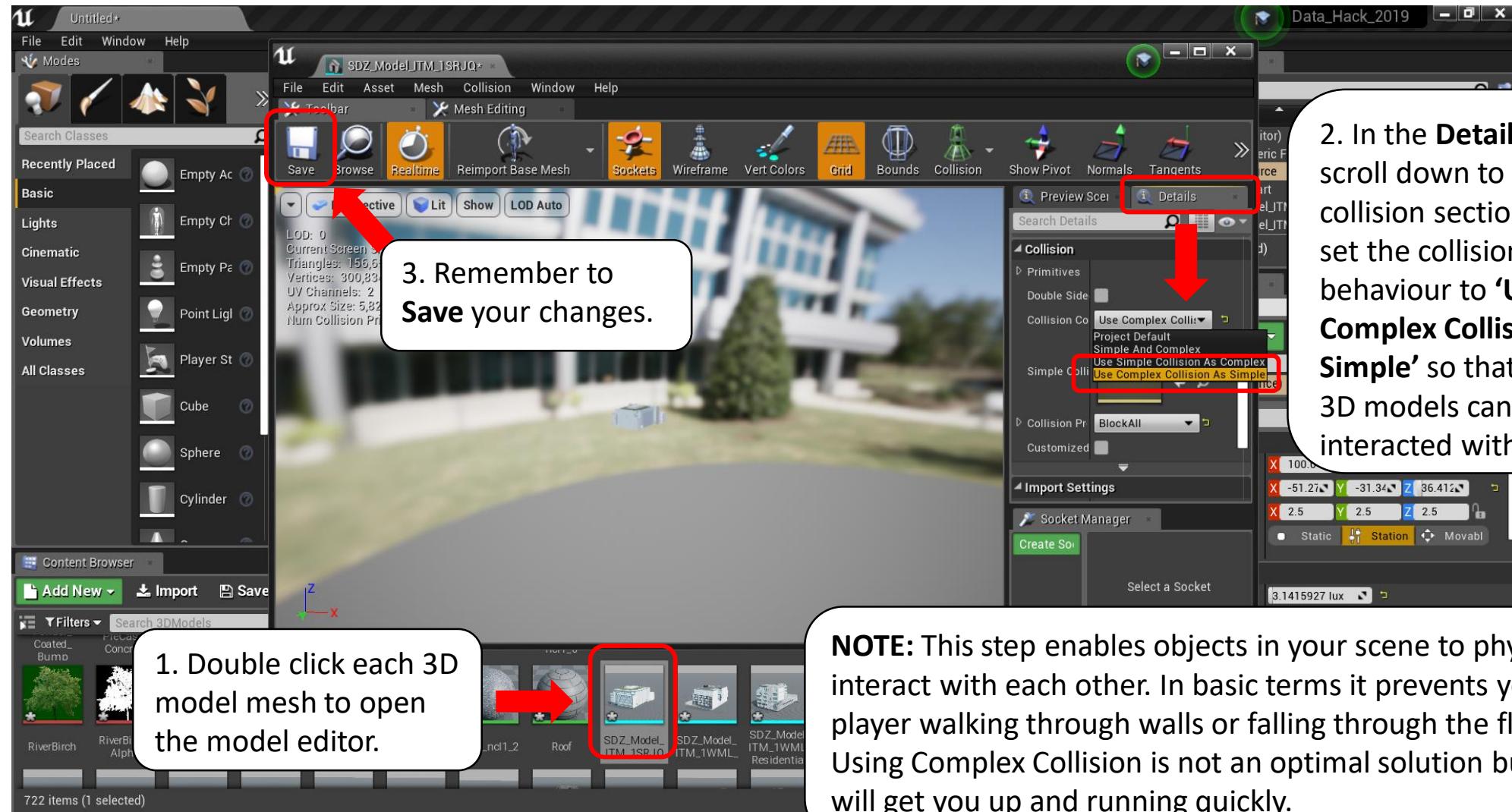


Set Sun to 'Stationery/Dynamic'



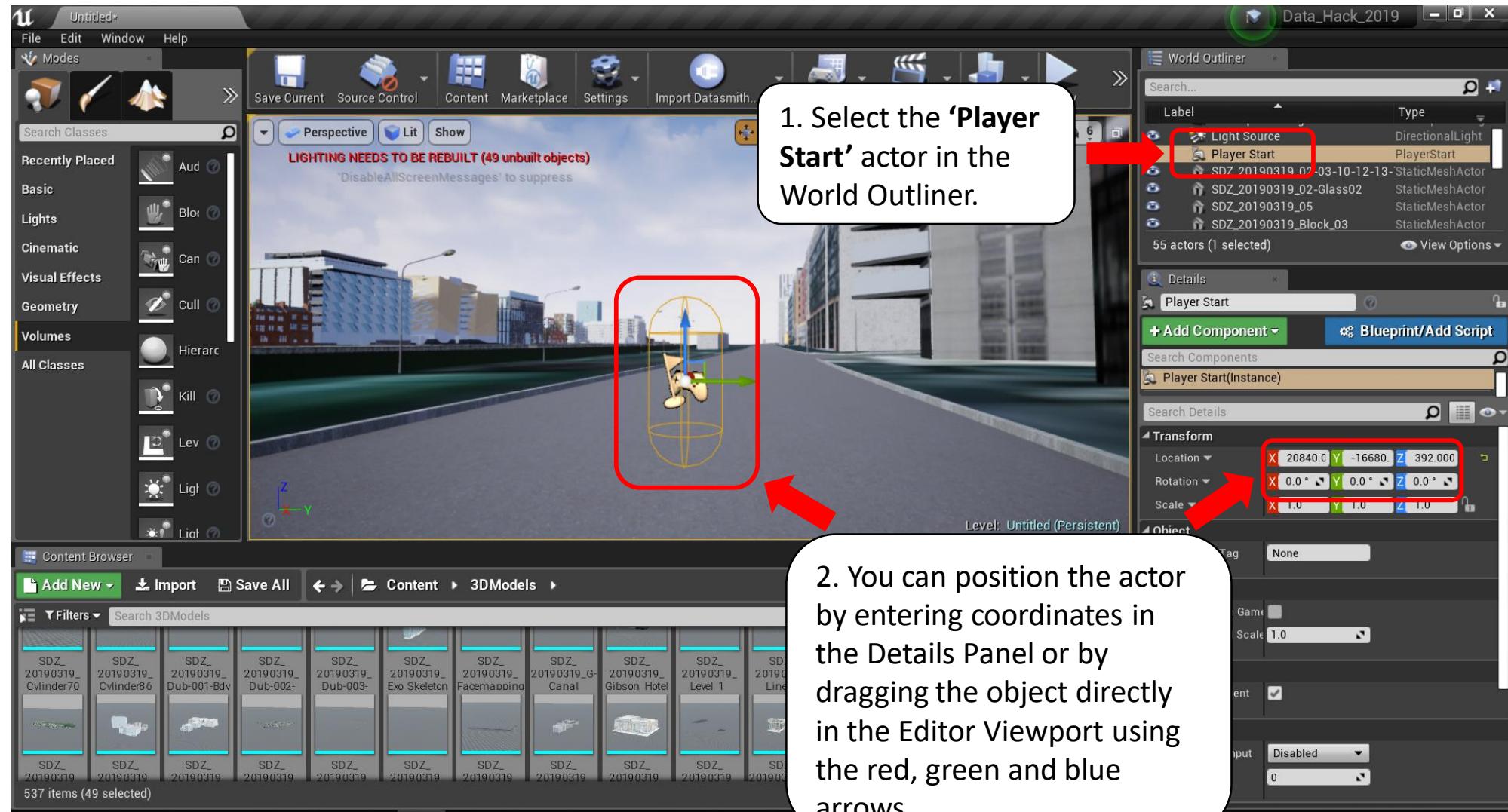


Set Complex Collision As Simple (each mesh)



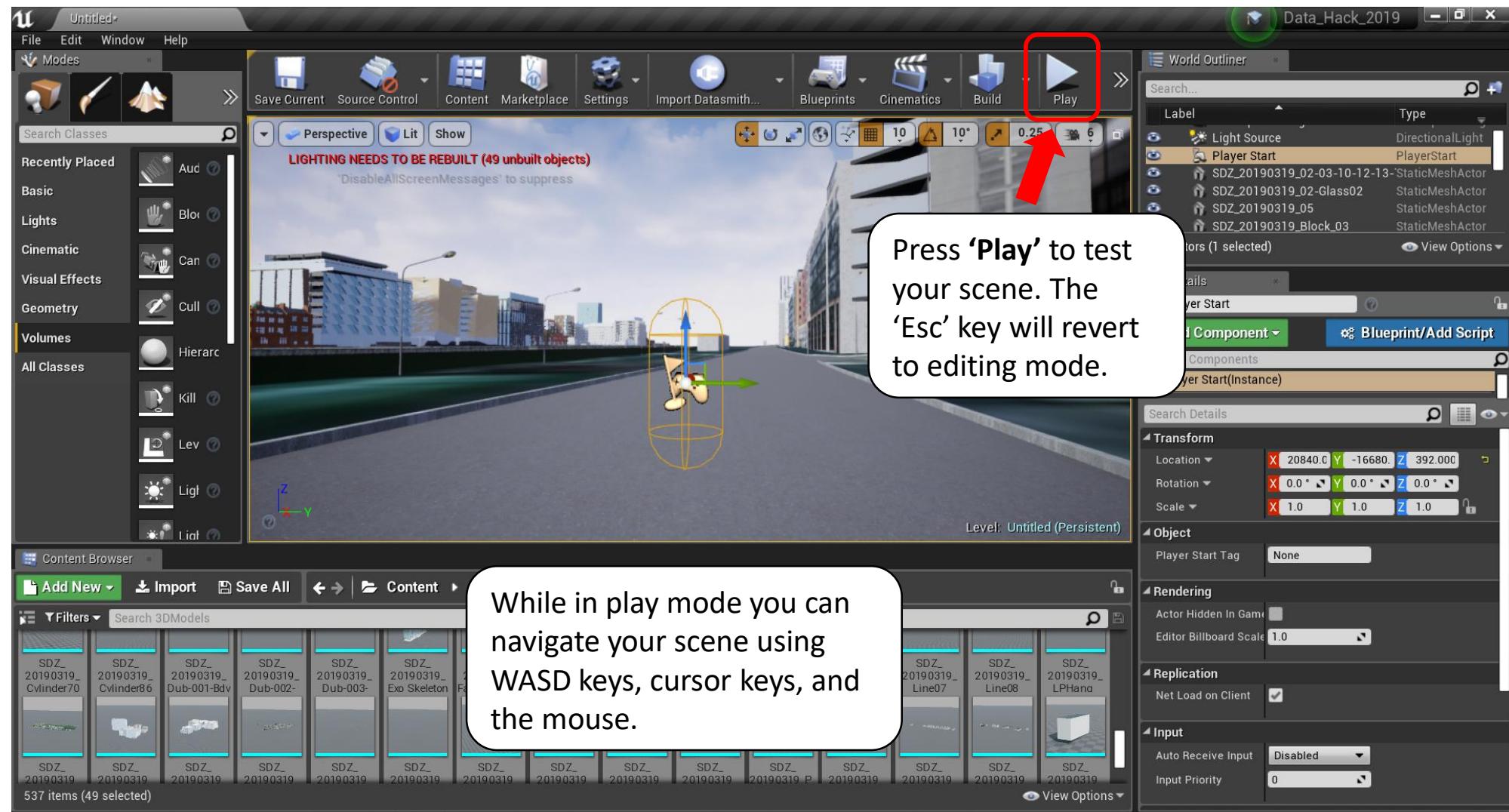


Move Player to your preferred start location



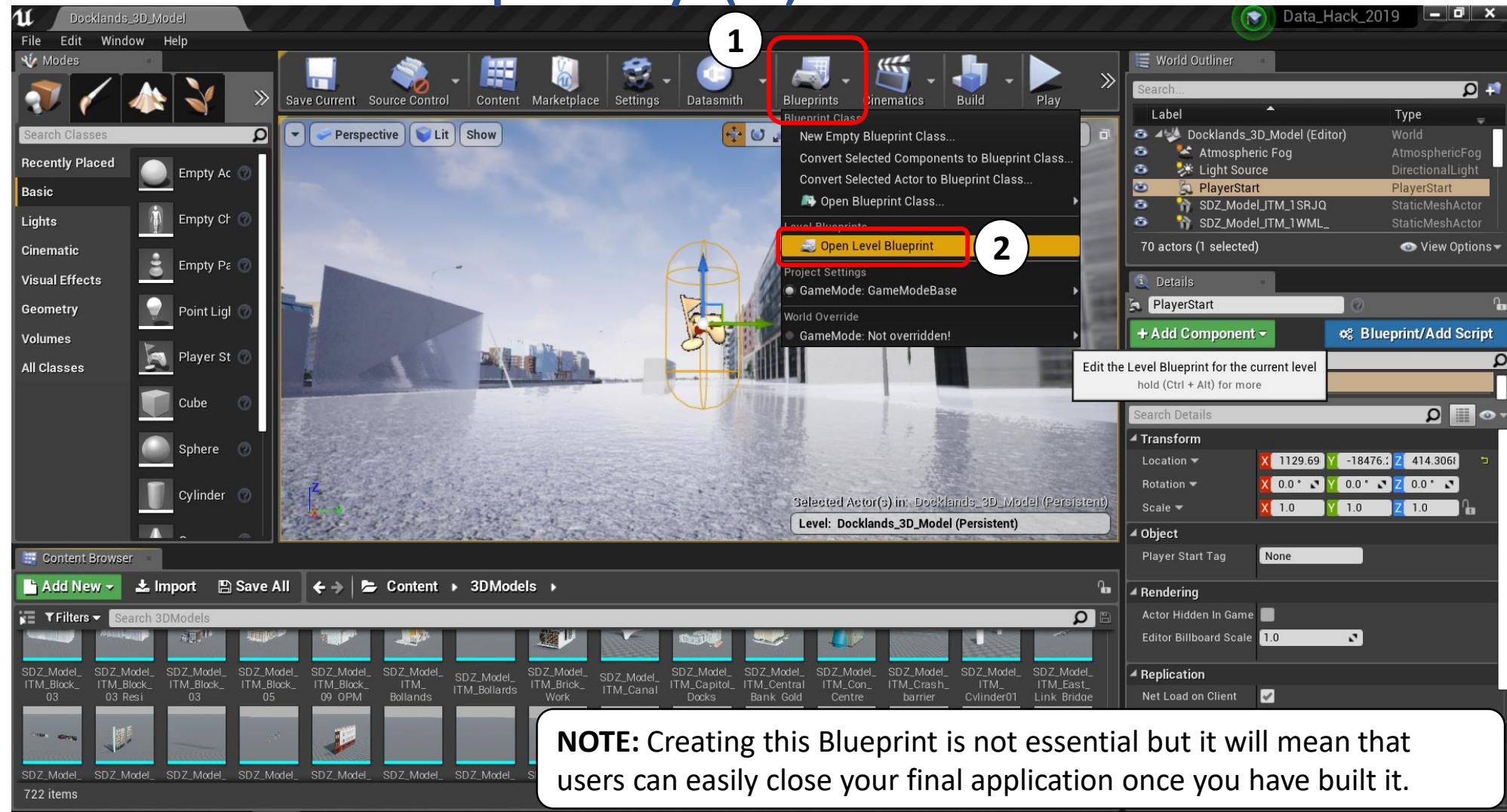


Press Play to test your scene



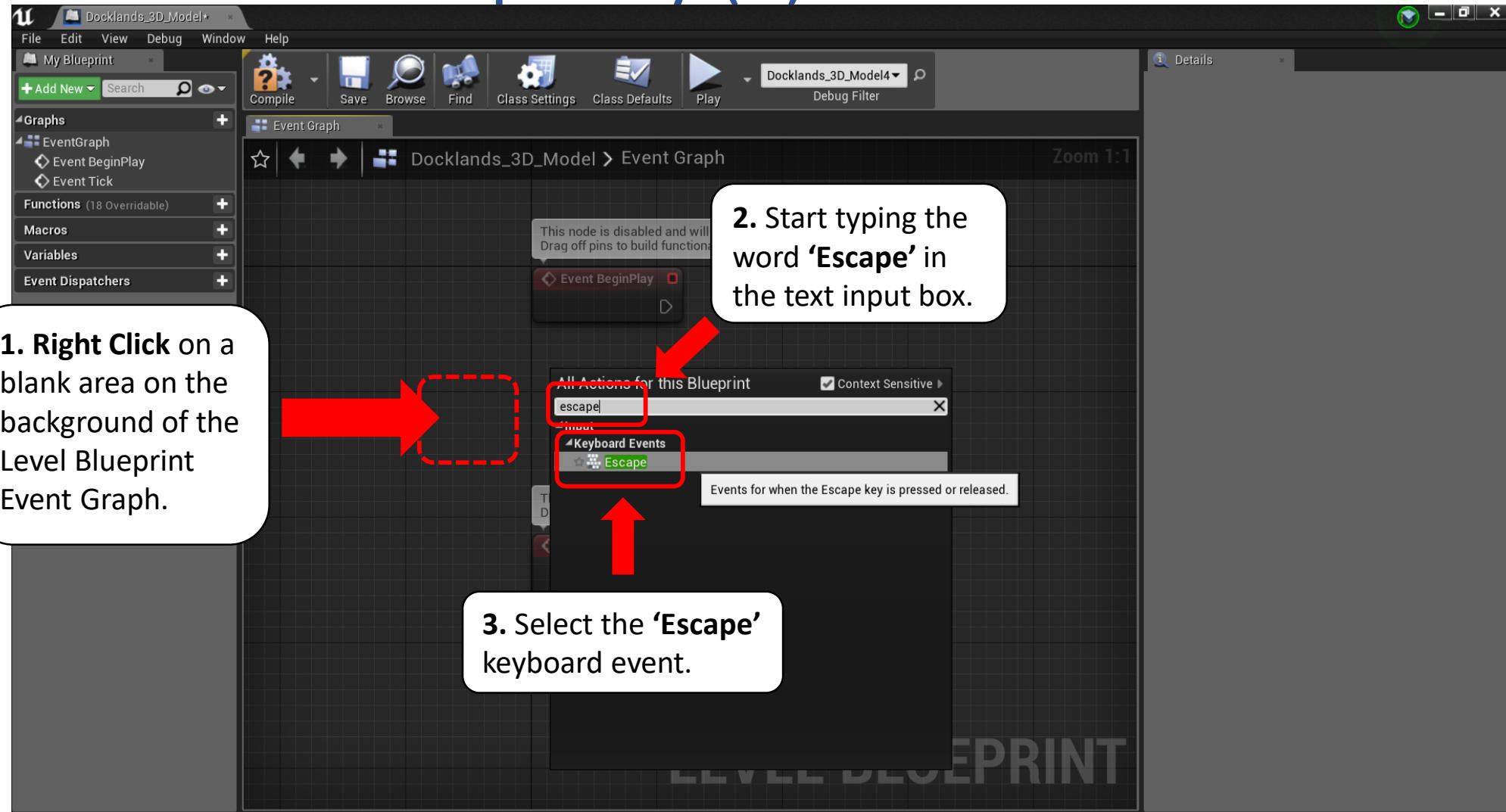


Creating a Blueprint to close your application with the Escape key (1)



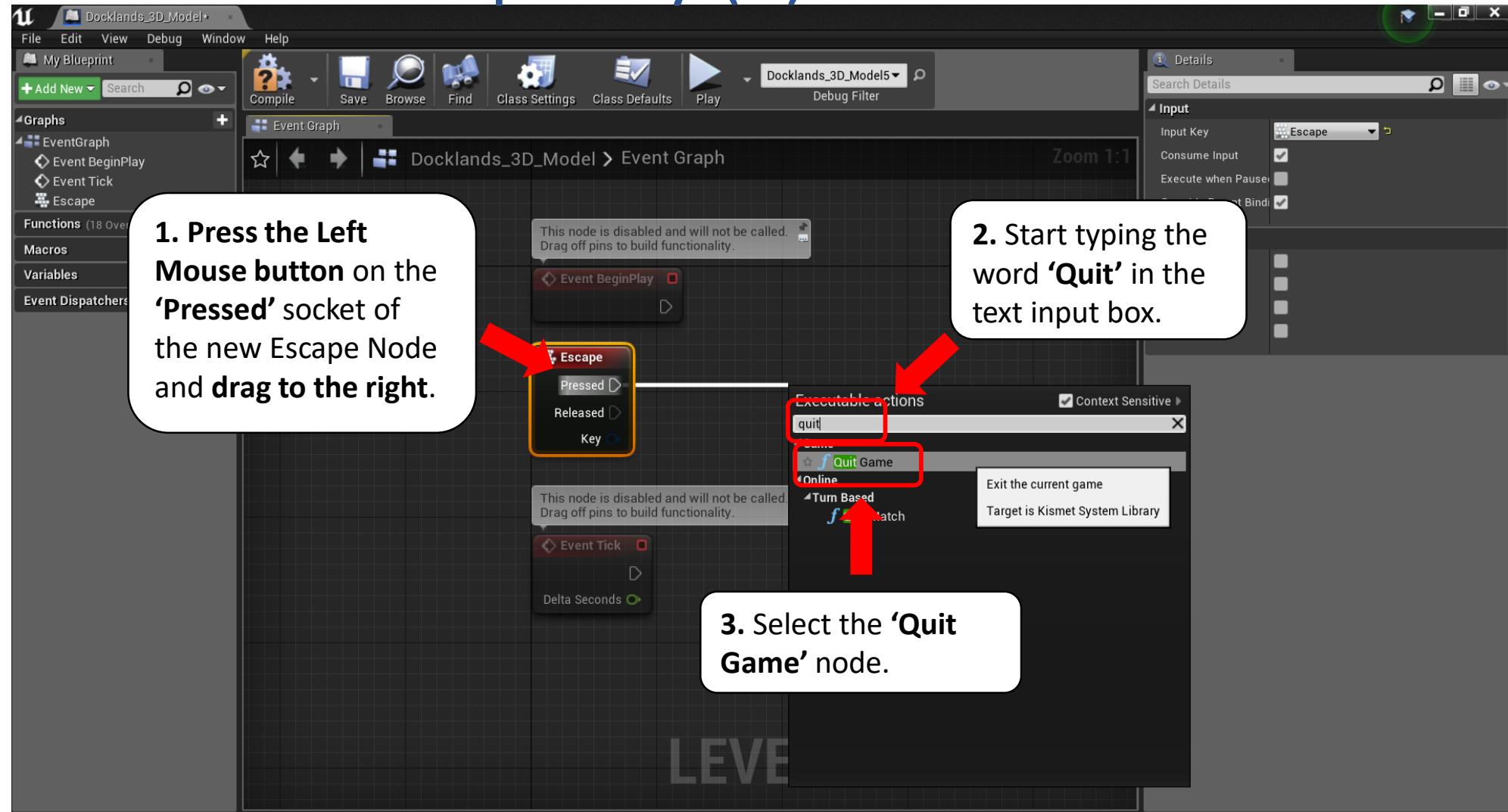


Creating a Blueprint to close your application with the Escape key (2)





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





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

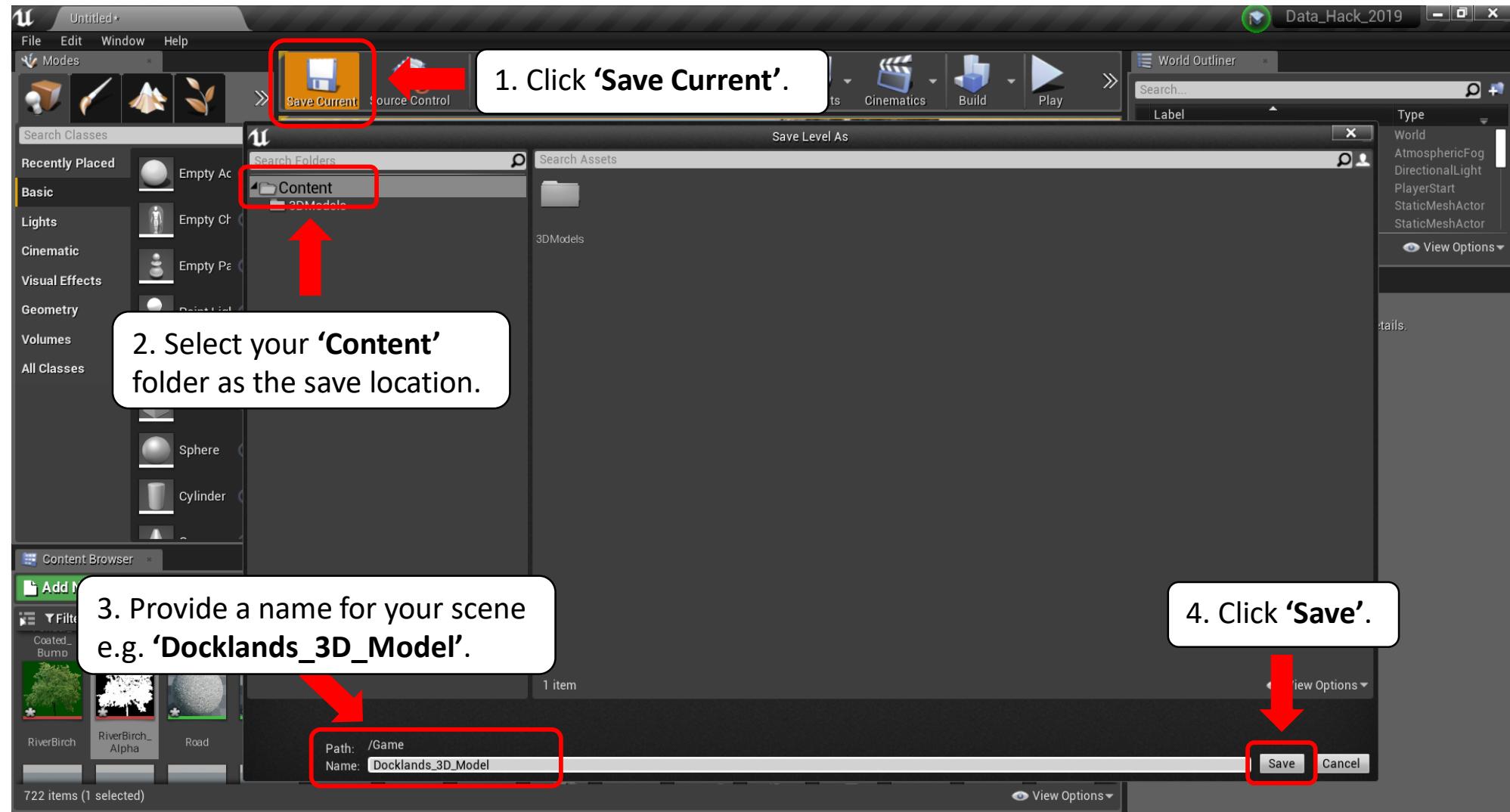
1. Click 'Save' and ensure the 'Compile' button to the left displays a green tick.

2. Close the level blueprint window.

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

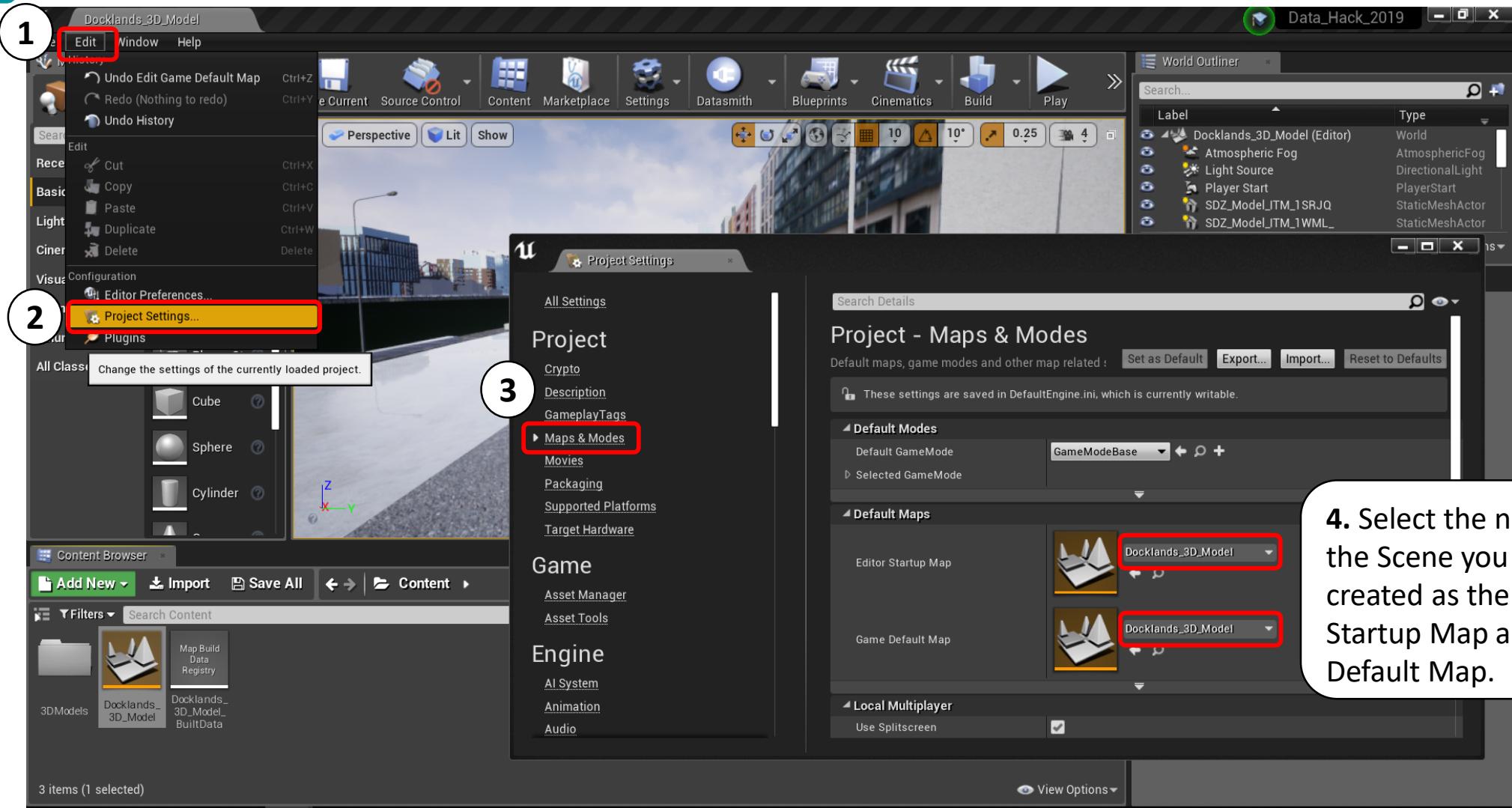


Save your scene





Package your project for distribution (1)





Package your project for distribution (2)

1

2

3. Select the platform you want to publish your application for e.g. Windows or iOS etc.

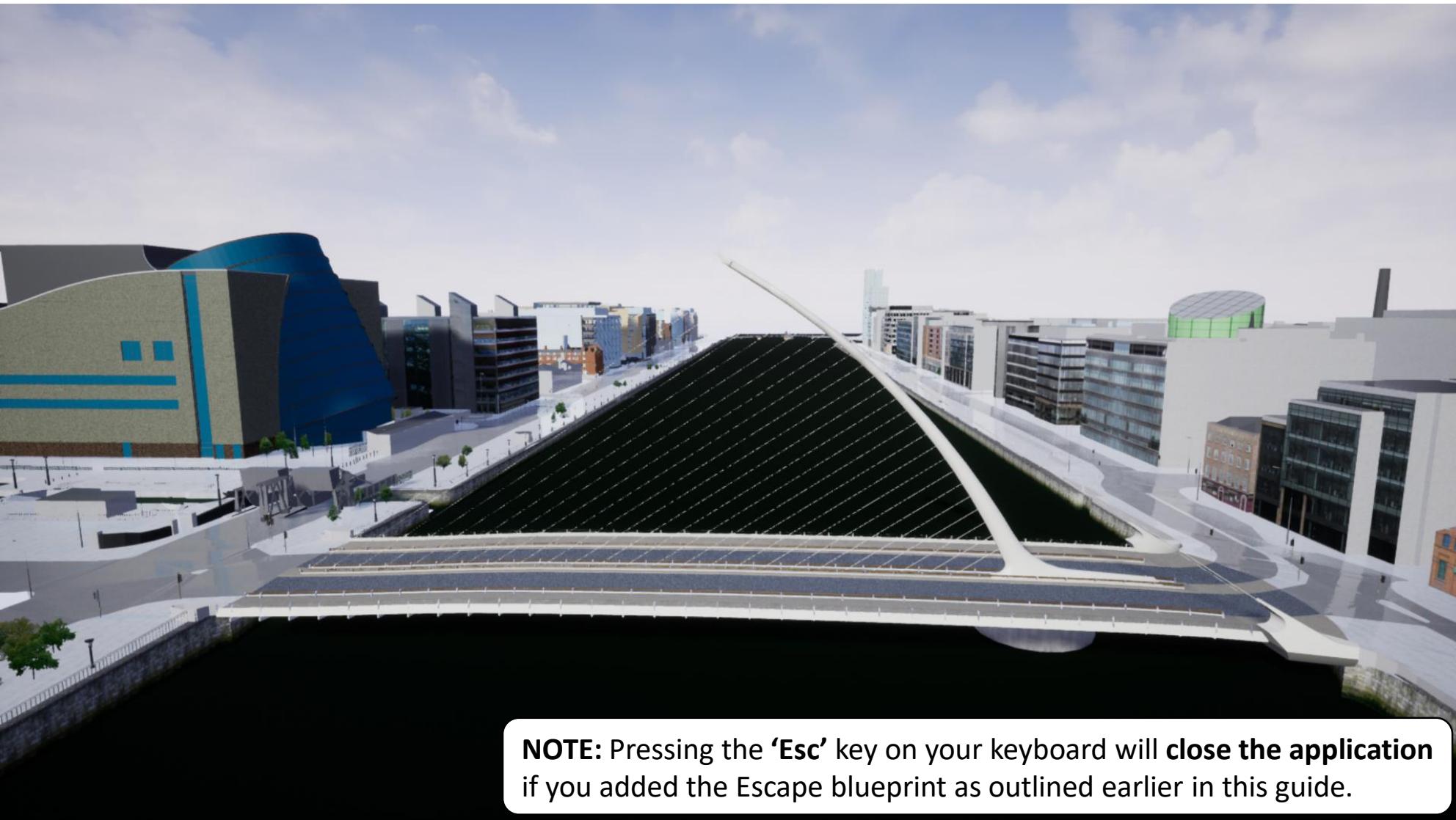
4. Choose a folder location for your application to be built in.

5

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



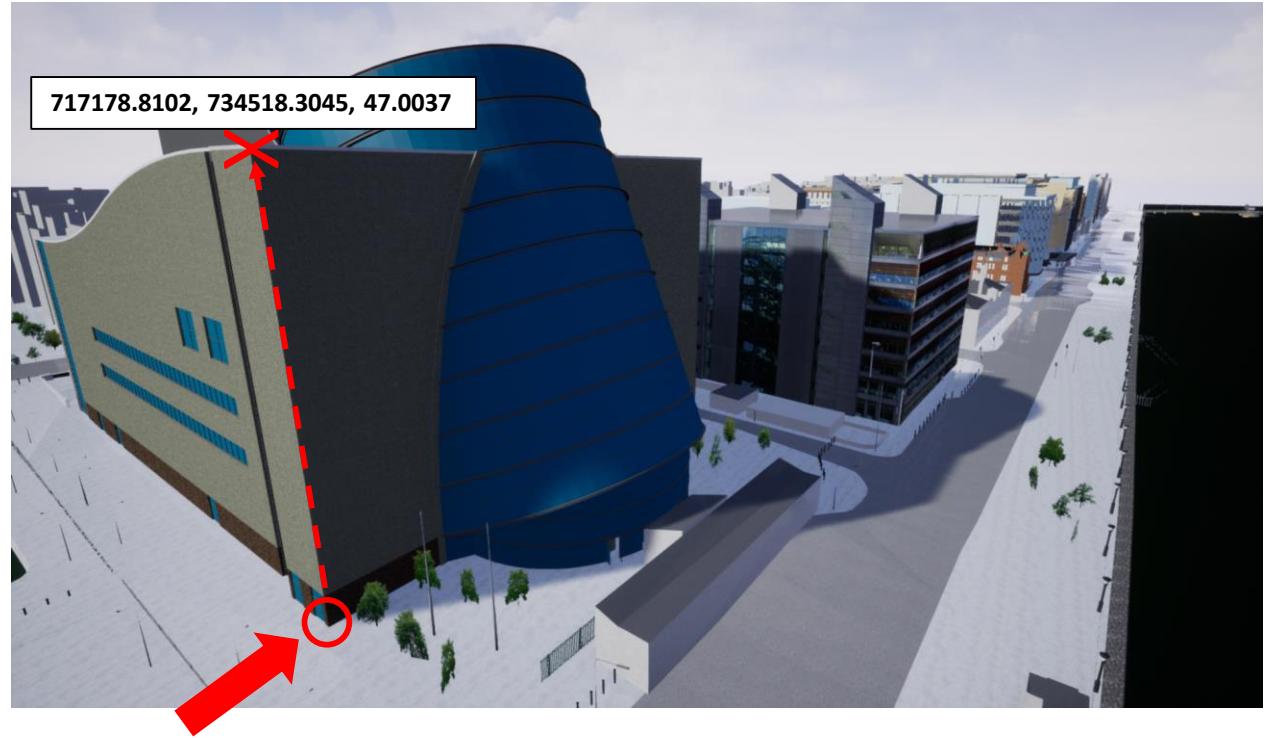
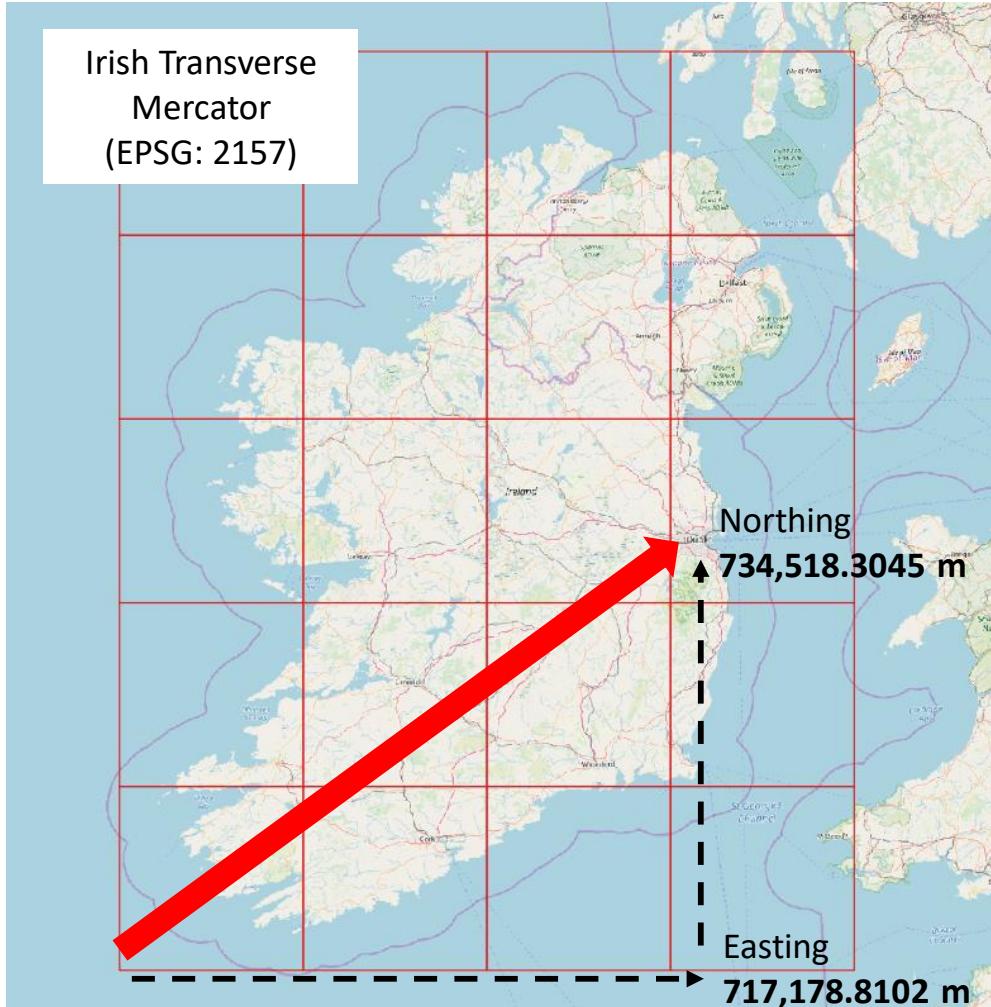
Run your application .exe to test



NOTE: Pressing the 'Esc' key on your keyboard will **close the application** if you added the Escape blueprint as outlined earlier in this guide.



A spatial reference for geolocating data



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

We gratefully acknowledge funding from
Science Foundation Ireland
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