



3D Data Hack Dublin

Unreal Engine Starter Guide



Building
City
Dashboards



dashboards.maynoothuniversity.ie
dashboards@mu.ie
[@dashbuild](https://twitter.com/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

Organisation

Transport and Infrastructure Manage

3D DATA HACK DUBLIN

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 PRIVATE [Give feedback on dataset](#)

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 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:

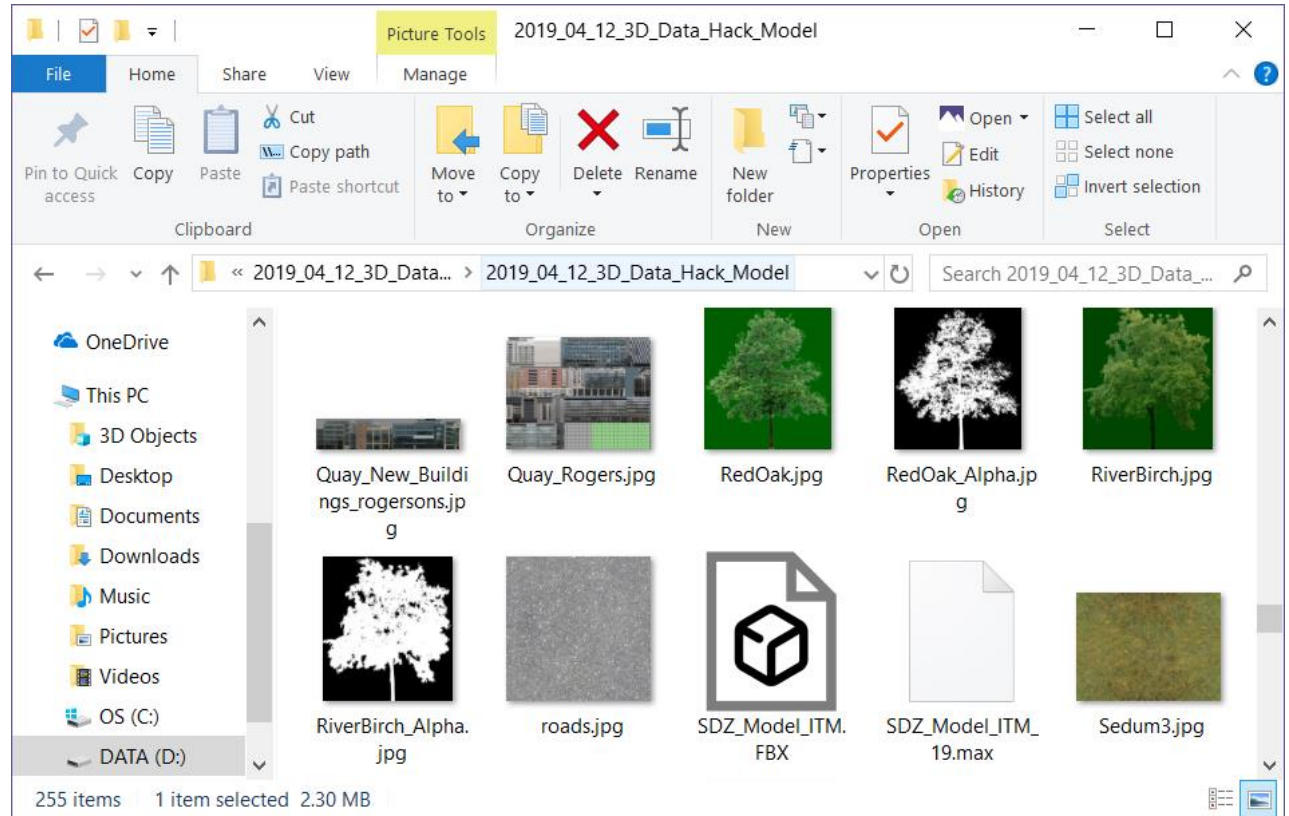
The spatial offset described by the move file can be used to determine the real world coordinates of objects that have been placed in the 3ds Max project. The offset is required because 3D modelling and visualisation software has tended to use a single precision floating point number format to describe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





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



Create an Account and Select a Licence

1

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*DISPLAY NAME

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*PASSWORD

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2

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Game Developers **Enterprise**

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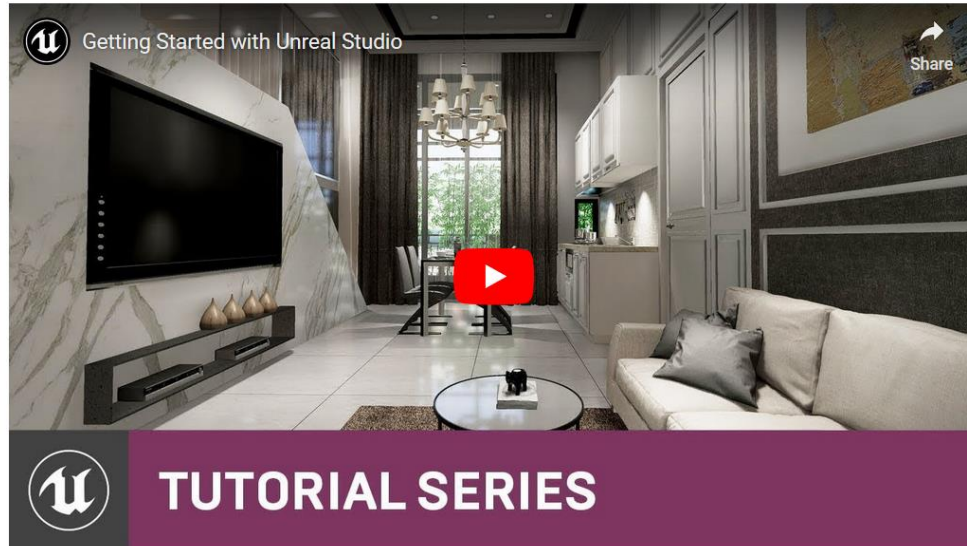
NOTE: We recommend that you read the License Agreement.



Download Unreal Engine

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

Here are some next steps:



Watch the online tutorial on setting up Unreal Engine

- **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'

The screenshot shows the Unreal Project Browser interface. The 'New Project' button is highlighted with a red box and a circled '1'. Below it, the 'Blueprint' tab is selected and highlighted with a red box and a circled '2'. The 'Blank' project template is highlighted with a red box and a circled '3'. At the bottom, the 'Name' field is set to 'Data_Hack_2019' and highlighted with a red box and a circled '4'. The 'Create Project' button is highlighted with a red box and a circled '5'.

Unreal Project Browser

Projects **1** New Project

2 Choose a **template** to use as a starting point for your new project. Any of these features can be added later by clicking **Add Feature or Content Pack** in **Content Browser**.

Blueprint C++ Unreal Studio

3 Blank First Person Flying Handheld AR nDisplay Puzzle Rolling Side Scroller 2D Side Scroller Third Person Top Down Twin Stick Shooter

Blank
A clean empty project with no code.

Choose some **settings** for your project. Don't worry, you can change these later in the **Target Hardware** section of **Project Settings**. You can also add the **Starter Content** to your project later using **Content Browser**.

Desktop / Console Maximum Quality No Starter Content

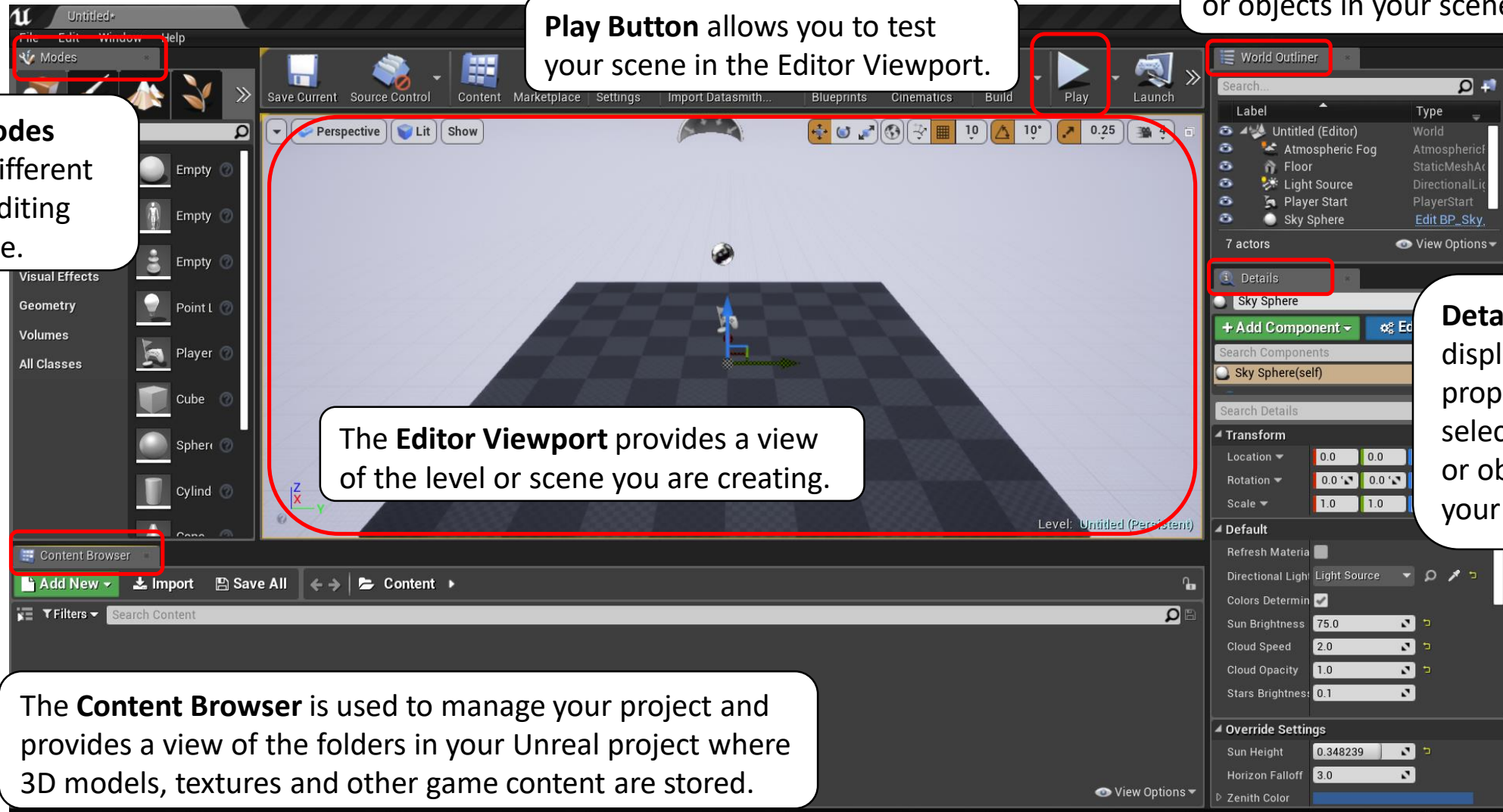
Select a **location** for your project to be stored.

C:\Users\odawkins\Documents\Unreal Projects Data_Hack_2019
Folder Name

5 Create Project



Unreal Engine User Interface





Create a new 3DModels folder

The screenshot shows the Unreal Engine 4 Content Browser interface. The 'Add New' button is highlighted with a red box and a circled '1'. The 'New Folder' option is highlighted with a red box and a circled '2'. The '3DModels' folder is highlighted with a red box and a circled '3'. A white callout box contains the following instructions:

1. In the content browser **Click 'Add New'**.
2. **Select 'New Folder'** from the dropdown menu.
3. Type a suitable name for the new folder such as **'3DModels'**.



Import 3D Model

The screenshot shows the Unreal Engine 4 interface. The 'Content Browser' at the bottom is open to a folder named '3DModels'. The 'Import' button is highlighted with a red box. A red arrow points to the 'Cylinder' class in the 'Classes' panel on the left. The 'World Outliner' on the right shows a list of objects in the scene, including 'Sky Sphere'.

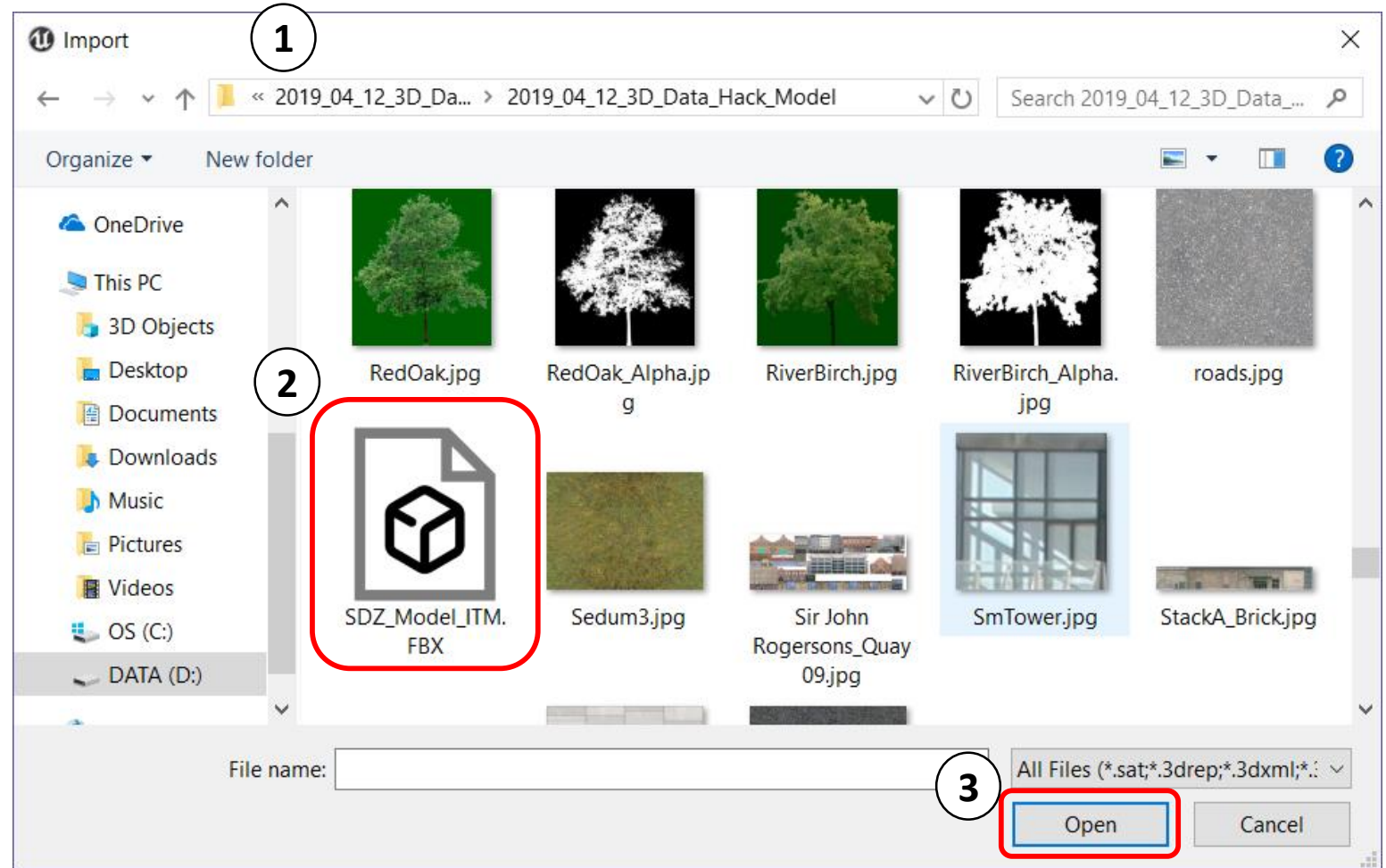
Open the new 3DModels folder by double clicking on it and then **click 'Import'**.



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.



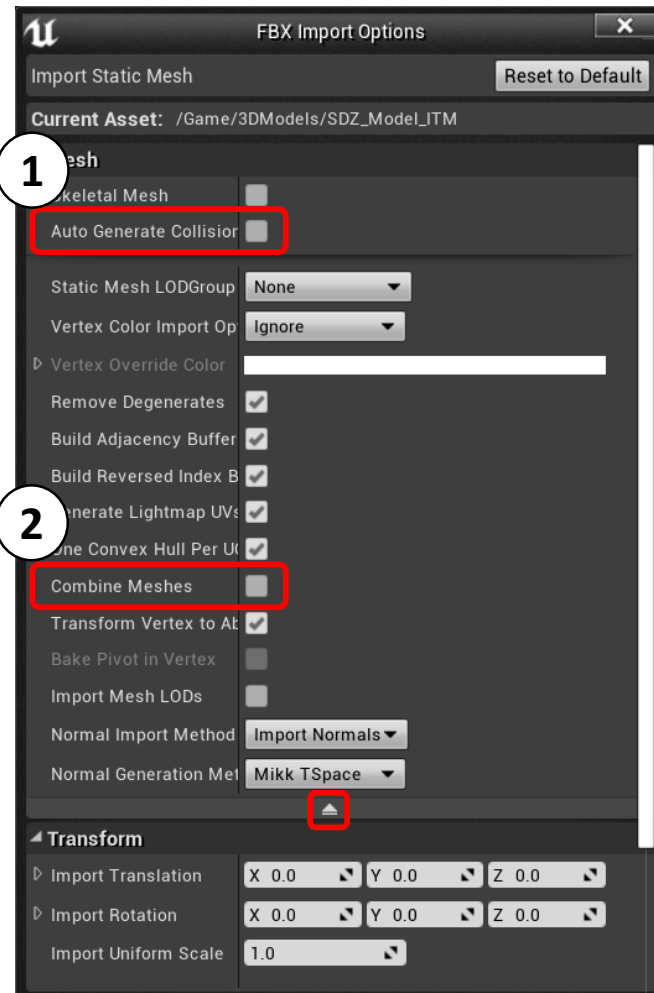


Import Settings

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.



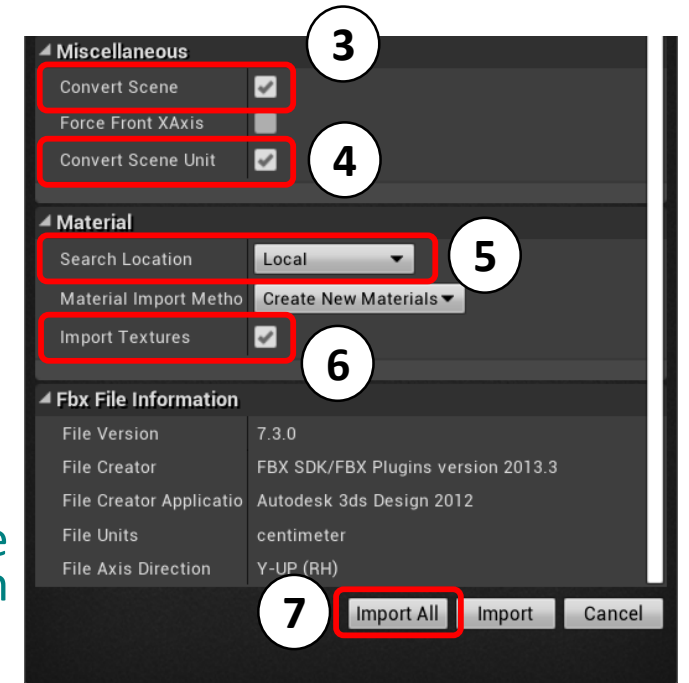
3. Check **'Convert Scene'** to use the UE4 coordinate system.

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

The screenshot shows the Unreal Engine 4 interface with the Message Log window open. The log contains 48 errors related to FBX import, such as 'Mesh [Geometry have no name] in the fbx file is not reference by any hierarchy node.' and 'SDZ_20190319_Object008 has some nearly zero tangents which can create some issues. (Tolerance of 1E-4)'. A callout box with a white background and black border contains the text: 'These errors are non-critical so you can clear them and close the error log.' A red arrow points from the callout box to a 'Clear' button located at the bottom right of the Message Log window.



Delete Default Floor Plane

1. Left Click on the default floor plane in the Editor Viewport.

2. Press 'Delete' on your keyboard and the floor plane will be removed from your scene.

The screenshot shows the Unreal Engine 4 editor interface. The main viewport displays a 3D scene with a default floor plane (a checkered floor). A red arrow points to the floor plane. A dashed red arrow points to the 'Floor' object in the World Outliner. The World Outliner shows a list of objects in the scene, including 'Untitled (Editor)', 'Atmospheric Fog', 'Floor', 'Light Source', and 'Player Start'. The 'Floor' object is highlighted. The Content Browser at the bottom shows a list of 3D models, with 'SDZ_Model_ITM_LTP002_Existing' selected. The Materials panel at the bottom right shows the 'DefaultMaterial' selected for 'Element 0'.



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.

The screenshot shows the Unreal Engine 4 interface. On the left, the 'Content' browser is open to the '3D Models' folder, where 64 models are selected. A red box highlights this selection. In the center, the editor viewport shows a perspective view of a scene with a red arrow pointing to the origin, indicating where the group of models should be placed. On the right, the 'Details' panel shows the 'Transform' section with the location coordinates (X, Y, Z) set to 0.0, 0.0, 0.0. A red box highlights these coordinates. Below the 'Transform' section, the 'Mobility' dropdown is set to 'Stationary', also highlighted with a red box. A red arrow points from the 'Stationary' dropdown to the 'Details' panel. At the bottom, another red box highlights the 'Materials' section, which is currently set to 'None'.

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'

1. Find and click on the main 'Light Source' actor in the world outliner.

2. Set the mobility to either 'Stationary' (recommended) or 'Moveable' (more computationally expensive).

NOTE: The 'Light' values on this actor control the quality of the sunlight in your scene.

The screenshot shows the Unreal Engine 4 interface. The main viewport displays a 3D scene with a sun actor. The World Outliner on the right shows a list of actors, with 'Light Source' selected and highlighted in a red box. The Details panel on the right shows the properties of the selected 'Light Source' actor, with the 'Mobility' dropdown set to 'Stationary' and highlighted in a red box. The 'Light' section of the Details panel shows various settings like Intensity, Light Color, Source Angle, etc. A red arrow points from the 'Light Source' actor in the World Outliner to the 'Stationary' mobility option in the Details panel. Another red arrow points from the 'Stationary' mobility option to the 'Light' section of the Details panel. A third red arrow points from the 'Light' section to the 'NOTE' text box.



Set Complex Collision As Simple (each mesh)

3. Remember to **Save** your changes.

2. In the **Details** tab scroll down to the collision section and set the collision trace behaviour to '**Use Complex Collision As Simple**' so that the 3D models can be interacted with.

1. Double click each 3D model mesh to open the model editor.

NOTE: This step enables objects in your scene to physically interact with each other. In basic terms it prevents your player walking through walls or falling through the floor. Using Complex Collision is not an optimal solution but it will get you up and running quickly.



Move Player to your preferred start location

The screenshot shows the Unreal Engine 4 interface. In the center, a 3D viewport displays a character in a yellow capsule, highlighted with a red box. A callout box points to the 'Player Start' actor in the World Outliner on the right, also highlighted with a red box. Another callout box points to the 'Transform' section in the Details Panel, where the location coordinates (X: 20840.0, Y: -16680.0, Z: 392.000) are highlighted with a red box. A third callout box points to the rotation values (X: 0.0°, Y: 0.0°, Z: 0.0°) in the same panel, also highlighted with a red box. The interface includes a top menu bar, a toolbar, a left-hand class browser, and a bottom content browser.

1. Select the 'Player Start' actor in the World Outliner.

2. You can position the actor by entering coordinates in the Details Panel or by dragging the object directly in the Editor Viewport using the red, green and blue arrows.



Press Play to test your scene

Press 'Play' to test your scene. The 'Esc' key will revert to editing mode.

While in play mode you can navigate your scene using WASD keys, cursor keys, and the mouse.



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

1

2

Edit the Level Blueprint for the current level
hold (Ctrl + Alt) for more

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)

1. Right Click on a blank area on the background of the Level Blueprint Event Graph.

2. Start typing the word **'Escape'** in the text input box.

3. Select the 'Escape' keyboard event.



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

1. Press the Left Mouse button on the 'Pressed' socket of the new Escape Node and drag to the right.

2. Start typing the word 'Quit' in the text input box.

3. Select the 'Quit Game' node.



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

1. Click 'Save Current'.

2. Select your 'Content' folder as the save location.

3. Provide a name for your scene e.g. 'Docklands_3D_Model'.

4. Click 'Save'.



Package your project for distribution (1)

The screenshot shows the Unreal Engine 4 interface with the following steps highlighted:

- 1**: The **Edit** menu is highlighted in the top-left corner.
- 2**: The **Project Settings...** option is highlighted in the **Edit** menu.
- 3**: The **Maps & Modes** section is highlighted in the **Project Settings** window.
- 4**: The **Docklands_3D_Model** scene name is highlighted in the dropdown menus for **Editor Startup Map** and **Game Default Map** in the **Project - Maps & Modes** settings.

The **Project - Maps & Modes** window shows the following settings:

- Default Modes**: Default GameMode is **GameModeBase**.
- Default Maps**: Editor Startup Map and Game Default Map are both set to **Docklands_3D_Model**.
- Local Multiplayer**: Use Splitscreen is checked.



Package your project for distribution (2)

1 File Edit Window Help

2 Package Project

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

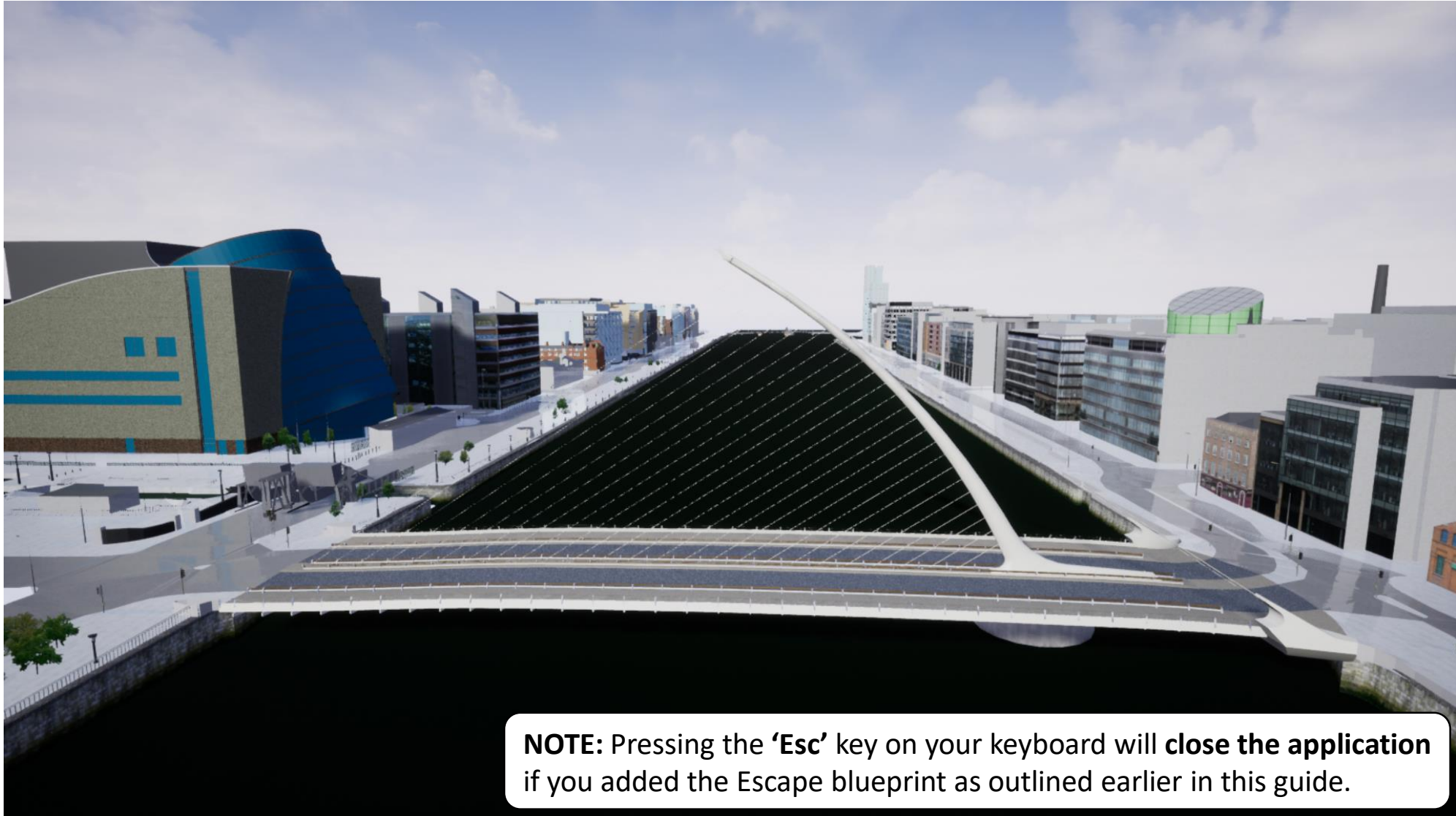
4 Choose a folder location for your application to be built in.

5 Select Folder

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

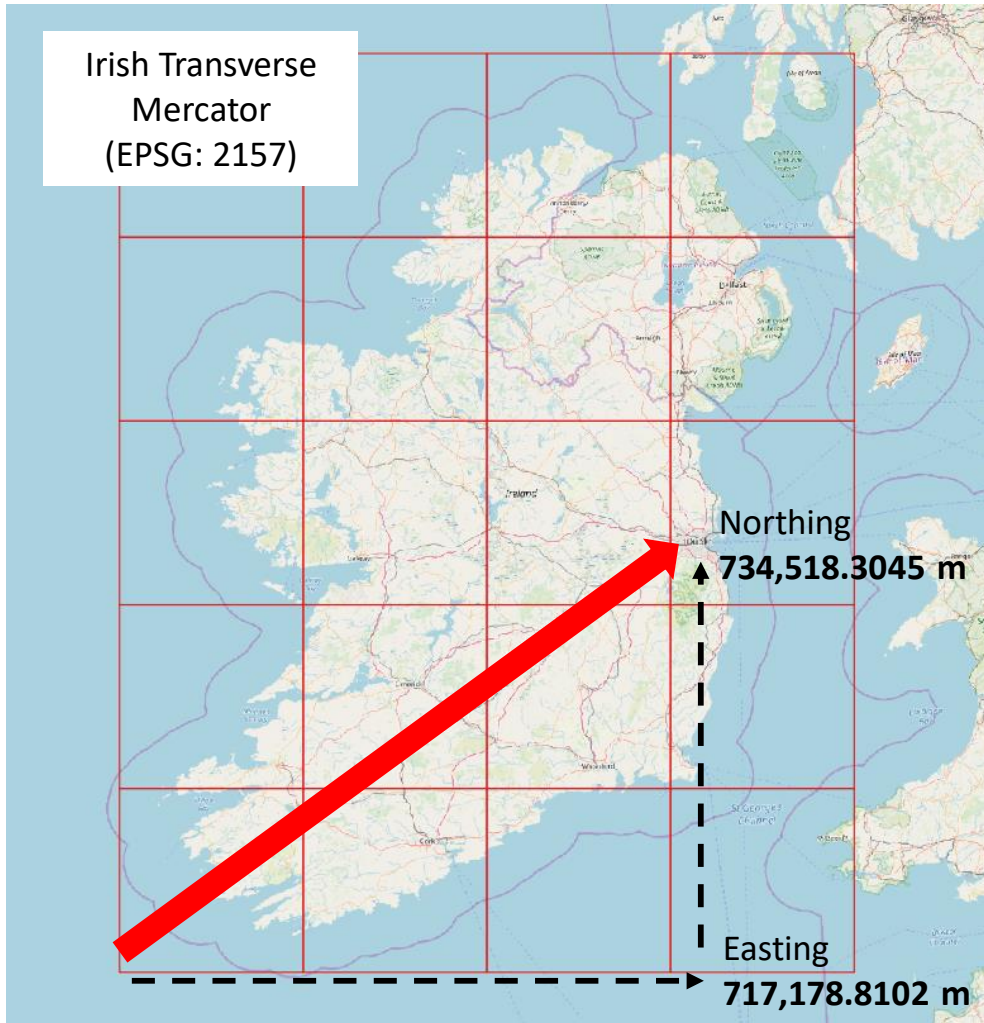


Run your application .exe to test





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>



We gratefully acknowledge funding from
Science Foundation Ireland
under the Investigator's Award Program.
Award number: 15/IA/3090