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JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

POLITEKNIK MALAYSIA
SULTAN SALAHUDDIN ABDUL AZIZ SHAH

BASIC DEVELOPMENT MODULE

AUGMENTED REALITY (AR)

APPS DEVELOPMENT BASED ON ANDROID PLATFORM

FOR BEGINNER

MOHD ROZAIMIN
SUMAINI
ROHAIZANA

unity vuforia android

MODULE 1

BASIC DEVELOPMENT MODULE

AUGMENTED REALITY (AR) FOR BEGINNER

APPS DEVELOPMENT BASED ON ANDROID PLATFORM

GS. MOHD ROZAIMIN BIN ABDUL HAMID
TS. SUMAINI BINTI CHE MAID
SR. TS. ROHAIZANA BINTI RAMLI

PROGRAM SARJANA MUDA TEKNOLOGI DALAM PENGURUSAN FASILITI
JABATAN KEJURUTERAAN AWAM
POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH
2024

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BASIC DEVELOPMENT MODULE

AUGMENTED REALITY (AR) FOR BEGINNER

APPS DEVELOPMENT BASED ON ANDROID PLATFORM

PREFACE

Welcome to Basic Development Module: Augmented Reality (AR) for Beginner Apps Development Based on the Android Platform. This eBook is designed to guide you through the fundamentals of AR development, specifically for Android devices. As AR continues to revolutionize industries, from gaming to education, it's essential for developers to grasp the basics of this powerful technology.

In this module, you'll learn how to create engaging AR experiences step by step, with practical examples that will help you understand both the theory and application of AR development. Whether you're new to programming or an experienced developer exploring AR for the first time, this guide will equip you with the skills needed to build your first AR app on the Android platform.

We hope this journey into the world of AR opens up new possibilities for your development career.

Win, Sumai & Zana

TABLE OF CONTENT

INTRODUCTION TO AUGMENTED REALITY

Augmented Reality (AR) blends the real world with digital information by layering computer-generated graphics onto live images of our surroundings. Most current AR research relies on 3D model and video feeds, which are digitally processed to add these virtual elements. In other words, AR enhances what we see in real time with added digital details, creating a more interactive experience.

Encyclopaedia Britannica [2013] gives the following definition for AR: “Augmented reality, in computer programming, a process of combining or augmenting’ video or photographic displays by overlaying the images with useful computer-generated data.”

Before you dive into this module, feel free to download an example target image and 3D models using the link provided below.

https://tinyurl.com/bukuintroAR

INTRODUCTION TO UNITY

Unity is a cross platform game engine, which is primarily used to develop both 3D and 2D video games and simulation for computers, consoles, and mobile devices [2].

- www.unity3d.com

INTRODUCTION TO VUFORIA

Vuforia is an Augmented Reality Software Development Kits (SDK) for mobile devices that enables the creation of Augmented Reality application. it uses Computer Vision Technology to recognize and track planar image (Image Targets/ Image Tracker) and simple 3D objects such as boxes in a real time [3].

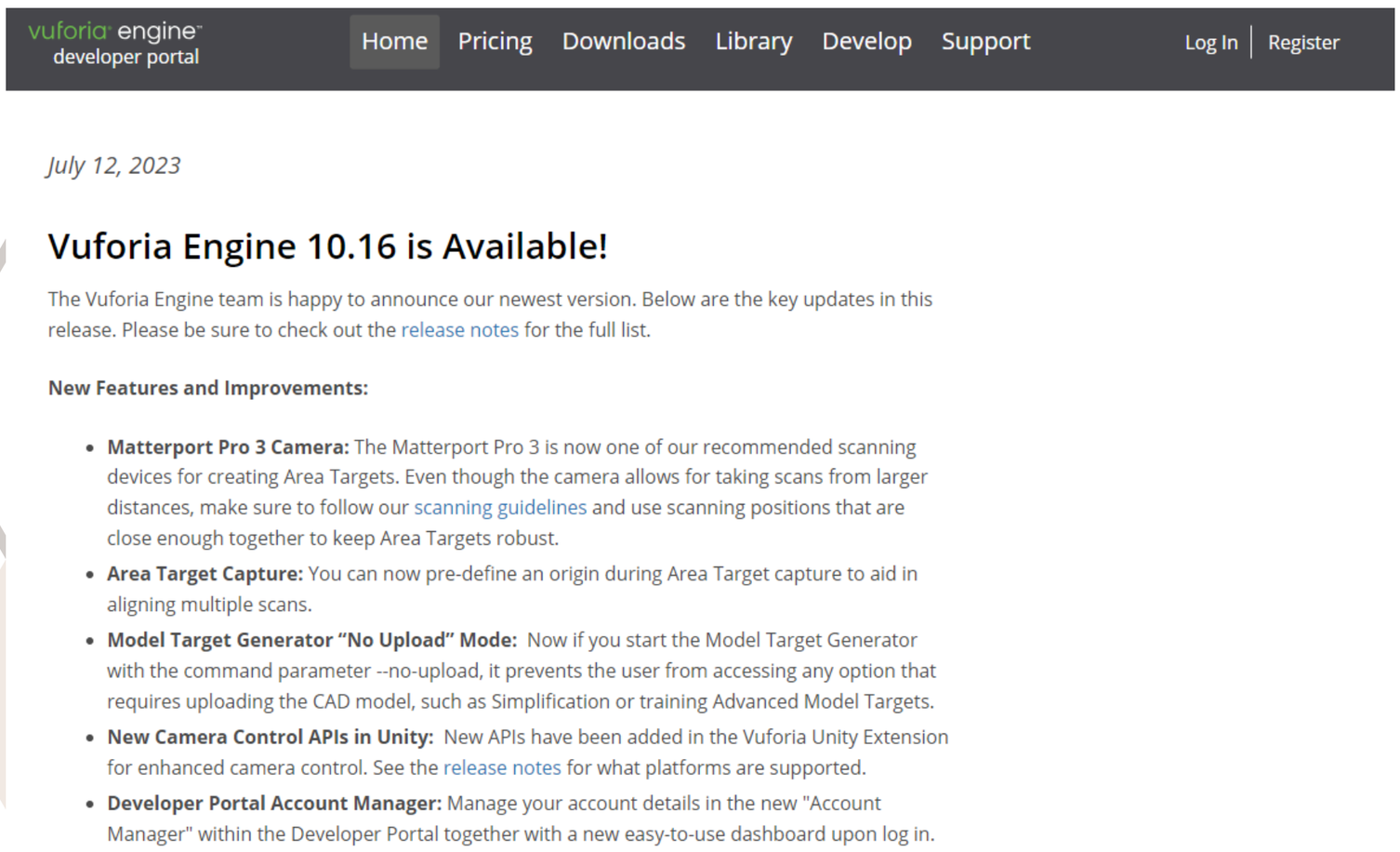
- www.vuforia.com

TARGET MANAGER VUFORIA

The Vuforia Target Manager is a web based tool that enables you to create and manage target databases online. You can also manage the assignment of databases to license keys using the Target Manager.

USE THE TARGET MANAGER TO VUFORIA

- Create Device, VuMark, and Cloud Databases
- Assign databases to license keys
- Add targets to databases
- Edit and remove targets
- Manage databases
- Download Device Databases



To begin working with the Target Manager, you'll need a Vuforia Developer account. Sign up Vuforia Developer account at *https://developer.vuforia.com/vui/auth/register*

REGISTER ACCOUNT FOR VUFORIA

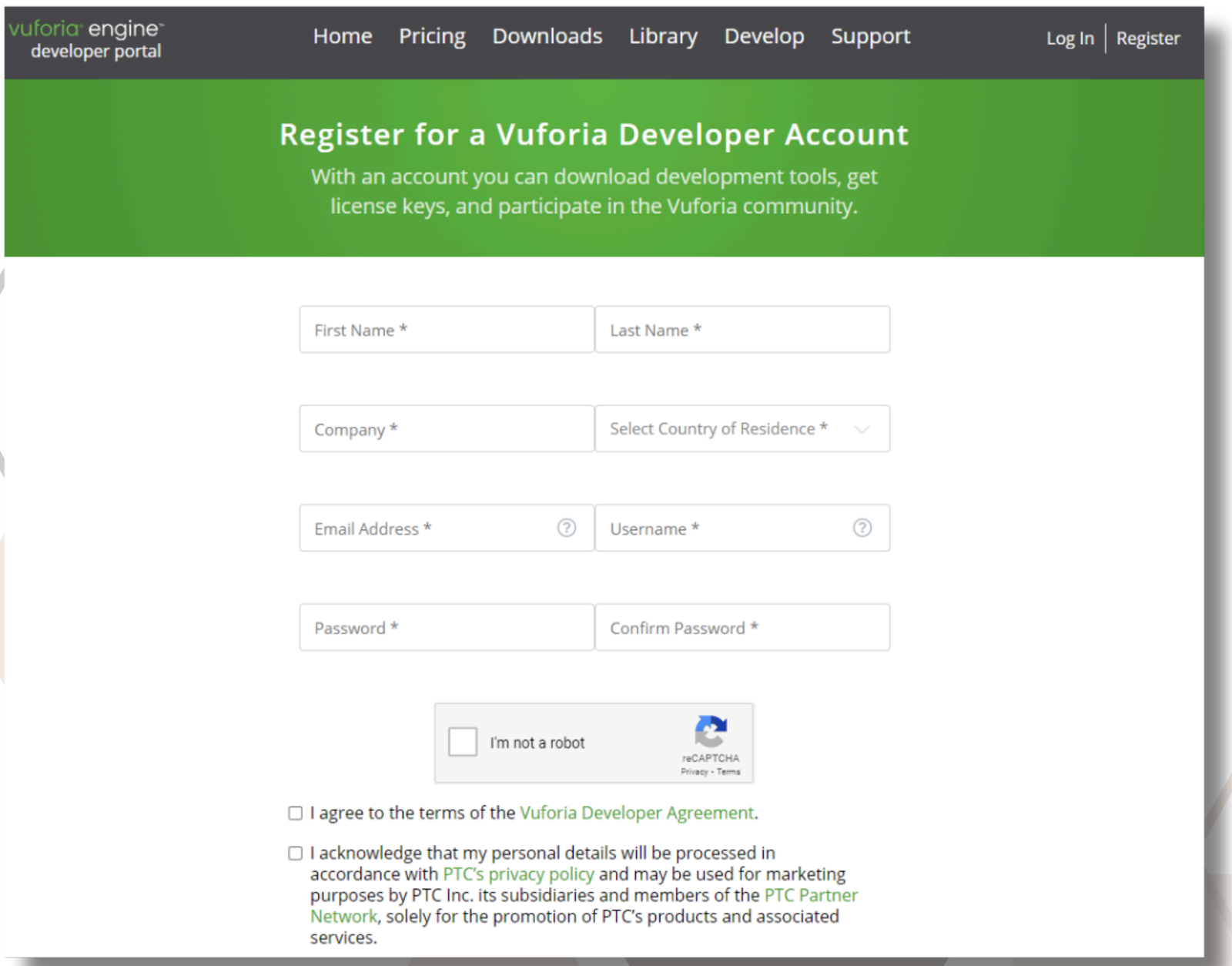
1. Click Register

2. Complete the registration form, agree to the Terms of Service, and click Register. A verification email is sent to the email address you've provided.

3. When you receive the verification email, follow the instructions to verify your registration.

4. After you have verified your registration, return to the Vuforia Developer portal and login to the site.

5. Now you can download the Vuforia SDK and Samples, and start creating licenses and databases for your apps.



LICENSE MANAGER FOR VUFORIA

The License Manager provides you with the tools and information you need to create and manage your licenses. Whether you are developing or deploying an app, you need a license key.

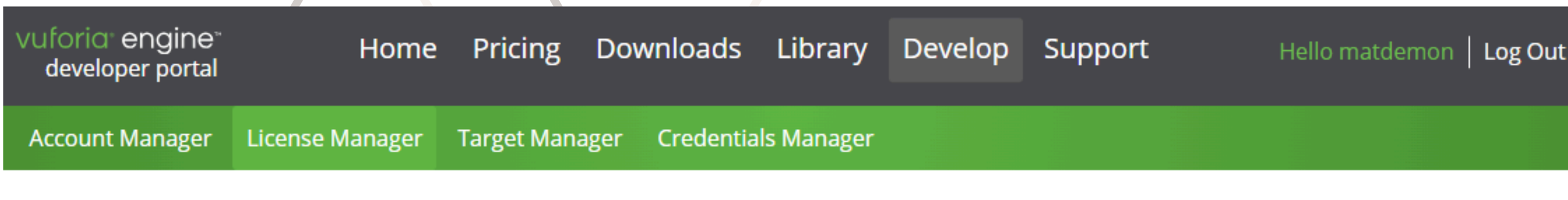
Creating a license key is simple.

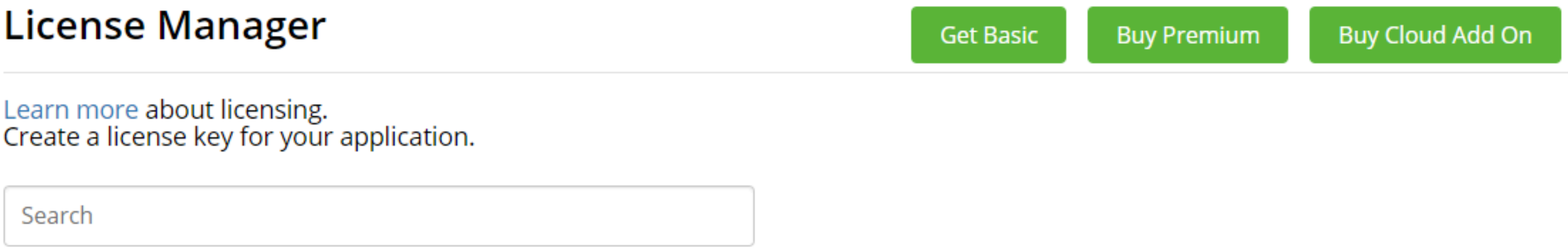
Select a Project Type

Basic plan - The free Basic plan lets you create Vuforia Engine license keys that unlocks the use of several of the Vuforia features and services.

Premium plan - The Premium plan is an annual subscription that lets you request and receive Vuforia Engine license keys that can be used with the Model Target and Area Target Vuforia features.

Cloud and Cloud Plus add-ons - The Cloud and Cloud Plus add-ons are subscriptions that let you create an individual Vuforia Engine license key that can be associated with a Cloud Database to increase your monthly Cloud Recognition limits.





LICENSE MANAGER FOR VUFORIA

Confirm your selection and get a license key for your app.

Each license key can only be used in a single app. You will need to create a unique license key for each Vuforia app that you develop, though you can use the same license key for all OS versions of the app supported by your license type.

To use the License Manager, you need an active Vuforia developer account.

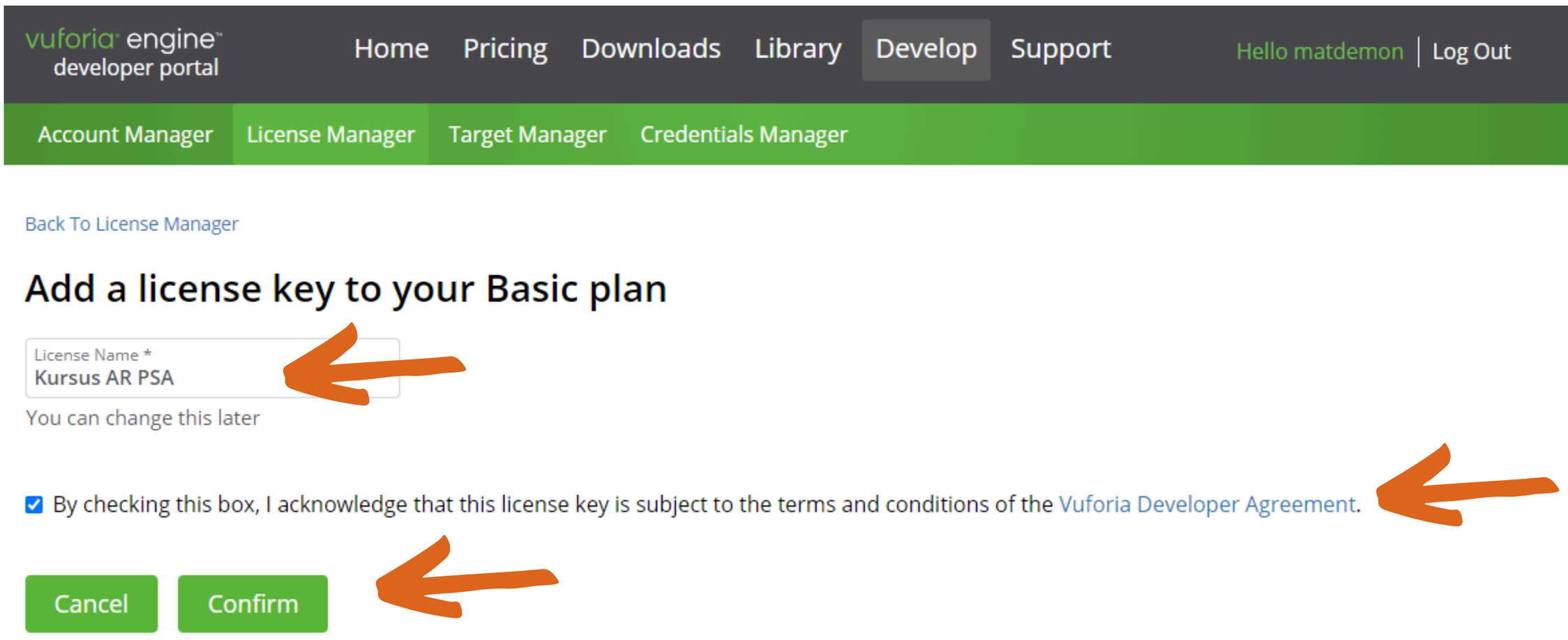
LICENSE MANAGER FOR VUFORIA

1. Select a licensing option based on your project and application type.

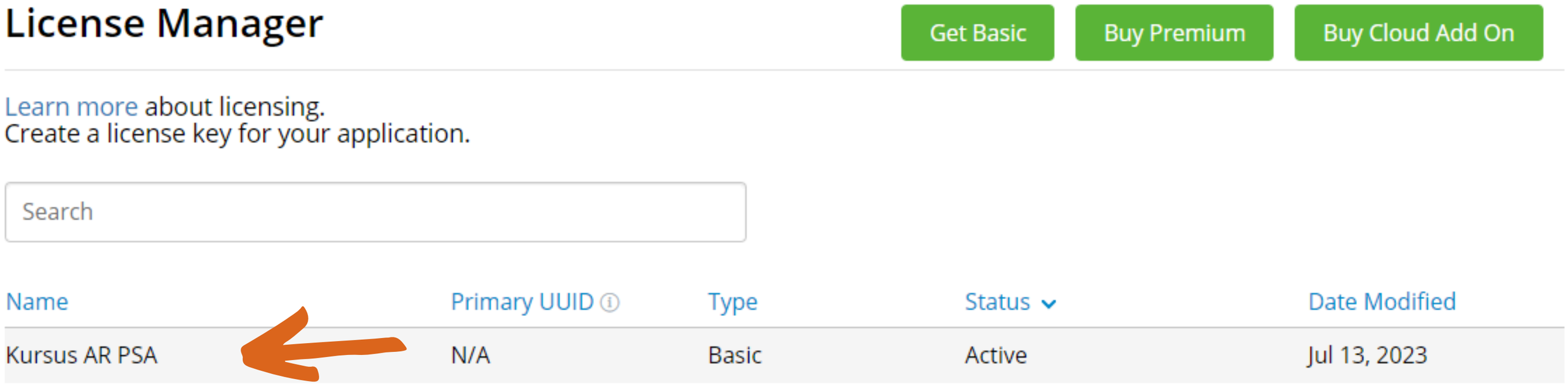
2.Fill in the License Name

3. Check the confirmation box to accept the Vuforia Developer Agreement and to authorize charges if you have chosen a paid plan.

4. Press Confirm. Your new license title will appear in the License Manager.



LICENSE MANAGER FOR VUFORIA



1. Click on Your new license title then License Key will appear in the License Manager.

2. Once you have a license key defined in the License Manager, you can:

- Copy the license key into your app
- Create a database
- Add targets
- Download your database and add it to your Vuforia project
- Update and manage your databases and targets throughout the life of your app.

LICENSE MANAGER FOR VUFORIA

vuforia engine developer portal | Home | Pricing | Downloads | Library | Develop | Support | Hello matdemon | Log Out

Account Manager | License Manager | Target Manager | Credentials Manager

License Manager > Kursus AR PSA

Kursus AR PSA Edit Name Delete License Key

License Key | Usage

Please copy the license key below into your app

```
AVLZIz/////[redacted]hHfZhl0yMN
FvRCzW[redacted]pbjMfYxq35
zDR57T[redacted]PXeIO65bOfv
+Kyb4pFspRnjyjUKIZfXYgWn2gXJ5z4a5/4v+PKc1d9BCE7nlAKdc7AMmamDDrEk/+btASj
```

Plan Type: Basic
Status: Active
Created: Jul 13, 2023 15:10
License UUID: f4f49df2a7e2432c9c31fda91fe3e2df

History:
License Created - Today 15:10

copy the license key into your app

VUFORIA ENGINE SDK

The Vuforia Engine SDK for Unity provides a set of tools, APIs, and functionalities that enable developers to integrate augmented reality (AR) capabilities into Unity projects. Here are some of the main functions and features of the SDK:

- *Marker-based tracking: Vuforia allows you to track and recognize predefined markers or images called "targets." You can create AR experiences by overlaying digital content onto these markers. The SDK provides APIs and components for marker detection, tracking, and rendering.*
- *Object recognition: Vuforia can recognize and track 3D objects in the real world, enabling you to create AR experiences based on physical objects. This feature allows you to augment objects with virtual content and interactions.*
- *Image targets: Vuforia supports the recognition and tracking of static images as targets. You can define images as targets and overlay virtual content on top of them. This feature is useful for creating AR experiences based on printed materials, posters, or images in magazines.*
- *Ground plane detection: With Vuforia, you can detect and place digital content on horizontal surfaces in the real world, such as floors or tables. This feature simplifies the process of anchoring virtual objects to the ground plane, enhancing the realism of AR experiences.*

VUFORIA ENGINE SDK

- *Environmental understanding: Vuforia offers environmental understanding capabilities, allowing you to detect and track objects in the environment, such as walls, obstacles, or furniture. This feature enables more interactive and dynamic AR experiences that can interact with the real-world surroundings.*

- *Virtual buttons and gestures: Vuforia provides APIs for creating virtual buttons and defining gestures, allowing users to interact with the AR content through touch or gestures. This functionality enables users to control and manipulate virtual objects in the AR scene.*

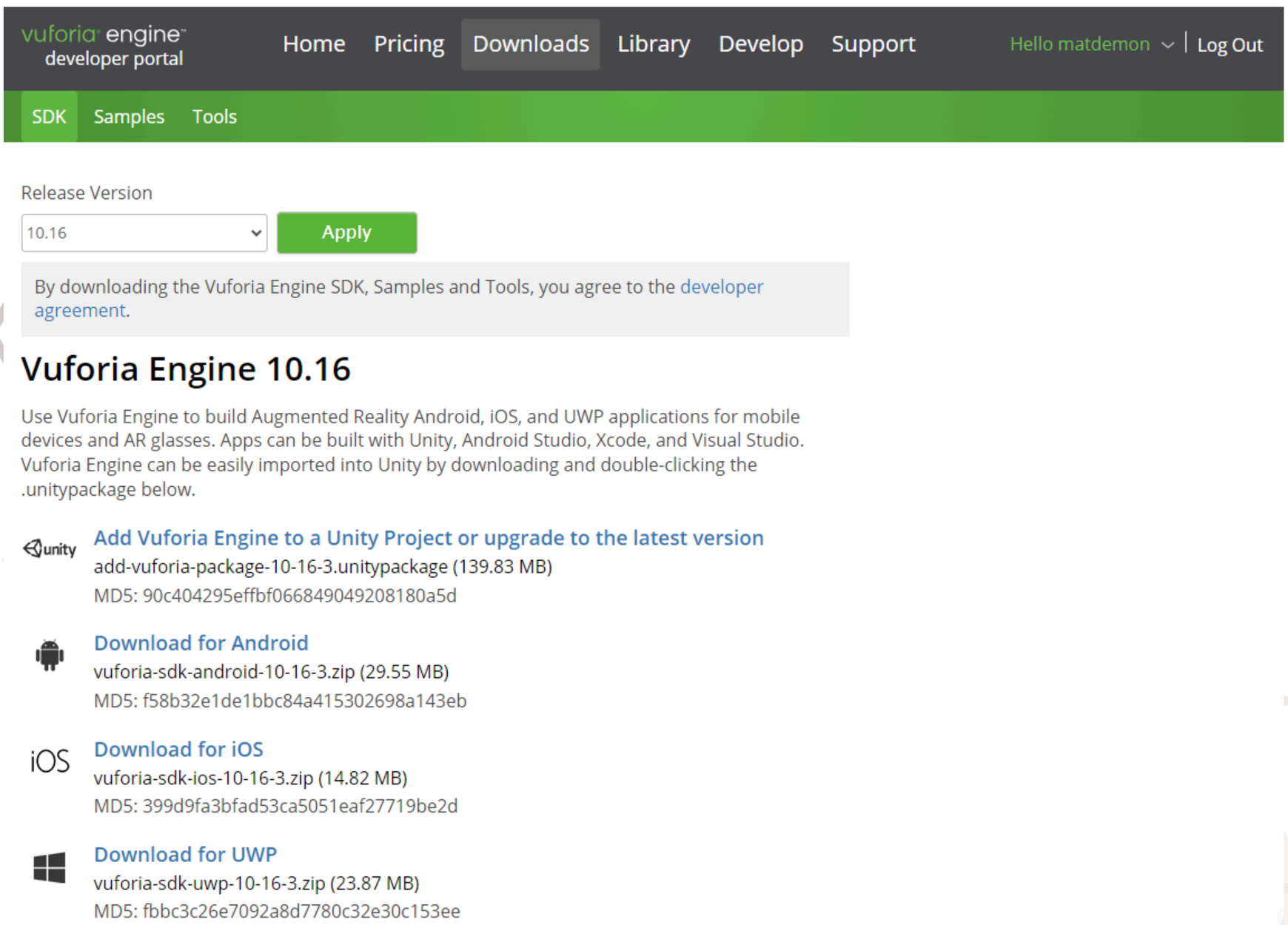
- *Cross-platform support: Vuforia supports multiple platforms, including iOS, Android, Windows, and Unity Editor. This allows developers to create AR applications that can run on a wide range of devices, reaching a broader audience.*

These are just some of the key functions provided by the Vuforia Engine SDK for Unity. The SDK offers a comprehensive set of tools and features that enable developers to create immersive AR experiences within the Unity development environment.

DOWNLOAD VUFORIA ENGINE SDK

1. Once you have your license key, go to the Downloads section of the Vuforia Developer Portal. Select the version of the Vuforia Engine SDK for Unity that you want to download. Make sure to choose the appropriate version based on your Unity project's requirements.
2. After downloading the SDK, follow the installation instructions provided by Vuforia to integrate it into your Unity project. The instructions will guide you through the necessary steps, including importing the Vuforia package into Unity, configuring the license key, and setting up the necessary components and scripts.

It's important to note that the steps above provide a general overview of the download process. The exact steps and procedures might change over time, so it's recommended to refer to the official Vuforia documentation and developer resources for the most up-to-date and detailed instructions on downloading and integrating the Vuforia Engine SDK into Unity.



DOWNLOAD AND INSTALL UNITY (GENERAL)

- ***Visit the Unity website***: *Go to the official Unity website at Add a little bit of body text and navigate to the Downloads page.*

- ***Select the appropriate version***: *On the Downloads page, you will find a list of available Unity versions. Look for the version you want to download, such as Unity 2023 if it is available at the time you're reading this.*

- ***Choose the installer***: *Unity offers different installer options based on your operating system. Select the installer that corresponds to your operating system (Windows, macOS, or Linux).*

- ***Select the edition***: *Unity provides different editions, such as Personal, Plus, and Pro. Choose the edition that suits your needs. The Personal edition is free for individuals or small teams.*

- ***Customize the installation***: *On the installer page, you may have the option to customize the installation settings. You can choose the installation path, additional components, and modules that you want to include.*

- ***Start the download***: *Click on the download button to begin the download process. The Unity installer file will be downloaded to your computer.*

DOWNLOAD AND INSTALL UNITY (GENERAL)

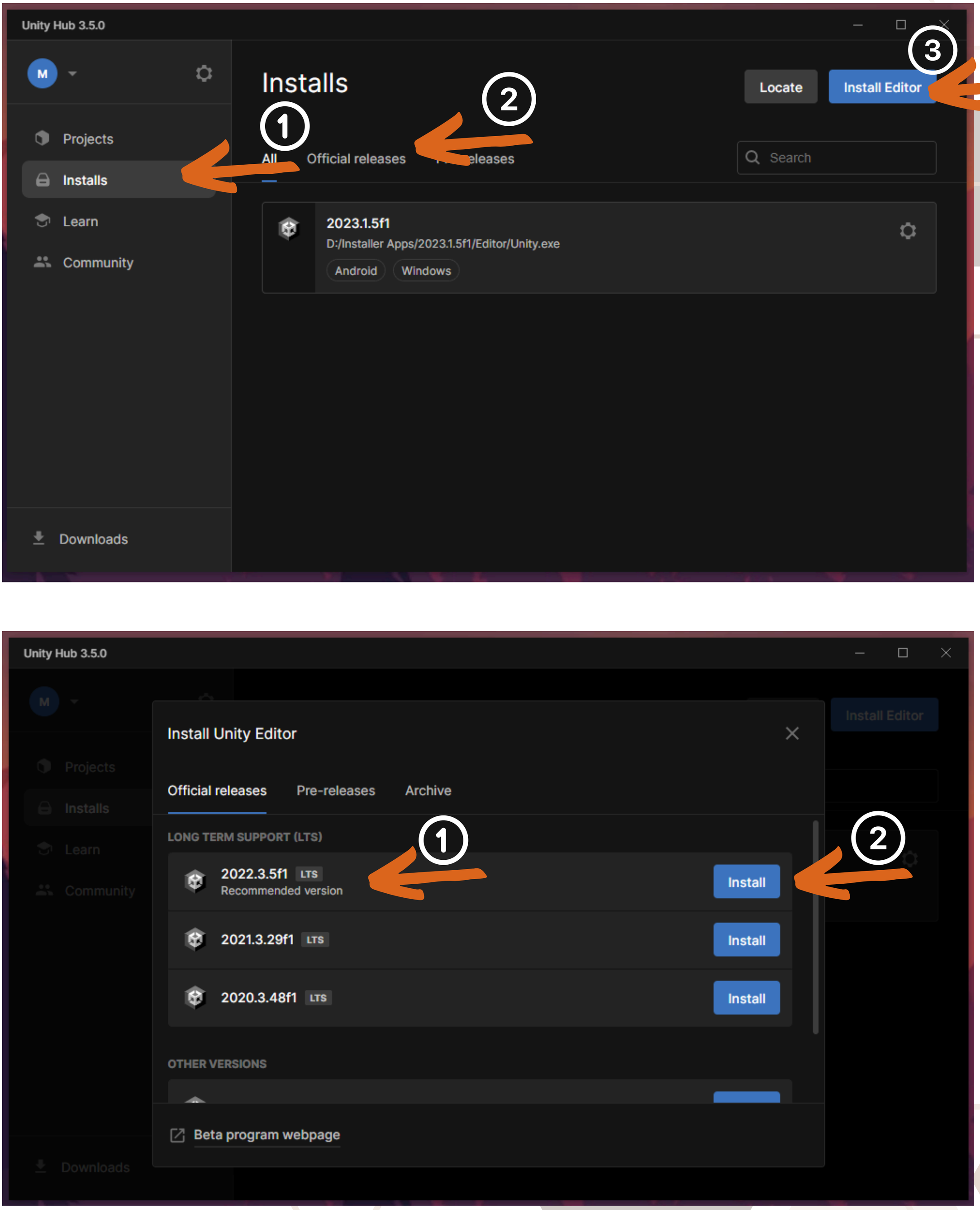
- ***Run the installer***: *Locate the downloaded installer file and run it. Follow the prompts and accept the license agreement.*

- ***Select components***: *During the installation process, you may be prompted to select additional components or modules to install. Choose the components you need or select the recommended options.*

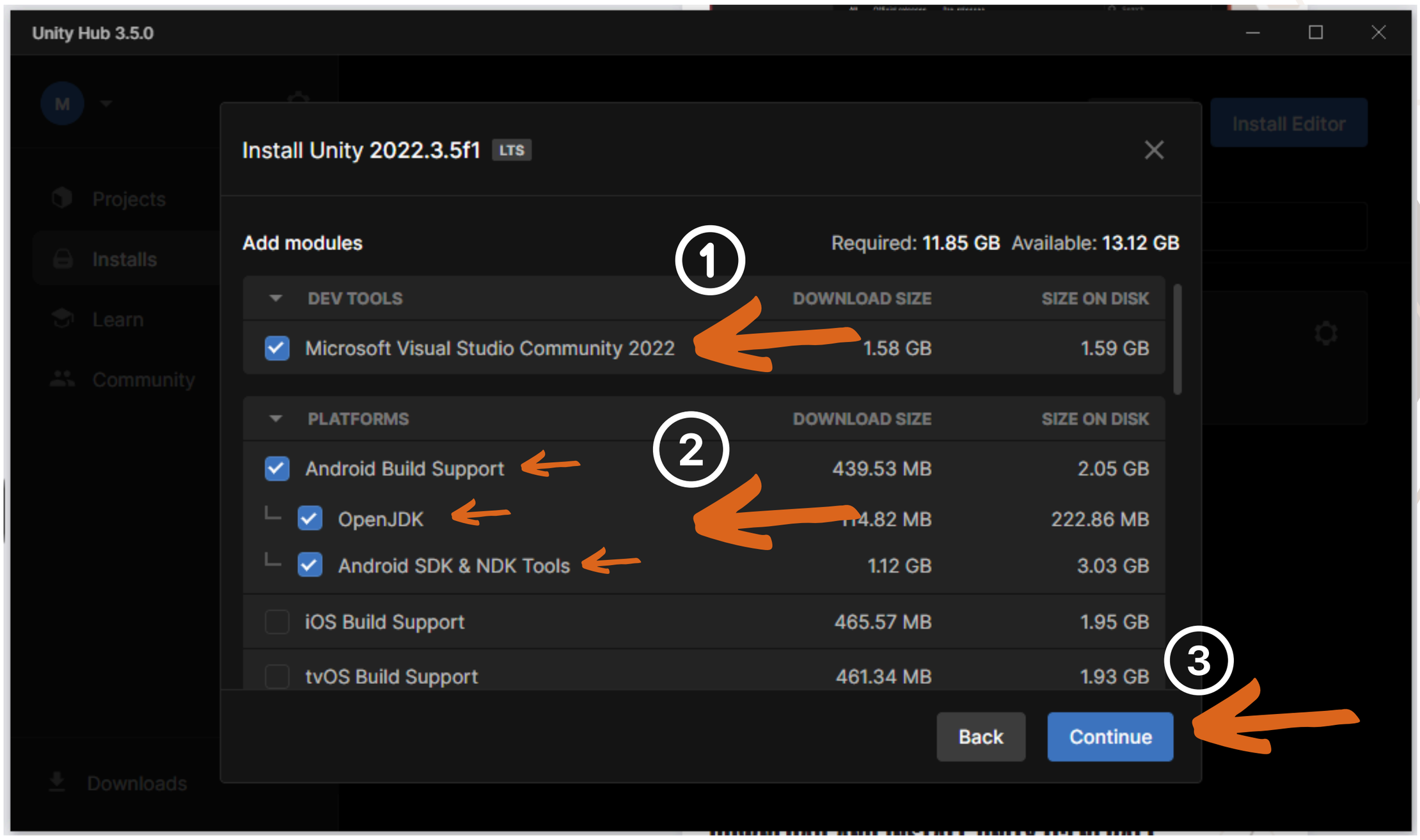
- ***Complete the installation***: *Once the installation is complete, you can launch Unity from the installed location or using the desktop shortcut.*

It's important to note that the steps mentioned above are general instructions, and the specific process might change with future versions of Unity. Therefore, it's recommended to refer to the official Unity website and documentation for the most accurate and up-to-date instructions on downloading and installing Unity 2023 or any other version beyond my knowledge cutoff.

DOWNLOAD AND INSTALL UNITY (GENERAL)



DOWNLOAD AND INSTALL UNITY (GENERAL)



CREATE NEW PROJECT IN UNITY (GENERAL)

- ***Open Unity Hub***: *Launch Unity Hub and sign in with your Unity account or create a new one if you don't have it.*

- ***Create a new project:*** *Click on the "New Project" button in the top right corner of Unity Hub. Choose the Unity version you installed in step 1, and then select the "3D" or "2D" template based on the type of project you want to create.*

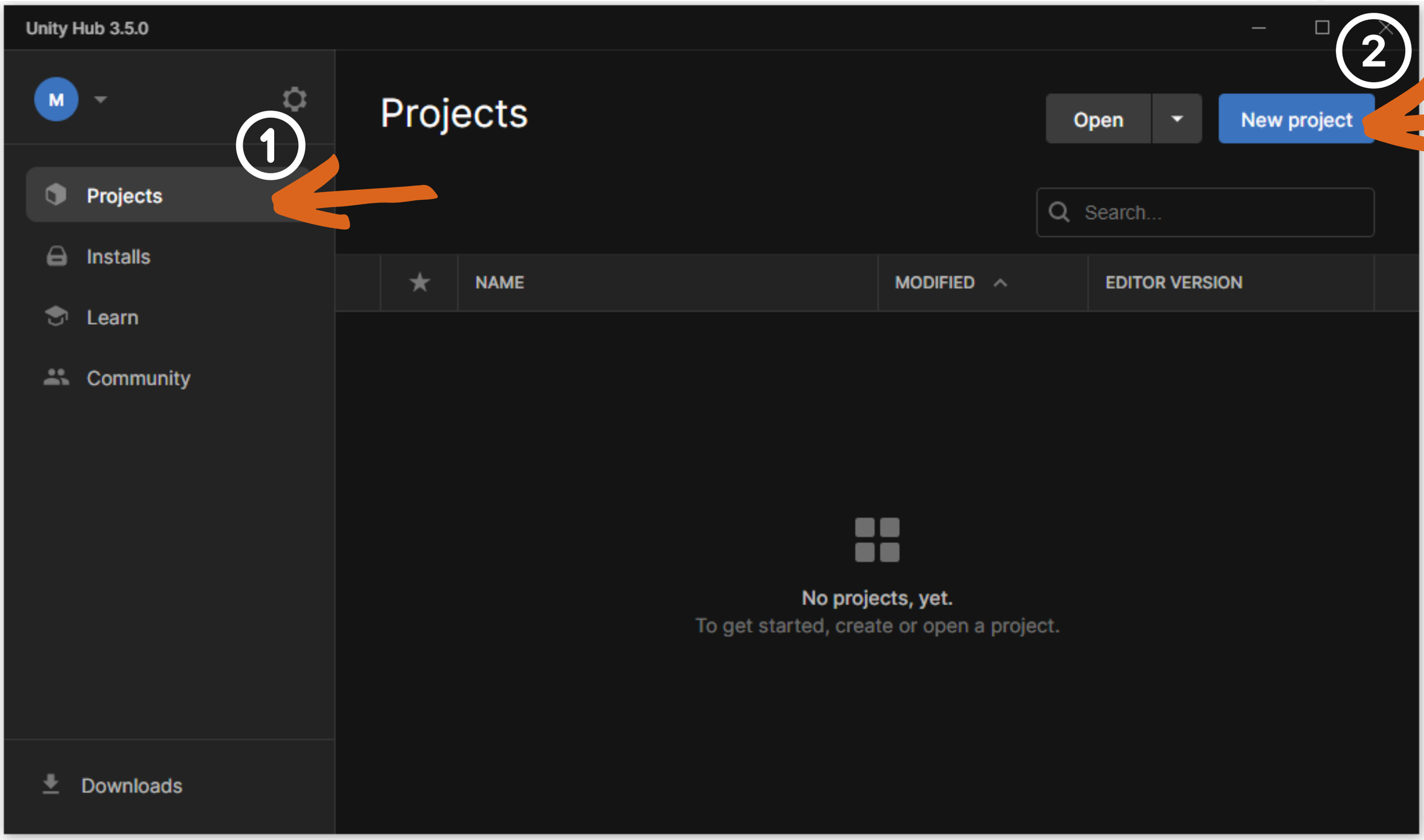
- ***Project settings:*** *Give your project a name and choose a location where you want to save it on your computer.*

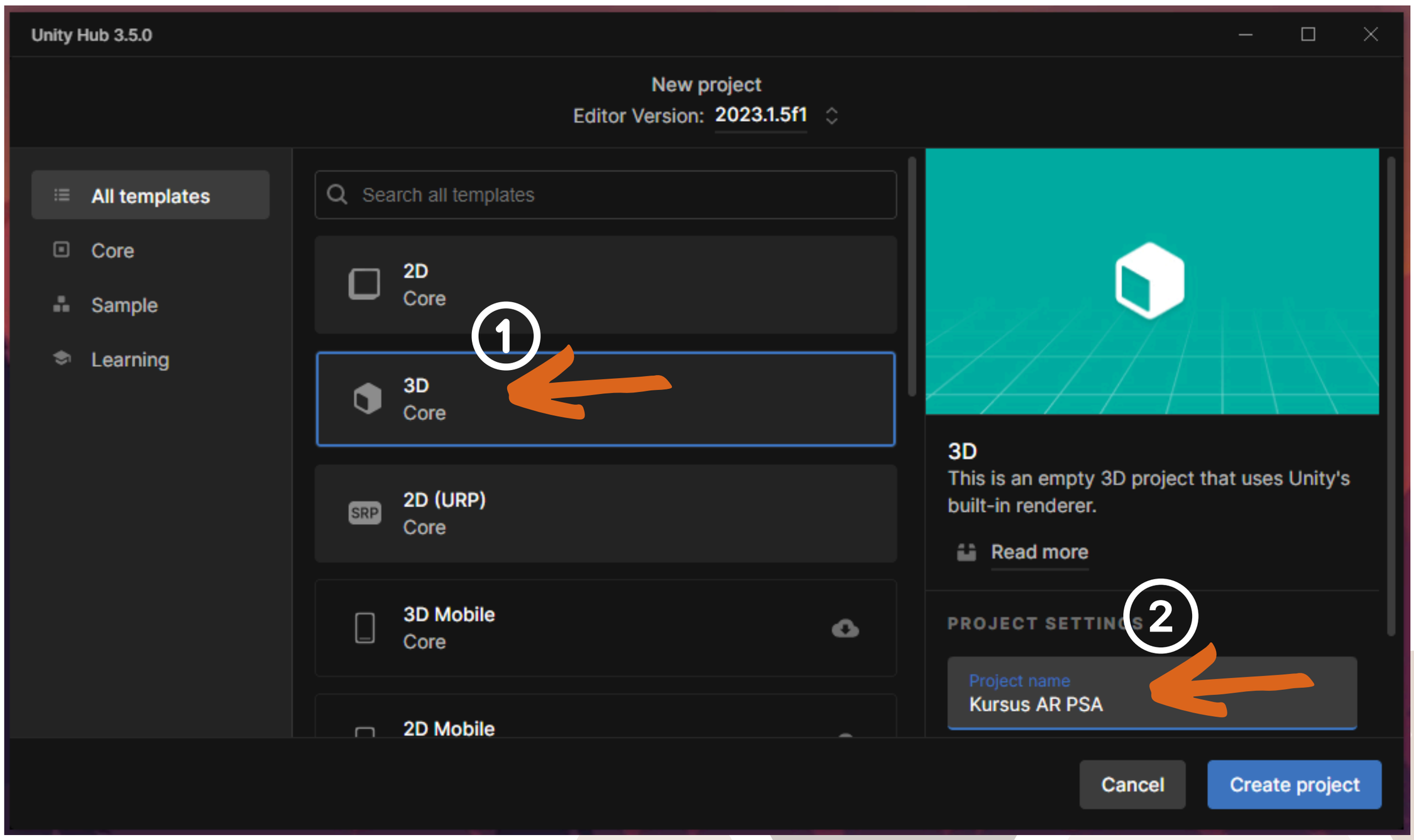
- ***Create the project:*** *Click the "Create" button, and Unity will generate your new project.*

Once the project is created, you will be taken to the Unity Editor where you can start building your game or application. Unity provides a user-friendly interface and a range of tools to help you design and develop your project.

Remember to save your progress regularly and have fun exploring the possibilities that Unity offers!

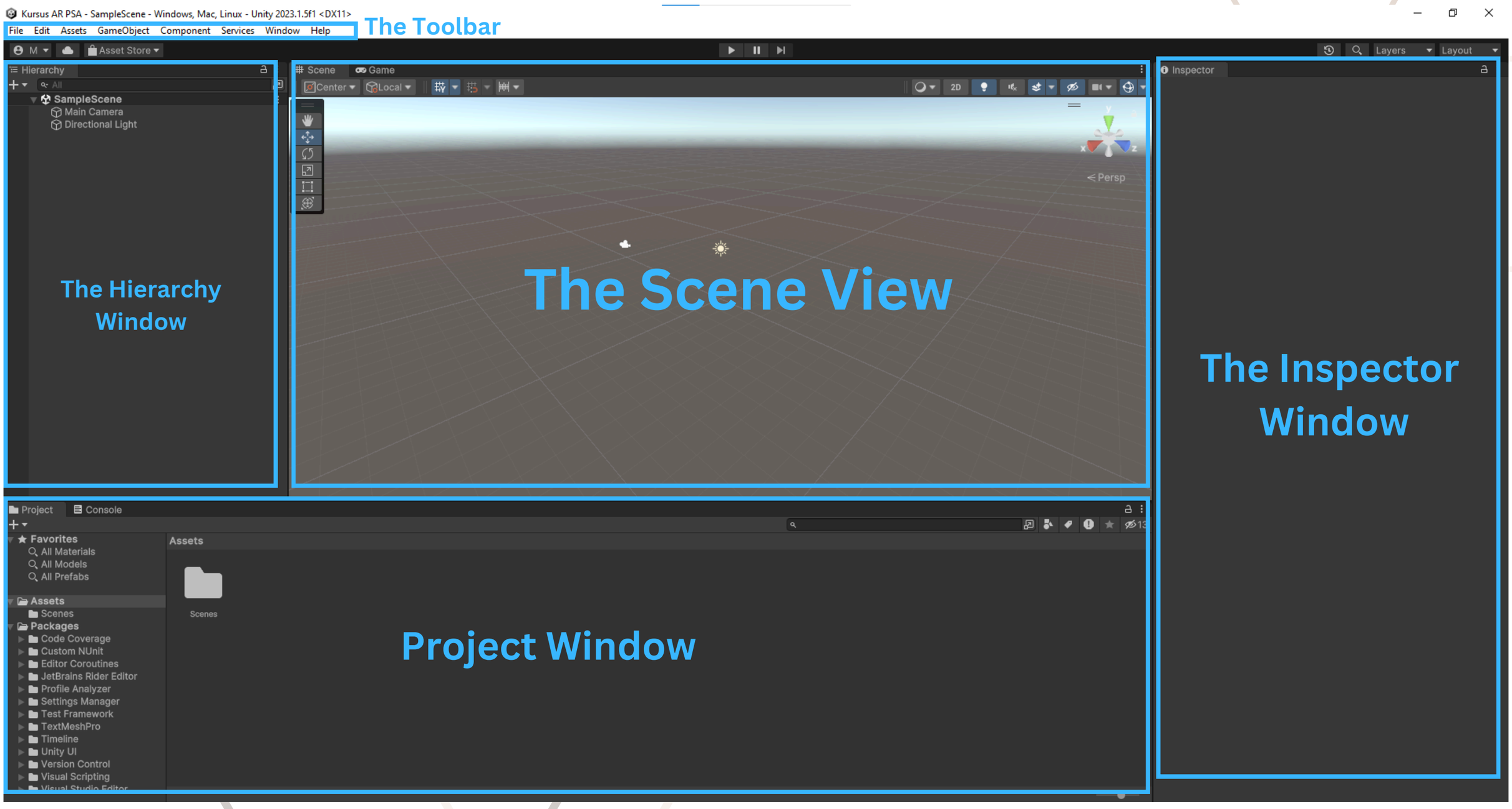
CREATE NEW PROJECT IN UNITY (GENERAL)





USER INTERFACE UNITY

Take your time to look over the editor interface and familiarize yourself with it. The main editor window is made up of tabbed windows which can be rearranged, grouped, detatched and docked. The default arrangement of windows gives you practical access to the the most common windows. The most common and useful windows are shown in their default positions, below:



USER INTERFACE UNITY

The Project Window *displays your library of assets that are available to use in your project. When you import assets into your project, they appear here.*

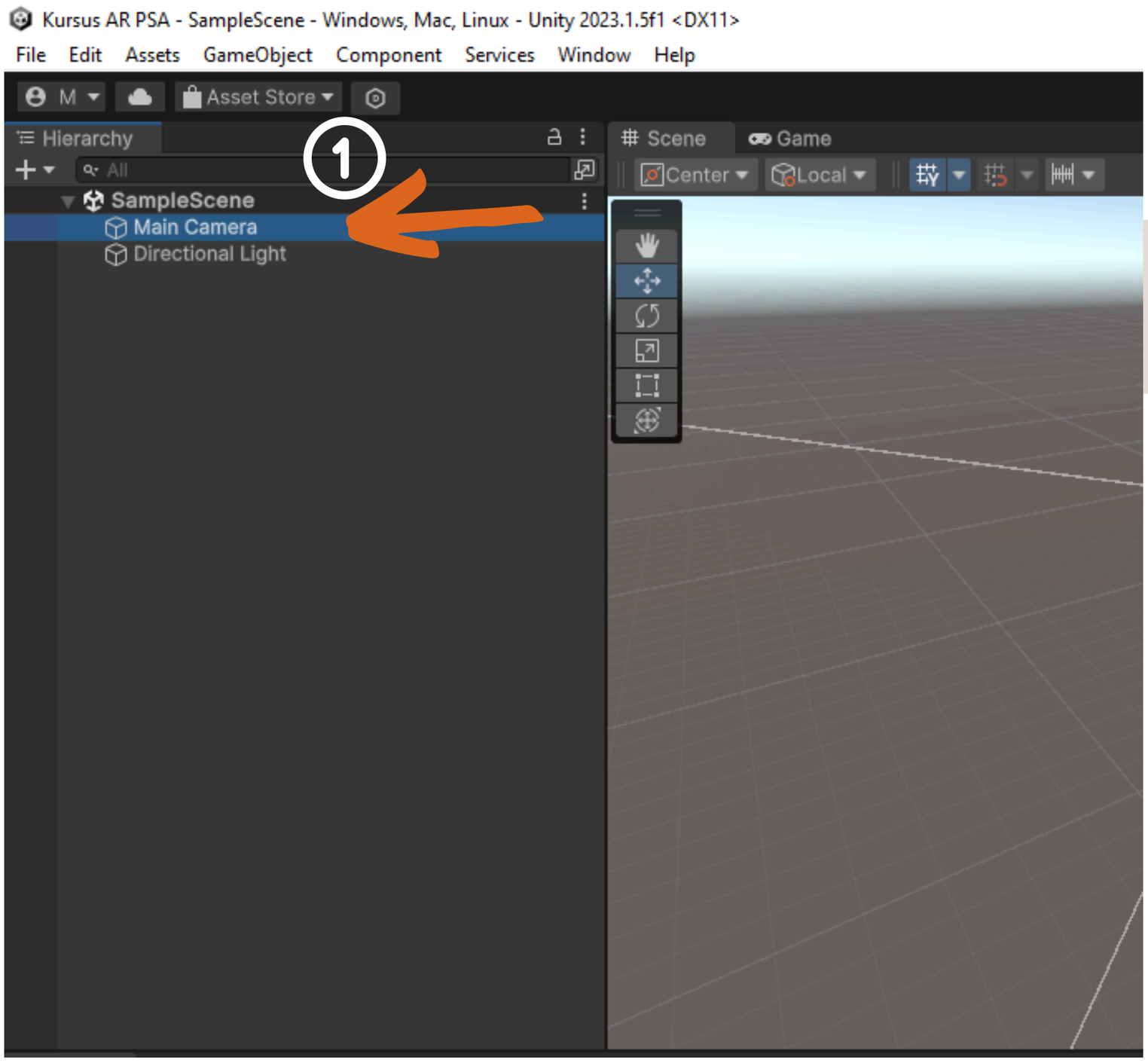
The Scene View *allows you to visually navigate and edit your scene. The scene view can show a 3D or 2D perspective, depending on the type of project you are working on.*

The Hierarchy Window *is a hierarchical text representation of every object in the scene. Each item in the scene has an entry in the hierarchy, so the two windows are inherently linked. The hierarchy reveals the structure of how objects are attached to one another.*

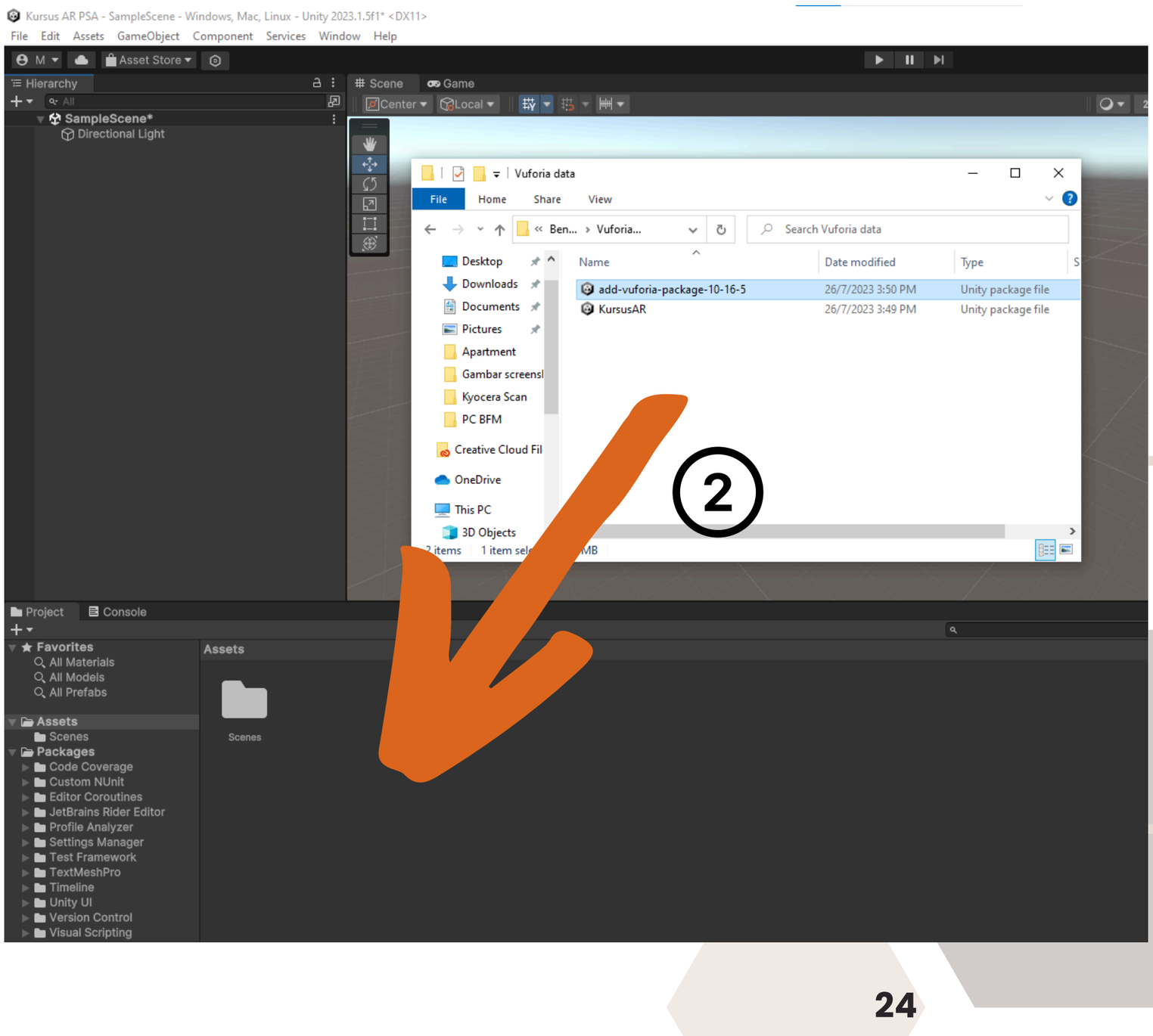
The Inspector Window *allows you to view and edit all the properties of the currently selected object. Because different types of objects have different sets of properties, the layout and contents of the inspector window will vary.*

The Toolbar *provides access to the most essential working features. On the left it contains the basic tools for manipulating the scene view and the objects within it. In the centre are the play, pause and step controls.*

NEW PROJECT IN UNITY (GENERAL)

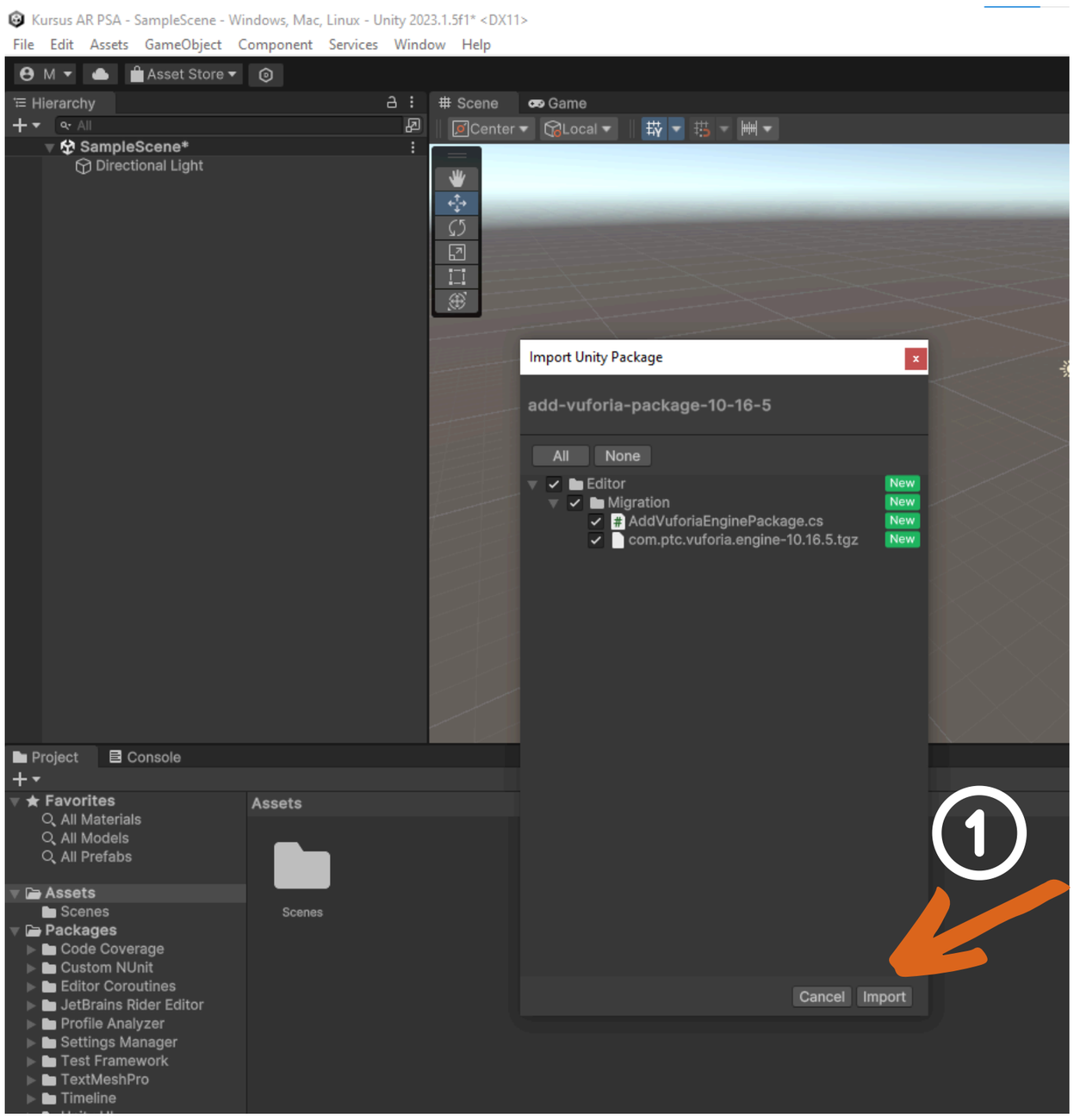


1. *Delete main Camera*



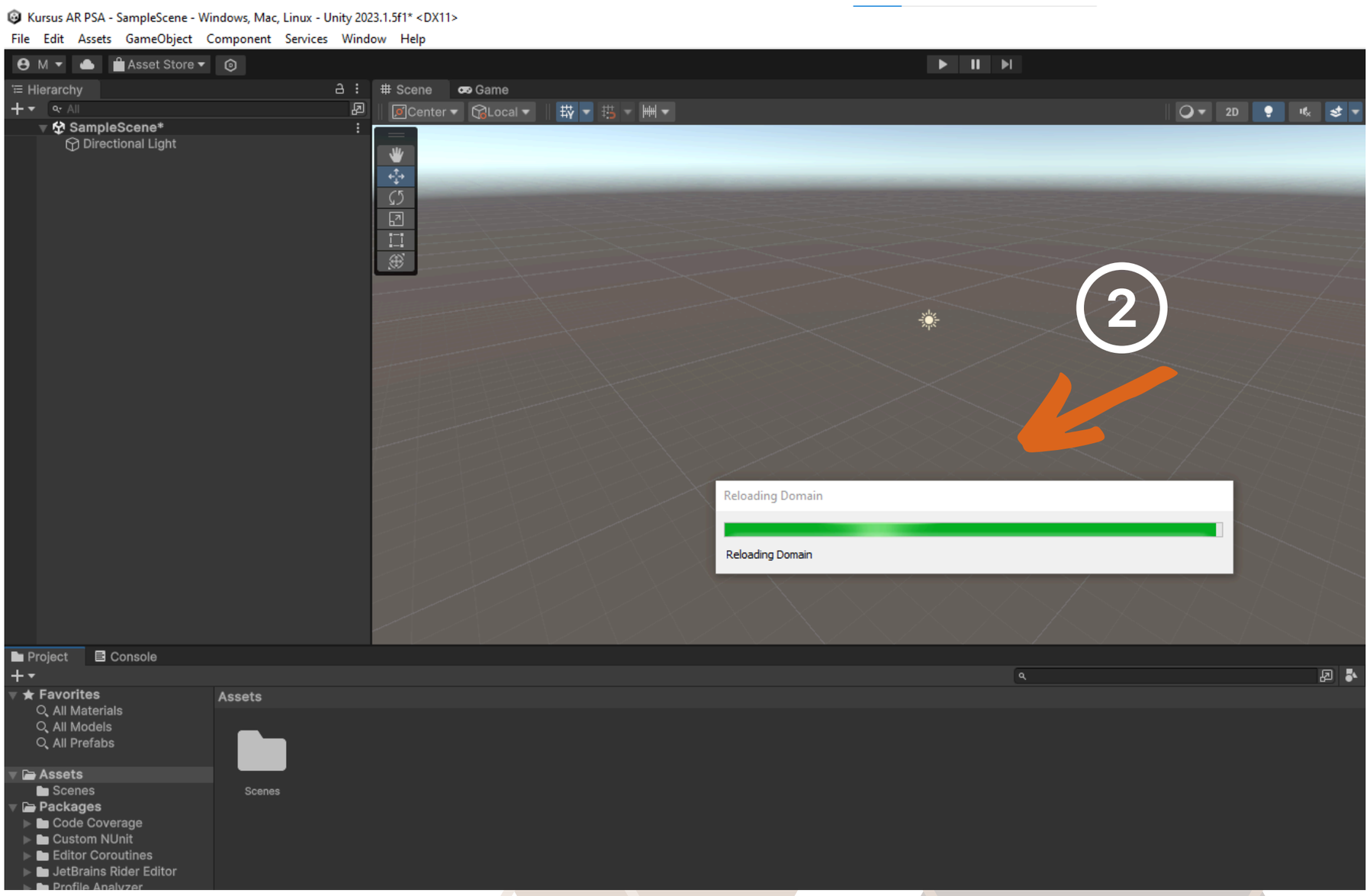
2. *Drag and Drop Vuforia Package to the Project Window*

NEW PROJECT IN UNITY (GENERAL)

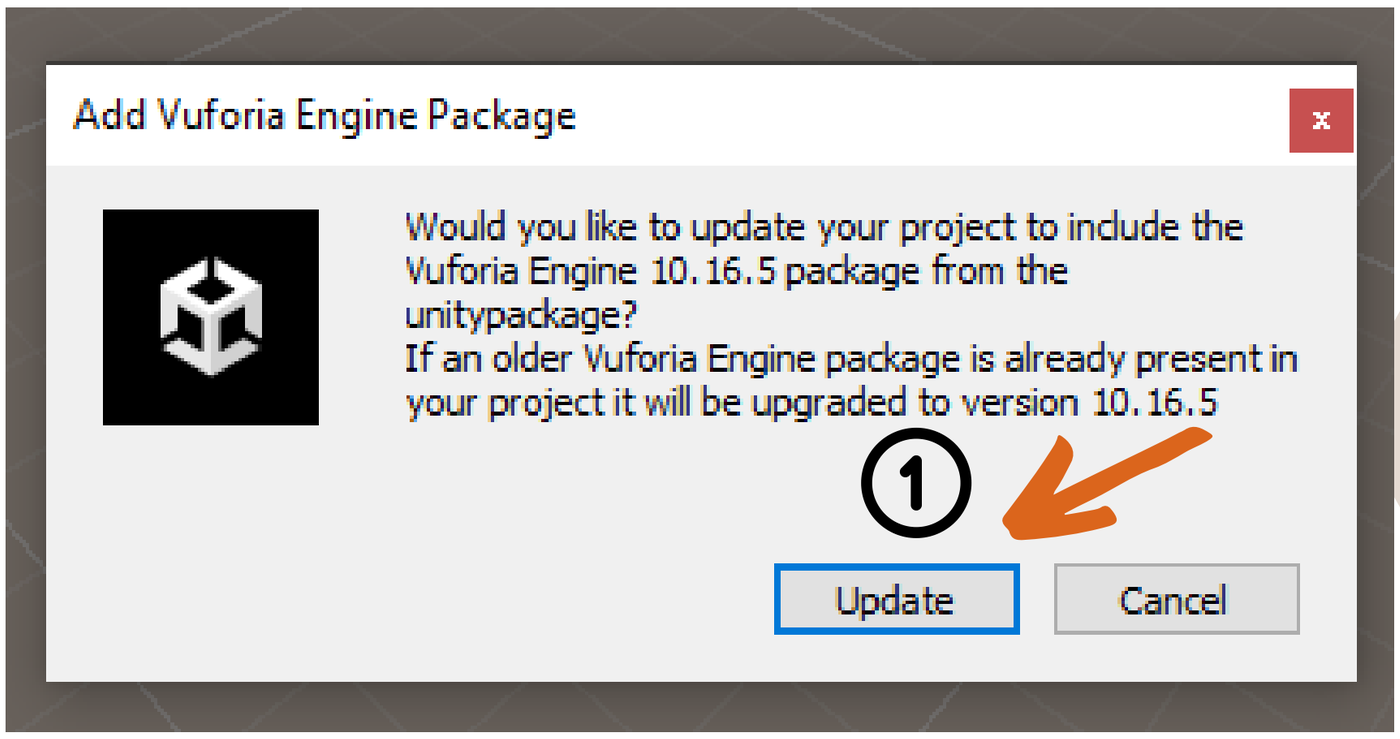


Click Import all the File at Vuforia Package ***(From Vuforia Engine)***

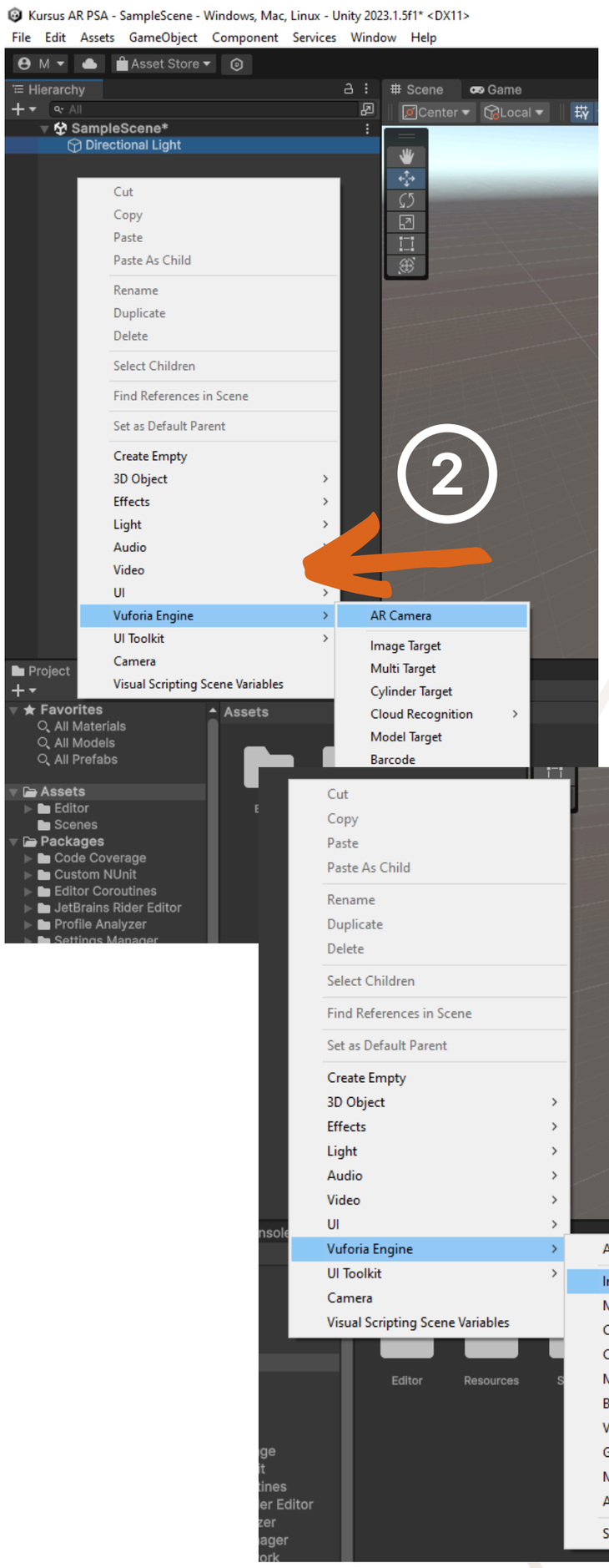
Wait until all package of File have been import



NEW PROJECT IN UNITY (GENERAL)



Click update if this notification has been popup.

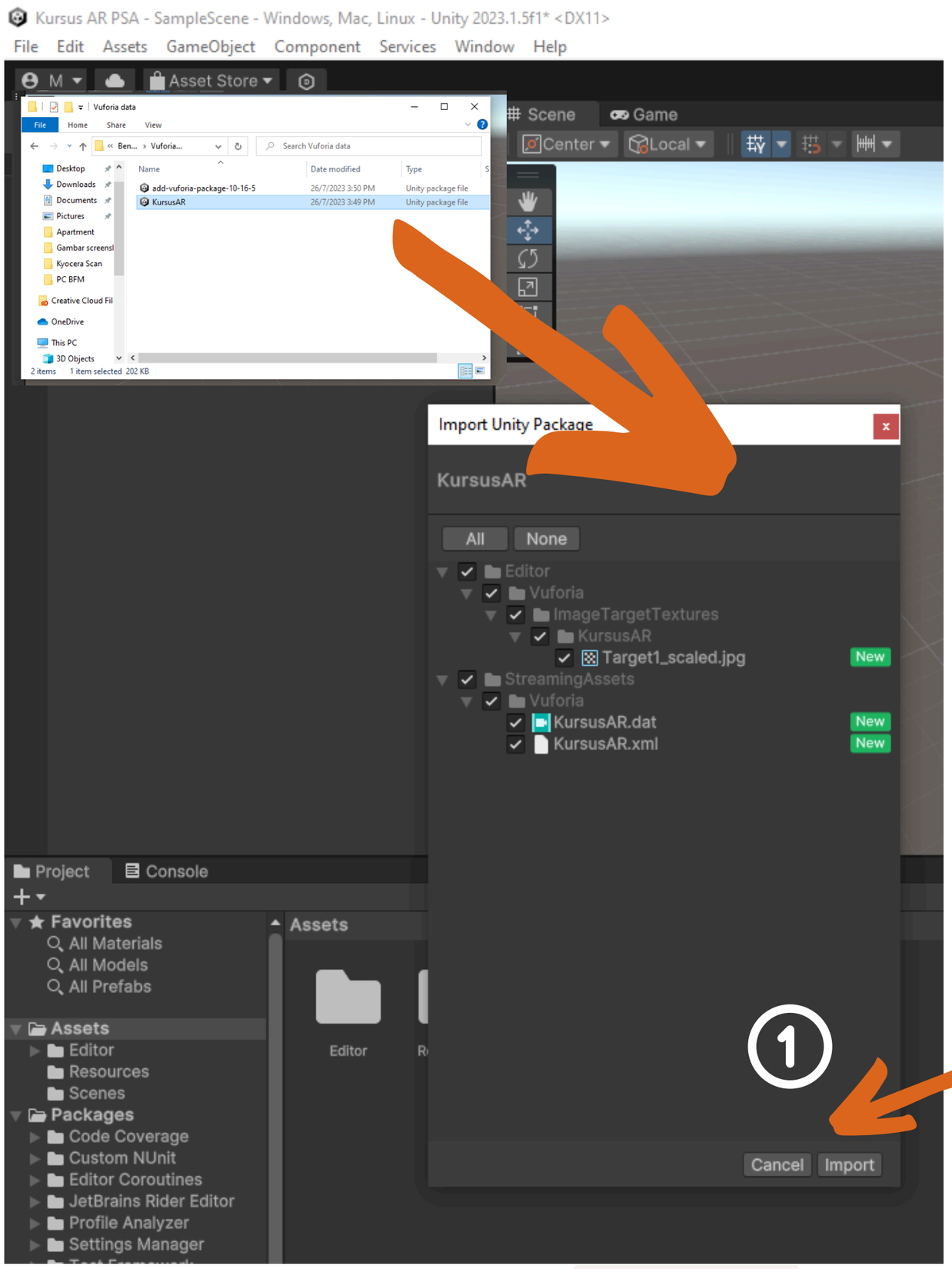


You need to drag 2 items:

Right click at the ***Hierarchy Window*** *and Select :*

VUFORIA ENGINE - AR CAMERA
and
VUFORIA ENGINE - IMAGE TARGET

NEW PROJECT IN UNITY (GENERAL)

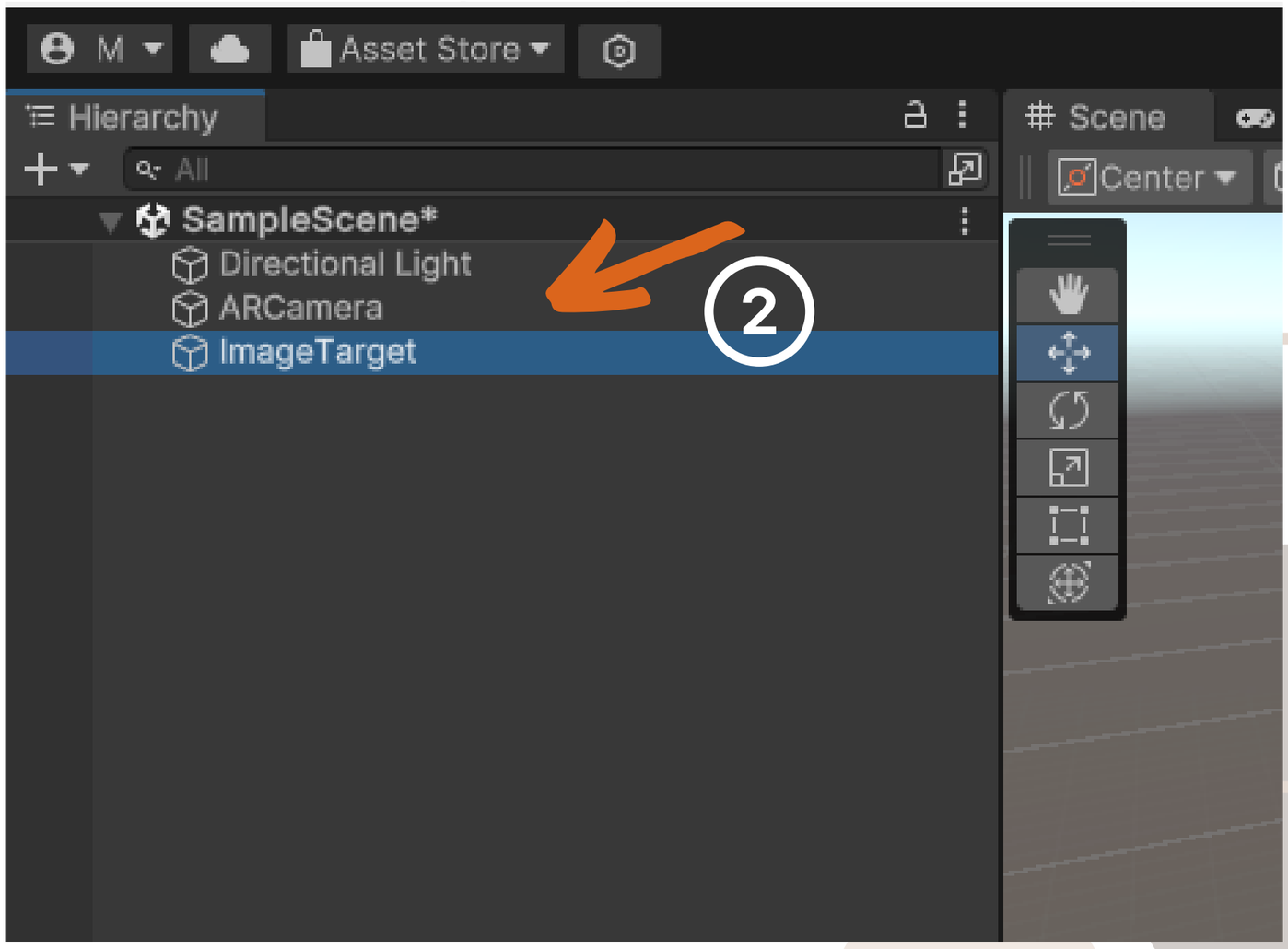


Drag and Drop Vuforia Package ***(From Target Manager)*** *to the Project Window*

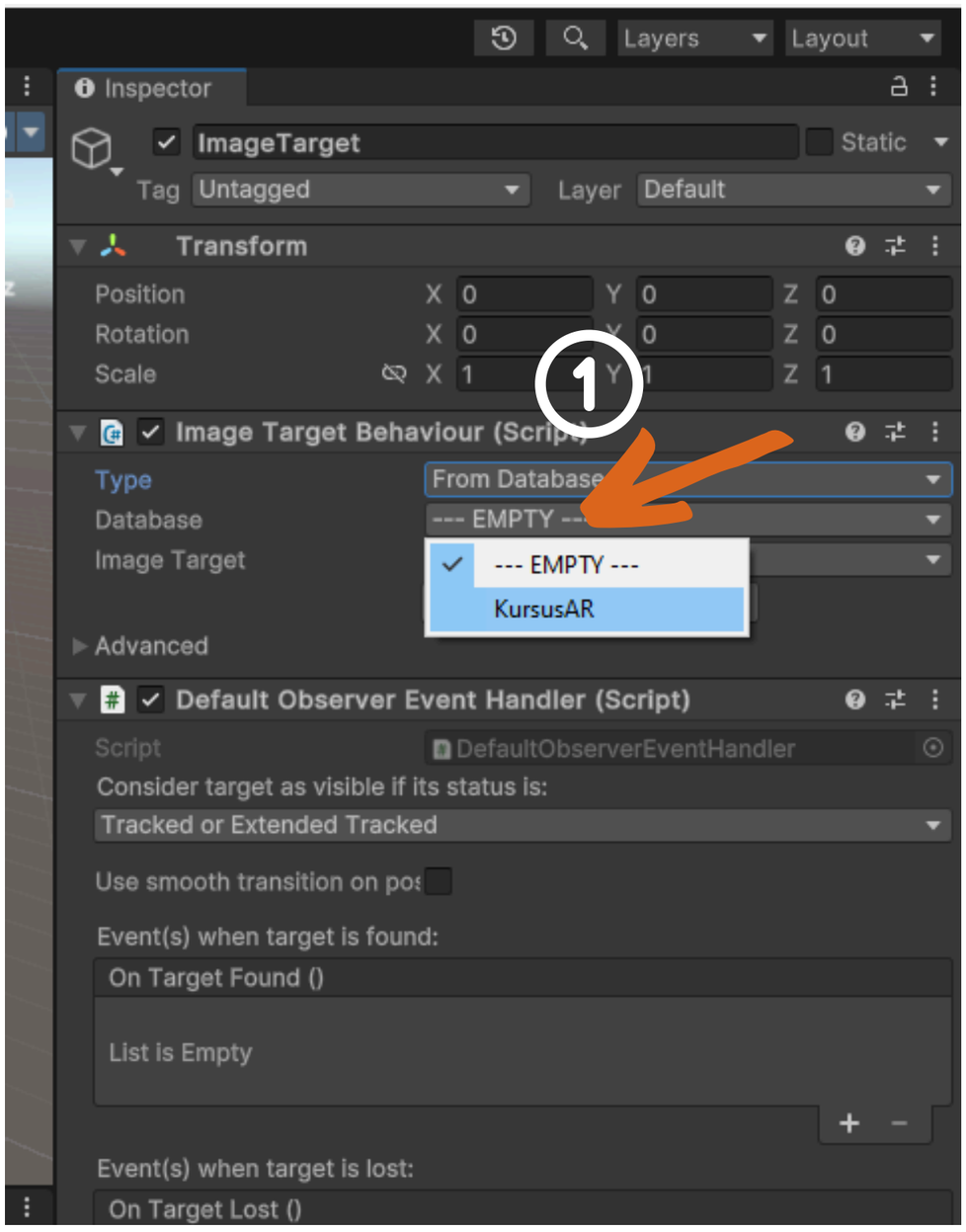
Click Import all the File at Vuforia Package ***(From Target Manager)***

Right Click ImageTarget at Hierarchy Window and go to Inspector window

At Inspector window, go to Column Image Target Behaviour and select :
Type - From Database
Database - (Select your image target)

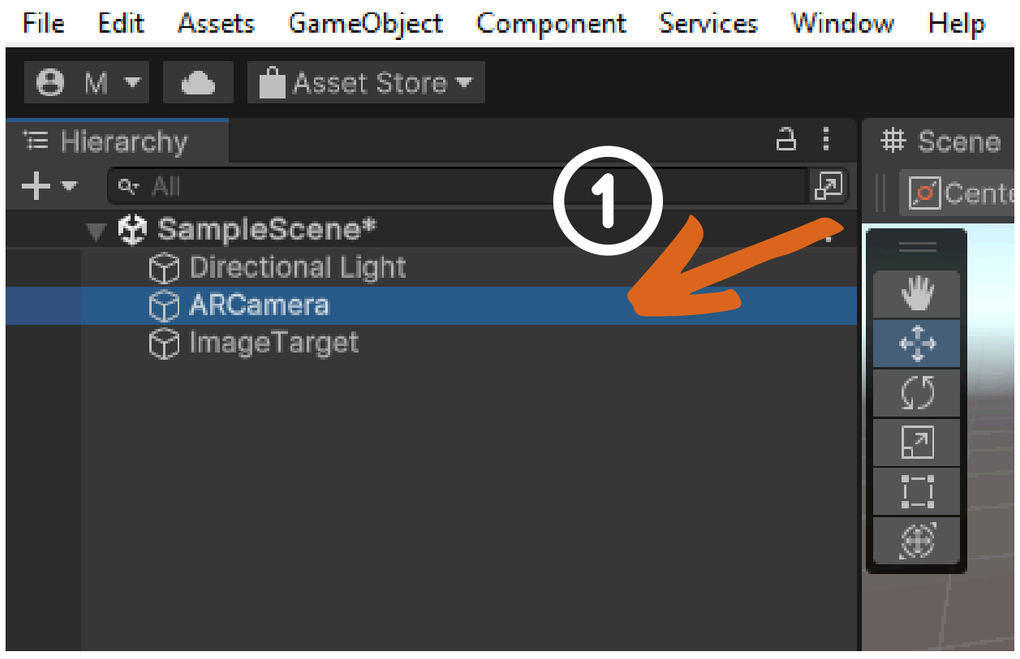


NEW PROJECT IN UNITY (GENERAL)



*After Database has been selected, your target image will be appear at the **SCENE VIEW***

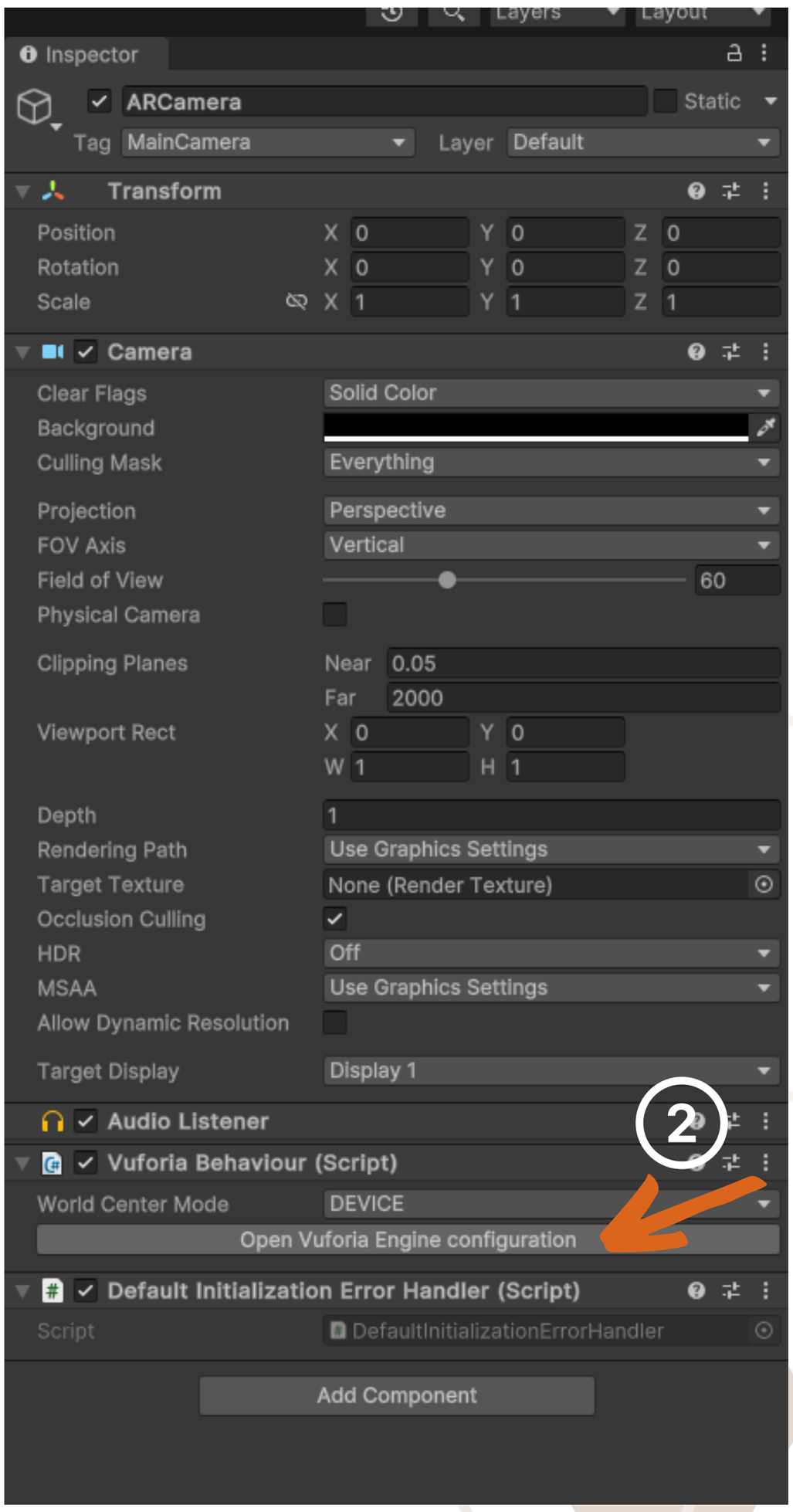
NEW PROJECT IN UNITY (GENERAL)

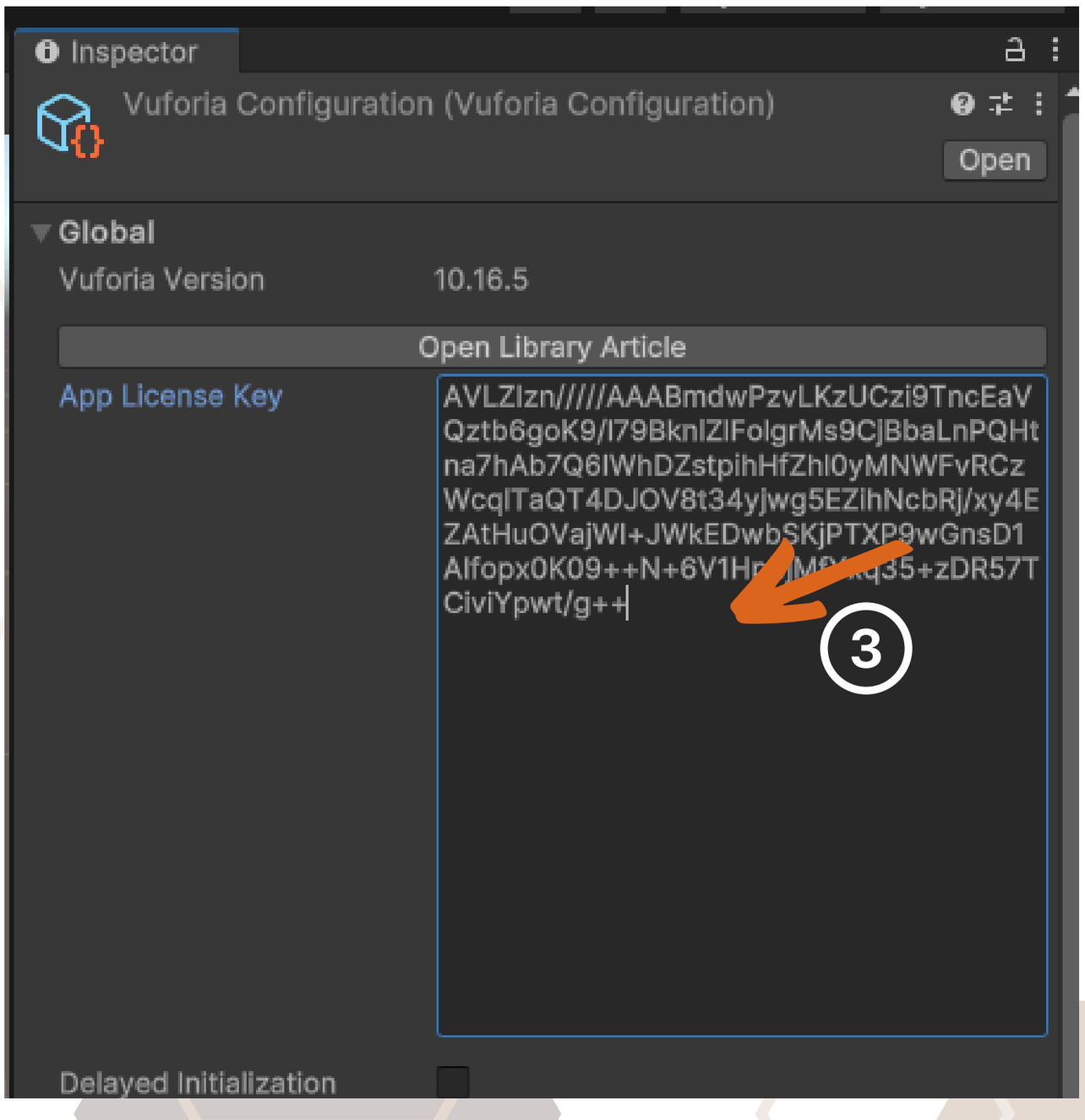


Next, select ARCamera at Hierarchy Window

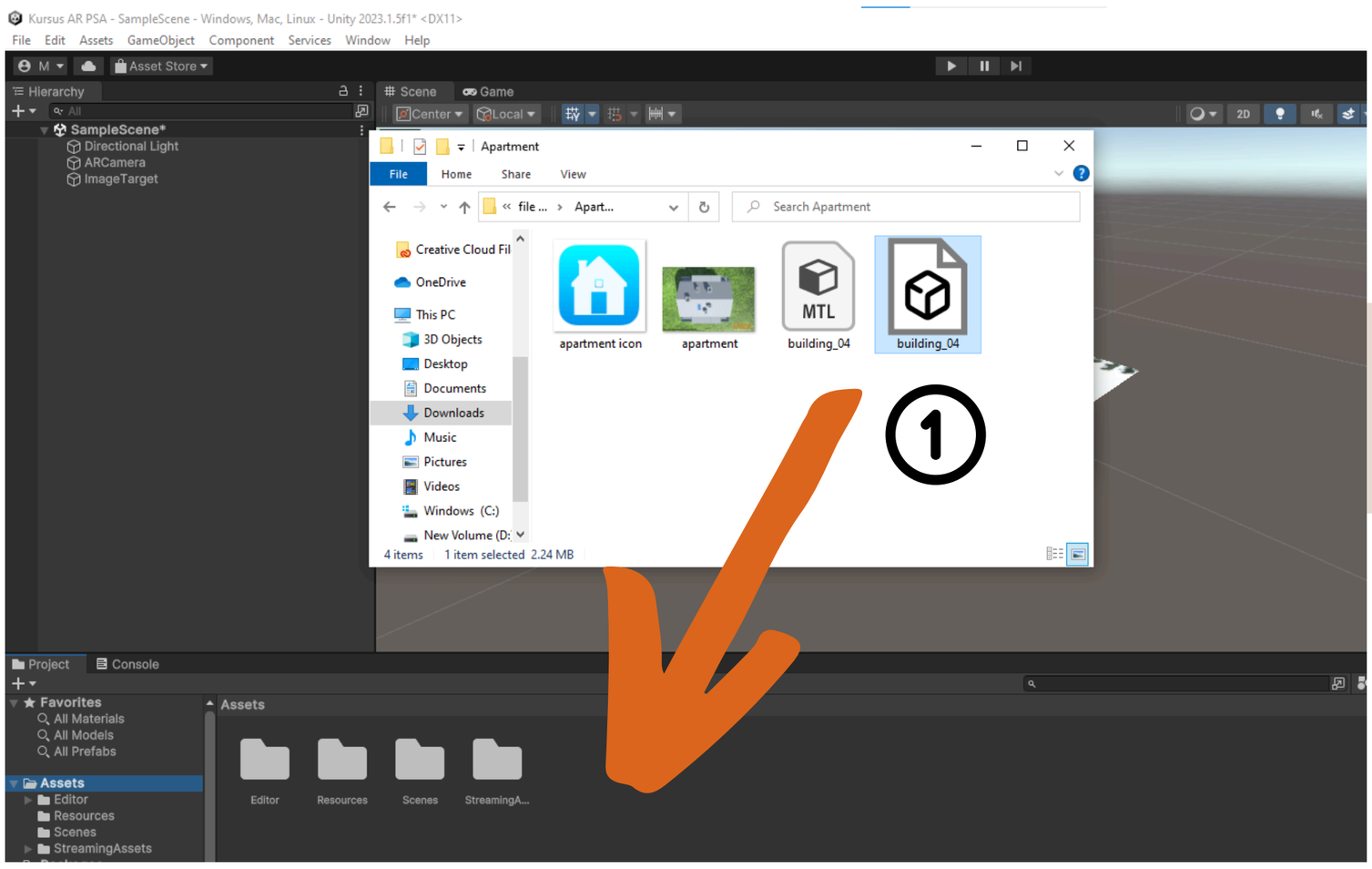
Go to Inspector Window and Click at ***OPEN VUFORIA ENGINE CONFIGURATION***

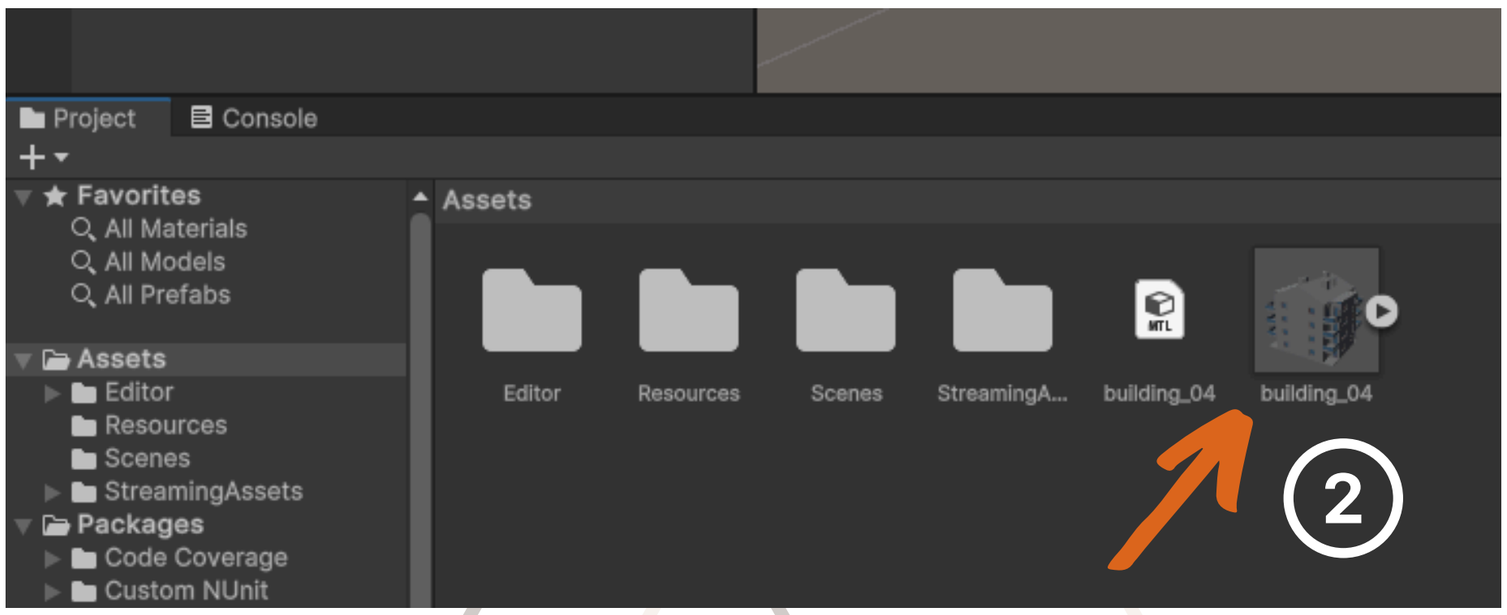
Fill in the License Key *you get from Vuforia Developer.*





NEW PROJECT IN UNITY (GENERAL)

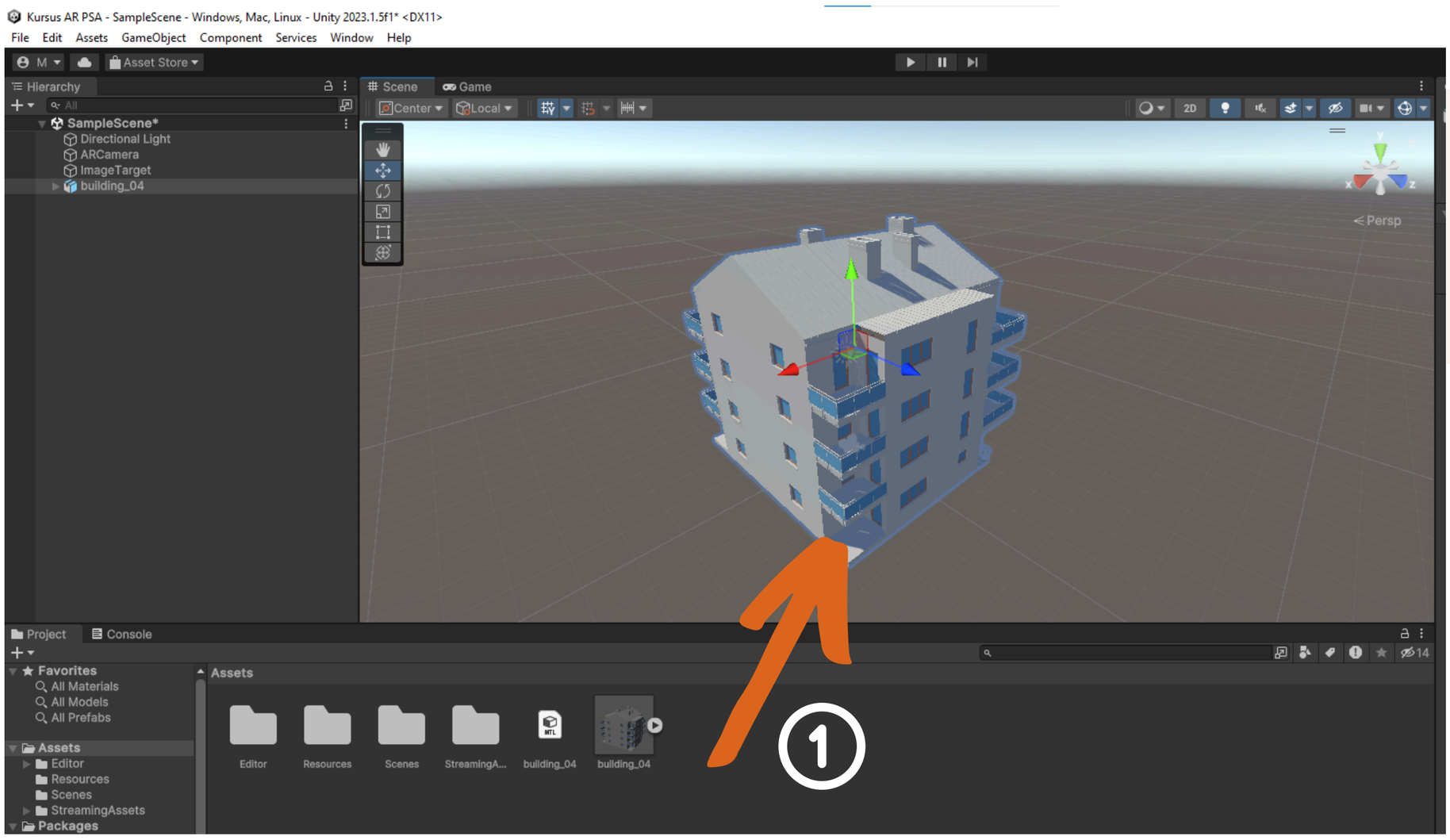


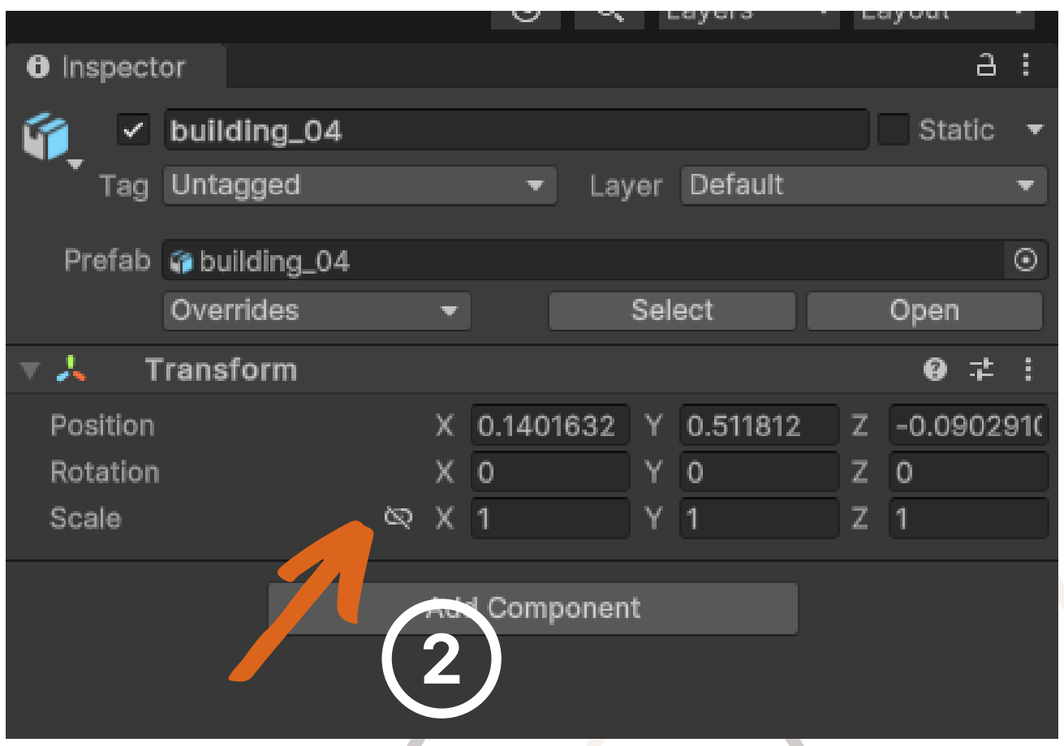


Drag and drop 3D model to the project window

Now you 3D model will be appear at Asset folder

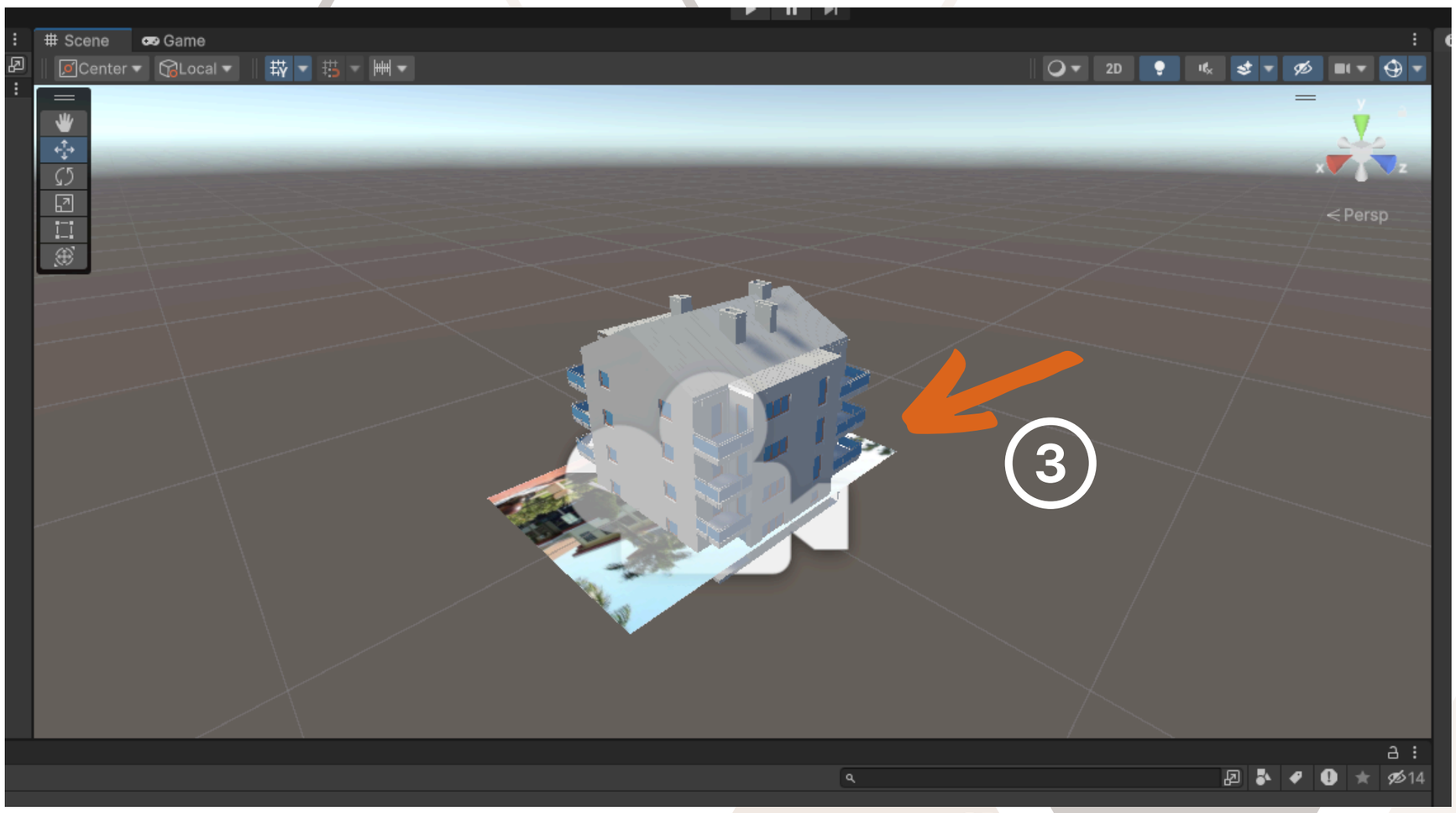
NEW PROJECT IN UNITY (GENERAL)



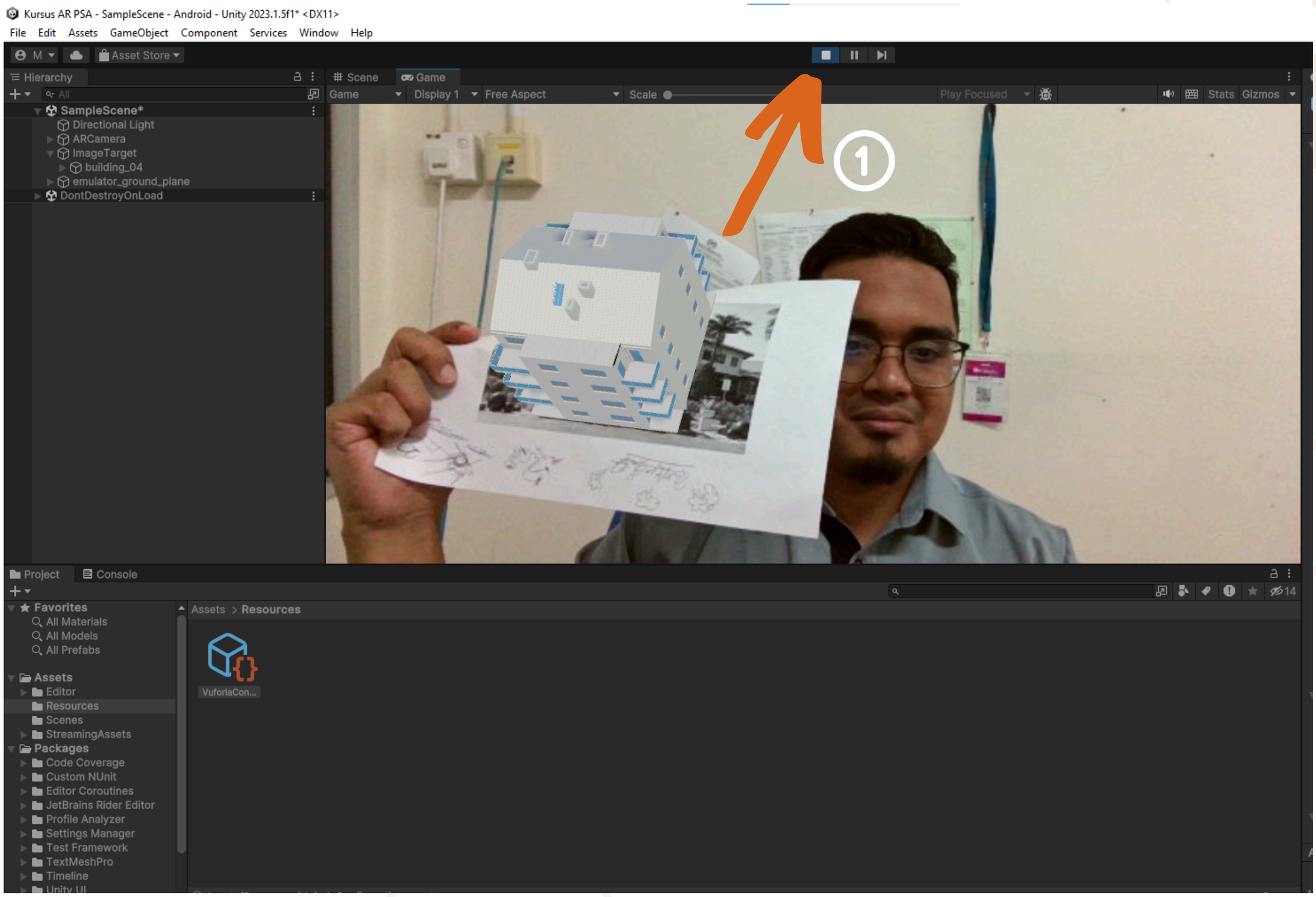


Next, Drag and drop 3D model to the Scene View

You need to adjust the Model Scale to make sure that the model will appear on the Target Image with normal size.



NEW PROJECT IN UNITY (GENERAL)

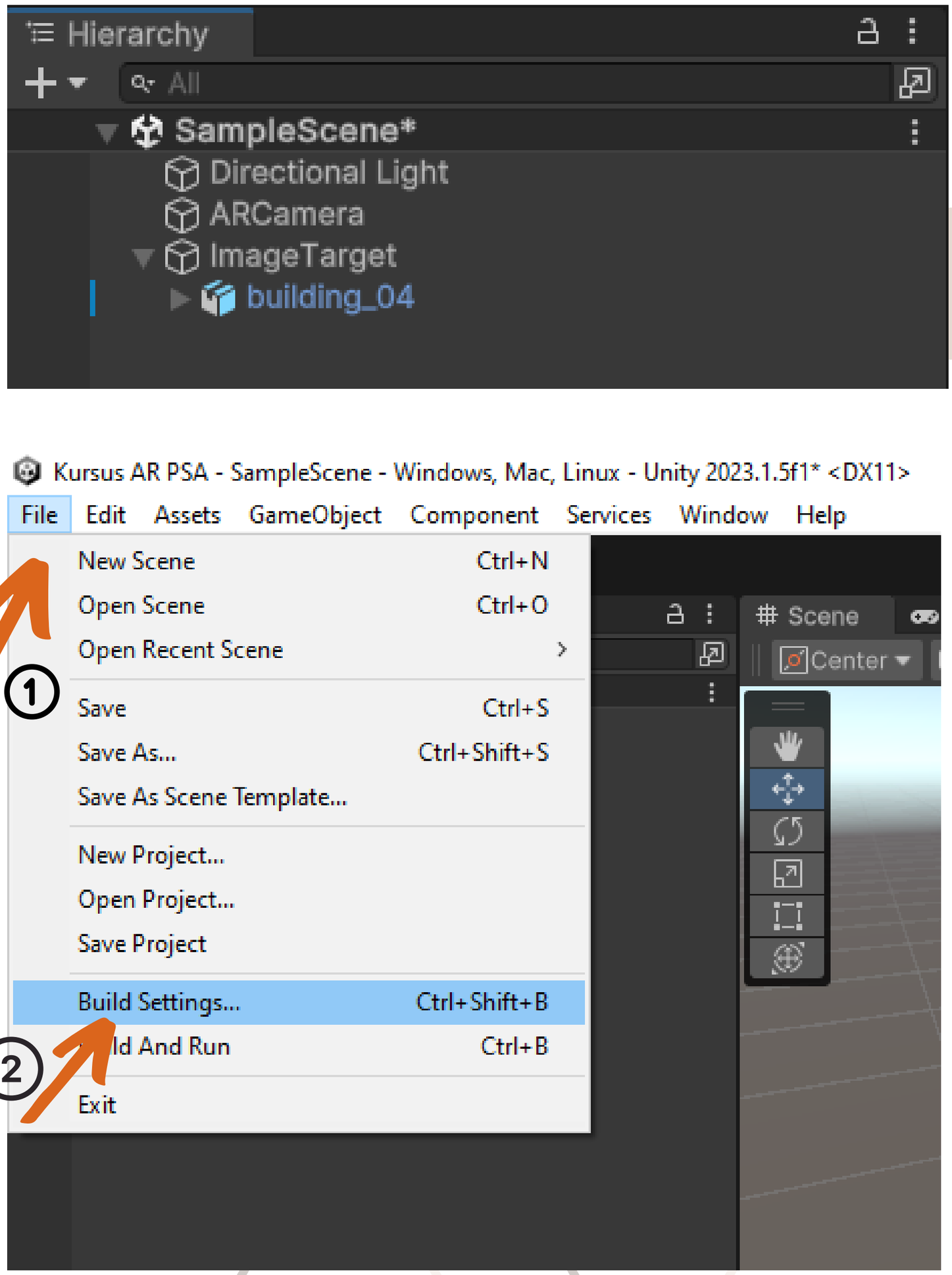


Now, the last stages is you need to make sure that your Augmented Reality application function with propoerly.

- *Click the "Play" button in the Unity Editor to run your AR application.*
- *Point your webcam at one of the recognized targets configured in the Vuforia Configuration. You should see the augmented reality content (3D Model) overlaying the target in the camera view.*

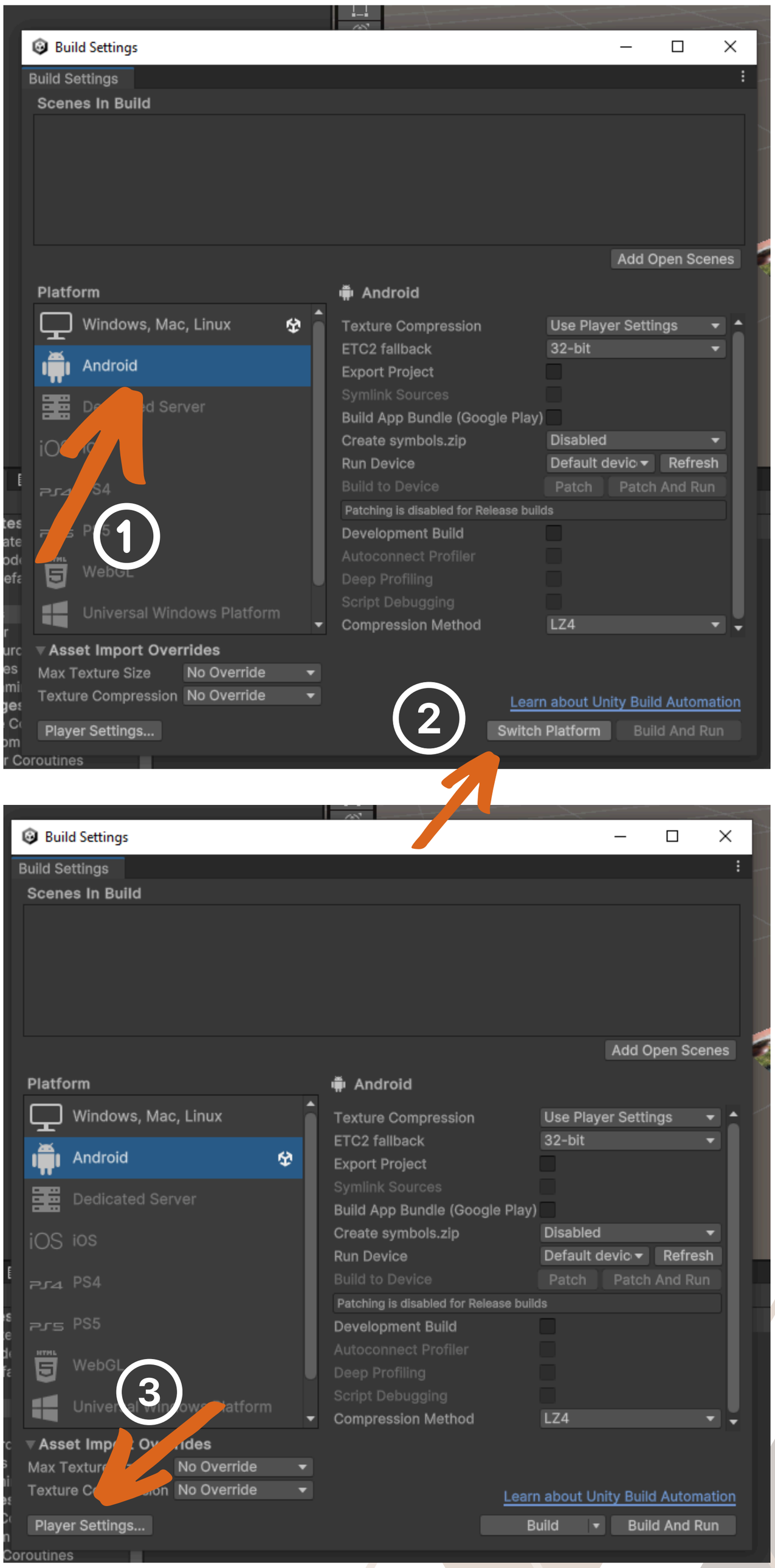
Remember that lighting conditions and the quality of the target images can affect the performance of your AR application. Make sure your target images are clear, well-lit, and distinct to ensure accurate recognition and tracking.

NEW PROJECT IN UNITY (GENERAL)



- *Go to "File" > "Build Settings" in the Unity Editor.*

BUILD APK FILE (CONFIGURE PLAYER SETTINGS) :

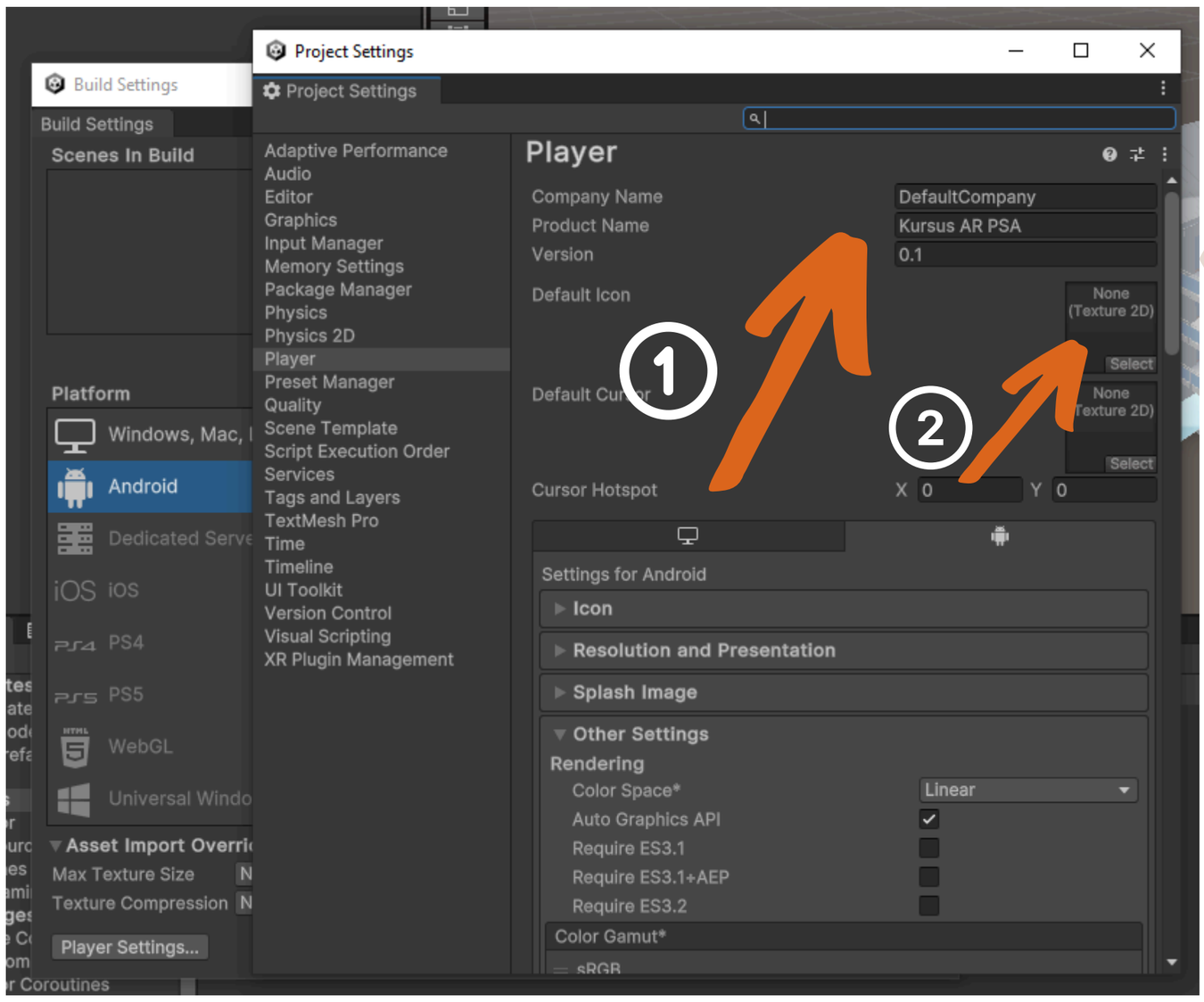


- *In the Build Settings window, select the "Android" platform.*

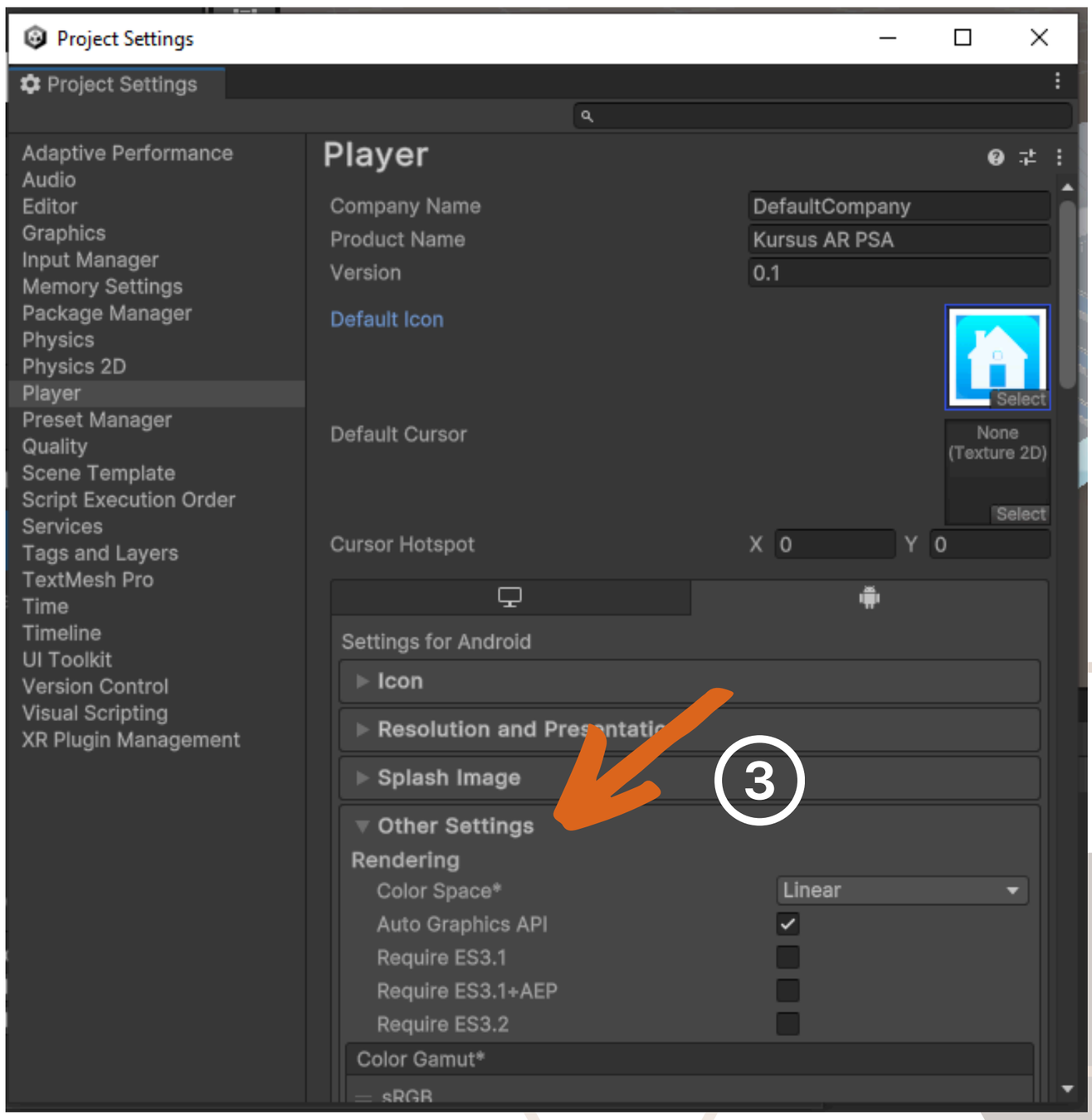
- *Click the "Switch Platform" button to set the target platform to Android.*

- *Next, In the Build Settings window, click the "Player Settings" button to open the Player Settings window.*

BUILD APK FILE (CONFIGURE PLAYER SETTINGS) :

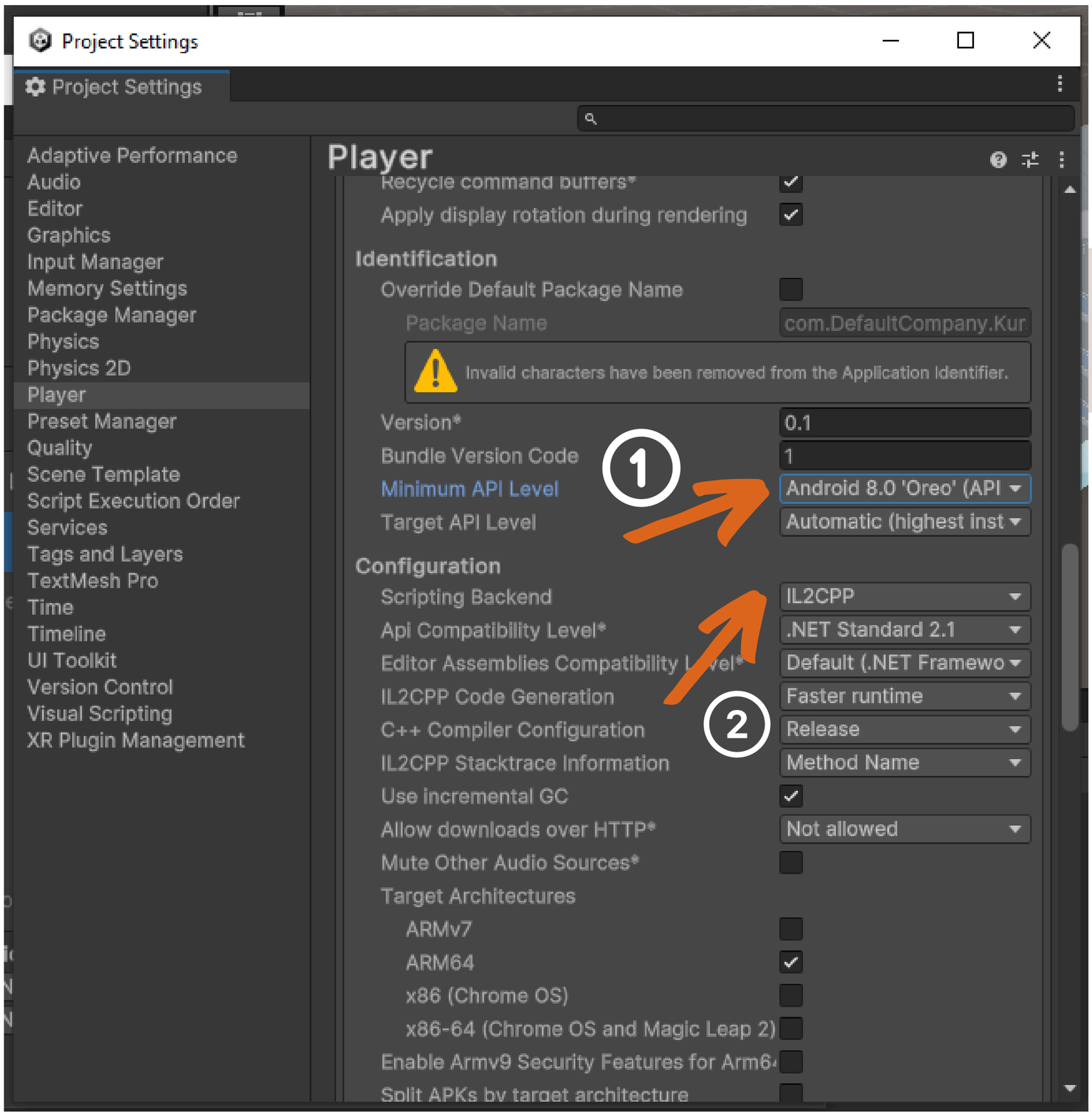


- *Configure other settings as needed, such as display name, icons, and orientation.*

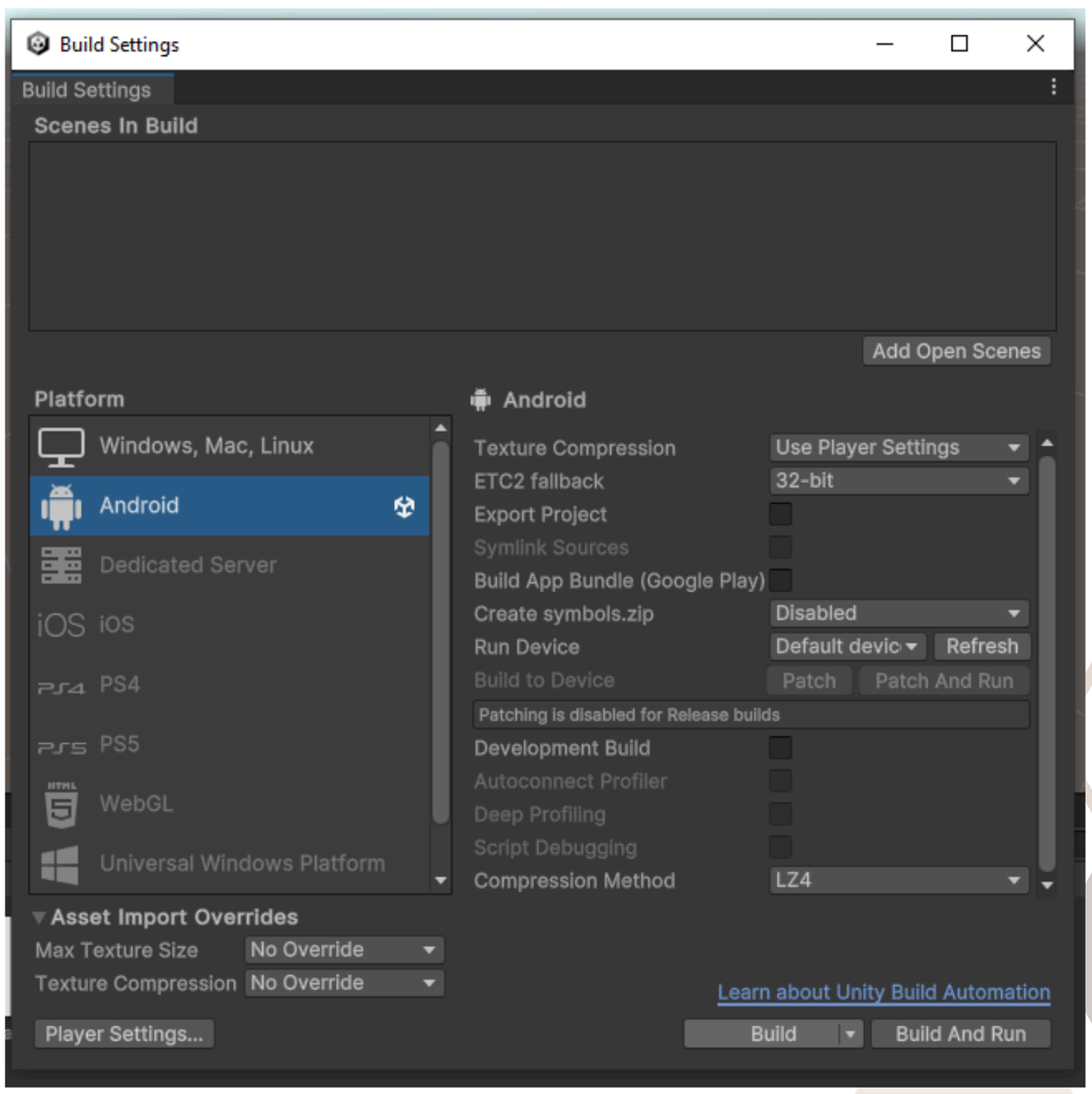


- *In the Player Settings, go to the "Other Settings" section.*

BUILD APK FILE (CONFIGURE PLAYER SETTINGS) :

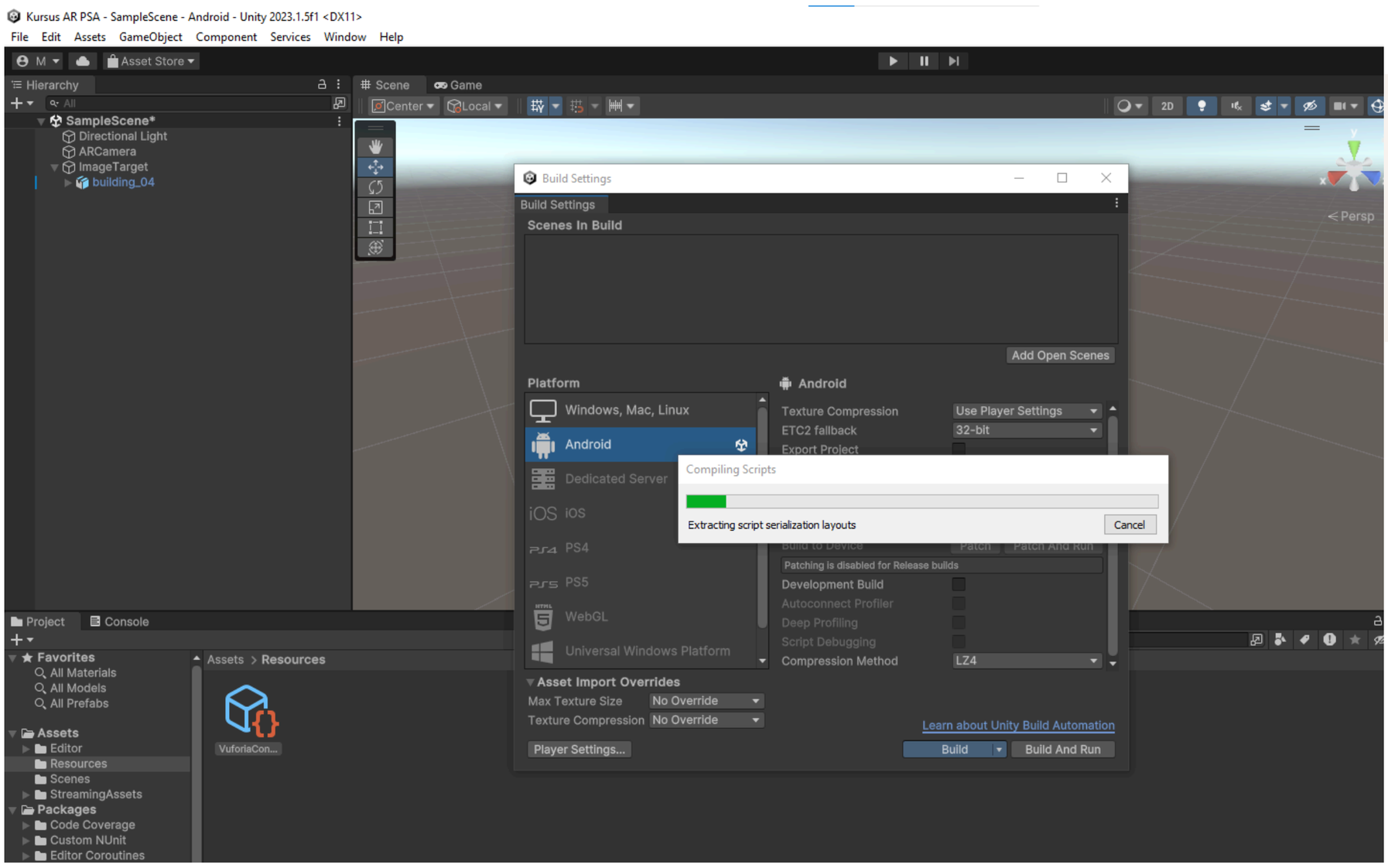


- *make sure on the Minimum API Level you pick - Android 8.0 'Oreo'*
- *and Scripting Backend you select IL2CPP*



- *Go back to the Build Settings window.*
- *Click the "Build" button in the Build Settings window.*
- *Choose a location to save the APK file and provide a filename (e.g., "MyARApp.apk").*
- *Click "Save" to start the build process.*

BUILD APK FILE :



Wait for Build to Complete:

- *Unity will compile and build the APK file. This process may take some time, depending on the complexity of your project.*

Transfer to Android Device:

- *Once the build is complete, locate the generated APK file on your computer.*

- *Transfer the APK file to your Android device using a USB cable or any preferred method.*

Install and Test:

- *On your Android device, locate the transferred APK file and tap on it to install the application.*

- *Open the app and test its functionality to ensure that Vuforia AR features are working as expected on the device.*

NEW PROJECT IN UNITY (GENERAL)

- *That's it! You've successfully built an APK file for your Unity project with Vuforia. You can now distribute the APK to others or upload it to the Google Play Store if you're ready to publish your AR application.*

- *Keep in mind that this process provides a general overview of building an APK with Vuforia. Specific settings and configurations may vary based on your project's requirements and the version of Unity you are using.*

STAY TUNED FOR MORE! CONTINUE YOUR JOURNEY IN MODULE 2 ON THE NEXT BOOK.....

BASIC DEVELOPMENT MODULE

AUGMENTED REALITY (AR)

FOR BEGINNER

> "AUGMENTED REALITY IS THE FUSION OF THE DIGITAL AND PHYSICAL WORLDS, WHERE IMAGINATION MEETS INNOVATION, TURNING EVERYDAY SCENES INTO IMMERSIVE ADVENTURES AND TRANSFORMING IDEAS INTO INTERACTIVE EXPERIENCES."

BASIC DEVELOPMENT MODULE

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MODULE 1

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