Game Optimization Toolkit (GOT) User Guide

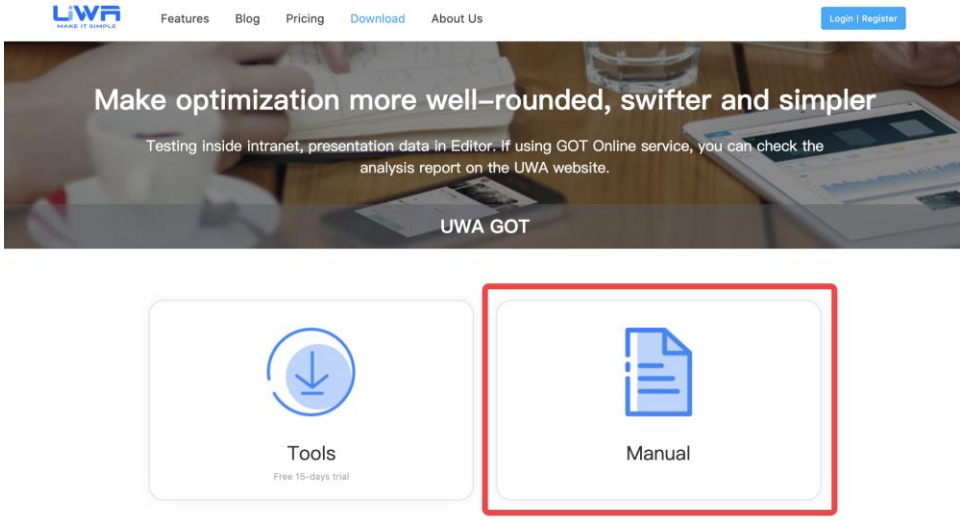
Platform supported: Android, iOS & Windows

Contents

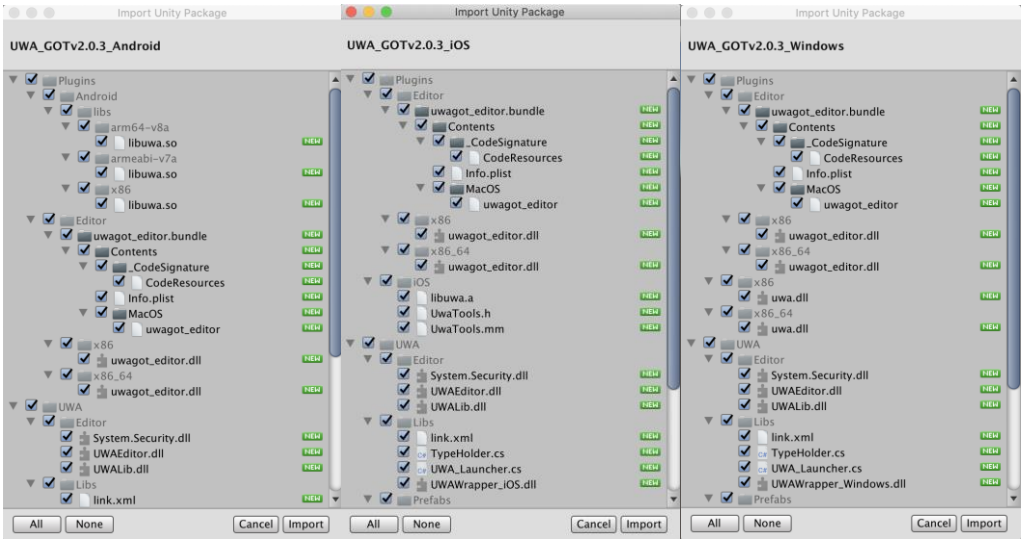
1. UWA GOT Local Test SDK

1.1. SDK Downloading and Integration

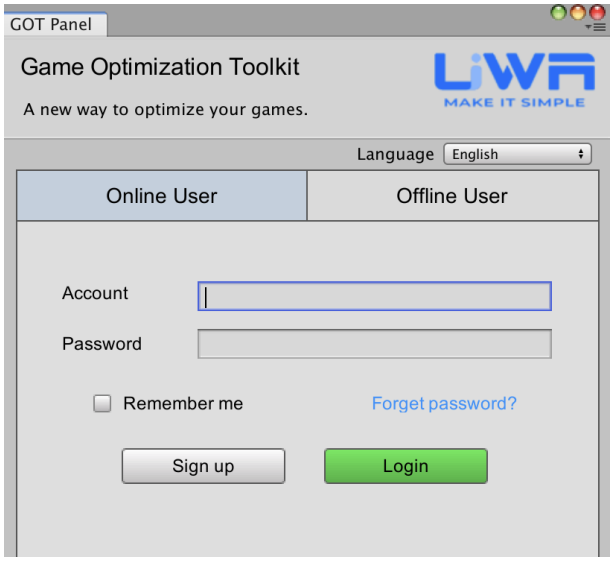
1. Visit UWA website homepage and login with UWA account.
2. Visit “Download” page: https://en.uwa4d.com/download, you will find UWA GOT Local Test SDK, if you bought the tool please click downing link.



3. Drag the package file into Unity project. Click “Import” button while the window displays as follow. (The left: Android; The center: iOS; The right: Windows)

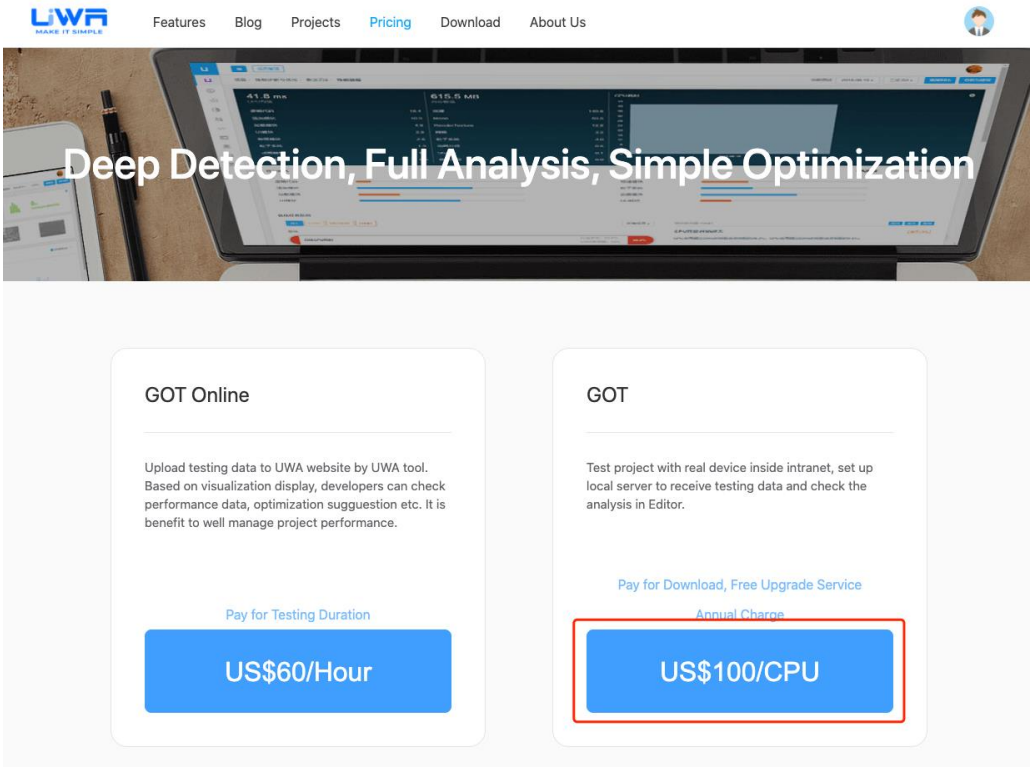


4. Click the menu “Tools->UWA GOT”, open “GOT Editor”.

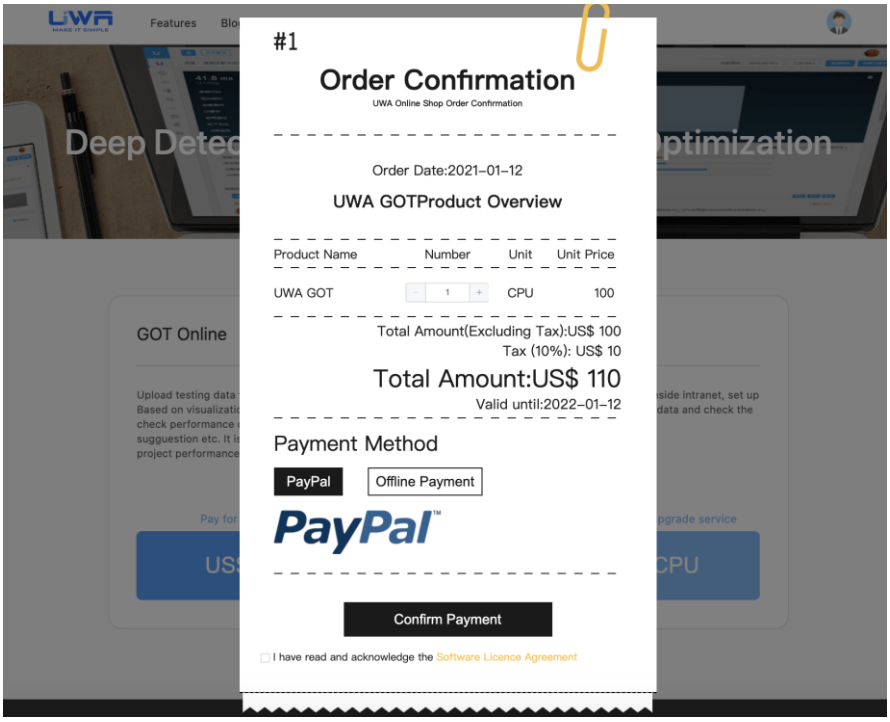


1.2.License Purchasing

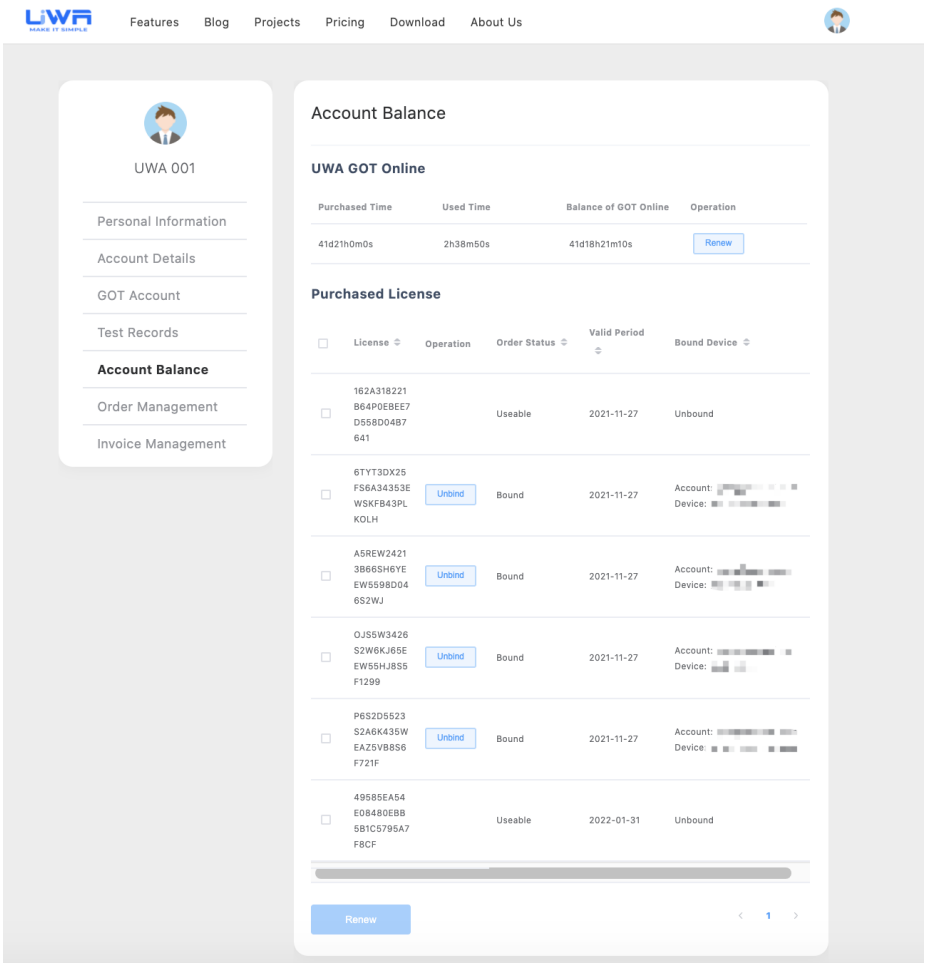
1. Visit UWA website “Pricing” page, select UWA GOT Local Test tool.



2. Confirm the license number and pay for it. PayPal method is available for you.



Payment succeed, you may check License number in “Account Setting - Balance” banner.

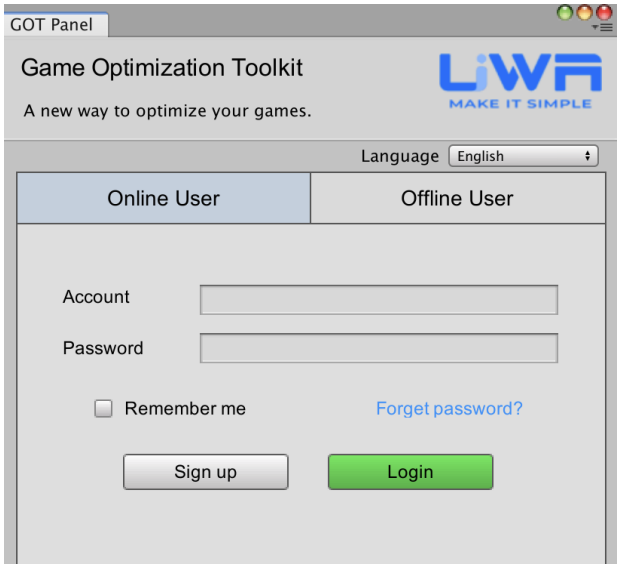


1.3.License Activation

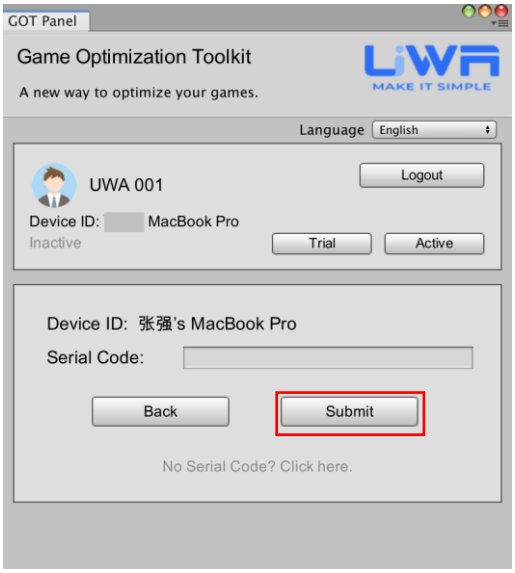
1.3.1 Online Activation

Online Activation is fit for the computer which can access Internet.

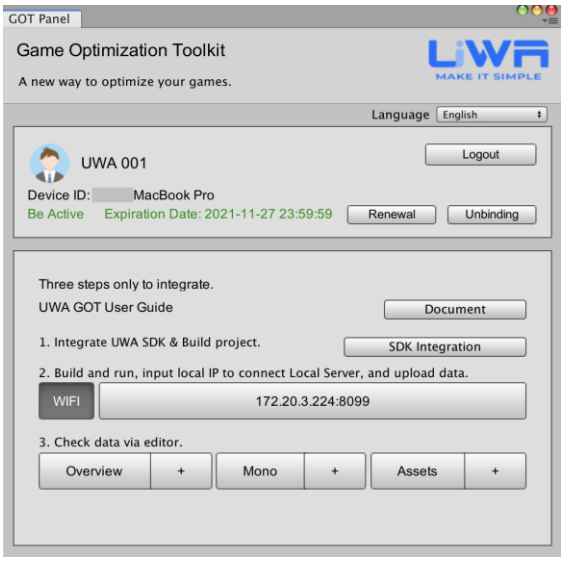
1) Select “Online User” in “GOT Editor” panel, login with UWA account.



2) Click “Active” button, input License serial number in activation panel, then please click “Active”.



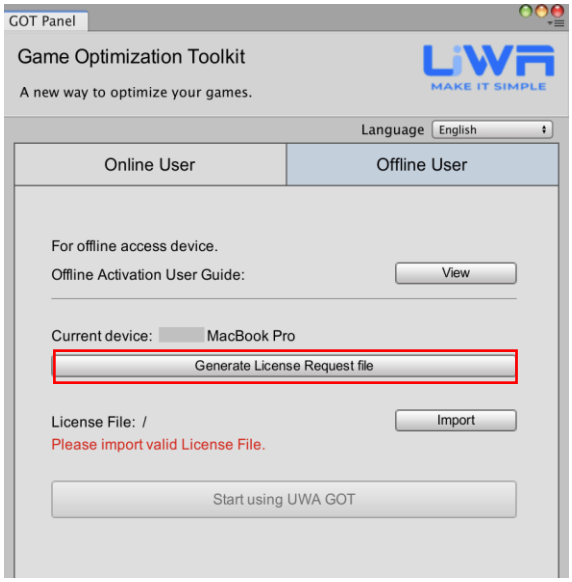
3) When activation is successful, you may use UWA GOT Local Test tool.



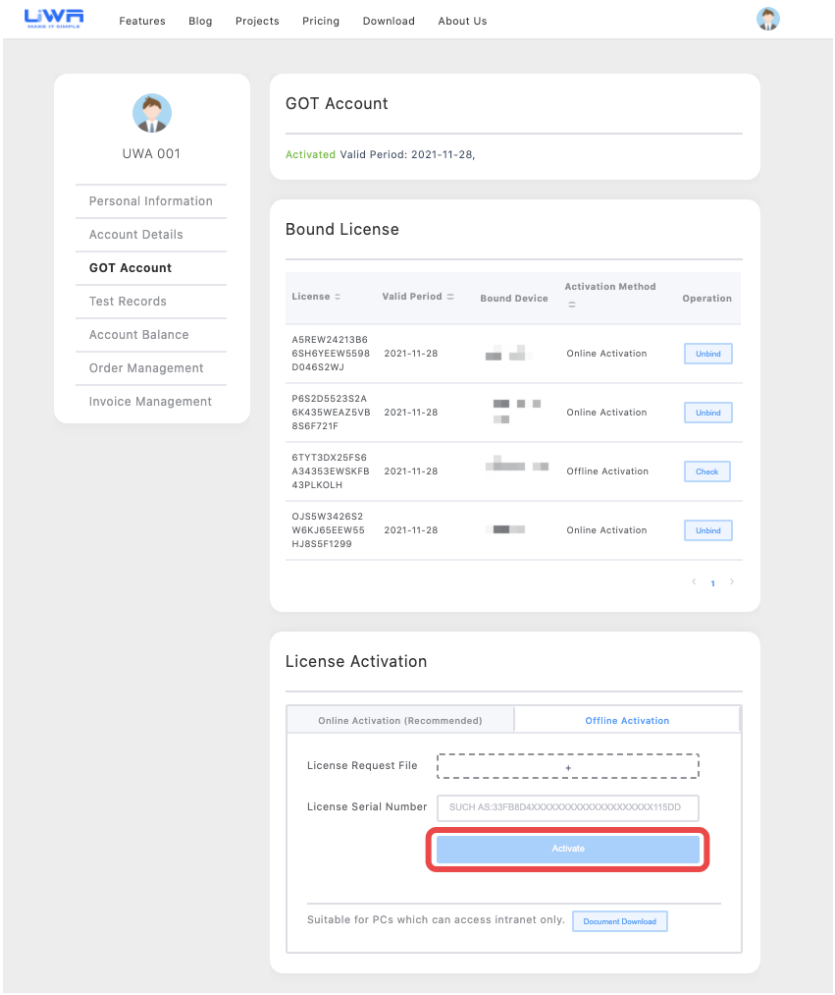
1.3.2 Offline Activation

Offline Activation is fit for the computer which can NOT access Internet. You will NOT be allowed to unbind license under “Offline Activation” method. Online Activation is recommended.

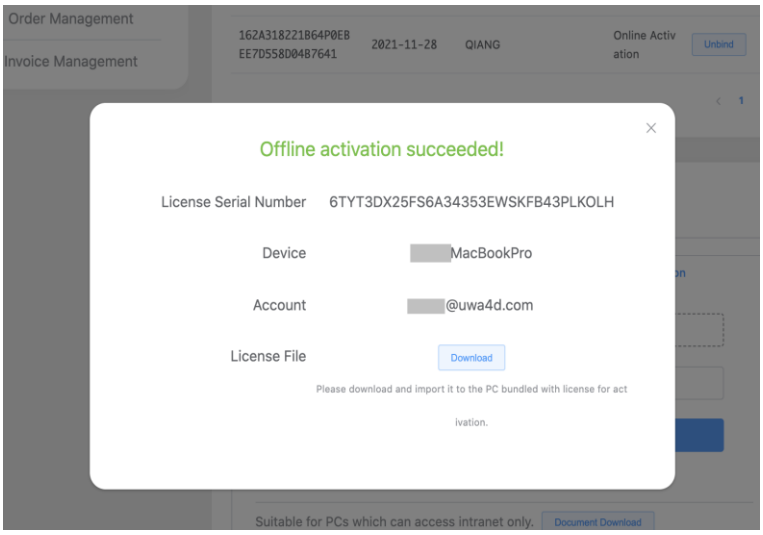
1) Select “Offline User” in GOT Editor panel, you can check PC name in “Current Device” panel. Click “Generate License Request” button to save “License Request” file which be generated.



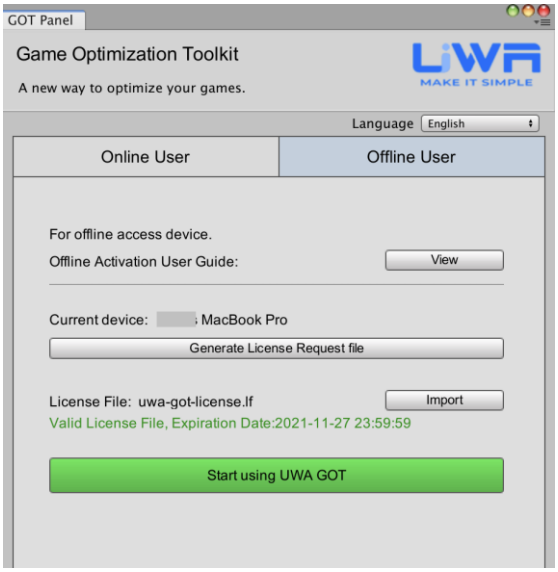
2) Please copy “License Request” file to another computer which can access Internet, login with UWA account in UWA homepage, goes to “Account Setting – GOT Account” panel, select “Offline Activation” tab. Please upload “License Request” file, fill License serial number and click “Active” button in order to active the license.



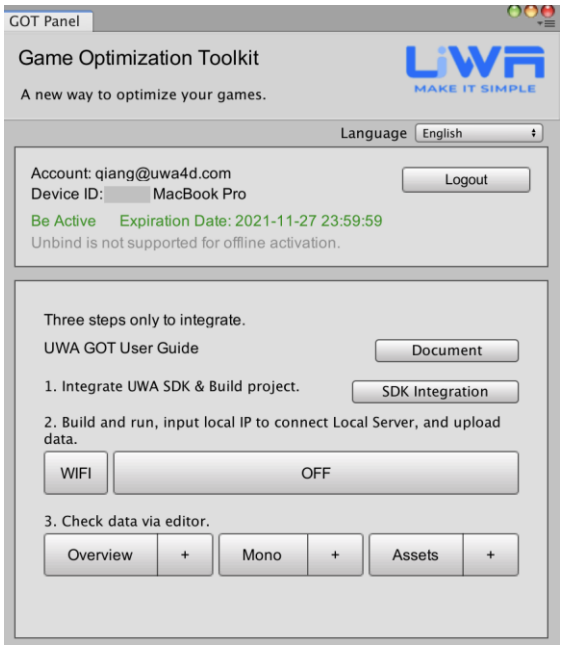
3) When activation is successful, you may download License File according to the notice.



4) Copy “License File” to computer which can NOT access Internet, open “GOT Editor” panel, click “Import” button to import file.

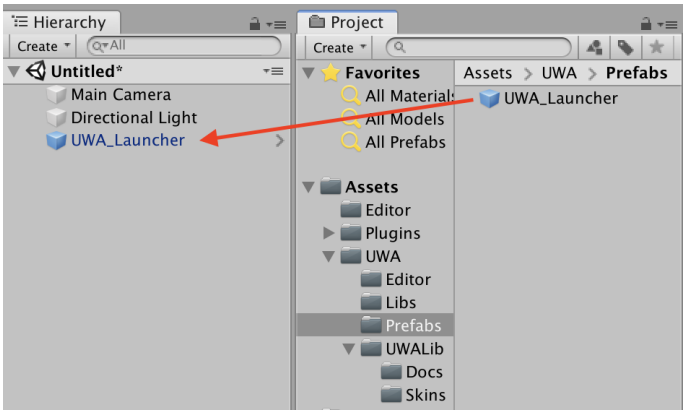


5) When succeed, click “Start Use UWA GOT”, now UWA GOT local test tool is available for you. You will NOT be allowed to unbind license under “Offline Activation” method.

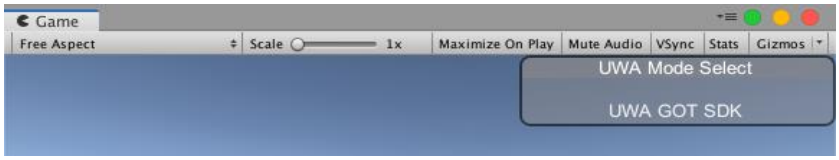


1.4.Integration and Build

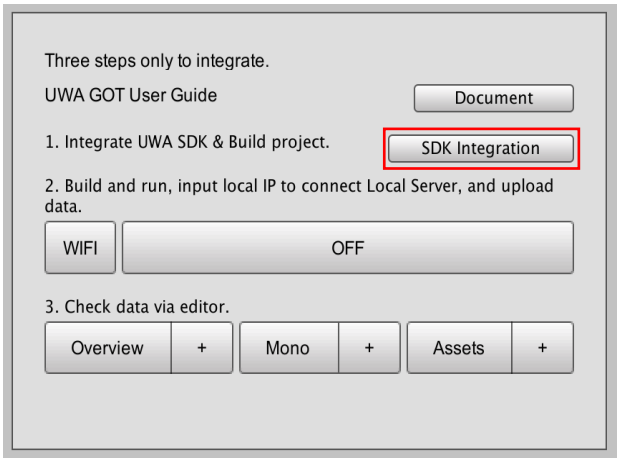
1. Drag the prefab file (UWA_Android.prefab for Android, UWA_Windows.prefab for Windows) in “UWA/Prefabs” into the hierarchy window to add this Gameobject to the first scene, as shown in the following figure. Pls make sure it’s will not be destroyed.



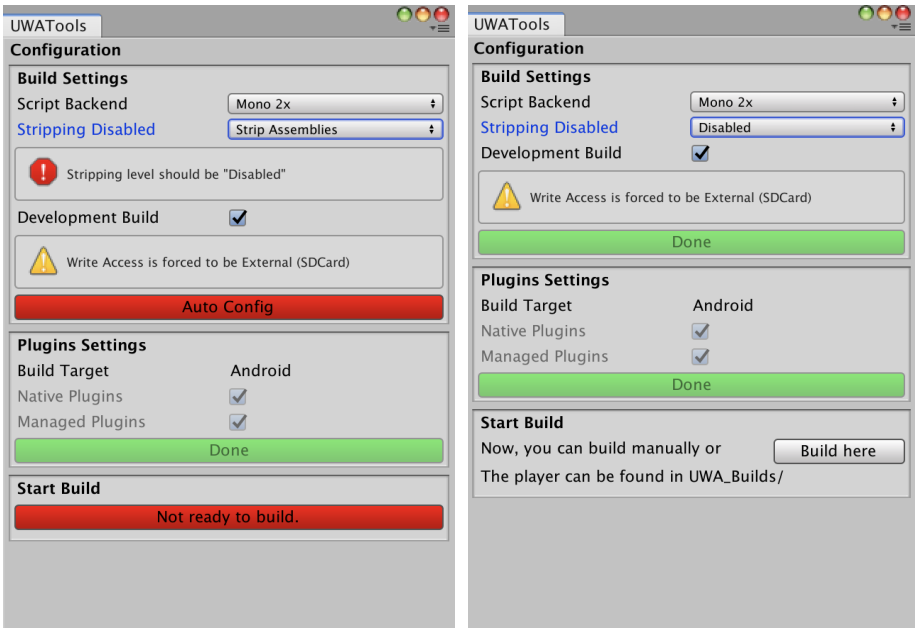
2. Play in the editor. If the “UWA Mode Select” UI appears on the upper right corner of the Game view window without any error message, it means UWA plugin has been integrated successfully.



3. Click the button “SDK Integration”, open UWA toolbar.



4. Change build-settings according to the guide, make sure the buttons turn green.



5. Build games.

   Recommend to use “Build here” to start one-click building, then the Apk file will be saved under the directory (“UWA Builds/Android” for Android; “UWA Builds/Windows” for Windows). Meanwhile, you can also build your games manually through “Build Settings->Build”, or use the BuildPlayer API with BuildOption.Development added.

Notice:

1. Make sure the buttons on panel are green.
2. Make sure it is a **Development Build**.
3. This tool does not support **il2cpp** build.
4. For Android devices:
   a) Root permission is **NOT** required.
   b) Screenshots tracking is only supported on **Android 5.0** or above.
5. For Windows devices:
   a) Change “**Color Space**” to **Gamma**, if the screenshot is empty.

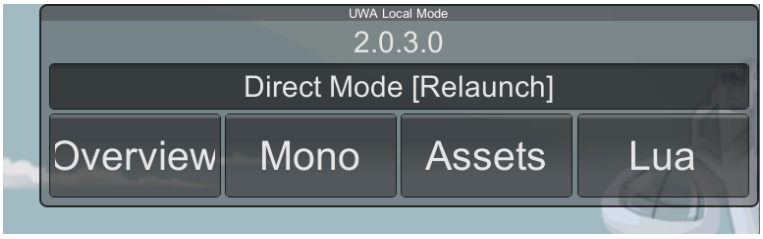
2. Profiling and Data Uploading（for Android & Windows）

2.1. Profiling Process

When the target app is built with UWA GOT integration, then install it on the Android device or PC for testing.

Open the app and select one of the modes for your purpose. Then the test starts and the UWA GOT tool works.

Direct Mode: If you want UWA GOT tool work immediately while launching the app, you can press “Direct Mode” (the button left will become green). And then the app will quit automatically after you select one of the modes, and UWA GOT tool will work immediately while the next launch.



The “Stop” panel is draggable, click the “Stop” when you want to finish the test. UWA GOT tool collected the data and saved data on the device.

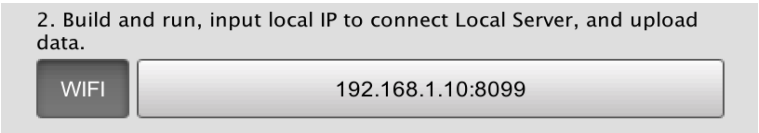
2.2. Data Uploading

Install UWATool_Android.apk on Android device (or unzip UWATool_Windows.zip on Windows device), it can be found in the zip file. This app is used to upload your data in two ways:

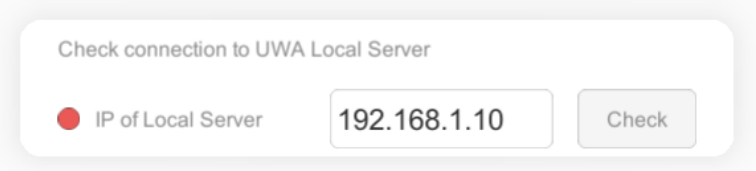
2.2.1. GOT Editor (Offline)

When used this way, you may check data report in GOT Editor (embedded in Unity Editor).

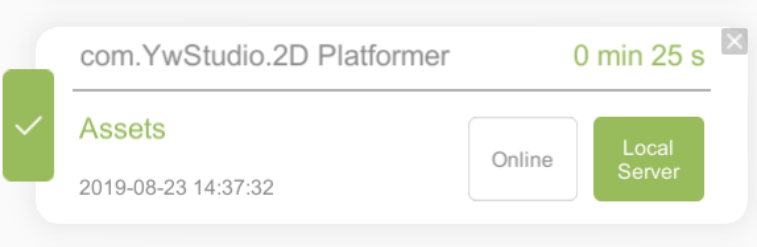
1) Click the menu “Tool->UWA GOT”, click the “WIFI” button to turn it on, and you will see the IP address as follow with the port fixed at 8099. If the IP does not show (happens on Mac sometimes), you can find your IP manually and write it into UWA/UWALib/serverip.txt.



2) Please make sure testing device and Unity Editor are in the same LAN. Open GOT app on the testing device, input IP address of local server and click “Check” button. If the circle turns green, Local Server is reachable. If not, please make sure the device and Unity Editor are in the same LAN, and try to turn of the firewall.



3) Click “Upload Data”, all the test data will be listed. Choose one of them and click “Local Server” and submit.

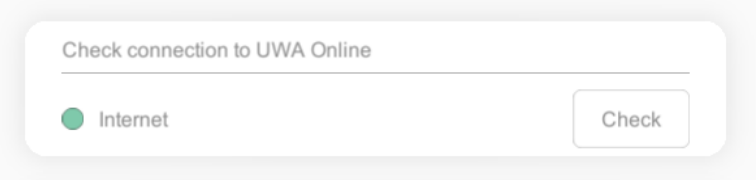


4) When uploading is finished, you can review the data in Local Server, see “GOT Editor User Guide” part for details.

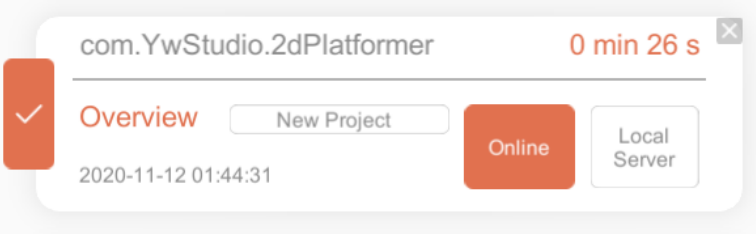
2.2.2. GOT Online (Online & Pay to Use)

When used this way, you may check data report in UWA website.

1) Open the App on testing device, make sure Internet is accessible. (Shows green circle)



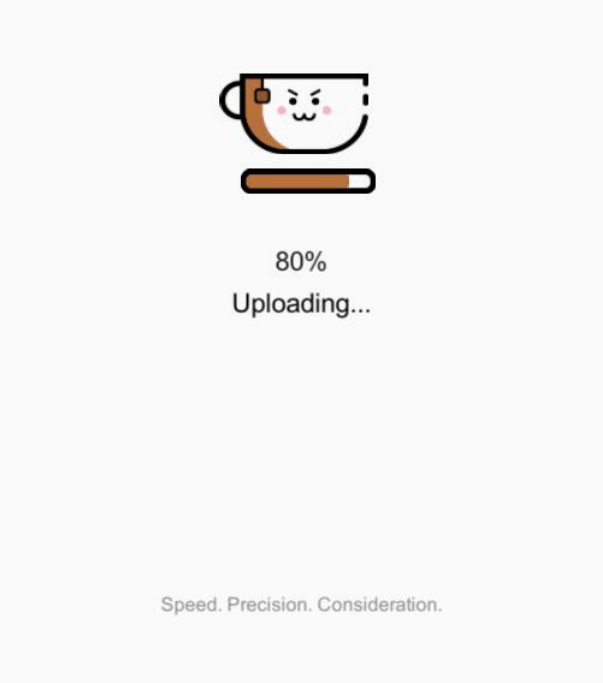
2) In GOT app, there is a list shows all data you tested. You can submit the data into “New Project” or existed project in drop-down box. If you select “New Project”, project will be renamed as data name automatically. Then you can click “Submit”.



3) When used this way, see “GOT Online User Guide” for more info about price and guide.

The two methods can work at the same time. If you want to delete any data, please click “x”.

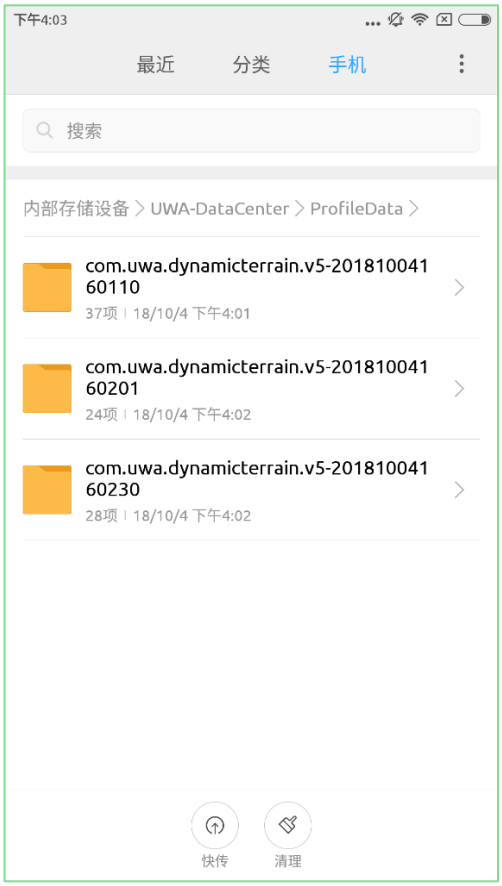
Click “Submit” and go to uploading period as following. When percentage is 100%, uploading is finished and successful.



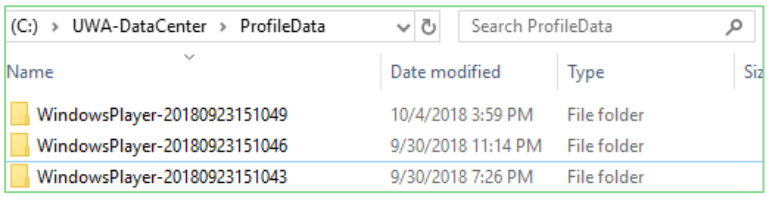
After uploading, we can check your report in Unity Editor (GOT Editor panel) or visit UWA website to check online report (via GOT Online).

2.2.3. Notice

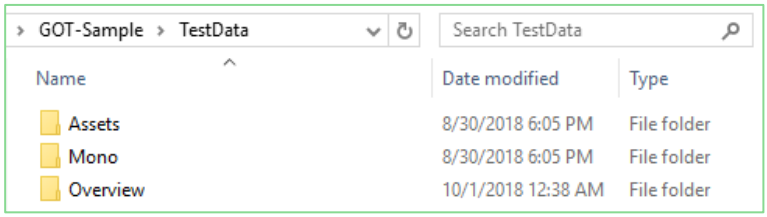
1) Lua profiling data can only upload to GOT Online.
2) If the App on testing device can not connect to Local Server, you can find the data on device:
   For Android: UWA-DataCenter/ProfileData



For Windows: C:/UWA-DataCenter/ProfileData



Cut the data folder to the GOT Editor (Local Server), in the “TestData” directory which is at the same level as Assets, there are several folders, corresponding to several test modes, and data folders can be placed in the corresponding folder.



The last step is to click any mode button on the Local Server to refresh the manually cut data and start viewing the corresponding report.

3. Profiling and Data Uploading（for iOS）

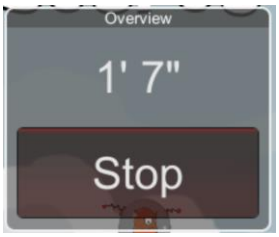
3.1. Profiling Process

When the target app is built with UWA GOT integration, then install it on the iOS device for testing.

Open the app and select one of the modes for your purpose. Then the test starts and the UWA GOT tool works.

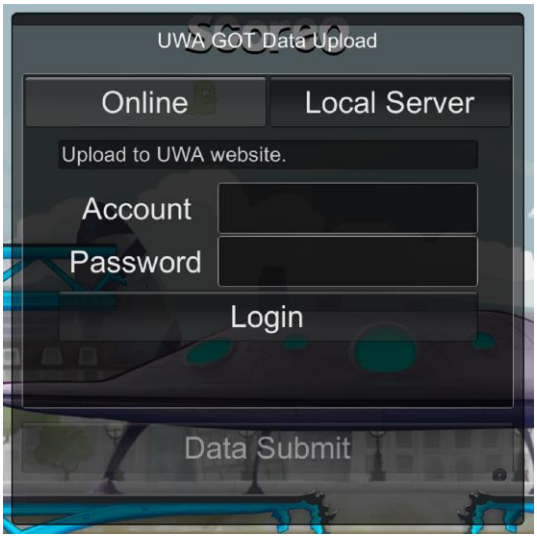
Direct Mode: If you want UWA GOT tool work immediately while launching the app, you can press “Direct Mode” (the button left will become green). And then the app will quit automatically after you select one of the modes, and UWA GOT tool will work immediately while the next launch.

The “Stop” panel is draggable, click the “Stop” when you want to finish the test. UWA GOT tool collected the data and saved data on the device.



3.2. Data Uploading

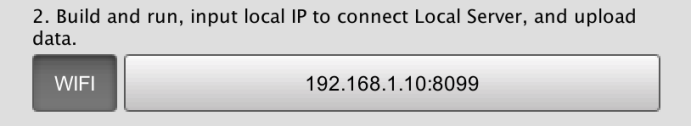
After completing the test process, the "UWA GOT Data Upload" panel will be automatically called. Please complete this step immediately to ensure that the test data is used effectively.



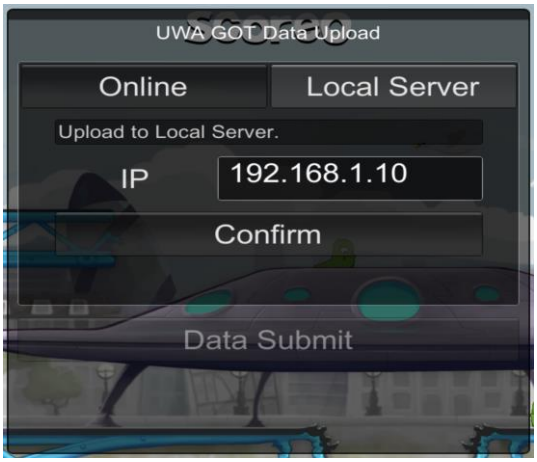
3.2.1. GOT Editor (Offline)

When used this way, you may check data report in GOT Editor (embedded in Unity Editor).

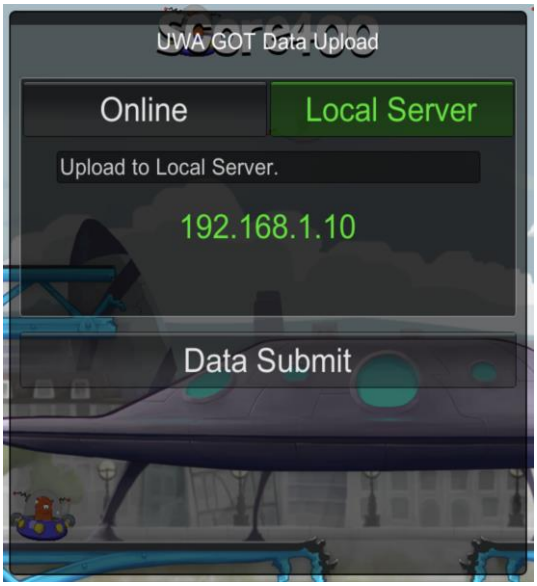
1) Click the menu “Tool->UWA GOT”, click the “WIFI” button to turn it on, and you will see the IP address as follow with the port fixed at 8099. If the IP does not show (happens on Mac OS sometimes), you can find your IP manually and write it into UWA/UWALib/serverip.txt.



2) Select the "Local Server" tab in the "UWA GOT Data Upload" panel, fill in the IP and click the "Confirm" button in order to connect Local Server.



3) The "Local Server" tab and IP turn green, which means that the Local Server is reachable.

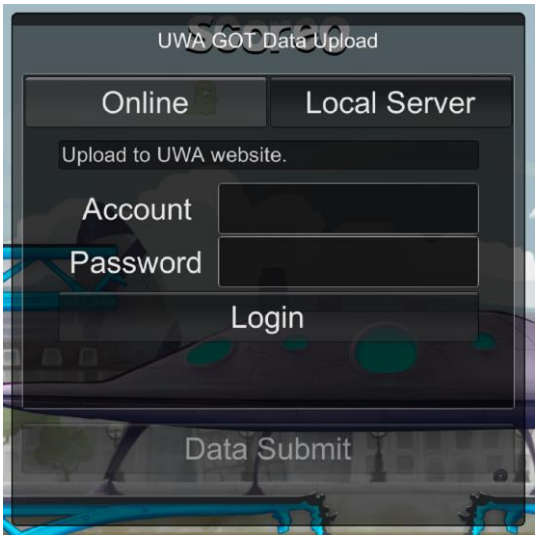


4) Click “Date Submit” then go to uploading period as following. When percentage is 100% and the "Finish" button appears, uploading is finished and successful.

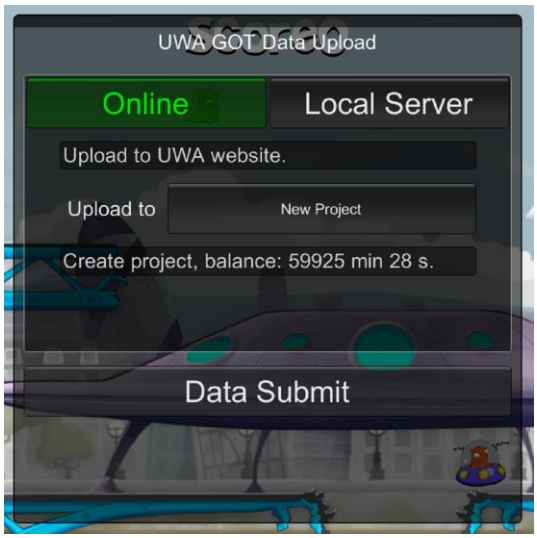
3.2.2. GOT Online (Online & Pay to Use)

When used this way, you may check data report in UWA website.

1) Select the "Local Server" tab in the "UWA GOT Data Upload" panel, log in with your UWA account.



2) The "Online" tab will turn green after login. You can check GOT Online balance through this page.



3) You can submit the data to the new project. After selecting "New Project", a new project with the same name as the data application will be created automatically. The project name can be renamed on the UWA website. You can also select an existing project in the account as the following table.

4) Click “Date Submit” and confirm the online time deduction, then go to uploading period as following. When percentage is 100% and the "Finish" button appears, uploading is finished and successful.

3.2.3. Notice

1) iOS platform only supports “Overview” and “Assets” mode.
2) If the testing data is uploaded failed, the data will be saved in the local device. But it cannot be uploaded again, have to retest if needed.
3) If you want to upload data to Online and LocalServer at the same time, you need to log in UWA account and connect local IP. When both tabs are green, click "Data Submit" button.

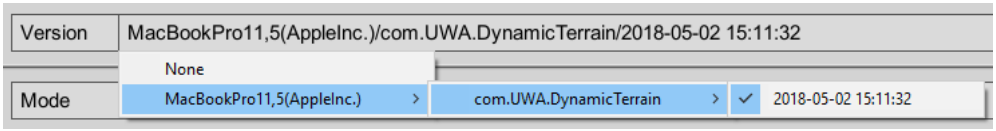
4. GOT Editor Instructions

4.1. Performance Overview

Select the “Overview” mode, you will find the overall performance of your application through the whole runtime.

1. CPU Usage

1) Select the one copy of data under “Version” drop-down list.



2) The corresponding data will be displayed in the panel, which consists of several areas:

a) CPU Cost Chart

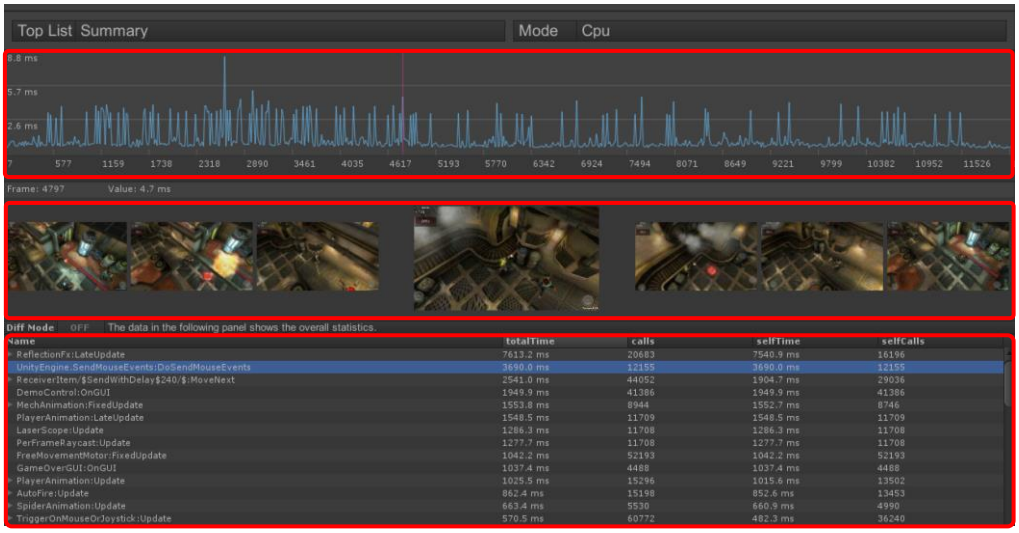
You may select one of function and find the CPU cost chart over the runtime.

b) Screenshot

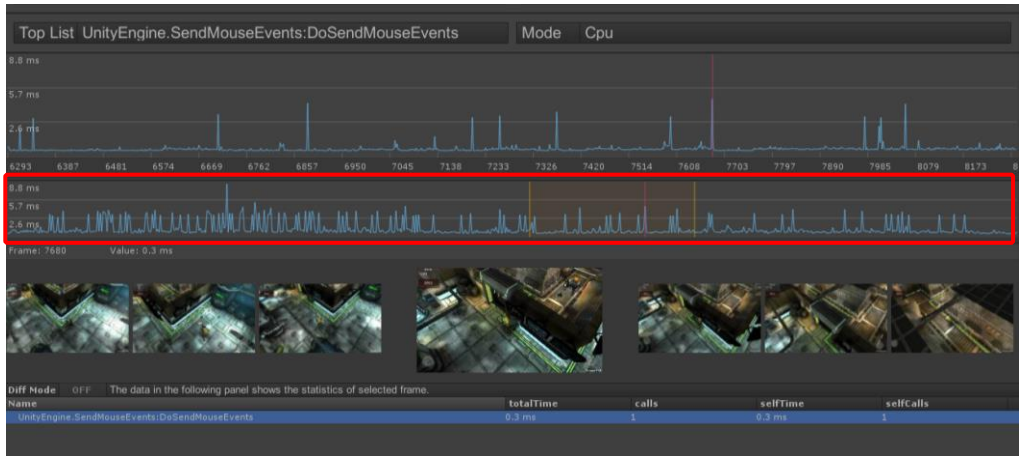
Select and click one frame, the corresponding screenshot will be displayed.

c) CPU Usage View

This area displays the CPU usage of the top 10 or 20 time-consuming functions in a hierarchical way. You could profile any pieces of code with UWA API, please see appendix 1 for details.



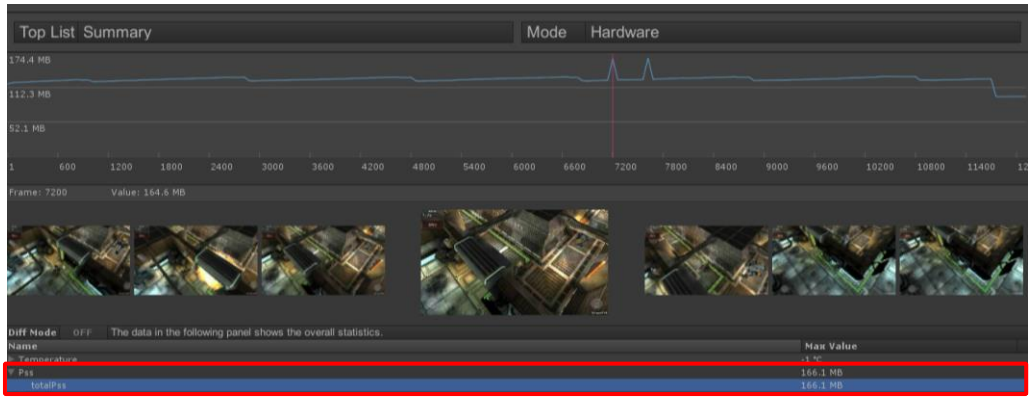
3) In this panel, you can switch to “Total” to review the CPU usage of all functions (user code) over the whole time. Alternatively, you can select one specific function to see performance during runtime. You can also adjust the slider to change ROI to see more details in the chart.



2. Hardware information

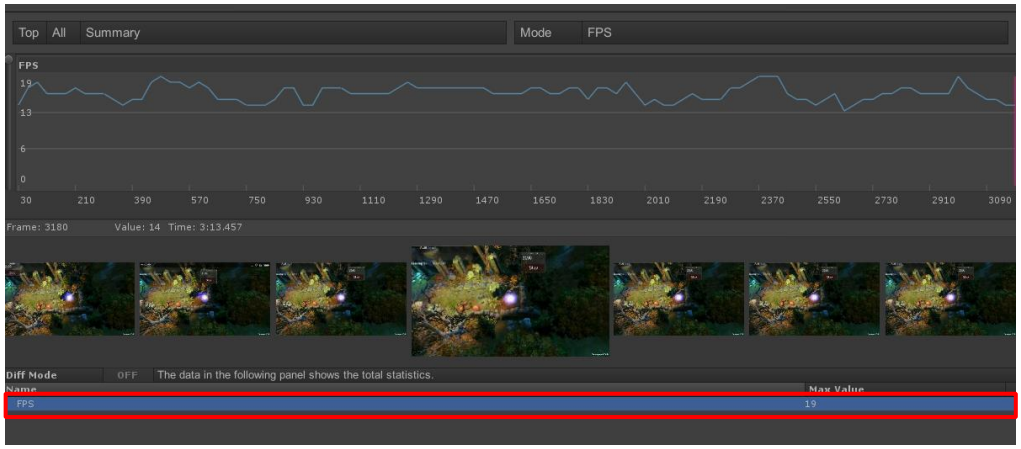
Select “Mode -> Hardware” to switch the mode to “Hardware” where you can inspect the following hardware information of your application during this period**.**

1) Device Memory. The PSS information over the whole runtime can be displayed. If the testing device is Windows PC, then the device memory means WorkingSet memory.



3. FPS

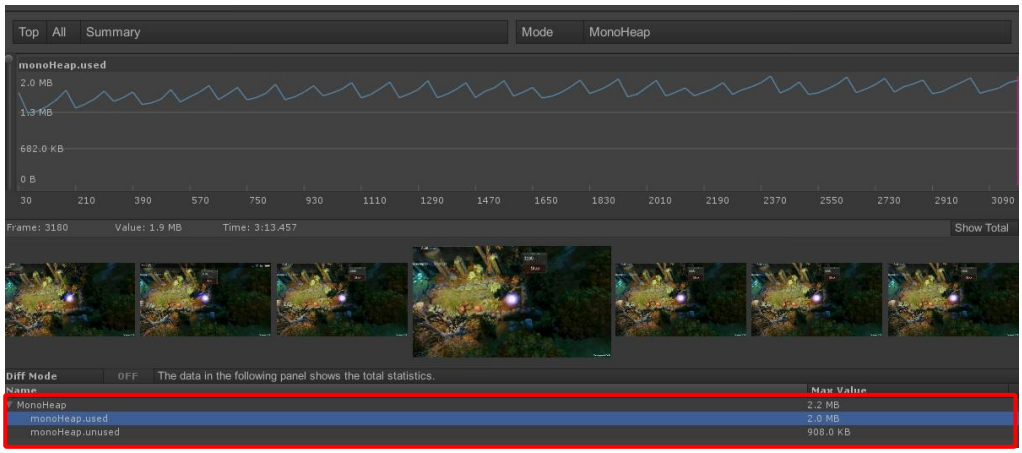
Select “Mode -> FPS”, shows the FPS over the whole runtime.



4. Mono Heap

Select “Mode -> MonoHeap”, switch the mode to “MonoHeap” where you can inspect

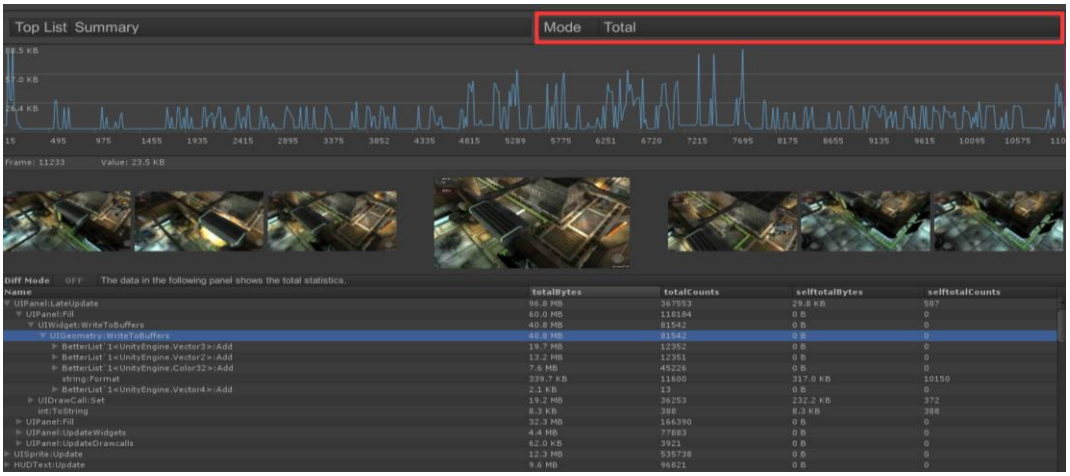
the following size of mono heap of your application during this period, including the used and unused parts.



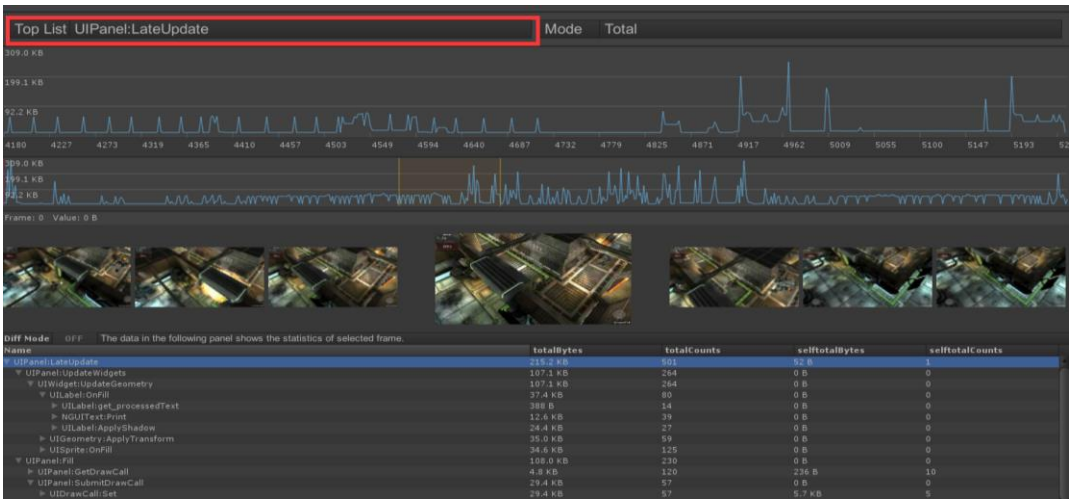
4.2. Mono Memory Analysis

Click the “Mono” button, check the Mono heap memory allocation statistics:

1. **Allocated Heap Memory**
   1) Select “Mode -> Total”, check the heap memory allocation of each function during runtime period.

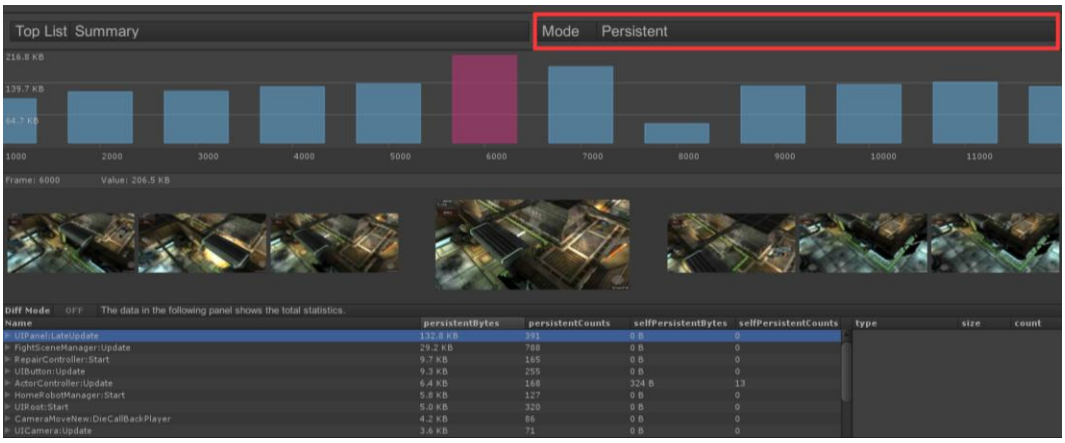


   2) Select the specific function name in the “Top List” drop down box, check its heap memory allocation during runtime. In addition, you can select a single frame in the chart, shows the heap memory allocation in the frame.

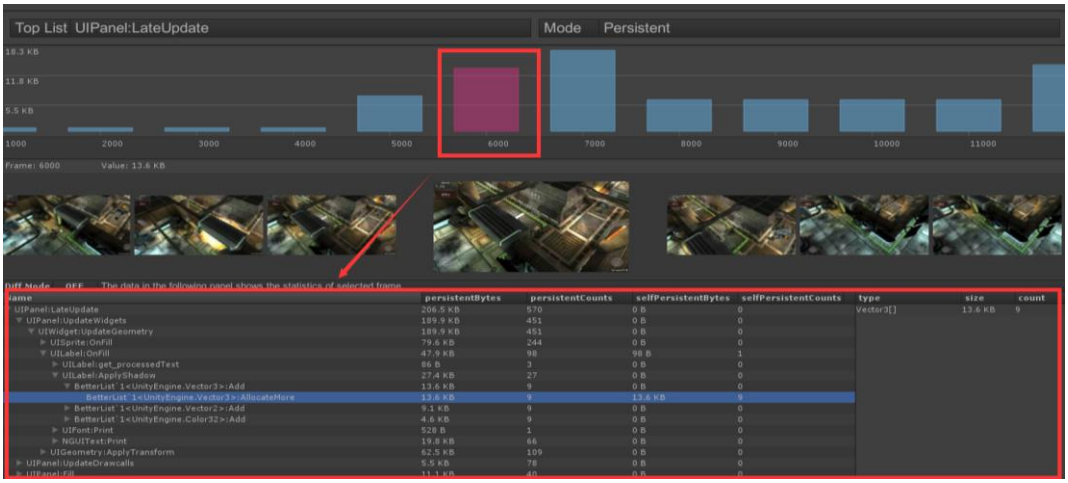


2. Memory Leak

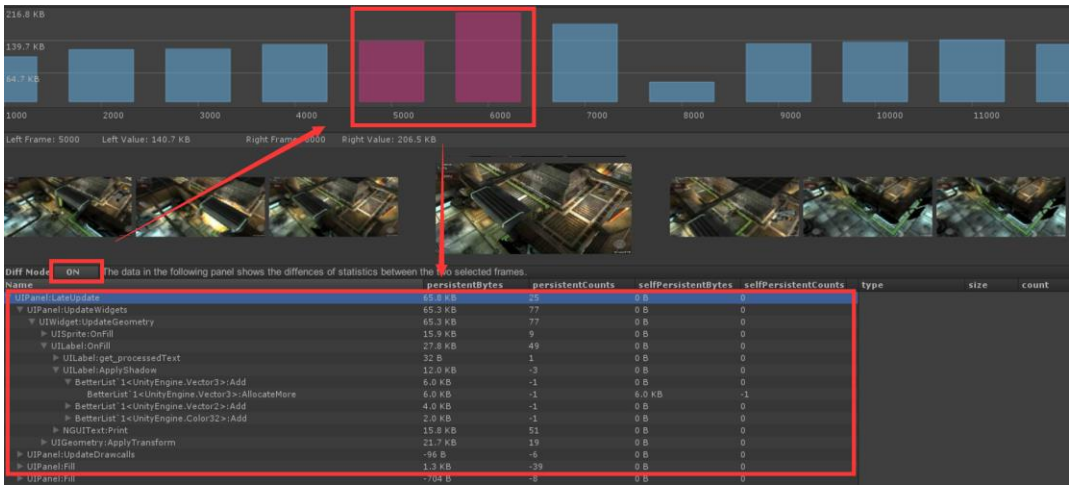
1) Select “Mode -> Persistent”, check the memory usage of each function of runtime. UWA captures the Mono heap memory usage of each function every 1K frame by default. The statistics are shown as histogram.



2) Select the specific function name in drop down box “Top List”, check the heap memory allocation of the specific function. In addition, when “selfPersistentCounts” is not zero(0), you can click the function name and see variable type which hold heap memory in the function.



3) In “Persistent” mode, you can also check the difference between two heap memory statistics by switching “Diff Mode” to “ON”. The difference between the two histograms are shown after you select them in the chart 在 Persistent.

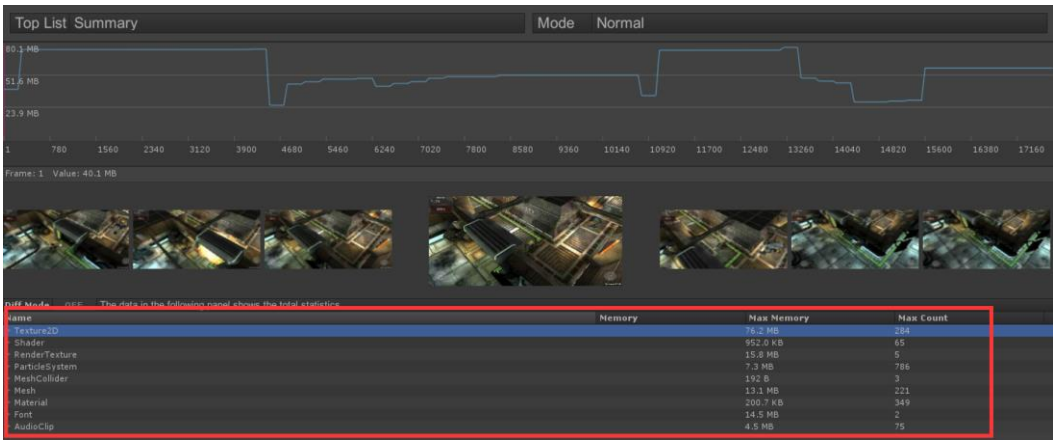


4.3. Runtime Asset Checking

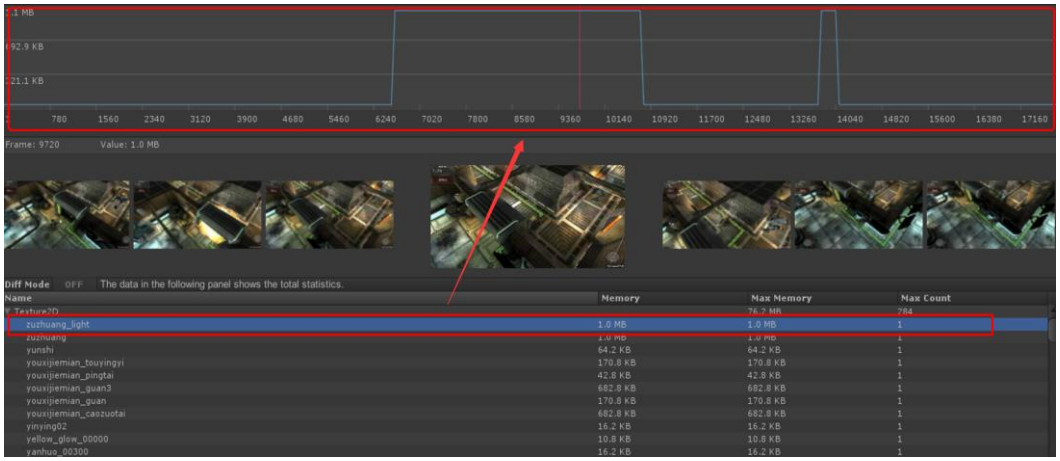
Click the “Assets” button, inspect the resource information of your application over the whole runtime.

1. Asset Usage

1) For each asset type, you can review the total memory usage of all assets over time.

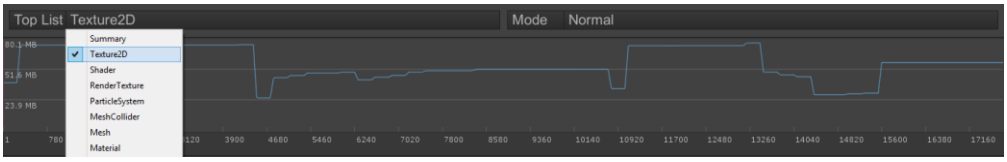


2) Click one asset to review its lifecycle during testing.

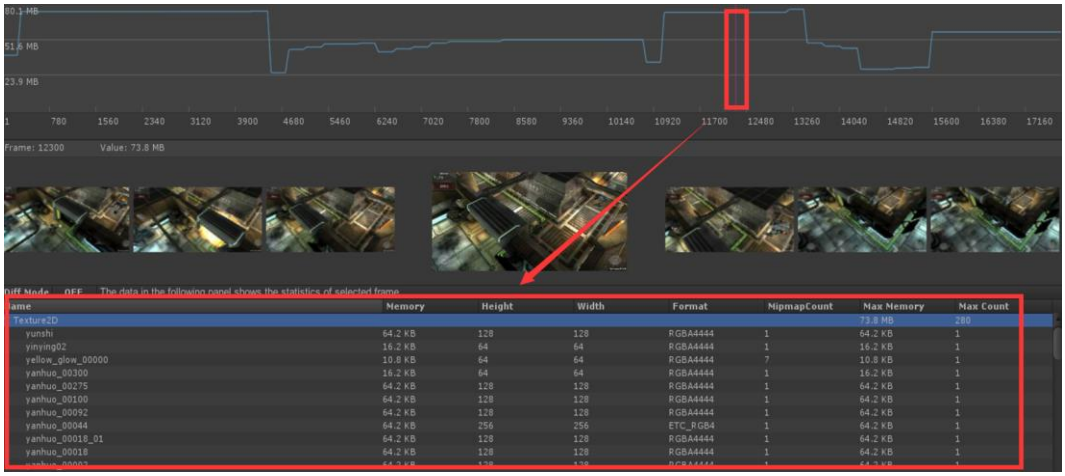


2. Assets usage per frame

1) Select one asset type in the “TopList” drop-down box.



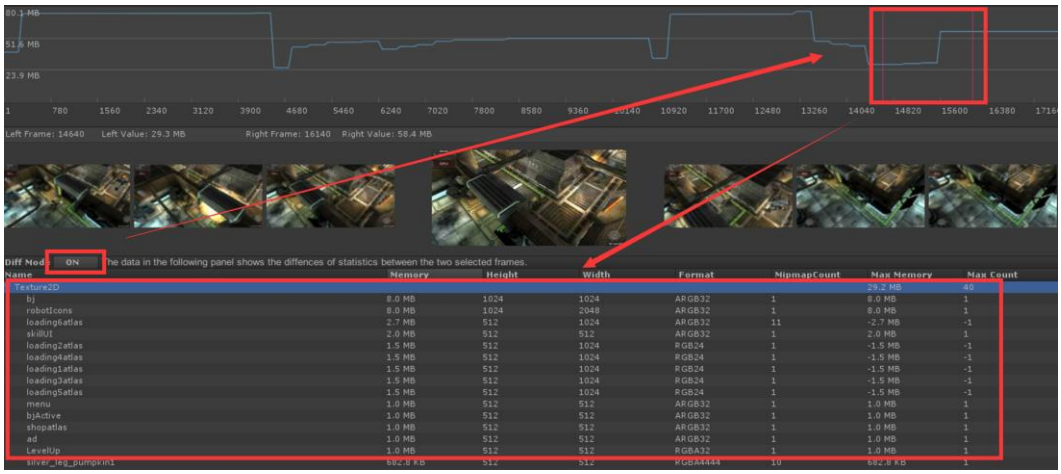
2) Detailed asset information will be shown while you click one frame in the memory usage chart.



3. Memory Leak Analysis

You can compare the assets difference between any two frames in order to estimate whether there is asset leak or not.

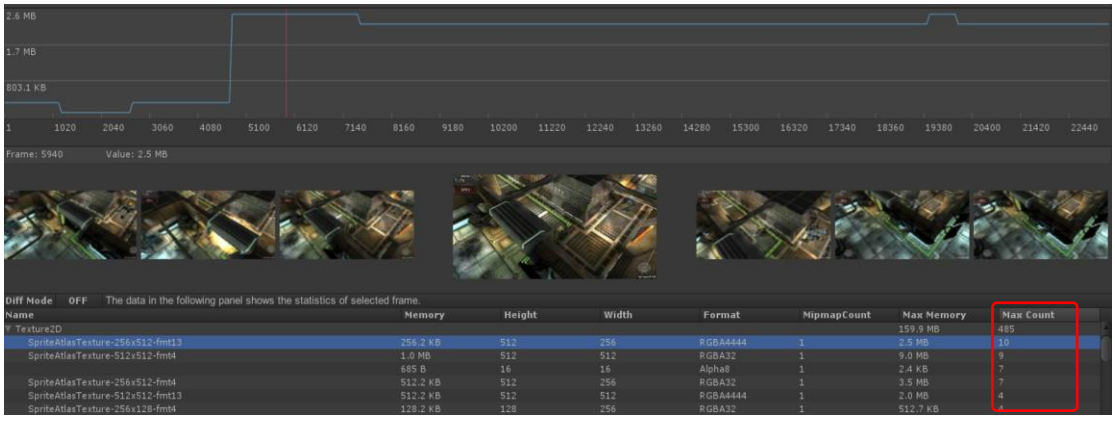
1) Switch **“Diff Mode”** to **ON**, then select any two frames, the difference will be shown in the below list.



2) In the above example, compared the “Texture” assets between frame #16140 & # 14640. The positive value of an asset in “Max Memory” column indicates that the quantity of that asset increased in the frame #16140. And the negative “Max Memory” value means the quantity decreased in the frame #16140.

4. Asset Redundancy Analysis

The assets are probably redundant during the runtime. We advise to check the asset list that whether the “Max Count” value of the asset is larger than 1. “Max Count” value is the maximum quantity of the asset used in one frame. If the count is more than 1, there is the high possibility of asset redundancy.



Notice: It’s possible that two different assets have the same name, same memory size and other properties. So we advise to double check whether it is reasonable while “Max Count” value is more than 1.

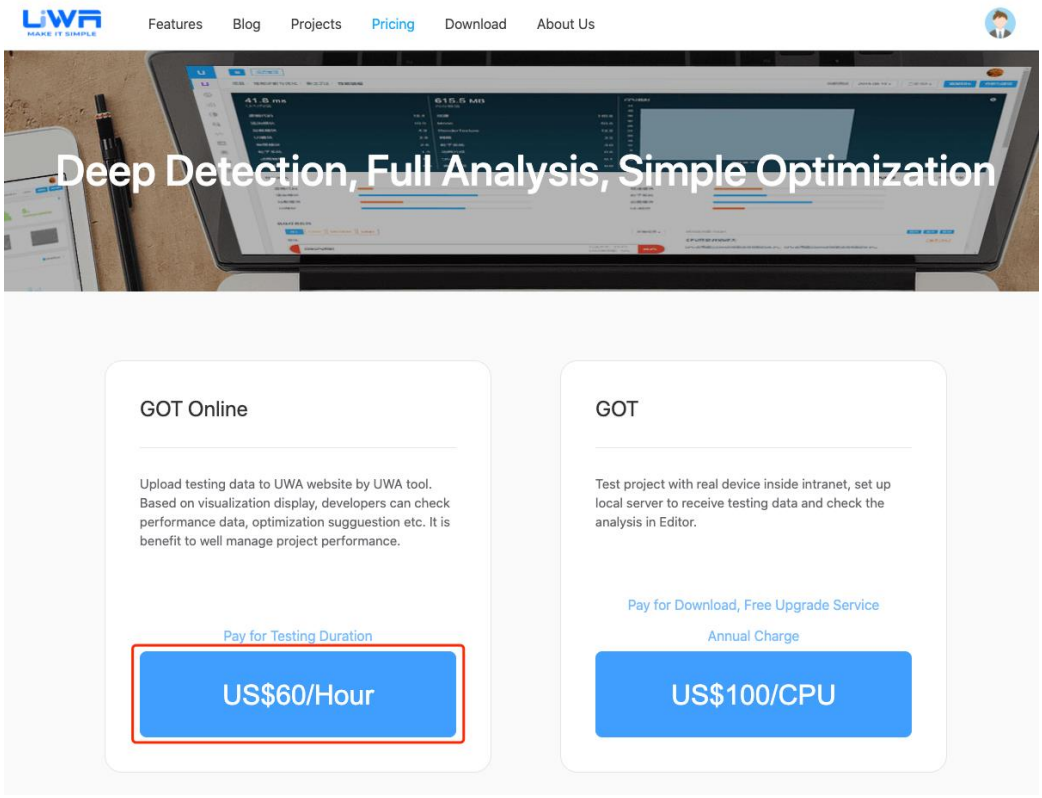
5. GOT Online Instructions

UWA GOT Online aims to help you get more intuitive analysis and well manage the performance report. You can upload local test data to UWA website to generate more detailed online reports. Online reports not only provide visualized test data, but also provide specific optimization suggestions. And it features the trend of performance parameters to help developers control the application quality. Meanwhile it provides quality monitoring for your project. By monitoring the trend of important performance parameters in each test version, it's easy for you to ensure the project development progress and make quality control.

The specific instructions are as follows:

5.1. Payment

The GOT Online service charges a fee based on the test duration of the uploaded data. Visit https://en.uwa4d.com, go to "Pricing" page and select "GOT Online".



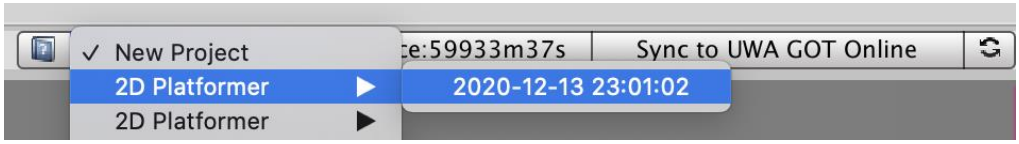
5.2. Data uploading via GOT App

After the testing on the device, you can upload the profiling data directly to UWA server (en.uwa4d.com) for analysis. Please find item 2.2.2 of this document for specific steps.

5.3. Data uploading via Local Server

As for existed performance data in the Unity Editor, you can upload to the GOT Online for analysis.

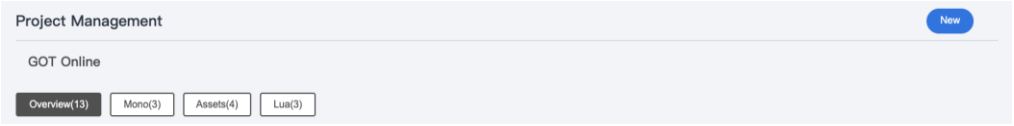
After logging in, click “Mode->Sync to GOT OL” button to upload current the profiling data or you can select the specific project to upload.



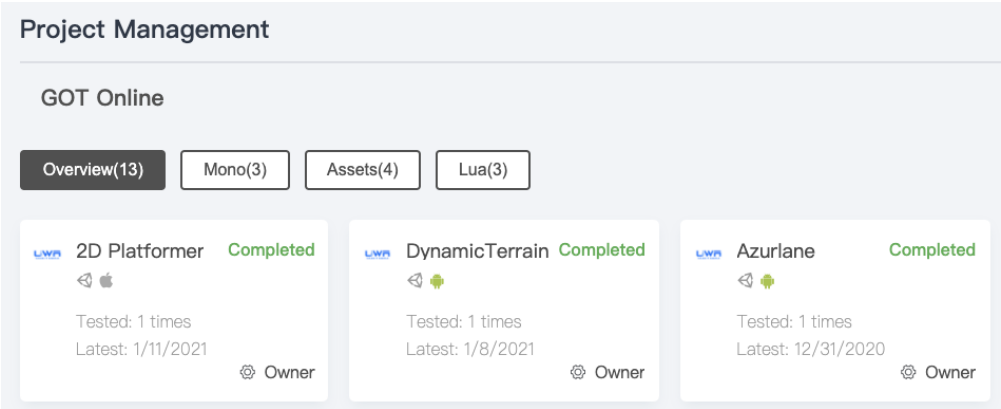
5.4. Check UWA GOT Online report

Finish uploading data, visit UWA website (en.uwa4d.com) and review the performance report in the relevant interface. The specific steps are as follows:：

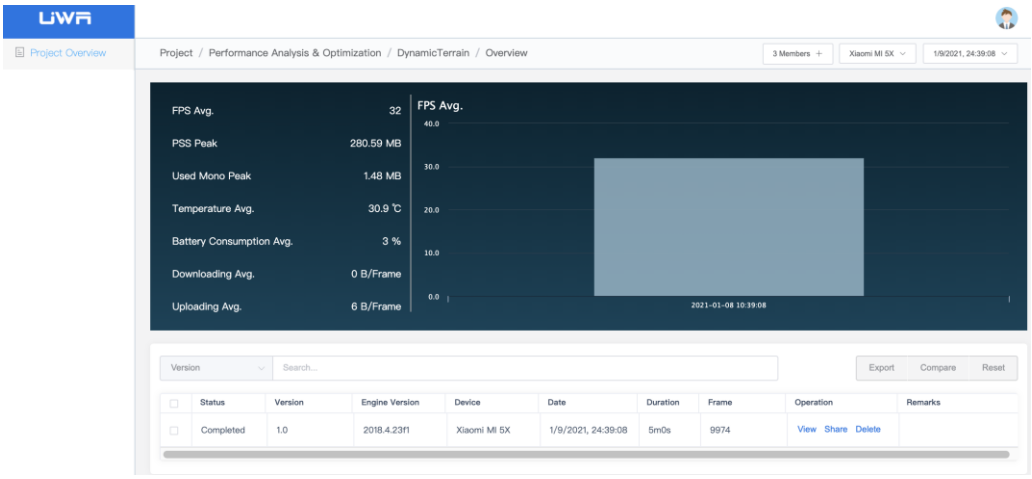
1) Log in UWA website, you will see the “UWA GOT Online” service as shown below.



2) Click “Overview-CPU Performance Analysis”, you will see one or more project cards in the page. The time displayed on the project card is the submission time of the latest one.



3) Click the project card to enter the project overview page:



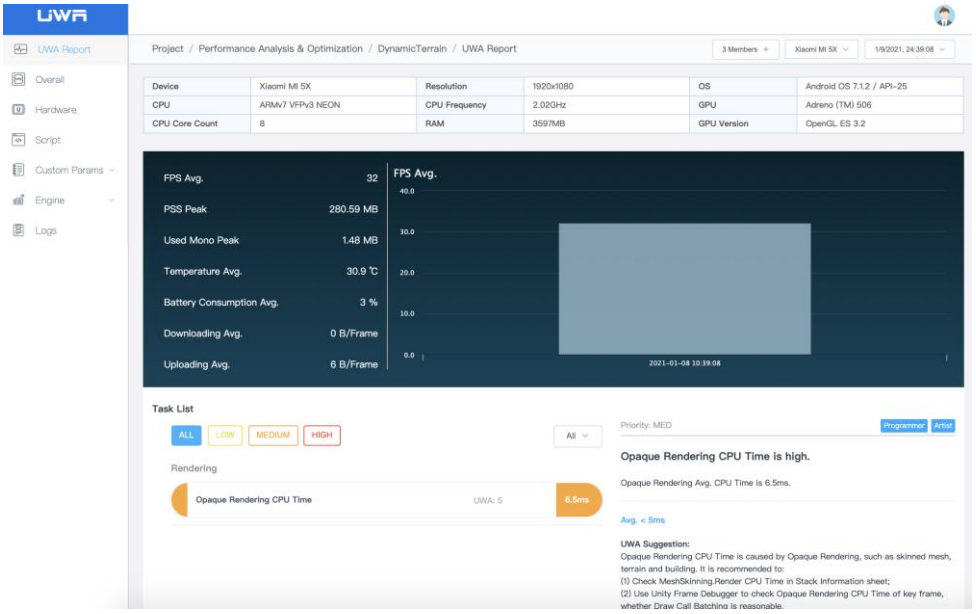
There are two parts in the overview page.

The first part is performance trend. You can click the important performance parameters in the left column to view the performance trend.

The second part is the test records. It allows you to know the status of each uploaded test, Unity engine version, the target device, the test date, and the test duration. At the same time, you can invite other members to view the performance report together, and view, share, delete the reports. Finally, you can also make notes for the specified test, like the specific situation, modification of the test etc.

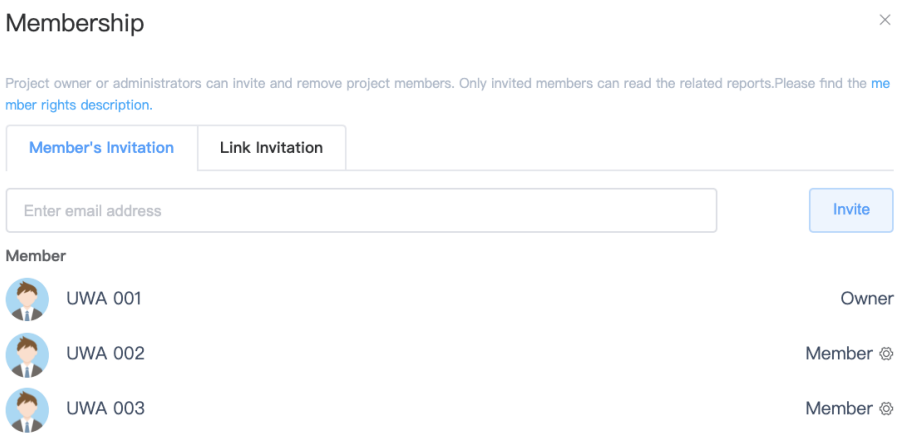
4) Click “View” button in the test record to enter the performance report page. In general, the content of the report page will vary depending on the test mode (Overview, Assets, Mono and Lua), but the layout is consistent. Below, we take the Overview ("CPU Performance Analysis") as an example to illustrate.

On the left is the navigation bar, you can click on these modules to view the specific page. For example, you can see the trend of the specific hardware parameters of the target device and the specific trend of other important performance parameters during the test. The corresponding running screenshots and the detailed logic code call stack.



5.5. Membership Management

In every project you create, you can invite partners to become a member of the project. The project members will be able to review the detailed report of the project. You can manage the membership in the projects you own. More specifically, you can "invite a member" ,"remove a member" or "change a member's permissions".



5.5.1. Member and role

There are mainly three types of membership in a project: owner, manager, and member. Their respective permissions are explained as follows:

Role	Owner	Manager	Member
Conditions	• The creator of the project will be “Owner”. • “Owner” can transfer the project to another member. And the right of Owner will be transferred.	• Designated by the "Owner" • “Manager” can be more than ONE.	• Invited by "Owner" or "Manager". • “Member” can be more than ONE.
Rights	• Review project all information	• Review project all information	• Review project all information

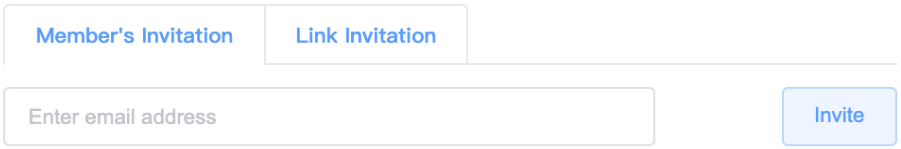
	• Modify project notes • Submit testing data • Invite member • Delete testing data • Share data to another project • Rename project • Designate “Manager” • Remove member • Transfer project • Delete project	• Modify project notes • Submit testing data • Invite member • Delete testing data • Share data to another project	• Modify project notes • Submit testing data

5.5.2. Member’s Invitation

The project "Owner" or "Manager" can invite members to join in two ways: Email invitations and link invitations.

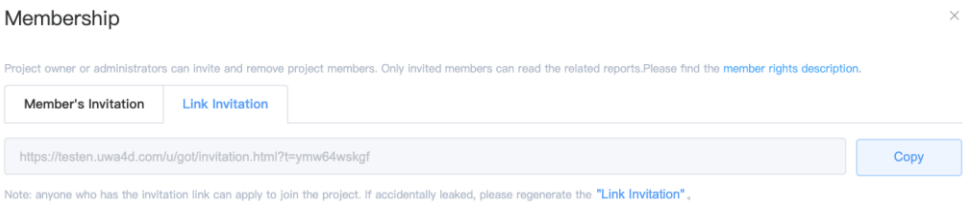
1) Email Invitation

The project owner or Manager can send the invitation letter to the inviter by entering the inviter's email address. If the account has been registered, he/she will directly enter the project as a member. If the account has not been registered before, the system will automatically send the invitation letter to invite him/her to join the project.



2) Link Invitation

The project “Owner” or “Manager” can send invitation link, member can enter the project directly through the link.

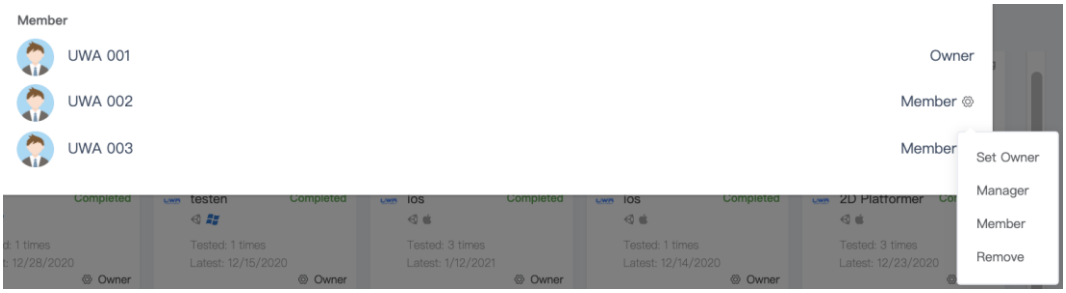


Notice: Anyone who sees an invitation link can be added directly to the project. Therefore, in order to be safe for your project, please operate carefully when using a link invitation. If it is

found that there is an accidental disclosure of the invitation link, it is recommended to regenerate an invitation link.

5.5.3. Membership Management

The project “Owner” or “Manager” can change the role of a selected member, and also remove a selected member from the project, transfer project to another member.



That’s all the instructions for using the GOT & GOT Online. If you have any questions, you are welcome to contact us. Please send email to: en.support@uwa4d.com.

Appendix 1: Introduction of UWA API

UWA.EditorTools.PrepareForBuild
public static void PrepareForBuild()

This API can be used ONLY in Unity Editor, aims to build player with script setting of UWA SDK, instead of setting manually in SDK integration panel. Here are the settings.

1) Stripping Level is “Disabled”
2) Strip Engine Code is “Disabled”
3) Development Build is “True”

Especially for Android platform, please make sure “Write Access” is “External (SDCard)”.

Note: If build App with “BuildPlayer” API, please make sure add parameter of “BuildOptions.Development”.

UWAEngine.StaticInit
public static void StaticInit();

This API can be used to initialize the UWA SDK, instead of draging the UWA_Android.prefab into your scene.

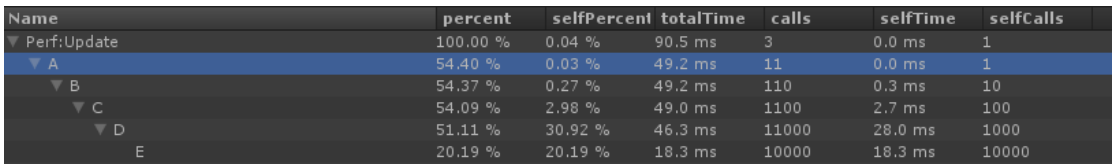
UWAEngine.PushSample/PopSample
public static void PushSample(string sampleName);
public static void PopSample();

This API can be used to profile custom pieces of code, which makes it simple to find the bottleneck in the script.

sampleName is used as a custom label. UWAEngine will record the time cost between the *PushSample* and *PopSample*, and you will see the statistics with the given label in the Local Server. Here is a simple usage example.

```
UWAEngine.PushSample(“MyCode”);
// some code …
UWAEngine.PopSample();
```

The statistics with custom labels is displayed as follows (A~E are customized code).



Name	percent	selfPercent	totalTime	calls	selfTime	selfCalls
Perf:Update	100.00 %	0.04 %	90.5 ms	3	0.0 ms	1
A	54.40 %	0.03 %	49.2 ms	11	0.0 ms	1
B	54.37 %	0.27 %	49.2 ms	110	0.3 ms	10
C	54.09 %	2.98 %	49.0 ms	1100	2.7 ms	100
D	51.11 %	30.92 %	46.3 ms	11000	28.0 ms	1000
E	20.19 %	20.19 %	18.3 ms	10000	18.3 ms	10000

Please make sure that the *PushSample* and *PopSample* are called in pairs. Any *return* or *yield return* between them will make the result confusing.
On the other hand, please be aware that, do not call *PushSample* and *PopSample* too many times in one single frame. Based on the preliminary statistics on some low level devices, 10000 calls makes about 50ms overhead.

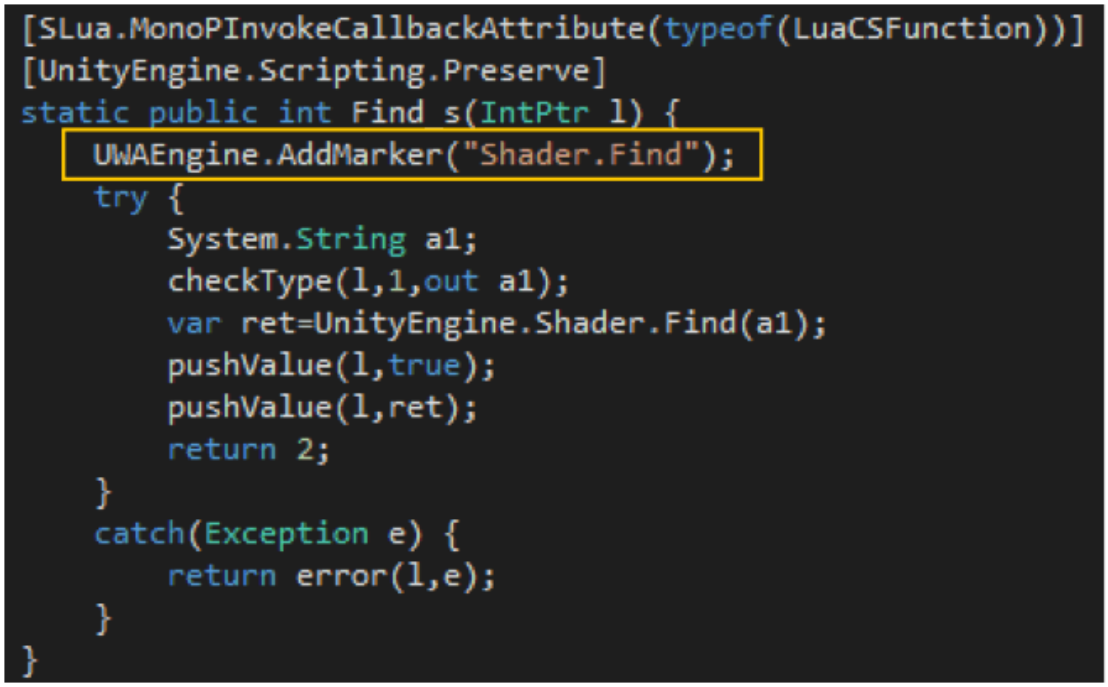
UWAEngine.LogValue
public static void LogValue(string valueName, float value);
public static void LogValue(string valueName, int value);
public static void LogValue(string valueName, bool value);
public static void LogValue(string valueName, Vector3 value);

This API can be used to count value of customized code, shows the trends of key variate.

“valueName” means value of customized code, “value” means current value of corresponding code.

UWAEngine.AddMarker
public static void AddMarker(string valueName);

This API can be used to count call number of customized mark such as called number of C# by Lua. Take Slua for example, modify SLua code generator, embed the code statement in each “Wrap” automatically.



UWAEngine.SetOverrideLuaLib
public static void SetOverrideLuaLib(string luaLib)

In UWA GOT-Lua mode, this API can be used to name customized Lua library with script such as libgamex.so. as for default Lua library of ulua/tolua/slua/xlua, no need to use this API.

UWAEngine.Start
public static void Start(Mode mode)

This API can be used to start the test with the given mode, instead of pressing the button in GUI panel.

UWAEngine.Stop
public static void Stop()

This API can be used to stop the test, instead of pressing the button in GUI panel.

Notes：

1. Now, UWA API are all compiled with [Conditional("ENABLE_PROFILER")]. So that the UWA API cost nothing in **Non-Development** Build.
2. **UWAEngine.Start/Stop** can be called only once in a run of the game.