

Get started with Graphics Analyzer

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Non-Confidential

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Contents

1. Overview	6
2. Configure your device	7
3. Capture a trace	9
4. Related information	13

1. Overview

This tutorial describes how to use Arm Graphics Analyzer to capture a graphics trace of a debuggable application running on an Android device with a Mali GPU.

You can also watch a video of this tutorial: Android graphics tracing with Graphics Analyzer on YouTube

Before you begin

On your host machine:

- 1. Download and install the Arm Mobile Studio package appropriate to your host platform (Windows, Linux, or macOS).
- 2. Install Android Debug Bridge (ADB). ADB is available with the Android SDK platform tools.
- 3. Edit your PATH environment variable to add the path to the Android SDK platform tools directory.



You can also set the path to Android Debug Bridge in Graphics Analyzer. Select Edit > Preferences and select Browse in the Path to ADB field to locate the adb executable.

2. Configure your device

Set up the device on which yoiu wamnt to run the analysis.

Procedure

- 1. Ensure Developer Mode is enabled, then enable USB Debugging using Settings > Developer options.
- 2. Connect the device to your host machine. To test the connection, run the adb devices command in a terminal window on the host, which should return the ID of your device.

```
adb devices
List of devices attached
ce12345abcdf1a1234 device
```

If adb devices does not work, check that you have installed Android Debug Bridge correctly, see Before you begin.

3. The device must be able to use TCP/IP on port 5002 to communicate with the host. Make sure that this port is not in use. The application you want to trace must be debuggable. For example, in Unity applications, select the Development Build checkbox in the Build Settings when you build your application.

Figure 2-1: Build	settings dialog with	Development Build chec	kbox selected and highlighted
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Build Settings					
Scenes In Build					
✓ Scenes/Demo					0
					Add Open Scenes
Platform					
PC Mac & Linux Standalone					
iOS ios	Texture Compression	Don't override			
*	ETC2 fallback	32-bit			
Android 🔇	Export Project				
1.00 tugs					
1005 1003	Build App Bundle (Google Pla	y 📕			
PS4 PS4	Create symbols.zip				
	Run Device	Default device			▼ Refresh
🖄 Xbox One	Development Build				
HTHL	Autoconnect Profiler				
	Deep Profiling Support				
	Script Debugging				
	Scripts Only Build				
	Compression Method	LZ4			
				Learn abo	ut Unity Cloud Build
Player Settings					Build And Run

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3. Capture a trace

Connect to your device and start the capture in Graphics Analyzer.

- 1. Launch Graphics Analyzer:
 - On Windows, open the Windows Start menu, navigate to the Arm Mobile Studio folder, and select the Graphics Analyzer shortcut.
 - On macOS, use Spotlight to search for Graphics Analyzer or go to the <install_directory>/graphics_analyzer/gui folder, and double-click the Graphics Analyzer.app file.
 - On Linux, navigate to the location where you extracted the package, go to the graphics_analyzer/gui directory, and run the aga file.

```
cd <install_directory>/graphics_analyzer/gui
./aga
```

- 2. Select Open the Device Manager from the Debug menu.
 - a. Select your connected device from the list of Android devices.
 - b. Select the application you want to debug
 - c. Select Trace Activity.

Figure 3-1: Device Manager dialog showing selected device

		Device	e Manager	
Android Linux / IP				
Android Device	S u want to connect to, and then	the package you want to	instrument	۷
Identifier	Name	Status		
R58M823FKNK	samsung SM-A505FN	🥖 Disconnected		
Packages				💝 Refresh
	Package		Main Activity	Debuggable
com.arm.malideveloper.openglessdk.shadowMapping			.ShadowMapping	✓ Ô
com.arm.malideveloper.openglessdk.spinningcubejava		.SpinningCubeJava	×	
com.arm.malideveloper.openglessdk.translucency		.Translucency	×	
com.arm.mstutorials			.MainActivity	✓
				Trace Activity
ADB Tasks				
Show on startup				

Graphics Analyzer connects to your device and installs the layer driver and daemon application that it uses to communicate with it.

3. Optionally, select Trace Config and select which API assets are captured. Only enable the asset types you need. The more asset types you enable, the slower the application will run, the more memory is required, and the generated trace file will be larger.

Figure 3-2: Process config dialog with custom trace config settings

🏚 🖗 🖻 🖷 🕐 다음 다음 🚦	Trace Config: Custom				
Process Trace Configuration: Custom					
OpenCL Program sources Explicit memory	OpenGL ES No Trace Fill Vulkan Shader sources Shader binaries Shader uniforms Implicit memory				
1> Capturing Target@127.0.0.1:50	 Shader binaries Texture contents Explicit buffers Implicit buffers Output buffers 				
This configuration will be applied to all newly created processes in this trace. The configuration can be changed at any time. Set as Default Apply Changes					

- 4. Perform your test scenario on the device. Graphics Analyzer displays the trace data as it receives it from the device.
- 5. When you get to a problem area, use the pause, step and play buttons to locate a frame that you want to analyze more closely:

	🔅 Trace Config: C	Custom					
Process Trace Configuration: Custom 🔻							
	Trace using a custom configuration.						
OpenCL	OpenGL ES	No Trace File	/ulkan				
Program sources	✓ Shader sources		Shader binaries				
Explicit memory	✓ Shader uniforms		Implicit memory	,			
1> Capturing Target@127.0.0.1:5002	Shader binaries			Catistics			
. # Return	✓ Texture contents						
	Explicit buffers						
	Implicit buffers						
Output buffers							
This configuration will be applied to all newly created processes in this trace. The configuration can be changed at any time.							
	Set as Default App	ly Changes		() Ass 2			

Figure 3-3: Analysis control buttons

- 6. Click the camera icon frame capture button to capture the frame buffer output at the current frame.
- 7. Optionally, capture extra frame data by enabling the following modes:
 - Overdraw
 - Shader 📕
 - Fragment count

Enable the mode, then click the camera icon 🔎 frame capture button to collect the data.

8. To stop tracing, click 🧖 .

All the frames are listed in the Trace Outline view. The frames where you've captured extra data are shown with an icon, to identify the type of frame capture you performed.

9. To filter the frames to just those where you've captured extra data, use the Show Only Frames With Features Enabled option:

Figure 3-4: Trace Outline tab with Show Only Frames With Features Enabled option selected



10. Expand a frame to see the renderpasses and draw calls within it.

Figure 3-5: Expanded frame showing nested render passes and draw calls

- Frame 564 1746525 vertices, 437 draws, 6460 instances, 1
 RenderPass 0 (Framebuffer 12) 139458 vertices, 40 draw
 RenderPass 1 (Framebuffer 1) 1561805 vertices, 234 drav
 glClear 5254784 GL_DEPTH_BUFFER_BIT|GL_COLOF
 glDrawElements 5255618 1275 vertices, 752 unique in
 glDrawElements 5255652 1224 vertices, 494 unique ir
 glDrawElements 5255690 5280 vertices, 3396 unique
 glDrawElements 5255727 6360 vertices, 4248 unique
 glDrawElements 5255763 9108 vertices, 6106 unique
- 11. Select frames, renderpasses and draw calls to explore their data. Refer to the Graphics Analyzer user guide information about the different data views.
- 12. Save or export the trace file, using options under the File menu.

4. Related information

Useful information and shortcuts to next steps.

- About Graphics Analyzer
- Graphics Analyzer Documentation
- Download Arm Mobile Studio
- About Arm Mobile Studio