RenderDoc for Arm® GPUs

Version 2025.5

User Guide

Non-Confidential

Issue 00
109669_2025.5_00_en

RenderDoc for Arm® GPUs User Guide

This document (109669_2025.5_00_en) was issued on 2025-09-10. There might be a later issue at https://developer.arm.com/documentation/109669

The product version is 2025.5.

See also: Proprietary notice | Product and document information | Useful resources

Start reading

If you prefer, you can skip to the start of the content.

Intended audience

This document is intended for software developers who want to use RenderDoc for Arm GPUs for frame-based graphical analysis of Android and Linux applications.

Inclusive language commitment

Arm values inclusive communities. Arm recognizes that we and our industry have used language that can be offensive. Arm strives to lead the industry and create change.

We believe that this document contains no offensive language. To report offensive language in this document, email terms@arm.com.

Feedback

Arm welcomes feedback on this product and its documentation. To provide feedback on the product, create a ticket on https://support.developer.arm.com.

To provide feedback on the document, fill the following survey: https://developer.arm.com/documentation-feedback-survey.

Contents

1. Introduction to Arm® RenderDoc for Arm GPUs

Arm® RenderDoc for Arm GPUs enables RenderDoc users to capture, analyze, and debug graphics applications from Windows, Linux, and Android targets. This section introduces Arm® RenderDoc for Arm GPUs and describes how it works with RenderDoc.

Overview of Arm® RenderDoc for Arm GPUs

Arm® RenderDoc for Arm GPUs is an Arm fork of the RenderDoc open-source graphics API debugger. The Arm release includes support for API features and extensions that are available on the latest Arm GPUs, but are not yet supported in upstream RenderDoc.

Arm contributes changes to the upstream project, but some Arm-specific or Android-specific features are only available in the Arm fork.

Arm-specific features

Arm® RenderDoc for Arm GPUs is based on upstream RenderDoc 1.39 and has the following extensions:

- Bundled pre-built glibc and musl binaries for remote Linux.
- Binary RenderDoc releases for developers using macOS host machines.
- Use `malioc` as a shader view tool.
- Support for capture and replay of Vulkan opacity micromaps.
- Support for libGPUCounters.
- Automatic attachment and swapchain image rotation based on swapchain pre-rotate.
- Configure Vulkan debug layers to use during capture and replay.
- Open captures remotely on Linux and Android targets.
- Support for ML extensions for Vulkan from the Arm Neural Graphic Development Kit.
- Python 3.10 UI extension support for all platforms.
- Per-region counter heatmaps for devices containing Arm Mali™-G1, or later.

Support

The following resources provide additional help and information:

Resource	Link
RenderDoc documentation	https://renderdoc.org/docs/index.html
To ask a question directly, you can email the Arm® Performance Studio team	performancestudio@arm.com
Arm® RenderDoc for Arm GPUs on Arm Community	Graphics, Gaming, and VR community forum

Note

The latest version of the Arm® RenderDoc for Arm GPUs User Guide is included in each product release. The user guide version might be older than the product version because the user guide is updated only as required.

2. Get started with Arm® RenderDoc for Arm GPUs

This tutorial describes how to set up a target and capture frames for analysis with Arm® RenderDoc for Arm GPUs.

Learn how to:

- Setup your Android target to prepare your computer and Android target.
- Setup your Linux target to prepare your computer and Linux target
- Capture frames from your application with a mobile application running on your Android target.
- Analyze and debug your capture highlights some of the analysis and debug features that are available in Arm® RenderDoc for Arm GPUs.

Additional learning resources

Additional tutorials and help articles are available as part of the RenderDoc documentation, including:

- *How do I use RenderDoc on Android?*
- *RenderDoc Quick Start*
- *How-to topics in the RenderDoc documentation*

2.1 Setup your Android target

Complete the required setup tasks before you use an Android target with Arm® RenderDoc for Arm GPUs.

Before you begin

Before you can setup your Android target, you must complete the following tasks:

- Install *Android Debug Bridge*. `adb` is available with the Android SDK platform tools, which are installed as part of *Android Studio*. Alternatively, you can download them separately as part of the *Android SDK platform tools*.
- *Download Arm Performance Studio for free* and follow the installation instructions in the *Arm® Performance Studio Release Notes*.

Note

Your Android target must be running Android 11.0 or later.

Procedure

1. Connect your target to your computer through USB and ensure that the target is switched on.
2. Enable *Developer Mode* on your target.
3. On your target, go to **Settings > Developer Options** and enable **USB Debugging**. If your target asks you to authorize connection to your computer, confirm the connection.
   Test the connection by entering `adb devices` in a command-line utility. If successful, the command returns the target ID.

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

   If you see that the target is listed as unauthorized, try disabling and re-enabling **USB Debugging** on the target, and accept the authorization prompt to enable connection to the computer.
4. If you have Android Studio open, it interferes with RenderDoc debugging by attaching to the package itself. You can either close Android Studio, or disable adb integration in Android Studio using the **Tools > Android > Enable ADB integration** setting.

Next steps

After connecting and configuring your Android target, you can now perform an on-target capture using Arm® RenderDoc for Arm GPUs.

- Capture frames from your application

2.2 Setup your Linux target

Complete the required setup tasks before you use a Linux target with Arm® RenderDoc for Arm GPUs.

Before you begin

Before you can setup your Linux target, you must complete the following tasks:

- *Download Arm Performance Studio for free* and follow the installation instructions in the *Arm® Performance Studio Release Notes*.
- Ensure that your host is running the minimum required version of Linux, or later:
  - `glibc`: Ubuntu 22.04
  - `musl`: Alpine 3.20.1

Procedure

1. Connect your target to your computer and ensure that the target is switched on.
2. Send the `glibc` and `musl` library files to the server using SCP. You can use any of the following commands to copy the files:

- `glibc`

```
scp share/renderdoc/plugins/aarch64/glibc/bin/renderdoccmd <remote
 device>:<remote path>
scp share/renderdoc/plugins/aarch64/glibc/lib/librenderdoc.so <remote
 device>:<remote path>
```

- `musl`

```
scp share/renderdoc/plugins/aarch64/musl/bin/renderdoccmd <remote
 device>:<remote path>
scp share/renderdoc/plugins/aarch64/musl/lib/librenderdoc.so <remote
 device>:<remote path>
```

3. Setup the Vulkan layer files to the correct location on the server:

```
renderdoccmd vulkanlayer --register --<system or user>
```

4. Run the remote server.
5. Connect to the remote server in the RenderDoc **Remote Host Manager** dialog box:
   a. Go to **Tools > Manage Remote Servers**.
   b. In **Hostname**, enter the address of the remote server.
   c. Click **Add**.

   The server is then shown in the **Hostname** list. The icon next to your server shows the connection status of your server:

   - Connected
   - Not connected. Make sure that the server is accessible.

   If required, to refresh the list of servers, click **Refresh All**.
6. Close the **Remote Host Manager** dialog box.
   For more information, see the RenderDoc documentation at *How do I capture and replay over a network?*

Next steps

After connecting and configuring your Linux target, you can now perform an on-target capture using Arm® RenderDoc for Arm GPUs.

- Capture frames from your application

2.3 Capture frames from your application

Set up and perform a capture on your target, ready for analysis using Arm® RenderDoc for Arm GPUs.

Before you begin

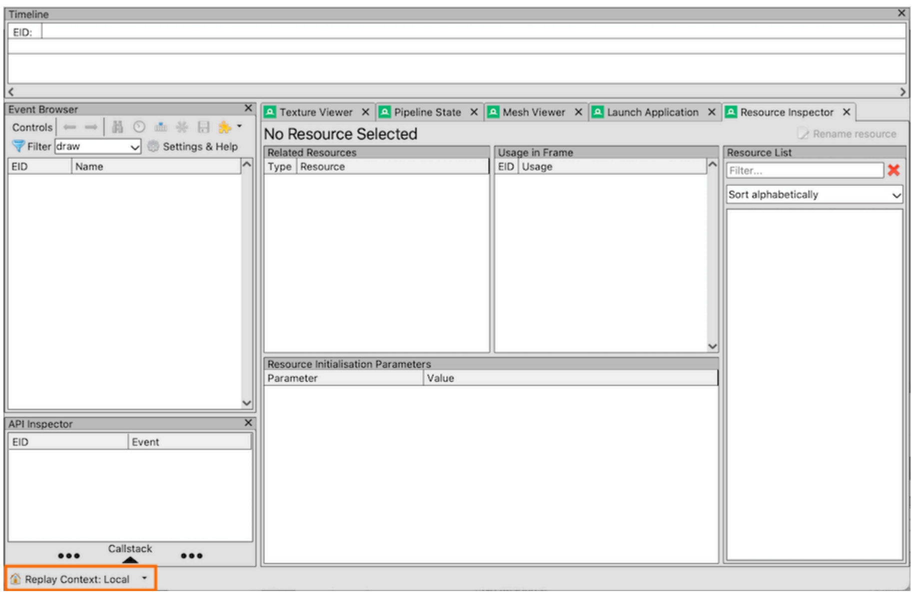
Before you begin this task, you must:

- Set up your target and system as described in Setup your Android target or Setup your Linux target.
- Ensure that your application is installed on your target.

Procedure

1. Connect your target to your host machine:
   - For Android only, ensure that adb can detect the target.
   - For Linux only, ensure that you can establish a TCP/IP connection to the target.
2. Select your connected target from the **Replay Context** dropdown list at the bottom left of the RenderDoc UI.

   Figure 2-1: Replay Context dropdown location in RenderDoc

   If you do not see your target listed in the dropdown list, check that you have set up the target correctly. See either Setup your Android target or Setup your Linux target.

   > **Note**
   >
   > A red cross next to your target indicates that the target is disconnected.

   For Android only, when you connect for the first time, RenderDoc installs its capture and replay application on the target. Now the target is shown as connected in the dropdown list. After connecting, the RenderDoc APK starts running on your target.
3. In RenderDoc, navigate to the **Launch Application** tab, and set the following options:
   a. Set the **Executable Path** to the application that you want to debug. Click the **Browse** button to view all of the installed application packages on the target and find the `.exe` file:

- For Android only, choose the required application package folder and select the activity executable within it.
- For Linux only, select the executable file.

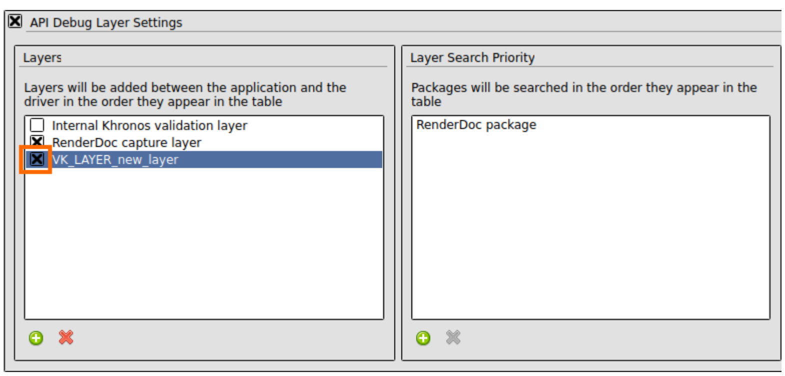
b. Optionally, you can specify the **Working Directory**. If you do not specify this, the capture is temporarily saved in the same location as the executable.

c. In the **Actions** section, you can also specify additional **Capture Options** and specify a list of frames to capture.

d. Arm® RenderDoc for Arm GPUs reads any Vulkan debug layers on the device and displays them in the **API Debug Layer Settings** section. Setup your Vulkan debug layers:

- Add or remove layers and packages for your capture session:
    - To add a new layer, click the **Add new layer** button located under the **Layers** table, then enter the layer name in the new row added to the table.
    - To add a new package, click the **Add new package** button located under the **Layer Search Priority** table, then select a package from the popup list.
    - To remove a layer or package, select the item that you want to remove, then click either the **Remove selected layer** button or **Remove selected package** button located under the appropriate table.
- To enable layers for your capture session, select the **Enabled** checkbox. Clear the **Enabled** checkbox for any layers that you do not want to use.

Figure 2-2: Enable layers

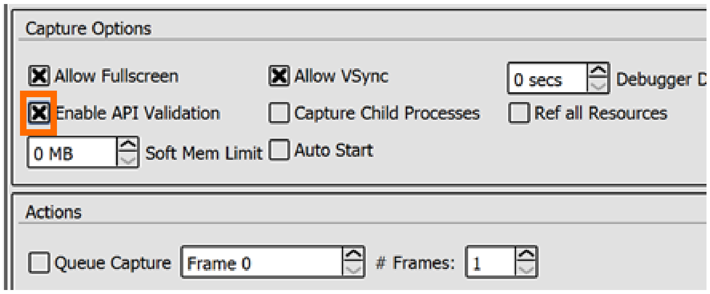


- The layers and packages are processed in the same order as they appear in the tables. Click and drag the layers and packages until they are in the required order.

Note

- You cannot edit or remove the included RenderDoc layer and RenderDoc package because they are required for the capture.
- To enable the validation layer, in the **Capture Options** dialog, select the **Enable API Validation** checkbox. Clear the **Enable API Validation** checkbox to disable this layer if you do not require it for your capture session.

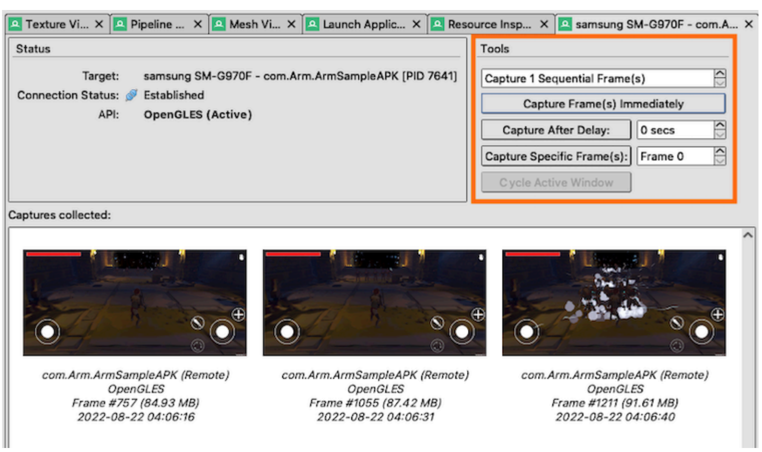
Figure 2-3: Enable API Validation



- Your capture will be unsuccessful if you add any new layers that do not exist.
- Layer settings persist between any captures that you open in the same capture session. When a device disconnects, or when RenderDoc closes, the layer settings on the device revert back to the same state they were in before the device connected to RenderDoc.

4. Click **Launch**, to start the application running on your target. After a successful launch, a new target-specific tab opens in the UI where you can select the frames that you want to capture:
   - Capture one or more frames immediately
   - Capture one or more frames after a delay
   - Capture one or more frames after a specific frame

Figure 2-4: Capture frame controls



Note

Captured frames are stored temporarily on the target.

5. When you have finished capturing the frames of interest, stop the application that you are debugging. Keep RenderDoc running though, so that you can analyze and debug your captures:

- For Android only, keep the RenderDoc APK running.
- For Linux only, keep the `renderdoccmd` running.

6. To open a capture, double-click on the thumbnail of the captured frame.

Next steps

When you have finished capturing, you can then analyze, debug, and edit your frames using RenderDoc.

- Analyze and debug your capture

2.4 Analyze and debug your capture

Use the debug features available in Arm® RenderDoc for Arm GPUs to analyze and debug your capture.

The primary purpose of RenderDoc is to help you diagnose rendering problems that occur in your application. When you have captured a frame, you can use the tool to interactively explore all of its API calls and rendering events. By stepping through the frame you can identify problem rendering events, and then review the configuration used by the event to discover the cause.

Note

This section describes some tasks that you can do with Arm® RenderDoc for Arm GPUs after you have captured a frame. See the *RenderDoc documentation* to explore the full list of features.

Load a saved capture

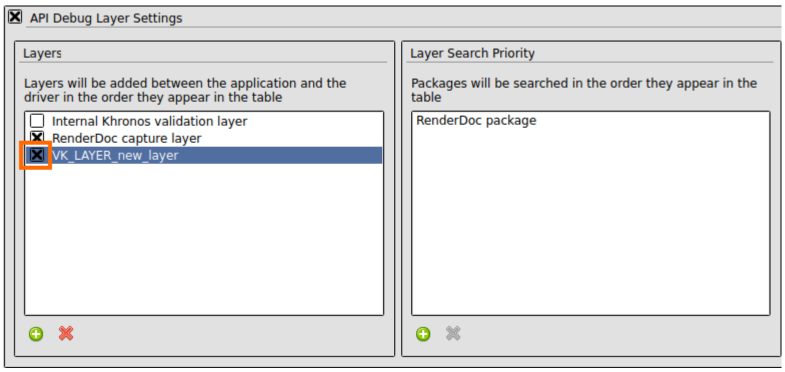
You can either load a frame capture for analysis directly after capture, or you can load a previously saved frame capture.

1. Ensure that your Android target is connected to your computer, and select your target from the **Replay Context** dropdown list.
2. If you have just taken a new frame capture, select the capture from the **Captures collected** window and click **Open**.
3. Alternatively, you can open a previous capture:
   - To load a previously saved frame capture, click **File > Open Capture**.
   - Setup Vulkan debug layers for your capture from the **File > Open Capture with Options** menu. The **API Debug Layer Settings** section shows the Vulkan layers and packages that Arm® RenderDoc for Arm GPUs reads from your device:
     - For Android users only, you can add or remove layers and packages for your capture:
       - To add a new layer, click the **Add new layer** button located under the **Layers** table, then enter the layer name in the new row added to the table.
       - To add a new package, click the **Add new package** button located under the **Layer Search Priority** table, then select a package from the popup list.

- To remove a layer or package, select the item that you want to remove, then click either the **Remove selected layer** button or **Remove selected package** button ✖ located under the appropriate table.

◦ To enable layers for your capture session, select the **Enabled** checkbox. Clear the **Enabled** checkbox for any layers that you do not want to use.

Figure 2-5: Enable layers

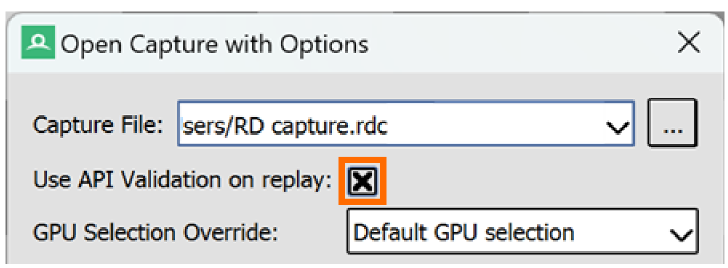


◦ The layers and packages are processed in the same order as they appear in the tables. Click and drag the layers and packages until they are in the required order.

Note

◦ To enable the validation layer, in the **Open Capture with Options** dialog, select the **Use API Validation on replay** checkbox. Clear the **Use API Validation on replay** checkbox to disable this layer if you do not require it.

Figure 2-6: Enable API Validation

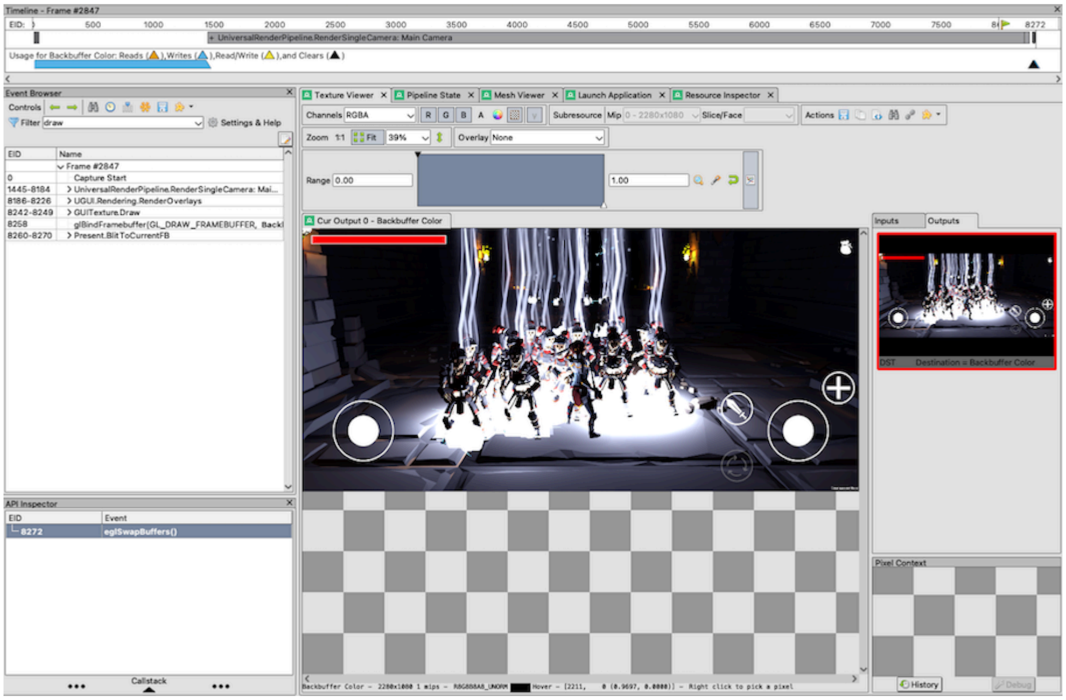


◦ Your capture will be unsuccessful if you add any new layers that do not exist.

◦ Layer settings persist between any captures that you open in the same replay session. When a device disconnects, or when RenderDoc closes, the layer settings on the device revert back to the same state they were in before the device connected to RenderDoc.

When the frame has loaded, it is displayed on the target and in the **Texture Viewer** tab, and the **Event Browser** is populated in Arm® RenderDoc for Arm GPUs.

Figure 2-7: RenderDoc UI with a loaded frame

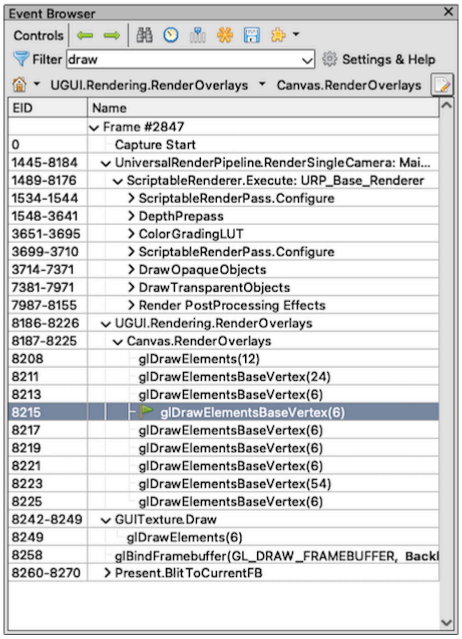


Navigate the frame capture

Use the **Event Browser** to navigate through the frame capture. By default, the **Event Browser** shows all `action()` events, which include draws, copies, and clears. Enter a search term in the **Filter** dropdown to filter these events.

Filter expressions can be complex. For more details, see the RenderDoc documentation at *How do I filter visible events?*.

Figure 2-8: Event browser view in RenderDoc



Selected events are highlighted with a green flag. All the other windows in the UI update to display information that is specific to the selected event. You can use this to view the render state and data resources that are used by the current event, and view the GPU output that resulted from it.

For more details, see the RenderDoc documentation at *Event Browser*

Debug a shader

Use the **Mesh Viewer** in RenderDoc to select an input vertex. Right-click anywhere in a row that is of interest, and select **Debug this Vertex** to open the vertex shader in the shader debugger.

Note

If the **Debug this Vertex** button is grayed out, this option might not be available for your target and API combination.

For more details, see the RenderDoc documentation at:

- *How do I debug a shader?*
- *How do I use shader debug information?*

Edit a shader

Shaders are one of the most important aspects of GPU processing, and errors in user shaders are a common cause of rendering problems. RenderDoc allows you to edit a shader used by an action event and replay it on the connected target. This feature allows you to quickly iterate changes without having to rebuild and deploy your entire application.

To launch the shader editor, click the **Pipeline State** tab then click the **Edit** button next to the shader. A text editor opens where you can make your edits to the code. To save and recompile the code, click **Apply changes**.

Figure 2-9: Edit shader button

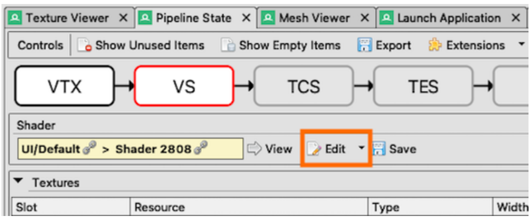


Figure 2-10: Editing the shader code

> **Note**
>
> Any changes to the shader will affect all action events that use this shader.

For more details, see the RenderDoc documentation at *How do I edit a shader?*

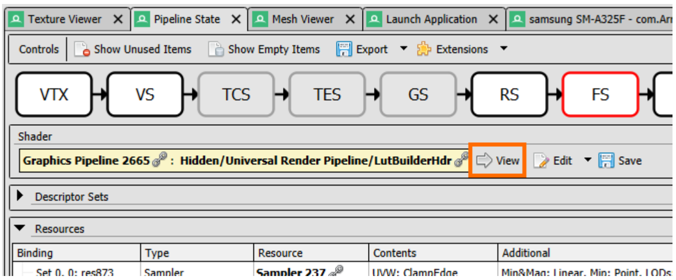
Review shader performance with Mali™ Offline Compiler

To review performance of your Vulkan shaders on the target GPU, use `malioc` to statically analyze the SPIR-V disassembly and generate a performance report from Mali™ Offline Compiler.

The report enables you to see details about the configuration, how the shader uses resources, performance cycle costs of the shader, and properties of the shader that can impact performance.

1. In the **Event Browser**, select a draw command.
2. Click the **Pipeline State** tab, select a shader, then click the **View** button.

Figure 2-11: View shader source



3. In the **Disassembly type** dropdown menu, and select the Mali Shader Performance report:
   - **Mali Shader Performance (malioc (Text Report))** opens a formatted and human readable text output of your shaders.
   - **Mali Shader Performance (malioc (JSON Report))** opens a machine-readable JSON format that you can export to other tools.

Figure 2-12: Disassembly_type_menu

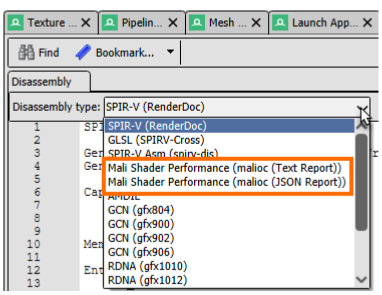
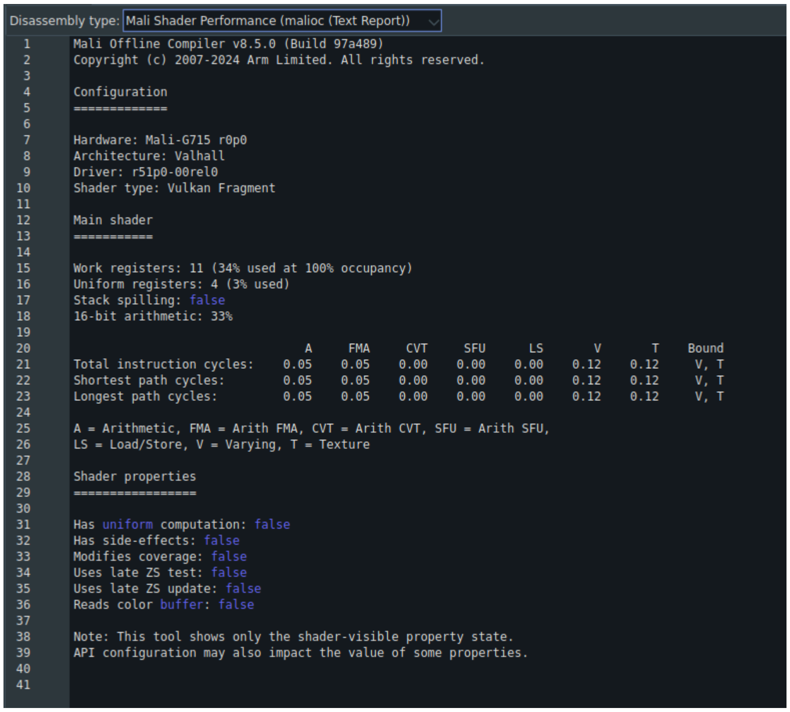


Figure 2-13: Example Mali Offline Compiler performance report



```
Disassembly type: Mali Shader Performance (malioc (Text Report))

Mali Offline Compiler v8.5.0 (Build 97a489)
Copyright (c) 2007-2024 Arm Limited. All rights reserved.

Configuration
=============

Hardware: Mali-G715 r0p0
Architecture: Valhall
Driver: r51p0-00rel0
Shader type: Vulkan Fragment

Main shader
===========

Work registers: 11 (34% used at 100% occupancy)
Uniform registers: 4 (3% used)
Stack spilling: false
16-bit arithmetic: 33%

                                A     FMA     CVT     SFU      LS       V       T    Bound
Total instruction cycles:    0.05    0.05    0.00    0.00    0.00    0.12    0.12     V, T
Shortest path cycles:        0.05    0.05    0.00    0.00    0.00    0.12    0.12     V, T
Longest path cycles:         0.05    0.05    0.00    0.00    0.00    0.12    0.12     V, T

A = Arithmetic, FMA = Arith FMA, CVT = Arith CVT, SFU = Arith SFU,
LS = Load/Store, V = Varying, T = Texture

Shader properties
=================

Has uniform computation: false
Has side-effects: false
Modifies coverage: false
Uses late ZS test: false
Uses late ZS update: false
Reads color buffer: false

Note: This tool shows only the shader-visible property state.
API configuration may also impact the value of some properties.
```

See the *Arm® Mali™ Offline Compiler User Guide* for more information about the metrics detailed in the Mali™ Offline Compiler performance report.

Review per-region counter performance

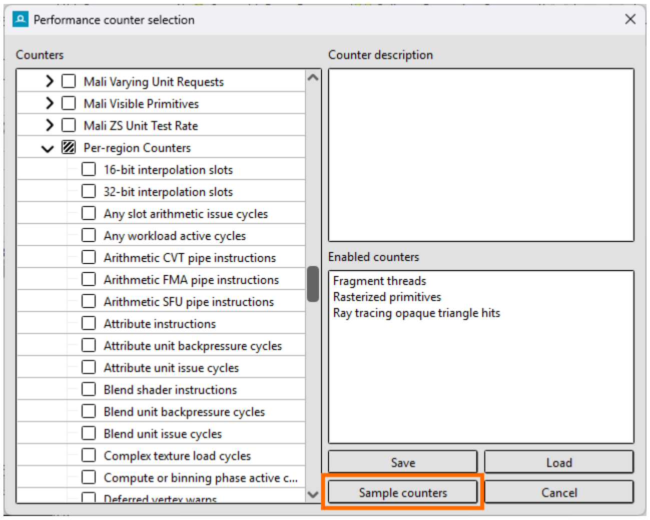
For captures on Android devices containing Mali™-G1 or later, you can view a heatmap that shows regions of high processing activity. Compare the heatmap to the rendered image to identify objects that might cause performance issues, and require optimization.

1. To select the per-region performance counters, open the **Performance Counter Viewer** tab, and click the **Capture counters** button.

   The **Performance counter selection** dialog opens and shows all of the performance counters that are supported by your connected device.

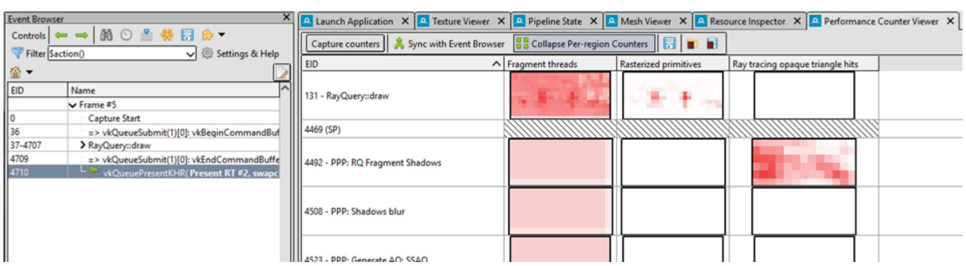
2. To collect the performance counter data, expand the **ARM > Per-region Counters** list, and select up to 4 per-region counters. Click the **Sample counters** button.

Figure 2-14: Per-region Counters selected



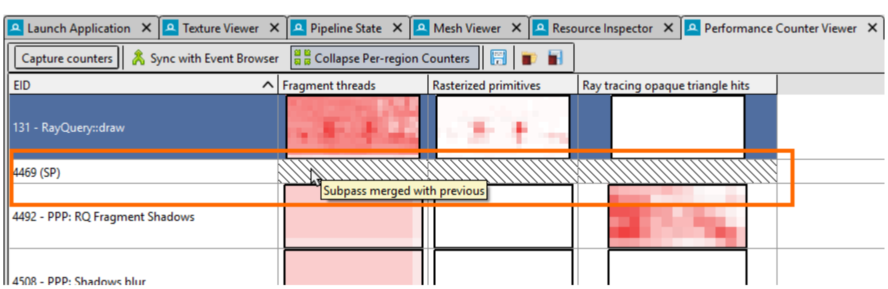
The heatmap uses the worst and best values for each selected counter type as the heatmap bounds. The heatmap displays as the background color that becomes a brighter red in regions where processing activity is higher. The proportions of the heatmap boxes correspond to the aspect ratio of the render pass or subpass, which can change during the frame.

Figure 2-15: Per-region heatmaps



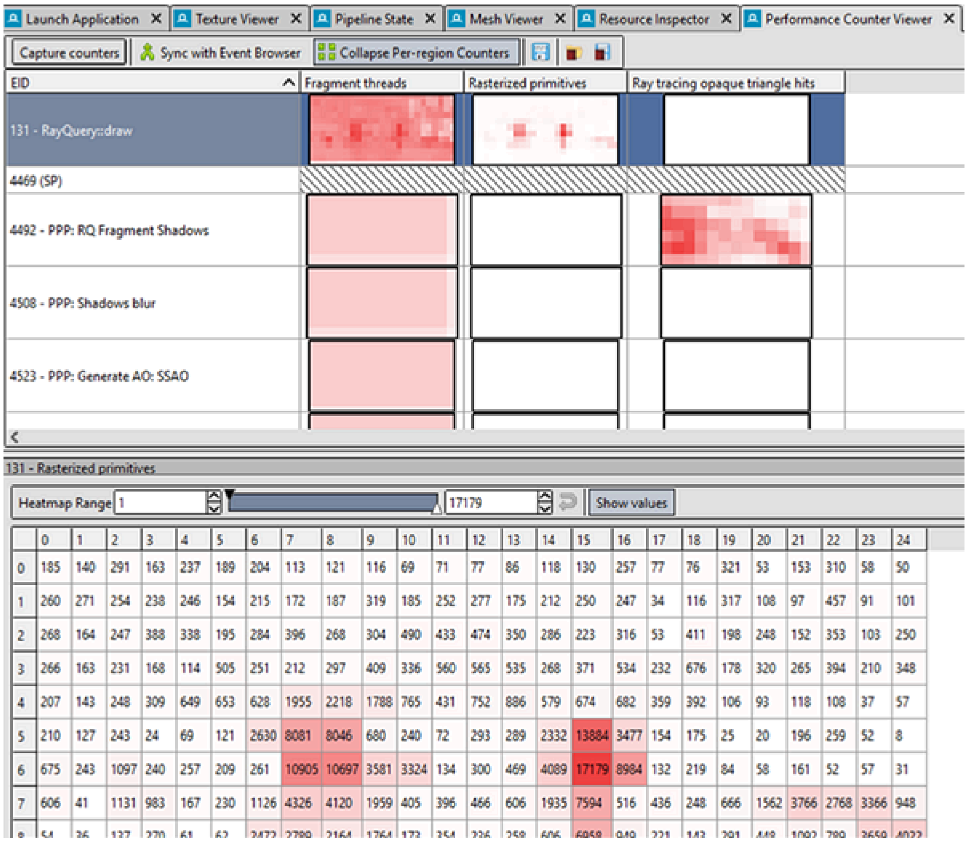
Subpasses are shown with the suffix **SP** in the **EID**. Diagonal hatch lines replace the heatmap to show any subpasses that were merged by the driver to optimize performance. To see which passes were merged by the driver, hover the mouse pointer over a flattened subpass. If the driver cannot merge a subpass, the heatmap is shown, and the tooltip explains the reason.

Figure 2-16: Merged subpass



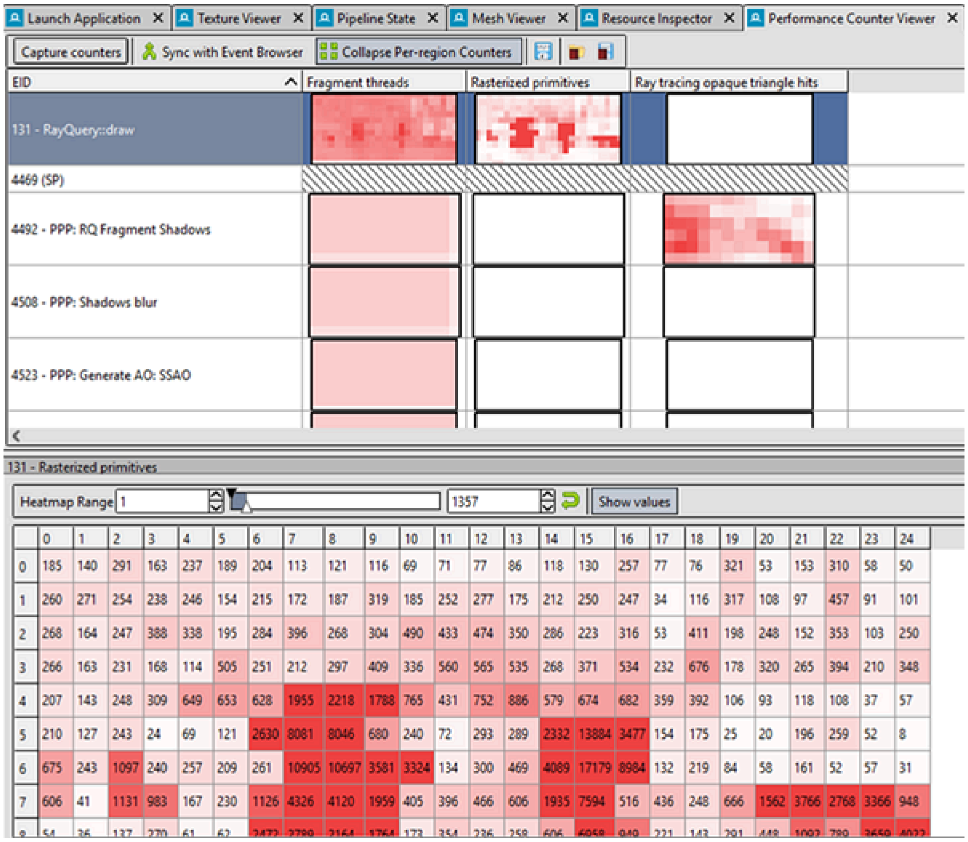
3. To show a grid of the raw counter values together with the heatmap color background, double-click on a heatmap box.

Figure 2-17: Per-region heatmap values



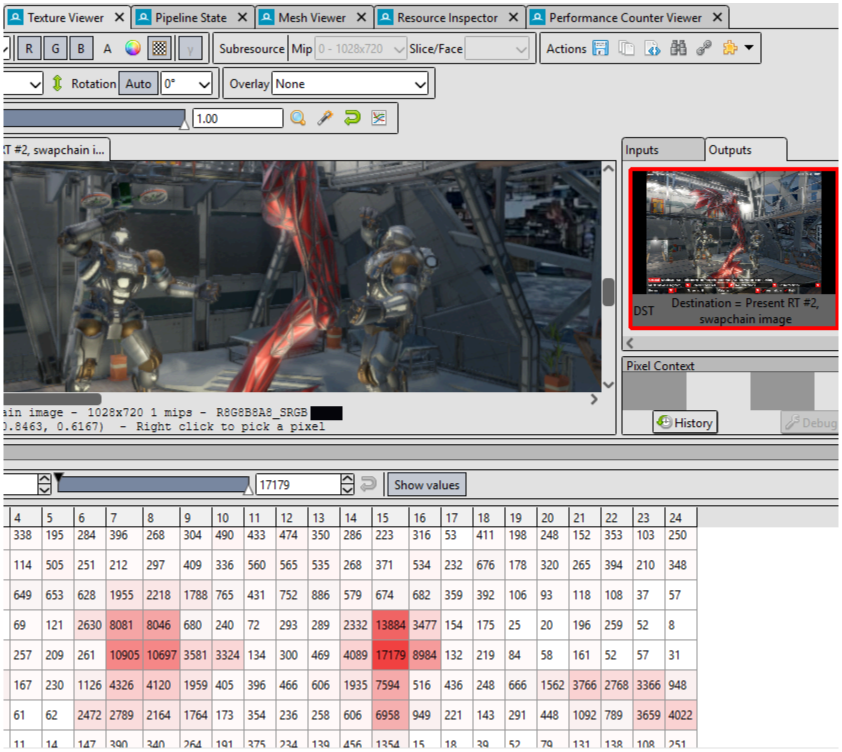
You can flatten the range of values to enhance the heatmap color for a particular range. Change the minimum and maximum values to show the range that you are interested in.

Figure 2-18: Per-region enhanced heatmap range



4. To see what was being rendered to cause the performance issue, you can look for the corresponding **EID** for the API call in the **Event Browser**. Or, to identify complex objects that require optimizing, open the **Texture Viewer** and compare the bright red regions on the heatmap with objects in the rendered image.

Figure 2-19: Compare heatmap to the rendered image



5. Optionally, you can export the heatmap range for post-process analysis of each counter type. Exporting the heatmap range for each counter type before and after you make changes to your application enables you to compare the captures, and determine whether the result is as intended.

3. Capture and analyze ML graph pipeline data

Arm® RenderDoc for Arm GPUs supports the capture and analysis of neural graphics on Vulkan using the Arm Neural Graphic Development Kit. Use Arm RenderDoc for Arm GPUs to capture frames from your Vulkan application using the Arm ML extensions for Vulkan. Then, use the debug features to inspect your data graph pipeline, and explore the tensor resources.

Before you begin

Before you can capture a frame that uses the ML extensions for Vulkan, you must:

- Install and enable the *ML extensions for Vulkan*. The extensions provide ML support for the tensor resources and data graph pipeline. For more information, see the *ML SDK for Vulkan documentation*.
- Optionally, to explore the data graph pipeline, you can install the *Tensor and Data Graph samples*. The emulation layers are configured using the Vulkan Configurator tool, which is part of the *Vulkan SDK*.
- For Unreal Engine users:
    - Install the Unreal Engine plugin provided in the *Neural Graphics Development Kit*.
    - In your Unreal Engine project, go to **Edit > Project Settings > Plugins > RenderDoc > RenderDoc executable path** and enter the path to the `qrenderdoc.exe` binary. Restart Unreal Engine.
- In RenderDoc, register the RenderDoc Vulkan capture layer. Click on the warning in the **Launch Application** dialog as described in *Vulkan Support*.

Note

Arm RenderDoc for Arm GPUs provides support only for Windows operating systems that are running the ML Emulation Layers for Vulkan from the Arm *Neural Graphics Development Kit*.

Capture the data graph pipeline

To capture structured tensor data from the data graph pipeline, use the ML extensions for Vulkan with your Vulkan application:

- For Windows users:
    1. In RenderDoc, navigate to the **Launch Application** tab.
    2. Set the required options in the **Program**, **Capture Options**, and **Actions** dialogs.
    3. Click **Launch**.

    For more information, see *How do I capture a frame* in the RenderDoc documentation.
- For Unreal Engine users, you can capture frames either by:
    - Attaching Unreal Engine to the running instance directly in RenderDoc.

- Use the plugin inside Unreal Engine to connect to RenderDoc, then capture frames in RenderDoc from your application running in Unreal Engine.

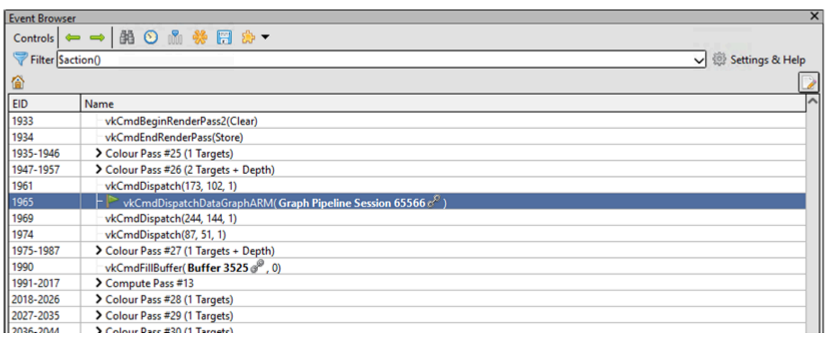
For more information about using RenderDoc in Unreal Engine, see the learning path *Neural Super Sampling in Unreal Engine*.

Analyze and debug the tensor data

1. Open your frame capture for analysis directly after capture, or you can open a previously saved frame capture:
    - If you have just captured a frame, select the capture from the **Captures collected** window and click **Open**.
    - Alternatively, open a previously saved frame capture from the **File > Open Capture** menu.

    The frame opens in the **Texture Viewer** tab, and the **Event Browser** is populated with Vulkan API calls.
2. In the **Event Browser**, inspect the Vulkan calls and select a call from the graph pipeline that contains ML data.

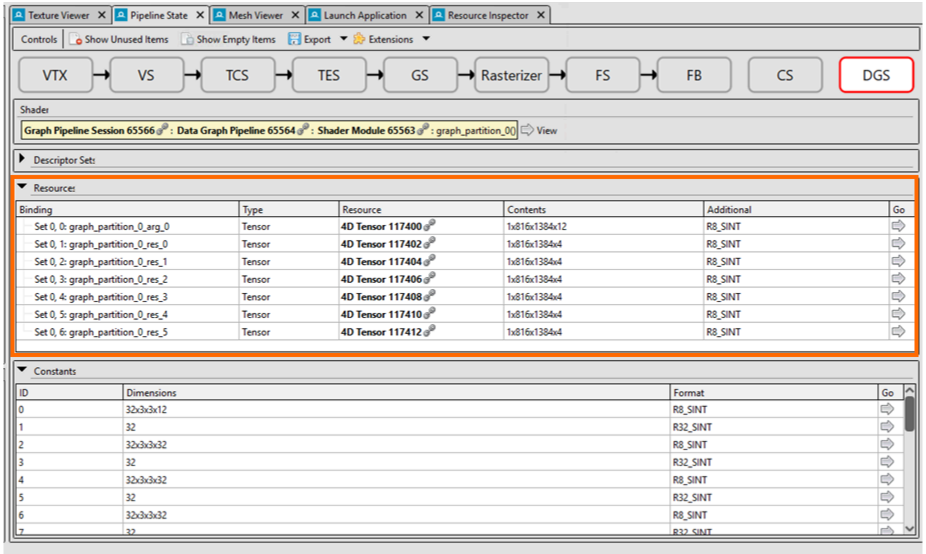
    Figure 3-1: Vulkan call from the graph pipeline



3. To see the resources from the data graph shader, click on the **Pipeline State**, then click on the **DGS** stage.

    The **Resources** section shows a list of the tensor resources in the data graph pipeline.

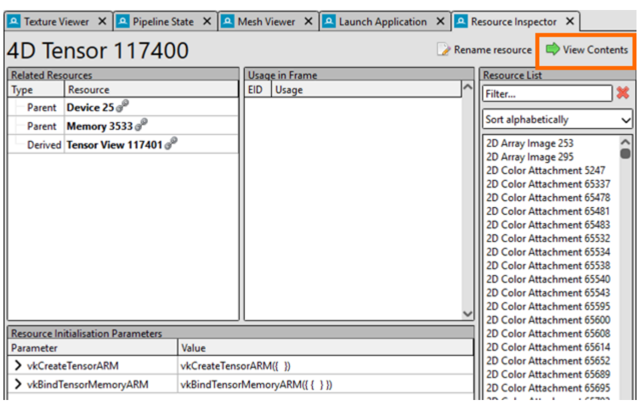
Figure 3-2: Tensor resources



Click on a tensor resource for information about the resource parameters, usage, and attachments.

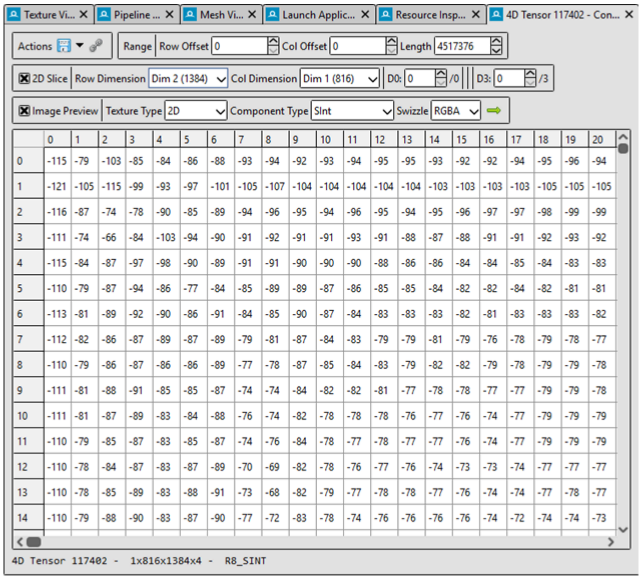
4. To open a resource, click **View Contents**.

Figure 3-3: View tensor resource



The co-ordinates and their pixel values are displayed in a multi-dimensional matrix. You can use the display options to manipulate the data view. For example to view a 2D slice of the tensor.

Figure 3-4: Example tensor data array



Look for unexpected patterns in the data, anomalies where values jump very high or low, or are zero. Repeated patterns, repeated values, unused values, or low values over large areas all indicate where you can improve performance.

Alternatively, to see a visual representation of the tensor data, select the **Image Preview** checkbox, then click the **Render in texture viewer** icon.

Figure 3-5: Render in texture viewer icon

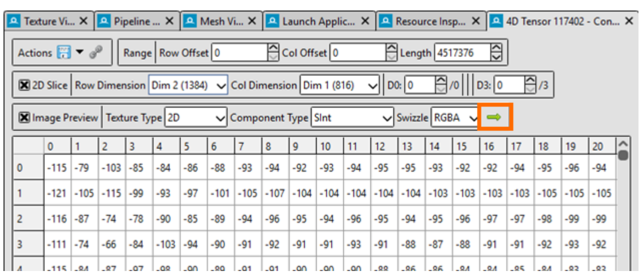
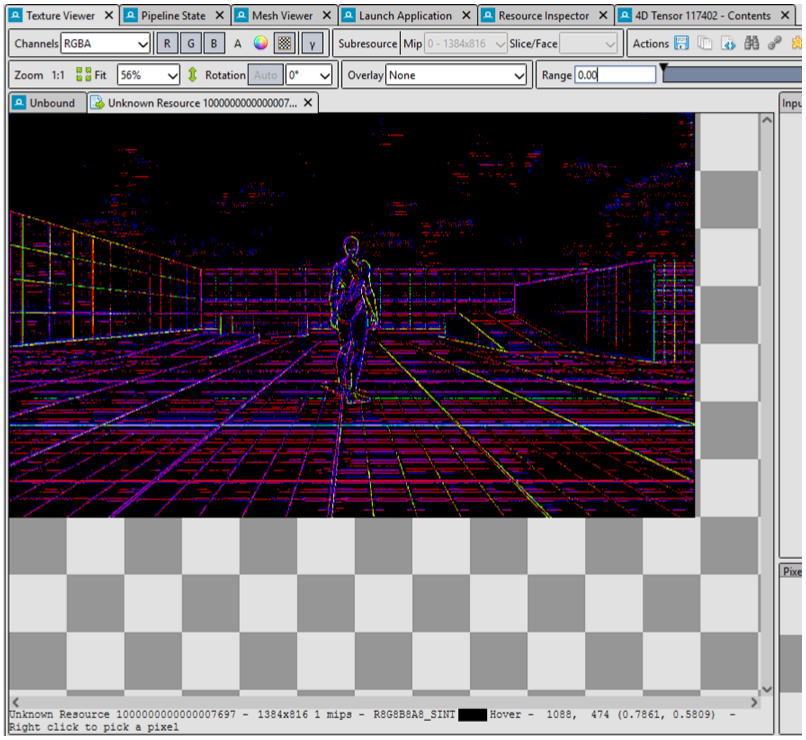


Figure 3-6: Image representation of tensor data



Viewing the data as an image enables you to identify problems in the data values, such as:

- Missing patterns or features
- Unexpected artifacts
- Brightness or saturation of colors
- Unexpected aspect ratios

5. To pan around the image, click and hold the left mouse button. To see the color format and values of an individual pixel, right-click on a pixel. The color values are displayed in a panel underneath the image viewer.

When you have finished exploring the tensor data, update your application code to resolve any problems that you found.

4. Troubleshooting RenderDoc

Find answers to problems that might occur when capturing or analyzing data in RenderDoc.

4.1 Capture fails to transfer over to the Android target

When you are connected to an Android target over USB, and you are loading a capture from a Linux or Mac host, the transfer of the capture to the target can fail on later versions of adb. You might also find that adb gets into a state where it cannot reconnect, and you must force it to stop.

A version of adb v34 or later disconnects the USB device mid-transfer

From adb version 34 or later, the default USB backend is `libusb`. You can check which USB backend that adb is using with the following command:

```
$ adb server-status
```

The following example shows an output returned for `libusb`:

```
usb_backend: LIBUSB
mdns_backend: OPENSCREEN
version: "35.0.2"
build: "12147458"
executable_absolute_path: "/tools/android-sdk/platform-tools/adb"
log_absolute_path: "/tmp/adb.28550.log"
os: "Linux 6.8.0-48-generic (x86_64)"
```

Solution

Start adb with the native USB backend enabled:

```
$ ADB_LIBUSB=0 adb start-server
```

The following example shows an output returned for the native USB backend:

```
usb_backend: NATIVE
usb_backend_forced: true
mdns_backend: OPENSCREEN
version: "35.0.2"
build: "12147458"
executable_absolute_path: "/tools/android-sdk/platform-tools/adb"
log_absolute_path: "/tmp/adb.28550.log"
os: "Linux 6.8.0-48-generic (x86_64)"
```

Proprietary Notice

This document is protected by copyright and other related rights and the use or implementation of the information contained in this document may be protected by one or more patents or pending patent applications. No part of this document may be reproduced in any form by any means without the express prior written permission of Arm Limited ("Arm"). No license, express or implied, by estoppel or otherwise to any intellectual property rights is granted by this document unless specifically stated.

Your access to the information in this document is conditional upon your acceptance that you will not use or permit others to use the information for the purposes of determining whether the subject matter of this document infringes any third party patents.

The content of this document is informational only. Any solutions presented herein are subject to changing conditions, information, scope, and data. This document was produced using reasonable efforts based on information available as of the date of issue of this document. The scope of information in this document may exceed that which Arm is required to provide, and such additional information is merely intended to further assist the recipient and does not represent Arm's view of the scope of its obligations. You acknowledge and agree that you possess the necessary expertise in system security and functional safety and that you shall be solely responsible for compliance with all legal, regulatory, safety and security related requirements concerning your products, notwithstanding any information or support that may be provided by Arm herein. In addition, you are responsible for any applications which are used in conjunction with any Arm technology described in this document, and to minimize risks, adequate design and operating safeguards should be provided for by you.

This document may include technical inaccuracies or typographical errors. THIS DOCUMENT IS PROVIDED "AS IS". ARM PROVIDES NO REPRESENTATIONS AND NO WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY, SATISFACTORY QUALITY, NON-INFRINGEMENT OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE DOCUMENT. For the avoidance of doubt, Arm makes no representation with respect to, and has undertaken no analysis to identify or understand the scope and content of, any patents, copyrights, trade secrets, trademarks, or other rights.

TO THE EXTENT NOT PROHIBITED BY LAW, IN NO EVENT WILL ARM BE LIABLE FOR ANY DAMAGES, INCLUDING WITHOUT LIMITATION ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, PUNITIVE, OR CONSEQUENTIAL DAMAGES, HOWEVER CAUSED AND REGARDLESS OF THE THEORY OF LIABILITY, ARISING OUT OF ANY USE OF THIS DOCUMENT, EVEN IF ARM HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Reference by Arm to any third party's products or services within this document is not an express or implied approval or endorsement of the use thereof.

This document consists solely of commercial items. You shall be responsible for ensuring that any permitted use, duplication, or disclosure of this document complies fully with any relevant

Product and document information

Read the information in these sections to understand the release status of the product and documentation, and the conventions used in Arm documents.

Product status

All products and services provided by Arm require deliverables to be prepared and made available at different levels of completeness. The information in this document indicates the appropriate level of completeness for the associated deliverables.

Product completeness status

The information in this document is Final, that is for a developed product.

Revision history

These sections can help you understand how the document has changed over time.

Document release information

The Document history table gives the issue number and the released date for each released issue of this document.

Document history

Issue	Date	Confidentiality	Change
2025.5-00	10 September 2025	Non-Confidential	New document for v2025.5
2025.4-01	12 August 2025	Non-Confidential	Updated document for v2025.4
2025.4-00	31 July 2025	Non-Confidential	New document for v2025.4
2025.2-00	1 May 2025	Non-Confidential	New document for v2025.2
2025.1-00	20 March 2025	Non-Confidential	New document for v2025.1
2025.0-00	6 February 2025	Non-Confidential	New document for v2025.0
2024.6-00	28 November 2024	Non-Confidential	New document for v2024.6
2024.4-00	5 September 2024	Non-Confidential	New document for v2024.4

Change history

For information about the functional changes to Arm® RenderDoc for Arm GPUs, see the *Arm® Performance Studio Release Notes*.

Conventions

The following subsections describe conventions used in Arm documents.

Glossary

The Arm Glossary is a list of terms used in Arm documentation, together with definitions for those terms. The Arm Glossary does not contain terms that are industry standard unless the Arm meaning differs from the generally accepted meaning.

See the Arm Glossary for more information: developer.arm.com/glossary.

Typographic conventions

Arm documentation uses typographical conventions to convey specific meaning.

Convention	Use
italic	Citations.
bold	Interface elements, such as menu names. Terms in descriptive lists, where appropriate.
`monospace`	Text that you can enter at the keyboard, such as commands, file and program names, and source code.
`monospace` <u>`underline`</u>	A permitted abbreviation for a command or option. You can enter the underlined text instead of the full command or option name.
`<and>`	Encloses replaceable terms for assembler syntax where they appear in code or code fragments. For example: `MRC p15, 0, <Rd>, <CRn>, <CRm>, <Opcode_2>`
SMALL CAPITALS	Terms that have specific technical meanings as defined in the *Arm® Glossary*. For example, IMPLEMENTATION DEFINED, IMPLEMENTATION SPECIFIC, UNKNOWN, and UNPREDICTABLE.

Caution

We recommend the following. If you do not follow these recommendations your system might not work.

Warning	Your system requires the following. If you do not follow these requirements your system will not work.
Danger	You are at risk of causing permanent damage to your system or your equipment, or harming yourself.
Note	This information is important and needs your attention.
Tip	A useful tip that might make it easier, better or faster to perform a task.
Remember	A reminder of something important that relates to the information you are reading.

Useful resources

This document contains information that is specific to this product. See the following resources for other useful information.

Arm documents are available on developer.arm.com/documentation.

Confidential documents are only available to licensees, when logged in. Each document link in the tables below provides direct access to the online version of the document.

Arm product resources	Document ID	Confidentiality
Arm® Mali™ Offline Compiler User Guide	101863	Non-Confidential
Arm® Performance Studio Release Notes	107649	Non-Confidential
Download Arm Performance Studio for free	–	Non-Confidential
ML SDK for Vulkan documentation	–	Non-Confidential
ML extensions for Vulkan	–	Non-Confidential
Neural Graphics Development Kit	–	Non-Confidential
Neural Super Sampling in Unreal Engine	–	Non-Confidential
Tensor and Data Graph samples	–	Non-Confidential

Non-Arm resources	Document ID	Organization
Android Debug Bridge	–	Android Developers
Android SDK platform tools	–	Android Developers
Android Studio	–	Android Developers
Developer Mode	–	Android Developers
Event Browser	–	RenderDoc
How do I capture a frame	–	RenderDoc
How do I capture and replay over a network?	–	RenderDoc
How do I debug a shader?	–	RenderDoc
How do I edit a shader?	–	RenderDoc
How do I filter visible events?	–	RenderDoc
How do I use RenderDoc on Android?	–	RenderDoc
How do I use shader debug information?	–	RenderDoc
How-to topics in the RenderDoc documentation	–	RenderDoc
RenderDoc Quick Start	–	RenderDoc
RenderDoc documentation	–	RenderDoc
Vulkan SDK	–	Vulkan
Vulkan Support	–	RenderDoc