Arm® Mobile Studio 2023.1

Product revision: r23p1-00rel0

Release Note

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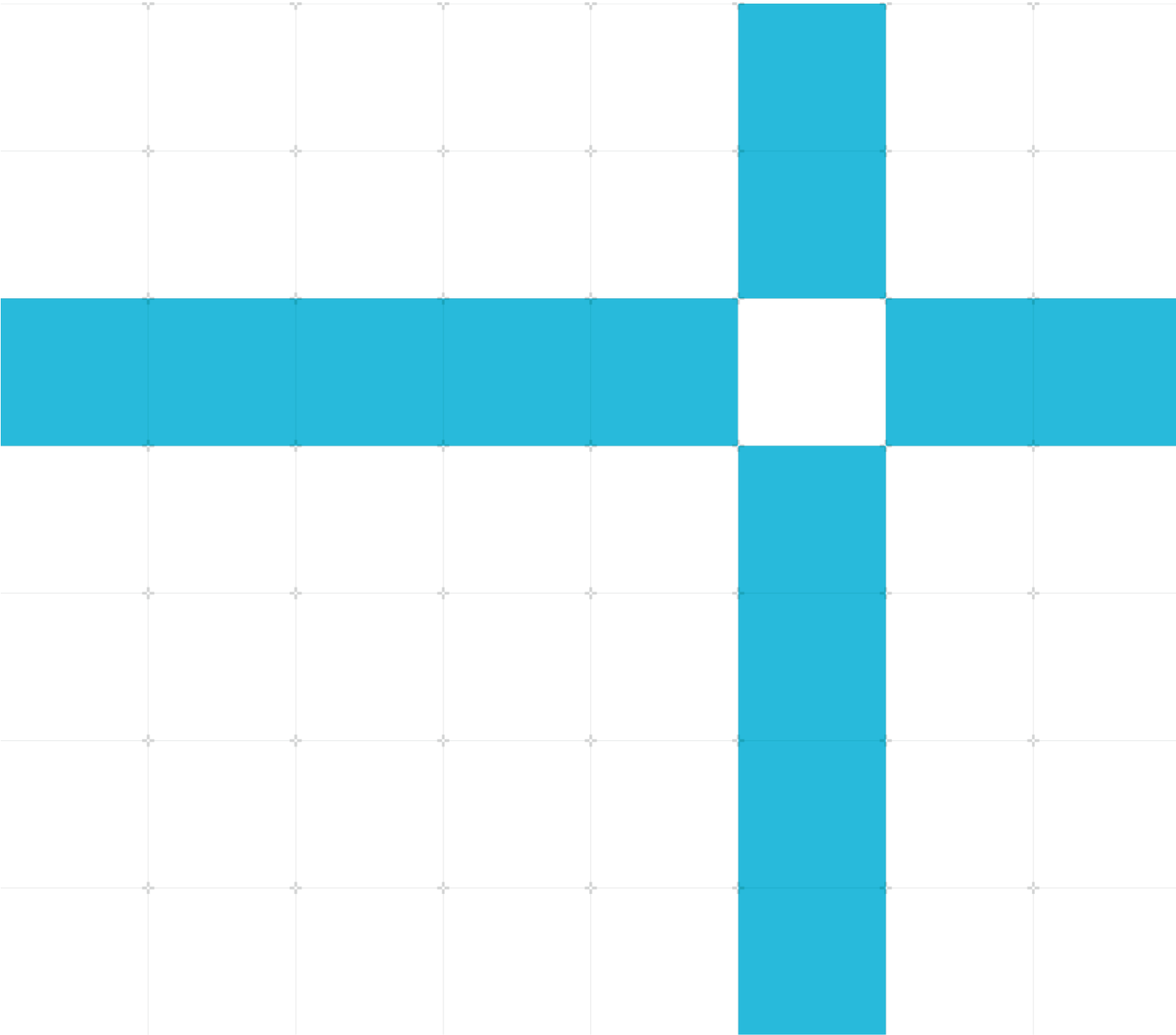

Arm Mobile Studio 2023.1

Release Note

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1 Release overview

The following sections describe the product and its quality status at time of release.

1.1 Product description

Arm® Mobile Studio is a tool suite enabling Android application developers to detect performance bottlenecks in their Arm CPU software and Arm Mali™ GPU rendering. Profiling is provided through analysis of performance counters from the hardware, and the target application's graphics API usage.

This release of Arm Mobile Studio includes:

- Streamline, for profiling application software and rendering performance. Streamline now integrates Performance Advisor, a reporting tool used for automating rendering performance analysis and reporting in continuous integration deployments.
- Graphics Analyzer, for debugging and inspecting usage of graphics APIs.
- Mali Offline Compiler, for static analysis of shader programs and compute kernels.

1.1.1 Component versions

This release of Arm Mobile Studio includes the following tool versions:

- Streamline 8.5
- Graphics Analyzer 5.12.1
- Mali Offline Compiler 7.9

1.2 Release status

This is the REL quality release of the Arm Mobile Studio 2023.1 (r23p1-00rel0) software.

1.3 Changes in this release

This release of Arm Mobile Studio contains the following changes.

1.3.1 Mobile Studio

Mobile Studio has the following product-wide changes:

- Performance Advisor is now a feature of the Streamline tool.

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1.3.2 Streamline

Streamline has the following changes:

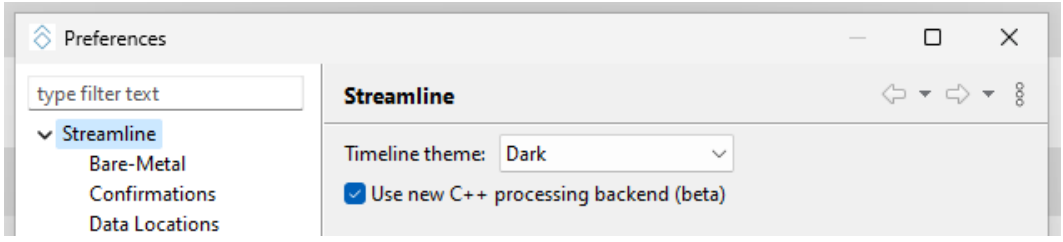
- Performance Advisor is now integrated into the Streamline command-line tool.
    - The files that were formerly located in the **<installation_directory>/performance_advisor** directory are now located in the **<installation_directory>/streamline** directory.
    - The **pa** command is no longer available. Performance reports are now generated using Streamline's **`Streamline-cli`** command with the **`-pa`** option. For example, on Windows:

```
Streamline-cli.exe -pa <options> my_capture.apc
```

- The Performance Advisor light-weight interceptor now supports Vulkan screenshots.
- Performance Advisor now uses heuristics to automatically select an application process if multiple processes are present and the user has not selected a specific process to analyze.
- Streamline counter templates for the Immortalis-G715 and Mali-G715 family now include a series to show the shading-rate in use for variable-rate shading and sample-rate shading.
- Streamline counter templates for the Immortalis-G715 and Mali-G715 family now include a series to show the number of rays started for ray tracing.
- Streamline command line data export can now filter the exported data by thread.
- Streamline OpenCL timeline is now supported for Arm drivers and GPUs that use Perfetto. This support requires the r44p0 Mali driver, or newer.
- **Fix:** The Performance Advisor light-weight interceptor now correctly associates each FPS count with the triggering frame, rather than the frame after it. This also means that a context or device will report zero FPS when idled without being destroyed, instead of propagating the last reported FPS forever.
- **Fix:** Mali timeline queue naming for CSF GPUs now uses the queue name string.
- **Fix:** CAM annotations now use the user-specified Job color.

Streamline 8.4 introduced a new data analysis backend which significantly improves capture analysis performance and reduces memory footprint. This new backend is enabled by default but can be turned off if problems are encountered.

- Via the GUI, the C++ analysis backend can be disabled by unticking the "Use new C++ processing backend (beta)" tick box in the Preferences.



- Via the command line, the C++ analysis backend can be disabled by setting the **`STREAMLINE_ENABLE_DBV3_DEMO`** environment variable to the value **`false`**.

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If you encounter any problems with the C++ backend, please contact the product team via the mobilestudio@arm.com email address, so that we can investigate and fix the issue for a future release.

1.3.3 Graphics Analyzer

Graphics Analyzer has the following changes:

- No changes in this release.

1.3.4 Mali Offline Compiler

Mali Offline Compiler has the following changes:

- Compiler backend for Bifrost GPUs updated to r42p0 DDK.
- Compiler backend for Valhall GPUs updated to r42p0 DDK.
- Performance reports show a more accurate cost for fragment shaders using `gl_FragCoord` or similar functionality.
- Performance reports show a more accurate cost for the varying interpolation pipeline.

1.4 Known issues in this release

This release of Arm Mobile Studio contains the following known issues.

1.4.1 Streamline

Streamline has the following known issues:

- SDDAP-11607: macOS host installs do not show Arm disassembly views.
- SDDAP-11426: Linux host installs using NVIDIA drivers can experience areas of the UI rendering as black rectangles when using monitor scaling. This can be worked around by setting the environment variable GDK_SCALE to 1 before launching Streamline. For ease of use, this can be set in the Streamline launch script.

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2 Support

To help you get started we provide a number of quick start guides available online:

- Getting Started Guides on developer.arm.com

Technical support for Arm Mobile Studio is provided via our developer forums:

- Developer forums on community.arm.com

2.1 How-to videos

Refer to the following videos to learn how to use Arm Mobile Studio tools.

- Streamline
- Performance Advisor
- Graphics Analyzer
- Mali Offline Compiler

To learn more about Mali GPUs and how to develop optimized graphics content for mobile devices, refer to the **Mali GPU Training Series**.

2.2 Host OS support

This release has been developed for the following host operating systems:

Table 2-1: Host operating system used in developing this release

Operating system	Version
Windows	10 or newer
macOS	10.15 (Catalina) or newer
Ubuntu Linux	18.04 (Bionic Beaver) or newer

2.3 Target OS support

This release has been developed for the following target operating systems:

Table 2-2: Target operating system used in developing this release

Feature	Version
Streamline	Android 8 or newer
Streamline Performance Advisor for OpenGL ES applications	Android 8 or newer with manual annotation Android 10 or newer to use the Light-weight Interceptor

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Streamline Performance Advisor for Vulkan applications	Android 9 or newer
Graphics Analyzer OpenGL ES	Android 8 or newer
Graphics Analyzer Vulkan	Android 9 or newer

2.4 Related projects

Arm provides several open-source projects that can be used by application developers as part of their application development.

2.4.1 Mobile Studio for Unity package

Current version: 1.5.0 (September 2022)

The Mobile Studio for Unity package provides an open-source Unity game engine integration for Streamline and Performance Advisor. The package provides:

- C# bindings for Streamline's annotation API, allowing users to export custom software counters, and event annotations.
- Integration with the Unity profiler data source, exporting Unity object counts and memory allocations as custom software counters.

The annotation API provides a generic means to markup a Streamline capture. It can be used to emit the semantic tags that Performance Advisor reports use to denote interesting gameplay regions.

The package is available on GitHub and can be imported directly into your Unity project using the Unity package manager. See the GitHub project documentation for more details.

- https://github.com/ARM-software/mobile-studio-integration-for-unity/

2.4.2 The Arm ASTC Encoder texture compressor

Current version: 4.4.0 (March 2023)

The Arm ASTC Encoder (astcenc) is an open-source texture compressor for the Adaptive Scalable Texture Compression (ASTC) texture format. It supports all block sizes, all color profiles, as well as both 2D and volumetric 3D textures.

The astcenc compressor can be built as either a standalone command line application or a library that can be integrated into an existing asset creation pipeline.

The source code is available on GitHub, in addition to binary releases of the command line utility for Windows, macOS, and Linux.

- https://github.com/ARM-software/astc-encoder

2.4.3 The libGPUInfo library

Current version: 1.0.0 (March 2023)

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The libGPUInfo library is an open-source utility that can be integrated into an application to query the configuration of the Arm GPU present in the system, including the GPU model, shader core count, shader core performance characteristics, and cache size. This information can be used to adjust the application workload at runtime to match the capabilities of the device being used.

The source code is available on GitHub:

- https://github.com/ARM-software/libGPUInfo

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3 Installation

This section describes how to install and configure Arm Mobile Studio to run on 64-bit Windows, macOS®, and Linux.

Mobile Studio requires **Android Debug Bridge (ADB)** and **Python 3.5** (or newer), to enable connection to your device. Make sure you have **these tools** installed and that you have configured your environment to use them.

3.1 Install on Windows

Arm Mobile Studio is provided with an installer executable. Double-click the **.exe** file and follow the instructions in the setup wizard.

- To launch Streamline, open the Windows Start menu, navigate to the Arm Mobile Studio folder, and select the "Arm MS Streamline 2023.1" shortcut,
- To launch Graphics Analyzer, open the Windows Start menu, navigate to the Arm Mobile Studio folder, and select the "Arm MS Graphics Analyzer 2023.1" shortcut.
- Performance Advisor is a command-line tool that is part of the Streamline application. To use it to generate a performance report, you must first run the provided Python script to enable Streamline to collect frame data from the device. This process is described in detail in the **Get started with Performance Advisor tutorial**.

  Once you have captured a profile with Streamline, run the `Streamline-cli -pa` command on the Streamline capture file. This command is added to your PATH environment variable during installation, so it can be used from anywhere.

  ```
  Streamline-cli.exe -pa <options> my_capture.apc
  ```

- To launch Mali Offline Compiler, open a command terminal, navigate to your work directory, and run the `malioc` command on a shader program. The `malioc` command is added to your PATH environment variable during installation, so can be used from anywhere.

  ```
  malioc.exe <options> my_shader.frag
  ```

3.2 Install on macOS

Arm Mobile Studio is provided as a **.dmg** package. To mount it, double-click the **.dmg** package and follow the instructions. The Mobile Studio directory tree is copied to the **Applications** directory on your local file system for easy access.

Launch the tools directly from the Arm Mobile Studio directory tree in your Applications directory.

- To launch Streamline, go to the **<installation_directory>/streamline** directory, and open the **Streamline.app** file.
- To launch Graphics Analyzer, go to the **<installation_directory>/graphics_analyzer/gui** directory and open the **Graphics Analyzer.app** file.

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- To launch Performance Advisor, go to the **<installation_directory>/streamline** directory, and double-click the **Streamline-cli-launcher** file. Your computer will ask you to allow Streamline to control the Terminal application. Allow this.

  The Performance Advisor launcher opens the Terminal application and updates your PATH environment variable so you can run Performance Advisor from any directory.

  Performance Advisor is a command-line tool that is part of the Streamline application. To use it to generate a performance report, you must first run the provided Python script to enable Streamline to collect frame data from the device. This process is described in detail in the Get started with Performance Advisor tutorial.

  Once you have captured a profile with Streamline, run the **`Streamline-cli -pa`** command on the Streamline capture file to generate a performance report:

  ```
  Streamline-cli -pa <options> my_capture.apc
  ```

- To launch Mali Offline Compiler, go to the **<installation_directory>/mali_offline_compiler** directory, and double-click the **mali_offline_compiler_launcher** file.

  The Mali Offline Compiler launcher opens the Terminal application and updates your PATH environment variable so you can run the **`malioc`** command from any directory.

  To generate a shader analysis report, run the **`malioc`** command on a shader program:

  ```
  malioc <options> my_shader.frag
  ```

On some versions of macOS, you might see a message that Mali Offline Compiler is not recognized as an application from an identified developer. To enable Mali Offline Compiler, cancel this message, then open **System Preferences > Security and Privacy**, and select **Allow Anyway** for the **`malioc`** application.

3.3 Install on Linux

Arm Mobile Studio is provided as a gzipped tar archive. Extract this tar archive to your preferred location, using a recent version (1.13 or later) of GNU tar:

```
tar xvzf Arm_Mobile_Studio_2023.1_linux.tgz
```

Launch the tools directly from the location where you extracted the package.

- To launch Streamline, go to the **<installation_directory>/streamline** directory and run the **`Streamline`** file.

  ```
  cd <installation_directory>/streamline
  ./Streamline
  ```

- To launch Graphics Analyzer, go to the **<installation_directory>/graphics_analyzer/gui** directory and run the **aga** file.

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

- Performance Advisor is a command-line tool that is part of the Streamline application. To use it to generate a performance report, you must first run the provided Python script to enable Streamline to collect frame data from the device. This process is described in detail

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in the Get started with Performance Advisor tutorial.

Once you have captured a profile with Streamline, go to the <installation_directory>/streamline directory and run the `Streamline-cli -pa` command on the Streamline capture file to generate a performance report:

```
cd <installation_directory>/performance_advisor
./Streamline-cli -pa <options> my_capture.apc
```

- To launch Mali Offline Compiler, go to the <installation_directory>/mali_offline_compiler directory and run the `malioc` command on a shader program.

```
cd <installation_directory>/mali_offline_compiler
./malioc <options> my_shader.frag
```

You might find it useful to edit your PATH environment variable to add the paths to the `Streamline-cli` and `malioc` executables so that you can run them from any directory. Add the following commands to the .bashrc file in your home directory, so that they are set whenever you initialize a shell session:

```
PATH=$PATH:/<installation_directory>/streamline
PATH=$PATH:/<installation_directory>/mali_offline_compiler
```

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