Radeon™ GPU Analyzer 2.6 – Release Notes

# Highlights

* **Added support for gfx1034** as a target in Vulkan, DX12, DXR, DX11, OpenCL and OpenGL modes.
* **DX12 mode**: you can now extract AMDIL disassembly for DX12 compute and graphics shaders.
* [[GitHub-77](https://github.com/GPUOpen-Tools/radeon_gpu_analyzer/issues/77)] **DXR and DX12 offline modes**:
  + You can now compile DXR and DX12 shaders and pipelines on machines that do not have an installed AMD card or driver by adding the **--offline** commandline switch to your RGA command. The tool ships with the latest released AMD DXR/DX12 driver at the time of the tool’s release, and it would use that driver if **--offline** is specified.
  + Plug & play DXR/DX12 driver: force RGA to load amdxc64.dll from a specific location by using the new **--amdxc** command line switch. This option also works on machines which do not have an AMD DXR/DX12 driver installed.
* **VGPR pressure GUI**: the UI now visualizes VGPR pressure in the disassembly view at the instruction level, allowing you to spot areas in your code that have the highest VGPR pressure and helping you identify where to focus your optimization. The UI shows the allocation and usage of VGPRs for each instruction, and hints on how many VGPRs need to be reduced to reduce the allocation.

A picture containing chart

Description automatically generated

**Note**: on Ubuntu, the minimum required OS version is Ubuntu 20.04.

# Known Issues

## Vulkan Live Driver Mode

* Source to disassembly correlation is not supported by AMD’s shader compiler and is therefore not supported in the UI.
* Keyboard navigation is not supported from some views in the GUI application.
* The RGA layer is a beta feature. It fails to extract the shaders and pipeline state from certain Vulkan apps.
* Notifications about the fact that modified SPIR-V binary does not match the disassembly will not appear for loaded projects (in case that you changed the SPIR-V code, did not build and re-loaded the project).

## Offline OpenCL Mode

* OpenCL C++ kernels are not yet supported by the Lightning Compiler.
* Cycle estimate for certain VALU instructions appears as “Varies” instead of 4.

## OpenGL Mode

Resource usage statistics for OpenGL mode only displays usage of SGPRs and VGPRs.

## DirectX12 Mode

* Live register analysis & CFG generation require using the --isa option to generate ISA disassembly.
* On Windows 11, when running the same RGA command more than once with the --il option in the command, the AMDIL disassembly for vertex shaders shows up corrupted.
* On Windows 11, Hull shader AMDIL disassembly contains a trail of a few garbage characters.

## Vulkan Offline Modes (vk-offline, vk-spv-offline, vk-spv-txt-offline)

SPIR-V support limitations:

1. The Vulkan Offline modes currently only support the following SPIR-V capabilities:

CapabilityMatrix

CapabilityShader

CapabilityGeometry

CapabilityTessellation

CapabilityFloat16

CapabilityFloat64

CapabilityInt64

CapabilityInt64Atomics

CapabilityGroups

CapabilityAtomicStorage

CapabilityInt16

CapabilityTessellationPointSize

CapabilityGeometryPointSize

CapabilityImageGatherExtended

CapabilityStorageImageMultisample

CapabilityUniformBufferArrayDynamicIndexing

CapabilitySampledImageArrayDynamicIndexing

CapabilityStorageBufferArrayDynamicIndexing

CapabilityStorageImageArrayDynamicIndexing

CapabilityClipDistance

CapabilityCullDistance

CapabilityImageCubeArray

CapabilitySampleRateShading

CapabilityImageRect

CapabilitySampledRect

CapabilityInt8

CapabilityInputAttachment

CapabilitySparseResidency

CapabilityMinLod

CapabilitySampled1D

CapabilityImage1D

CapabilitySampledCubeArray

CapabilitySampledBuffer

CapabilityImageBuffer

CapabilityImageMSArray

CapabilityStorageImageExtendedFormats

CapabilityImageQuery

CapabilityDerivativeControl

CapabilityInterpolationFunction

CapabilityTransformFeedback

CapabilityGeometryStreams

CapabilityStorageImageReadWithoutFormat

CapabilityStorageImageWriteWithoutFormat

CapabilityMultiViewport

CapabilitySubgroupDispatch

CapabilityNamedBarrier

CapabilityPipeStorage

CapabilityGroupNonUniform

CapabilityGroupNonUniformVote

CapabilityGroupNonUniformArithmetic

CapabilityGroupNonUniformBallot

CapabilityGroupNonUniformShuffle

CapabilityGroupNonUniformShuffleRelative

CapabilityGroupNonUniformClustered

CapabilityGroupNonUniformQuad

CapabilitySubgroupBallotKHR

CapabilityDrawParameters

CapabilitySubgroupVoteKHR

CapabilityStorageBuffer16BitAccess

CapabilityStorageUniformBufferBlock16

CapabilityStorageUniform16

CapabilityUniformAndStorageBuffer16BitAccess

CapabilityStorageInputOutput16

CapabilityDeviceGroup

CapabilityMultiView

CapabilityVariablePointersStorageBuffer

CapabilityVariablePointers

CapabilitySampleMaskPostDepthCoverage

CapabilityStorageBuffer8BitAccess

CapabilityUniformAndStorageBuffer8BitAccess

CapabilityDenormPreserve

CapabilityDenormFlushToZero

CapabilitySignedZeroInfNanPreserve

CapabilityRoundingModeRTE

CapabilityRoundingModeRTZ

CapabilityFloat16ImageAMD

CapabilityImageGatherBiasLodAMD

CapabilityFragmentMaskAMD

CapabilityStencilExportEXT

CapabilityImageReadWriteLodAMD

CapabilityInt64ImageEXT

CapabilityShaderClockKHR

CapabilityShaderViewportIndexLayerEXT

CapabilityFragmentShadingRateKHR

CapabilityFragmentDensityEXT

CapabilityShaderNonUniformEXT

CapabilityRuntimeDescriptorArrayEXT

CapabilityInputAttachmentArrayDynamicIndexingEXT

CapabilityUniformTexelBufferArrayDynamicIndexingEXT

CapabilityStorageTexelBufferArrayDynamicIndexingEXT

CapabilityUniformBufferArrayNonUniformIndexingEXT

CapabilitySampledImageArrayNonUniformIndexingEXT

CapabilityStorageBufferArrayNonUniformIndexingEXT

CapabilityStorageImageArrayNonUniformIndexingEXT

CapabilityUniformTexelBufferArrayNonUniformIndexingEXT

CapabilityStorageTexelBufferArrayNonUniformIndexingEXT

CapabilityVulkanMemoryModel

CapabilityVulkanMemoryModelKHR

CapabilityVulkanMemoryModelDeviceScope

CapabilityVulkanMemoryModelDeviceScopeKHR

CapabilityPhysicalStorageBufferAddresses

CapabilityPhysicalStorageBufferAddressesEXT

CapabilityDemoteToHelperInvocationEXT

CapabilityAtomicFloat32MinMaxEXT

CapabilityAtomicFloat64MinMaxEXT

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CapabilityDemoteToHelperInvocationEXT

CapabilityAtomicFloat32MinMaxEXT

CapabilityAtomicFloat64MinMaxEXT

* In Vulkan offline mode, in the case where no output file name is provided and post-processing (live register analysis or control-flow graph generation) is enabled, a false error message is printed.

## GUI Application

* VGPR Pressure feature: certain instructions (image\_\* in particular) may report more live registers than actually used.
* “Correlation Disabled” notification in the source code editor is not being saved for projects after they were closed.
* Certain SALU instructions are being misclassified as VALU instructions.
* Certain GDS instructions are being misclassified as SALU.
* Changing disassembly columns can be sluggish on certain systems in projects with multiple .cl files.

## Shader Analysis

The following instructions are marked as <unknown> in live VGPR reports and CFG files:

* v\_mad\_mixlo\_f16
* v\_mad\_mixhi\_f16
* v\_dot2\_\*

# Notes for OpenCL Mode Users

The Offline OpenCL mode uses the Lightning Compiler package that ships with RGA, which is based on clang.

As of version 2.0, RGA allows developers to replace the Lightning Compiler package that ships with the product with a user-provided LLVM-based package. For more information, see the Radeon GPU Analyzer GUI app’s help manual, or run the command line tool with –s opencl –h as arguments (look for the “Alternative OpenCL Lightning Compiler” section).

# Notes for DirectX 11 Mode Users

RGA’s DirectX 11 (-s dx11) mode will use the driver that is associated with the primary display adapter, by default. If your primary display adapter is not an AMD GPU, or if you would like RGA to use a driver that is associated with a different display adapter that is installed on your system, use the --adapters and --set-adapter <id> command line switches to instruct RGA to use the relevant driver.

# System Requirements

It is generally recommended to use RGA with the latest Radeon Software version. Specifically, to target the RDNA architecture, the latest Radeon Software version is required (except for all Vulkan® modes and the Offline OpenCL mode, which are independent of the driver).

## Vulkan Mode

To use the installed driver in Vulkan mode:

1. Vulkan SDK 1.1.97.0 or later is required.
2. Latest Adrenalin or amdgpu-pro driver is required.

## Vulkan Offline Modes (vk-offline, vk-spv-offline, vk-spv-txt-offline)

All Vulkan offline modes (vk-offline, vk-spv-offline and vk-spv-txt-offline) are independent of the installed driver and graphics hardware and should work on any x86-based system.

## DirectX 12 and DirectX 11 Modes

It is recommended to use the latest Adrenalin drivers for the best experience in DirectX 12 and DirectX 11 modes.

## Offline OpenCL Mode

Offline OpenCL mode (-s opencl) is independent of the installed driver and graphics hardware and should work on any x86-based system.

## OpenGL Mode

OpenGL mode requires the latest amdgpu-pro driver on Linux and latest Adrenalin Software on Windows.