Radeon™ GPU Analyzer 2.7 – Release Notes

# Highlights

* Compile and analyze shaders and kernels for the RDNA3™ architecture (gfx1100), even without a physical RDNA3™ card installed on your system.
* Jump to areas in your shaders and kernels which have maximum VGPR pressure using the RGA GUI application. After successfully compiling your shader, use:
  + Edit->Go to next maximum VGPR pressure line (Ctrl+F4), or:
  + Right-click on any ISA disassembly line -> Go to next maximum VGPR pressure line (Ctrl+F4).
* DirectX®11 mode (-s dx11) is now an offline mode and works regardless of the installed driver. Support in this mode was limited to VS, PS and CS.
* Updates to Vulkan and OpenGL® backend components.
* OpenCL™ mode now uses an updated version of AMD’s LLVM-based Lightning Compiler.

**Notes**:

* AMDIL input is no longer supported by the tool with the new DX11 mode.
* On Ubuntu, the minimum required OS version is Ubuntu 22.04.

# Known Issues

## Vulkan Live Driver Mode

* Certain 16-bit instruction may appear as “Unknown” in the disassembly.
* 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 where the user changed the SPIR-V code, did not build, and re-loaded the project).
* Linux only: attempt to compile shaders with invalid pipeline state may result in very long compilation time. This is going to be addressed by an upcoming driver release.
* Linux only: if no amdgpu-pro driver is installed on the system, the bundled driver will only support targets up to RDNA2.

## 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.

## DirectX12 Mode

* Live register analysis & CFG generation require using the --isa option to generate ISA disassembly.
* 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

1. The Vulkan Offline modes currently only support the following extensions:

SPV\_KHR\_shader\_ballot

SPV\_KHR\_subgroup\_vote

SPV\_KHR\_device\_group

SPV\_KHR\_multiview

SPV\_KHR\_shader\_draw\_parameters

SPV\_KHR\_16bit\_storage

SPV\_KHR\_storage\_buffer\_storage\_class

SPV\_KHR\_8bit\_storage

SPV\_KHR\_variable\_pointers

SPV\_KHR\_float\_controls

SPV\_KHR\_shader\_clock

SPV\_KHR\_vulkan\_memory\_model

SPV\_KHR\_post\_depth\_coverage

SPV\_KHR\_non\_semantic\_info

SPV\_KHR\_physical\_storage\_buffer

SPV\_KHR\_terminate\_invocation

SPV\_KHR\_FRAGMENT\_SHADING\_RATE

SPV\_KHR\_workgroup\_memory\_explicit\_layout

SPV\_EXT\_nonuniform\_qualifier

SPV\_EXT\_shader\_stencil\_export

SPV\_EXT\_shader\_viewport\_index\_layer

SPV\_EXT\_demote\_to\_helper\_invocation

SPV\_EXT\_shader\_image\_atomic\_int64

SPV\_EXT\_mesh\_shader

SPV\_AMD\_shader\_ballot

SPV\_AMD\_shader\_trinary\_minmax

SPV\_AMD\_shader\_explicit\_vertex\_parameter

SPV\_AMD\_gcn\_shader

SPV\_AMD\_gpu\_shader\_half\_float

SPV\_AMD\_texture\_gather\_bias\_lod

SPV\_AMD\_gpu\_shader\_int16

SPV\_AMD\_shader\_fragment\_mask

SPV\_AMD\_shader\_image\_load\_store\_lod

SPV\_AMD\_shader\_texel\_buffer\_explicit\_format

SPV\_AMD\_property\_id\_attachment

SPV\_AMD\_anisotropic\_lod\_compensation

SPV\_ARB\_shader\_ballot

SPV\_GOOGLE\_decorate\_string

SPV\_GOOGLE\_hlsl\_functionality1

SPV\_GOOGLE\_user\_type

SPV\_NV\_cooperative\_matrix SPV\_GOOGLE\_user\_type

## 

## 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.
* On systems with default Unicode path for the RGA projects folder, the tool will not be able to save files. A workaround has been provided in version 2.6.1 (allowing the user to change the folder in which projects are saved).

# 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).

# 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, OpenCL mode, OpenGL mode and DX11 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

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

## DirectX 11

DirectX 11 offline mode (-s dx11) is independent of the installed driver and graphics hardware and should work on any x86-based system.

## 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 (-s opengl) is independent of the installed driver and graphics hardware and should work on any x86-based system.