AMD ROCm™ Release Notes v3.8

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DISCLAIMER

Table of Contents

SUPPORTED OPERATING SYSTEMS

This document describes the features, fixed issues, and information about downloading and installing the AMD ROCm™ software.

It also covers fixed defects and known issues in the AMD ROCm v3.8 release.

SUPPORTED OPERATING SYSTEMS

Support for Ubuntu 20.04

In this release, AMD ROCm extends support to Ubuntu 20.04, including v5.4 and v5.6-oem.

Support for Vega 7nm Workstation

This release extends support to the Vega 7nm Workstation (Vega20 GL-XE) version.

List of Supported Operating Systems

The AMD ROCm platform is designed to support the following operating systems:

- Ubuntu 20.04 (5.4 and 5.6-oem) and 18.04.5 (Kernel 5.4)
- CentOS 7.8 & RHEL 7.8 (Kernel 3.10.0-1127) (Using devtoolset-7 runtime support)
- CentOS 8.2 & RHEL 8.2 (Kernel 4.18.0) (devtoolset is not required)
- SLES 15 SP1

FRESH INSTALLATION OF AMD ROCM V3.8 RECOMMENDED

A fresh and clean installation of AMD ROCm v3.8 is recommended. An upgrade from previous releases to AMD ROCm v3.8 is not supported.

For more information, refer to the *AMD ROCm Installation Guide*.

Note: AMD ROCm release v3.3 or prior releases are not fully compatible with AMD ROCm v3.5 and higher versions. You must perform a fresh ROCm installation if you want to upgrade from AMD ROCm v3.3 or older to 3.5 or higher versions and vice-versa.

Note: *render group* is required only for Ubuntu v20.04. For all other ROCm supported operating systems, continue to use *video group*.

- For ROCm v3.5 and releases thereafter, the *clinfo* path is changed to */opt/rocm/opencl/bin/clinfo*.
- For ROCm v3.3 and older releases, the *clinfo* path remains */opt/rocm/opencl/bin/x86_64/clinfo*.

AMD ROCm V3.8 DOCUMENTATION UPDATES

AMD ROCM INSTALLATION GUIDE

The AMD ROCm Installation Guide in this release includes the following updates:

- *Supported Environments*
- *Installation Instructions*
  - *HIP Installation Instructions*
  - *Tensorflow ROCm Port: Basic Installation on RHEL v8.2*

HIP DOCUMENTATION UPDATES

- *HIP Repository Information*

ROCM DATA CENTER TOOL USER GUIDE

- Error-Correction Codes Field and Output Documentation

For more information, refer to the ROCm Data Center Tool User Guide at:

https://github.com/RadeonOpenCompute/ROCm/blob/master/AMD_ROCm_DataCenter_Tool_User_Guide.pdf

AMD ROCM GENERAL DOCUMENTATION LINKS

- For AMD ROCm documentation, see
  https://rocmdocs.amd.com/en/latest/

- For installation instructions on supped platforms, see
  https://rocmdocs.amd.com/en/latest/Installation_Guide/Installation-Guide.html

- For AMD ROCm binary structure, see
  https://rocmdocs.amd.com/en/latest/Installation_Guide/Installation-Guide.html#build-amd-rocm

- For AMD ROCm Release History, see
  https://rocmdocs.amd.com/en/latest/Installation_Guide/Installation-Guide.html#amd-rocm-version-history

WHAT'S NEW IN THIS RELEASE

HIPFORT - INTERFACE FOR GPU KERNEL LIBRARIES

Hipfort is an interface library for accessing GPU Kernels. It provides support to the AMD ROCm architecture from within the Fortran programming language. Currently, the *gfortran* and *HIP-Clang* compilers support hipfort. Note, the *gfortran* compiler belongs to the GNU Compiler Collection (GCC). While *hipfc* wrapper calls *hipcc* for the non-fortran kernel source, *gfortran* is used for FORTRAN applications that call GPU kernels.

The hipfort interface library is meant for Fortran developers with a focus on *gfortran* users.

For information on HIPFort installation and examples, see

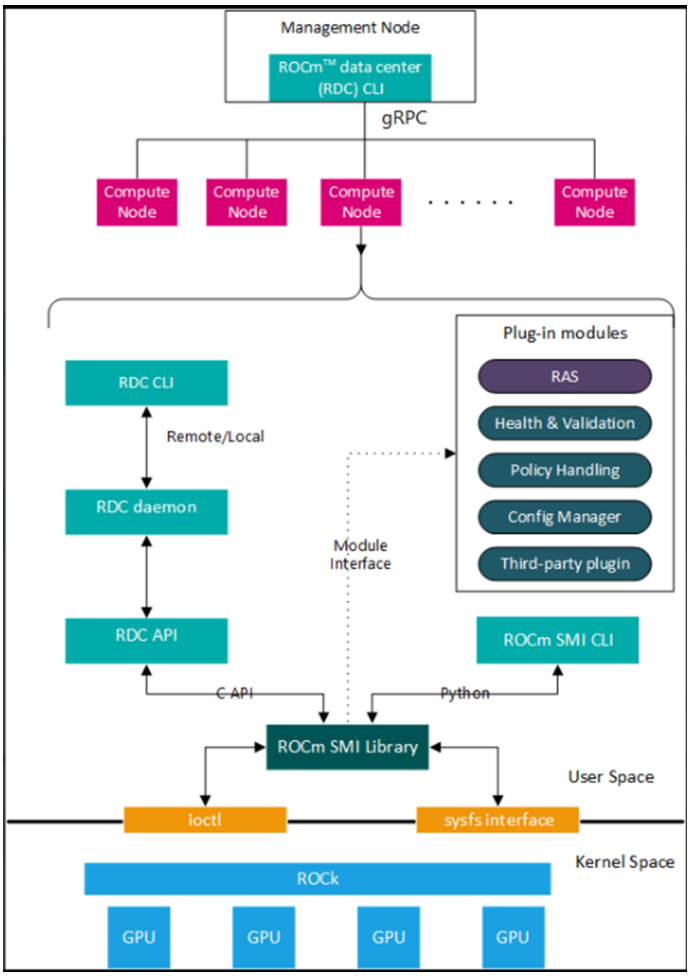
https://github.com/ROCmSoftwarePlatform/hipfort

AMD ROCM DATA CENTER TOOL

The ROCm™ Data Center Tool™ simplifies the administration and addresses key infrastructure challenges in AMD GPUs in cluster and datacenter environments. The important features of this tool are:

- GPU telemetry
- GPU statistics for jobs
- Integration with third-party tools
- Open source

The ROCm Data Center Tool can be used in the standalone mode if all components are installed. The same set of features is also available in a library format that can be used by existing management tools.



Refer to the ROCm Data Center Tool™ User Guide for more details on the different modes of operation.

NOTE: The ROCm Data Center User Guide is intended to provide an overview of ROCm Data Center Tool features and how system administrators and Data Center (or HPC) users can administer and configure AMD GPUs. The guide also provides an overview of its components and open source developer handbook.

For installation information on different distributions, refer the *ROCm Data Center User Guide*.

Error-Correcting Code Fields

The ROCm Data Center (RDC) tool is enhanced to provide counters to track correctable and uncorrectable errors. While a single bit per word error can be corrected, double bit per word errors cannot be corrected.

The RDC tool now helps monitor and protect undetected memory data corruption. If the system is using ECC- enabled memory, the ROCm Data Center tool can report the error counters to monitor the status of the memory.

Fields

```
% rdci dmon -l
Supported fields Ids:
100 RDC_FI_GPU_CLOCK: Current GPU clock frequencies.
101 RDC_FI_MEM_CLOCK: Current Memory clock frequencies.
140 RDC_FI_MEMORY_TEMP: Memory temperature in millidegrees Celsius.
150 RDC_FI_GPU_TEMP: GPU temperature in millidegrees Celsius.
155 RDC_FI_POWER_USAGE: Power usage in microwatts.
200 RDC_FI_PCIE_TX: PCIe Tx utilization in bytes/second.
201 RDC_FI_PCIE_RX: PCIe Rx utilization in bytes/second.
203 RDC_FI_GPU_UTIL: GPU busy percentage.
312 RDC_FI_ECC_CORRECT_TOTAL: Accumulated correctable ECC errors.
313 RDC_FI_ECC_UNCORRECT_TOTAL: Accumulated uncorrectable ECC errors.
525 RDC_FI_GPU_MEMORY_USAGE: Memory usage of the GPU instance in bytes.
```

Output

```
$ rdci stats -j 123
|         Summary
|------- Execution Stats ----------+-----------------------------
| Start Time                       | 1588619202
| End Time                         | 1588619211
| Total Execution Time (sec)       | 9
+------- Performance Stats --------+-----------------------------
| Energy Consumed (Joules)         | 841
| Power Usage (Watts)              | Max: 41 Min: 31 Avg: 38
| GPU Clock (MHz)                  | Max: 1000 Min: 874 Avg: 962
| Memory Clock (MHz)               | Max: 500 Min: 500 Avg: 500
| GPU Utilization (%)              | Max: 0 Min: 0 Avg: 0
| Max GPU Memory Used (bytes)      | 506695680
| Memory Utilization (%)           | Max: 11 Min: 11 Avg: 11
| GPU Temperature (Celsius)        | Max: 46 Min: 45 Avg: 45
| PCIe Rx Bandwidth (megabytes)    | Max: 1 Min: 1 Avg: 1
| PCIe Tx Bandwidth (megabytes)    | Max: 0 Min: 0 Avg: 0
| Correctable ECC Errors           | 0
| Uncorrectable ECC Errors         | 0
```

ROCM COMMUNICATIONS COLLECTIVE LIBRARY

Static Linking Libraries

The underlying libraries of AMD ROCm are dynamic and are called shared objects (.so) in Linux.

The AMD ROCm v3.8 release includes the capability to build static ROCm libraries and link to the applications statically. CMake target files enable linking an application statically to ROCm libraries and each component exports the required dependencies for linking. The static libraries are called Archives (.a) in Linux.

This release also comprises of the requisite changes required for all the components to work in a static environment. The components have been successfully tested for basic functionalities like *rocminfo* */rocm_bandwidth_test* and archives.

In the AMD ROCm v3.8 release, the following libraries support static linking:

ROCm Libraries	

• Thunk
• ROCr
• Comgr
• hip_on_rocclr
• Rocm_smi
• llvm
	• MIOpen
	• Math Libraries
	  ○ rocFFT
	  ○ rocSPARSE
	  ○ rocALUTION
	  ○ rocBLAS
	  ○ rocSOLVER
	  ○ rocCUB
	  ○ rocPRIM
	  ○ rocRAND
	  ○ rocThrust
	  ○ hipBLAS
	  ○ hipSPARSE
	  ○ hipFFT
	  ○ hipCUB
	  ○ RCCL

FIXED DEFECTS

The following defects are fixed in this release.

Defects	Resolution
GPU Kernel C++ Names Not Demangled	Code fix
MIGraphX Fails for fp16 Datatype	Code fix
Issue with Peer-to-Peer Transfers	Code fix
‘rocprof’ option ‘--parallel-kernels’ Not Supported in this Release	Code fix

KNOWN ISSUES

The following are the known issues in this release.

Undefined Reference Issue in Statically Linked Libraries

Libraries and applications statically linked using flags -rtlib=compiler-rt, such as rocBLAS, have an implicit dependency on *gcc_s* not captured in their CMAKE configuration.

Client applications may require linking with an additional library *-lgcc_s* to resolve the undefined reference to symbol *'_Unwind_Resume@@GCC_3.0'*.

MIGraphX Pooling Operation Fails for Some Models

MIGraphX does not work for some models with pooling operations and the following error appears:

‘test_gpu_ops_test FAILED’

This issue is currently under investigation and there is no known workaround currently.

MIVisionX Installation Error on CentOS/RHEL8.2 and SLES 15

Installing ROCm on MIVisionX results in the following error on CentOS/RHEL8.2 and SLES 15:

"Problem: nothing provides opencv needed"

As a workaround, install *opencv* before installing MIVisionX.

HARDWARE AND SOFTWARE SUPPORT

HARDWARE SUPPORT

ROCm is focused on using AMD GPUs to accelerate computational tasks such as machine learning, engineering workloads, and scientific computing. In order to focus our development efforts on these domains of interest, ROCm supports the following targeted set of hardware configurations.

Supported Graphics Processing Units

As the AMD ROCm platform has a focus on specific computational domains, AMD offers official support for a selection of GPUs that are designed to offer good performance and price in these domains.

ROCm officially supports AMD GPUs that use the following chips:

- GFX8 GPUs
  "Fiji" chips, such as on the AMD Radeon R9 Fury X and Radeon Instinct MI8
  "Polaris 10" chips, such as on the AMD Radeon RX 580 and Radeon Instinct MI6

- GFX9 GPUs
  "Vega 10" chips, such as on the AMD Radeon RX Vega 64 and Radeon Instinct MI25
  "Vega 7nm" chips, such as on the Radeon Instinct MI50, Radeon Instinct MI60 or AMD Radeon VII

ROCm is a collection of software ranging from drivers and runtimes to libraries and developer tools. Some of this software may work with more GPUs than the "officially supported" list above, though AMD does not make any official claims of support for these devices on the ROCm software platform.

The following list of GPUs is enabled in the ROCm software. However, full support is not guaranteed:

- GFX8 GPUs
  "Polaris 11" chips, such as on the AMD Radeon RX 570 and Radeon Pro WX 4100
  "Polaris 12" chips, such as on the AMD Radeon RX 550 and Radeon RX 540

- GFX7 GPUs
  "Hawaii" chips, such as the AMD Radeon R9 390X and FirePro W9100

As described in the next section, GFX8 GPUs require PCI Express 3.0 (PCIe 3.0) with support for PCIe atomics. This requires both CPU and motherboard support. GFX9 GPUs require PCIe 3.0 with support for PCIe atomics by default, but they can operate in most cases without this capability.

The integrated GPUs in AMD APUs are not officially supported targets for ROCm. As described below, "Carrizo", "Bristol Ridge", and "Raven Ridge" APUs are enabled in AMD upstream drivers and the ROCm OpenCL runtime. However, they are not enabled in the HIP runtime, and may not work due to motherboard or OEM hardware limitations. Note, they are not yet officially supported targets for ROCm.

GFX8 GPUS

ROCm offers support for the following microprocessors from AMD's "gfx8" generation of GPUs.

Note: The GPUs require a host CPU and platform with PCIe 3.0 with support for PCIe atomics.

GFX8 GPUs			
Fiji (AMD)	**Polaris 10 (AMD)**	**Polaris 11 (AMD)**	**Polaris 12 (Lexa) (AMD)**
• Radeon R9 Fury • Radeon R9 Nano • Radeon R9 Fury X • Radeon Pro Duo (Fiji) • FirePro S9300 X2 • Radeon Instinct MI8	• Radeon RX 470 • Radeon RX 480 • Radeon RX 570 • Radeon RX 580 • Radeon Pro Duo (Polaris) • Radeon Pro WX 5100 • Radeon Pro WX 7100 • Radeon Instinct MI6	• Radeon RX 460 • Radeon RX 560 • Radeon Pro WX 4100	• Radeon RX 540 • Radeon RX 550 • Radeon Pro WX 2100 • Radeon Pro WX 3100

GFX9 GPUS

ROCm offers support for two chips from AMD's most recent "gfx9" generation of GPUs.

GFX9 GPUs

Vega 10 (AMD)	Vega 7nm (AMD)
• Radeon RX Vega 56 • Radeon RX Vega 64 • Radeon Vega Frontier Edition • Radeon Pro WX 8200 • Radeon Pro WX 9100 • Radeon Pro V340 • Radeon Pro V340 MxGPU • Radeon Instinct MI25 **Note:** ROCm does not support Radeon Pro SSG.	• Radeon VII • Radeon Instinct MI50 • Radeon Instinct MI60

SUPPORTED CPUS

As described above, GFX8 GPUs require PCIe 3.0 with PCIe atomics to run ROCm. In particular, the CPU and every active PCIe point between the CPU and GPU require support for PCIe 3.0 and PCIe atomics. The CPU root must indicate PCIe AtomicOp Completion capabilities and any intermediate switch must indicate PCIe AtomicOp Routing capabilities.

The current CPUs which support PCIe Gen3 + PCIe Atomics are:

- AMD Ryzen CPUs
- CPUs in AMD Ryzen APUs
- AMD Ryzen Threadripper CPUs
- AMD EPYC CPUs
- Intel Xeon E7 v3 or newer CPUs
- Intel Xeon E5 v3 or newer CPUs
- Intel Xeon E3 v3 or newer CPUs
- Intel Core i7 v4, Core i5 v4, Core i3 v4 or newer CPUs (i.e. Haswell family or newer)
- Some Ivy Bridge-E systems

Beginning with ROCm 1.8, GFX9 GPUs (such as Vega 10) no longer require PCIe atomics. We have similarly made more options available for many PCIe lanes. GFX9 GPUs can now be run on CPUs without

PCIe atomics and on older PCIe generations, such as PCIe 2.0. This is not supported on GPUs below GFX9, e.g. GFX8 cards in the Fiji and Polaris families.

If you are using any PCIe switches in your system, please note that PCIe Atomics are only supported on some switches, such as Broadcom PLX. When you install your GPUs, make sure you install them in a PCIe 3.0 x16, x8, x4, or x1 slot attached either directly to the CPU's Root I/O controller or via a PCIe switch directly attached to the CPU's Root I/O controller.

In our experience, many issues stem from trying to use consumer motherboards which provide physical x16 connectors that are electrically connected as e.g. PCIe 2.0 x4, PCIe slots connected via the Southbridge PCIe I/O controller, or PCIe slots connected through a PCIe switch that does not support PCIe atomics.

If you attempt to run ROCm on a system without proper PCIe atomic support, you may see an error in the kernel log (`dmesg`):

kfd: skipped device 1002:7300, PCI rejects atomics

Experimental support for our Hawaii (GFX7) GPUs (Radeon R9 290, R9 390, FirePro W9100, S9150, S9170) does not require or take advantage of PCIe Atomics. However, AMD recommends that you use a CPU from the list provided above for compatibility purposes.

NOT SUPPORTED OR LIMITED SUPPORT UNDER ROCM

LIMITED SUPPORT

- ROCm 3.8.x should support PCIe 2.0 enabled CPUs such as the AMD Opteron, Phenom, Phenom II, Athlon, Athlon X2, Athlon II and older Intel Xeon and Intel Core Architecture and Pentium CPUs. However, we have done very limited testing on these configurations, since our test farm has been catering to CPUs listed above. This is where we need community support.
  Please report these issues.
- Thunderbolt 1, 2, and 3 enabled breakout boxes should now be able to work with ROCm. Thunderbolt 1 and 2 are PCIe 2.0 based, and thus are only supported with GPUs that do not require PCIe 3.0 atomics (e.g. Vega 10). However, we have done no testing on this configuration and would need community support due to limited access to this type of equipment.
- AMD "Carrizo" and "Bristol Ridge" APUs are enabled to run OpenCL, but do not yet support HIP or our libraries built on top of these compilers and runtimes.
  - As of ROCm 2.1, "Carrizo" and "Bristol Ridge" require the use of upstream kernel drivers.

  - In addition, various "Carrizo" and "Bristol Ridge" platforms may not work due to OEM and ODM choices when it comes to key configurations parameters such as inclusion of the required CRAT tables and IOMMU configuration parameters in the system BIOS.
  - Before purchasing such a system for ROCm, please verify that the BIOS provides an option for enabling IOMMUv2 and that the system BIOS properly exposes the correct CRAT table. Inquire with your vendor about the latter.

- AMD "Raven Ridge" APUs are enabled to run OpenCL, but do not yet support HIP or our libraries built on top of these compilers and runtimes.
  - As of ROCm 2.1, "Raven Ridge" requires the use of upstream kernel drivers.
  - In addition, various "Raven Ridge" platforms may not work due to OEM and ODM choices when it comes to key configurations parameters such as inclusion of the required CRAT tables and IOMMU configuration parameters in the system BIOS.
  - Before purchasing such a system for ROCm, please verify that the BIOS provides an option for enabling IOMMUv2 and that the system BIOS properly exposes the correct CRAT table. Inquire with your vendor about the latter.

NOT SUPPORTED

- "Tonga", "Iceland", "Vega M", and "Vega 12" GPUs are not supported.
- AMD does not support GFX8-class GPUs (Fiji, Polaris, etc.) on CPUs that do not have PCIe3.0 with PCIe atomics.
  - AMD Carrizo and Kaveri APUs as hosts for such GPUs are not supported
  - Thunderbolt 1 and 2 enabled GPUs are not supported by GFX8 GPUs on ROCm. Thunderbolt 1 & 2 are based on PCIe 2.0.

In the default ROCm configuration, GFX8 and GFX9 GPUs require PCI Express 3.0 with PCIe atomics. The ROCm platform leverages these advanced capabilities to allow features such as user-level submission of work from the host to the GPU. This includes PCIe atomic Fetch and Add, Compare and Swap, Unconditional Swap, and AtomicOp Completion.

Current CPUs which support PCIe 3.0 + PCIe Atomics:

AMD	INTEL
Ryzen CPUs (Family 17h Model 01h-0Fh) • Ryzen 3 1300X • Ryzen 3 2300X • Ryzen 5 1600X • Ryzen 5 2600X • Ryzen 7 1800X • Ryzen 7 2700X	Intel Core i3, i5, and i7 CPUs from Haswell and beyond. This includes: • Haswell CPUs such as the Core i7 4790K • Broadwell CPUs such as the Core i7 5775C • Skylake CPUs such as the Core i7 6700K • Kaby Lake CPUs such as the Core i7 7740X • Coffee Lake CPUs such as the Core i7 8700K • Xeon CPUs from "v3" and newer • Some models of "Ivy Bridge-E" processors
Ryzen APUs (Family 17h Model 10h-1Fh – previously code-named Raven Ridge) such as: • Athlon 200GE • Ryzen 5 2400G **Note:** The integrated GPU in these devices is not guaranteed to work with ROCm.	
Ryzen Threadripper Workstation CPUs (Family 17h Model 01h-0Fh) such as: • Ryzen Threadripper 1950X • Ryzen Threadripper 2990WX	
EPYC Server CPUs (Family 17h Model 01h-0Fh) such as: • Epyc 7551P • Epyc 7601	