AMD ROCm™ Release Notes v4.2

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ROCm Installation Updates

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

It also covers known issues and deprecations in the AMD ROCm v4.2 release.

LIST OF SUPPORTED OPERATING SYSTEMS

The AMD ROCm platform supports the following operating systems:

- Ubuntu 20.04.2 HWE (5.4 and 5.6-oem) and 18.04.5 (Kernel 5.4)
- CentOS 7.9 (3.10.0-1127) & RHEL 7.9 (3.10.0-1160.6.1.el7) (Using devtoolset-7 runtime support)
- CentOS 8.3 (4.18.0-193.el8)and RHEL 8.3 (4.18.0-193.1.1.el8) (devtoolset is not required)
- SLES 15 SP2

COMPLETE INSTALLATION OF AMD ROCM V4.2 RECOMMENDED

Complete uninstallation of previous ROCm versions is required before installing a new version of ROCm. **An upgrade from earlier releases to AMD ROCm v4.2 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*.

ROCM MULTI-VERSION INSTALLATION UPDATE

With the AMD ROCm v4.2 release, the following ROCm multi-version installation changes apply:

The meta packages *rocm-dkms<version>* are now deprecated for multi-version ROCm installs. For example, *rocm-dkms3.7.0, rocm-dkms3.8.0*.

- Multi-version installation of ROCm should be performed by installing *rocm-dev<version>* using each of the desired ROCm versions. For example, *rocm-dev3.7.0, rocm-dev3.8.0, rocm-dev3.9.0.*
- Install the rock-dkms loadable kernel modules using a single *rock-dkms* package.
- ROCm v3.9 and above will not set any *ldconfig* entries for ROCm libraries for multi-version installation. Users must set *LD_LIBRARY_PATH* to load the ROCm library version of choice.

NOTE: The single version installation of the ROCm stack remains the same. The *rocm-dkms* package can be used for single version installs and is not deprecated at this time.

AMD ROCm V4.2 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*

HIP DOCUMENTATION UPDATES

- HIP Programming Guide v4.2
  https://github.com/RadeonOpenCompute/ROCm/blob/master/AMD%20HIP%20Programming%20Guide_v4.2.pdf

- HIP API Guide v4.2
  https://github.com/RadeonOpenCompute/ROCm/blob/master/AMD_HIP_API_Guide_4.2.pdf

- HIP-Supported CUDA API Reference Guide v4.2
  https://github.com/RadeonOpenCompute/ROCm/blob/master/HIP_Supported_CUDA_API_Reference_Guide_v4.2.pdf

- HIP FAQ
  https://rocmdocs.amd.com/en/latest/Programming_Guides/HIP-FAQ.html#hip-faq

ROCM DATA CENTER TOOL USER AND API GUIDE

- ROCm Data Center Tool User Guide - Reliability, Accessibility, and Serviceability (RAS) Plugin Integration

  For more information, refer to the ROCm Data Center User Guide at,
  https://github.com/RadeonOpenCompute/ROCm/blob/master/AMD_ROCm_DataCenter_Tool_User_Guide_v4.2.pdf

- ROCm Data Center Tool API Guide

  https://github.com/RadeonOpenCompute/ROCm/blob/master/ROCm_Data_Center_Tool_API_Guide_v4.2.pdf

ROCM SMI API GUIDE

- ROCm SMI API Guide
  https://github.com/RadeonOpenCompute/ROCm/blob/master/ROCm_SMI_Manual_4.2.pdf

ROC DEBUGGER USER AND API GUIDE

- ROC Debugger User Guide
  https://github.com/RadeonOpenCompute/ROCm/blob/master/ROCm_Debugger_User_Guide_v4.2.pdf

- Debugger API Guide
  https://github.com/RadeonOpenCompute/ROCm/blob/master/ROCm_Debugger_API_Guide_v4.2.pdf

AMD ROCM GENERAL DOCUMENTATION LINKS

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

- For installation instructions on supported 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/Software-Stack-for-AMD-GPU.html

- For AMD ROCm release history, see
  https://rocmdocs.amd.com/en/latest/Current_Release_Notes/ROCm-Version-History.html

What's New in This Release

HIP ENHANCEMENTS

The ROCm v4.2 release consists of the following HIP enhancements:

HIP Target Platform Macro

The platform macros are updated to target either the AMD or NVIDIA platform in HIP projects. They now include corresponding headers and libraries for compilation/linking.

- *__HIP_PLATFORM_AMD__* is defined if the HIP platform targets AMD.
  Note, *__HIP_PLATFORM_HCC__* was used previously if the HIP platform targeted AMD.
  This is now deprecated.

- *__HIP_PLATFORM_NVIDIA__* is defined if the HIP platform targets NVIDIA.
  Note, *_HIP_PLATFORM_NVCC__* was used previously if the HIP platform targeted NVIDIA. This is now deprecated.

For example,

```
#if (defined(__HIP_PLATFORM_AMD__)) && !(defined(__HIP_PLATFORM_NVIDIA__))

#include <hip/amd_detail/hip_complex.h>

#elif !(defined(__HIP_PLATFORM_AMD__)) && (defined(__HIP_PLATFORM_NVIDIA__))

#include <hip/nvidia_detail/hip_complex.h>
```

Updated HIP 'Include' Directories

In the ROCm4.2 release, updates to HIP *include* header directories for platforms are:

- *amd_detail/* - includes source header details for the 'amd' platform implementation. The "hcc_detail" directory was defined in previous releases, and it is now deprecated.

- *nvidia_detail/* - includes source header details for the 'nvidia' platform implementation. The "nvcc_detail" directory was defined in previous releases, and it is now deprecated.

HIP Stream Memory Operations

The ROCm v4.2 extends support to Stream Memory Operations to enable direct synchronization between Network Nodes and GPU. The following new APIs are added:

- hipStreamWaitValue32
- hipStreamWaitValue64
- hipStreamWriteValue32
- hipStreamWriteValue64

For more details, see the HIP API guide at

https://github.com/RadeonOpenCompute/ROCm/blob/master/AMD_HIP_API_Guide_4.2.pdf

HIP Events in Kernel Dispatch

HIP events in kernel dispatch using *hipExtLaunchKernelGGL/hipExtLaunchKernel* and passed in the API are not explicitly recorded and should only be used to get elapsed time for that specific launch.

Events used across multiple dispatches, for example, *start* and *stop* events from different *hipExtLaunchKernelGGL/hipExtLaunchKernel* calls, are treated as invalid unrecorded events. In such scenarios, HIP will display the error *"hipErrorInvalidHandle"* from hipEventElapsedTime.

For more details, refer to the HIP API Guide at

https://github.com/RadeonOpenCompute/ROCm/blob/master/AMD_HIP_API_Guide_4.2.pdf

Changed Environment Variables for HIP

In the ROCm v3.5 release, the Heterogeneous Compute Compiler (HCC) compiler was deprecated, and the HIP-Clang compiler was introduced for compiling Heterogeneous-Compute Interface for Portability (HIP) programs. In addition, the HIP runtime API was implemented on top of Radeon Open Compute Common Language Runtime (ROCclr). ROCclr is an abstraction layer that provides the ability to interact with different runtime backends such as ROCr.

While the HIP_PLATFORM=hcc environment variable was functional in subsequent releases, in the ROCm v4.1 release, the following environment variables were changed:

```
HIP_PLATFORM=hcc to HIP_PLATFORM=amd
HIP_PLATFORM=nvcc to HIP_PLATFORM=nvidia
```

Therefore, any applications continuing to use the HIP_PLATFORM=hcc variable will fail. You must update the environment variables to reflect the changes as mentioned above.

ROCM DATA CENTER TOOL

RAS Integration

The ROCm Data Center (RDC) Tool is enhanced with the Reliability, Accessibility, and Serviceability (RAS) plugin.

For more information about RAS integration and installation, refer to the ROCm Data Center Tool User guide at:

https://github.com/RadeonOpenCompute/ROCm/blob/master/AMD_ROCm_DataCenter_Tool_User_Guide_v4.2.pdf

ROCM MATH AND COMMUNICATION LIBRARIES

In this release, ROCm Math and Communication Libraries consists of the following enhancements and fixes:

Library	Changes

rocBLAS	Enhancements and fixes:
	• Added option to install script to build only rocBLAS clients with a pre-built rocBLAS library
	• Supported gemm ext for unpacked int8 input layout on gfx908 GPUs
	  ○ Added new flags rocblas_gemm_flags::rocblas_gemm_flags_pack_int8x4 to specify if using the packed layout
	  ▪ Set the rocblas_gemm_flags_pack_int8x4 when using packed int8x;, this should always be set on GPUs before gfx908
	  ▪ For gfx908 GPUs, unpacked int8 is supported. Setting of this flag is no longer required
	  ▪ Notice the default flags 0 uses unpacked int8 and changes the behavior of int8 gemm from ROCm 4.1.0
	• Added a query function rocblas_query_int8_layout_flag to get the preferable layout of int8 for gemm by device
	https://rocblas.readthedocs.io/en/master/

rocRAND	• Performance fixes *https://rocrand.readthedocs.io/en/latest/*

rocSOLVER	Support for:
	• Multi-level logging functionality
	• Implementation of the Thin-SVD algorithm
	• Reductions of generalized symmetric- and hermitian-definite eigenproblems:
	  ○ SYGS2, SYGST (with batched and strided_batched versions)
	  ○ HEGS2, HEGST (with batched and strided_batched versions)

Library	Changes

	• Symmetric and hermitian matrix eigensolvers:
	  ○ SYEV (with batched and strided_batched versions)
	  ○ HEEV (with batched and strided batched versions)
	• Generalized symmetric- and hermitian-definite eigensolvers:
	  ○ SYGV (with batched and strided_batched versions)
	  ○ HEGV (with batched and strided_batched versions)
	https://rocsolver.readthedocs.io/en/latest/

rocSPARSE	Enhancements: • SpMM (CSR, COO) • Code coverage analysis *https://rocsparse.readthedocs.io/en/latest/usermanual.html#rocsparse-gebsrmv*
hipSPARSE	Enhancements: • Generic API support, including SpMM (CSR, COO) • csru2csr, csr2csru *https://rocsparse.readthedocs.io/en/latest/usermanual.html#types*

Known Issues in This Release

The following are the known issues in this release.

UPGRADE TO AMD ROCM V4.2 NOT SUPPORTED

An upgrade from previous releases to AMD ROCm v4.2 is not supported. Complete uninstallation of previous ROCm versions is required before installing a new version of ROCm.

PERL MODULES FOR HIP-BASE PACKAGE

The hip-base package has a dependency on Perl modules that some operating systems may not have in their default package repositories. Use the following commands to add repositories that have the required Perl packages:

For SLES 15 SP2

```
sudo zypper addrepo
```

For more information, see

https://download.opensuse.org/repositories/devel:languages:perl/SLE_15/devel:languages:perl.repo

For CentOS8.3

```
sudo yum config-manager --set-enabled powertools
```

For RHEL8.3

```
sudo subscription-manager repos --enable codeready-builder-for-rhel-8-x86_64-
rpms
```

MODULEFILE FAILS TO INSTALL AUTOMATICALLY IN ROCM MULTI-VERSION ENVIRONMENT

The ROCm v4.2 release includes a preliminary implementation of environment modules to enable switching between multi versions of ROCm installation. The modulefile in */opt/rocm-4.2/lib/rocmmod* fails to install automatically in the ROCm multi-version environment.

This is a known limitation for environment modules in ROCm, and the issue is under investigation at this time.

Workaround

Ensure you install the modulefile in */opt/rocm-4.2/lib/rocmmod* manually in a multi-version installation environment.

For general information about modules, see

http://modules.sourceforge.net/

ISSUE WITH INPUT/OUTPUT TYPES FOR SCAN ALGORITHMS IN ROCTHURST

As rocThrust is updated to match CUDA Thrust 1.10, the different input/output types for scan algorithms in rocThrust/CUDA Thrust are no longer officially supported. In this situation, the current C++ standard does not specify the intermediate accumulator type leading to potentially incorrect results and ill-defined behavior.

As a workaround, users can:

- Use the same types for input and output
  Or
- For exclusive_scan, explicitly specify an *InitialValueType* in the last argument
  Or
- For inclusive_scan, which does not have an initial value argument, use a *transform_iterator* to explicitly cast the input iterators to match the output's value_type

PRECISION ISSUE IN AMD RADEON™ PRO VII AND AMD RADEON™ VII

In AMD Radeon™ Pro VII AND AMD Radeon™ VII, a precision issue can occur when using the Tensorflow XLA path.

This issue is currently under investigation.

Deprecations in This Release

This section describes deprecations and removals in AMD ROCm.

COMPILER-GENERATED CODE OBJECT VERSION 2 DEPRECATION

Compiler-generated code object version 2 is no longer supported and has been completely removed.

Support for loading code object version 2 is also deprecated with no announced removal release.

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. 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.

Note: The integrated GPUs of Ryzen are not officially supported targets for ROCm.

ROCm officially supports AMD GPUs that use the following chips:

- 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, AMD Radeon VII, Radeon Pro VII
- CDNA GPUs
  - MI100 chips such as on the AMD Instinct™ MI100

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

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 4.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 configuration parameters such as the 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 configuration parameters such as the 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	

ROCM SUPPORT IN UPSTREAM LINUX KERNELS

As of ROCm 1.9.0, the ROCm user-level software is compatible with the AMD drivers in certain upstream Linux kernels.

As such, users have the option of either using the ROCK kernel driver that are part of AMD's ROCm repositories or using the upstream driver and only installing ROCm user-level utilities from AMD's ROCm repositories.

These releases of the upstream Linux kernel support the following GPUs in ROCm:

- 4.17: Fiji, Polaris 10, Polaris 11
- 4.18: Fiji, Polaris 10, Polaris 11, Vega10
- 4.20: Fiji, Polaris 10, Polaris 11, Vega10, Vega 7nm

The upstream driver may be useful for running ROCm software on systems that are not compatible with the kernel driver available in AMD's repositories.

For users that have the option of using either AMD's or the upstreamed driver, there are various tradeoffs to take into consideration:

	Using AMD's rock-dkms package	Using the upstream kernel driver
Pros	More GPU features and are enabled earlier	Includes the latest Linux kernel features
	Tested by AMD on supported distributions	May work on other distributions and with custom kernels
	Supported GPUs enabled regardless of kernel version	
	Includes the latest GPU firmware	
Cons	May not work on all Linux distributions or versions	Features and hardware support varies depending on the kernel version
	Not currently supported on kernels newer than 5.4	Limits GPU's usage of system memory to 3/8 of system memory (before 5.6). For 5.6 and beyond, both DKMS and upstream kernels allow the use of 15/16 of system memory.
		IPC and RDMA capabilities are not yet enabled
		Not tested by AMD to the same level as rock-dkms package
		Does not include the most up-to-date firmware