



# **AOCL 4.0 Release Notes**

© 2022 Advanced Micro Devices, Inc. All rights reserved.

The information contained herein is for informational purposes only, and is subject to change without notice. While every precaution has been taken in the preparation of this document, it may contain technical inaccuracies, omissions and typographical errors, and AMD is under no obligation to update or otherwise correct this information. Advanced Micro Devices, Inc. makes no representations or warranties with respect to the accuracy or completeness of the contents of this document, and assumes no liability of any kind, including the implied warranties of noninfringement, merchantability or fitness for particular purposes, with respect to the operation or use of AMD hardware, software or other products described herein. No license, including implied or arising by estoppel, to any intellectual property rights is granted by this document. Terms and limitations applicable to the purchase or use of AMD's products are as set forth in a signed agreement between the parties or in AMD's Standard Terms and Conditions of Sale. Any unauthorized copying, alteration, distribution, transmission, performance, display or other use of this material is prohibited.

---

## **Trademarks**

AMD, the AMD Arrow logo, AMD AllDay, AMD Virtualization, AMD-V, PowerPlay, Vari-Bright, and combinations thereof are trademarks of Advanced Micro Devices, Inc. Other product names used in this publication are for identification purposes only and may be trademarks of their respective companies.

Dolby is a trademark of Dolby Laboratories.

HDMI is a trademark of HDMI Licensing, LLC.

HyperTransport is a licensed trademark of the HyperTransport Technology Consortium.

Microsoft, Windows, Windows Vista, and DirectX are registered trademarks of Microsoft Corporation in the US and/or other countries.

MMX is a trademark of Intel Corporation.

OpenCL is a trademark of Apple Inc. used by permission by Khronos.

PCIe is a registered trademark of PCI-Special Interest Group (PCI-SIG).

USB Type-C® and USB-C® are registered trademarks of USB Implementers Forum.

Reverse engineering or disassembly is prohibited.

USE OF THIS PRODUCT IN ANY MANNER THAT COMPLIES WITH THE MPEG ACTUAL OR DE FACTO VIDEO AND/OR AUDIO STANDARDS IS EXPRESSLY PROHIBITED WITHOUT ALL NECESSARY LICENSES UNDER APPLICABLE PATENTS. SUCH LICENSES MAY BE ACQUIRED FROM VARIOUS THIRD PARTIES INCLUDING, BUT NOT LIMITED TO, IN THE MPEG PATENT PORTFOLIO, WHICH LICENSE IS AVAILABLE FROM MPEG LA, L.L.C., 6312 S. FIDDLERS GREEN CIRCLE, SUITE 400E, GREENWOOD VILLAGE, COLORADO 80111.

---

---

## Contents

---

<b>Contents</b>	<b>3</b>
<b>Release Highlights</b>	<b>4</b>
AOCL-LibM	4
AOCL-FFTW	4
AOCL-BLIS	5
AOCL-libFLAME	5
AOCL-ScaLAPACK	5
AOCL-Sparse	5
AOCL-RNG	6
AOCL-Cryptography	6
AOCL-LibMem	6
AOCL-Compression	6

---

# Release Highlights

---

In this release, all the AOCL libraries support AMD “Zen4” configuration.

## AOCL-LibM

- Black-Scholes support improved with optimizations for scalar and vector versions of logf, expf, and erff functions
- WRF support improved with speed benchmarks
- Geekbench support improved with optimized sincos and sincosf scalar functions
- AVX-512 logarithmic, exponentials, and trigonometric variants optimized for the following vector functions:
  - vrs16\_expf and vrs16\_exp2f
  - vrs16\_logf, vrs16\_log2f, and vrs16\_log10f
  - vrs16\_sinf, vrs16\_cosf, and vrs16\_tanf
  - vrs16\_asinf, vrs16\_acosf, and vrs16\_atanf
  - vrs16\_tanhf
  - vrd8\_exp and vrs8\_exp2
  - vrd8\_log and vrd8\_log2
  - vrd8\_pow
  - vrd8\_sin, vrd8\_cos, and vrd8\_tan
  - vrd8\_asin and vrd8\_atan
- Fast scalar variants:
  - powf\_fast, logf\_fast, and expf\_fast
  - asinf\_fast and acosf\_fast
  - sinf\_fast, cosf\_fast, and tanf\_fast
  - exp\_fast and log\_fast
  - asin\_fast, acos\_fast, and atan\_fast
  - cos\_fast, sin\_fast, and tan\_fast

***Note:** For more information on fast scalar variants, refer to AOCC 4.0 user guide.*

## AOCL-FFTW

- AVX-512 enablement of DFT kernels
- AVX-512 optimization of copy and transpose routines

## AOCL-BLIS

- Following MatMul APIs for INT8 and Brain Floating Point (bfloat16) types are added with post-ops support:
  - aocl\_gemm\_u8s8s32o32 AVX-512-VNNI optimized
  - aocl\_gemm\_u8s8s16o16 AVX2 optimized
  - aocl\_gemm\_bf16bf16bf16 and aocl\_gemm\_bf16bf16f32 AVX-512 optimized
- SGEMM with packed/reorder buffer support (aocl\_gemm\_f32f32f32f32)
- Dynamic dispatch supports AMD “Zen4” configuration
- Optimizations and performance improvements for DGEMM, DGEMMT, SGEMM, ZGEMM and DTRSM

## AOCL-libFLAME

- Update to LAPACK 3.10.1 specification that includes several bug fixes from Netlib LAPACK
- Improved performance of the following APIs:
  - Eigen Value routine (ZGGEV)
  - SVD routines (DGESDD, CGESDD, and ZGESDD)
- Logging feature supports timing for real double precision libFLAME APIs
- AOCL-Progress feature that provides progress update on API computations running for a long time is extended for more APIs: {S/C/Z}GETRF, {S/D}POTRF, {S/D}GEQRF, {S/C/D/Z}GBTRF

## AOCL-ScaLAPACK

- Upgrade to Netlib ScaLAPACK 2.2.0
- AOCL-Progress feature that provides progress update on API computations running for a long time is extended for more APIs: LU, QR, and Cholesky factorization
- Tracing and logging support for LU Factorization APIs

## AOCL-Sparse

- New Iterative Solver APIs: CG, GMRES, and Gauss-Seidel (pre-conditioner)
- AVX-512 implementation for SPMV API
- Improved performance of the following:
  - TRSV
  - Multi-thread SPMV

## **AOCL-RNG**

- Improved performance of the SFMT generator
- Windows support

## **AOCL-Cryptography**

- AES modes optimized for AVX-512
- AES mode support extended to include CTR, XTS, and GCM
- API plugin for compatibility with Intel® Integrated Performance Primitives (IPP) library

## **AOCL-LibMem**

AVX-512 support for mem\* functions:

- Malloc
- Memcpy
- Mempcpy
- Memmove
- Memset
- Memcmp

## **AOCL-Compression**

- Software stack support for Linux and Windows
- Standardized API set
- Test framework
- Optimization of LZ4, SNAPPY, and ZLIB compression algorithms
- ZLIB API plugin support
- Benchmarking support for IPP library in the test framework
- Dynamic dispatcher for creating a single optimized portable library