# AMD Embedded Linux Driver 2023.10 Release Notes

# Contents

# Chapter 1 Overview

AMD's Linux® Driver includes an open source graphics driver for AMD's embedded platforms and other peripheral devices on selected development platforms.

New features supported in this release:

- Kernel 6.1 LTS support.
- V3C18 - GA support
- Bug fixes.

# Chapter 2 Linux® Kernel Support

- 6.1.0 LTS

# Chapter 3 Linux Distribution Support

- Ubuntu 22.04.1

# Chapter 4 Component Versions

The following table shows git commit details of the sources and binaries used in the package.

The patches present in the patches folder of this release package must be applied on top of the git commit mentioned in the following table to get the full sources corresponding to this driver release. The sources directory in this package contains patches pre-applied to these commit IDs.

| Component Name | Version | Commit ID | Source Link for git clone |
|---|---|---|---|
| Kernel | 6.1.0 LTS | 830b3c68c1fb1e9176028d02ef86f3cf76aa2476 | *https://github.com/torvalds/linux/tree/v6.1* |
| Libdrm | 2.4.115 | ee558cea20d1f9d822fe1a28e97beaf365bf9d38 | *https://gitlab.freedesktop.org/mesa/drm/-/tree/libdrm-2.4.115* |
| Mesa | 23.0.0 | bbf142b8de7454a80729b2949249203c7bee7230 | *https://github.com/mesa3d/mesa/tree/mesa-23.0.0* |
| Ddx | 21.1.0 | 533bd30ceaa373788b3d0bfd4d486f0f1c624d0c | *https://github.com/freedesktop/xorg-xf86-video-amdgpu.git* |
| Gstomx | 1.0.0.1 | 5c4bff4a433dff1c5d005edfceaf727b6214bb74 | *git://people.freedesktop.org/~leoliu/gstomx* |
| Wayland | 1.21.0 | 8135e856ebd79872f886466e9cee39affb7d9ee8 | *https://github.com/wayland-project/wayland* |
| libva | 2.16.0 | 1333034d7ec6e4f8bcb340d8f7b81b8d32835c49 | *https://github.com/intel/libva.git* |
| LLVM | 14.0.6 | f28c006a5895fc0e329fe15fead81e37457cb1d1 | *https://github.com/llvm/llvm-project* |
| Firmware | Master | 8bb75626e9dd831d323c4e460414b56260f0b700 | *https://git.kernel.org/pub/scm/linux/kernel/git/firmware/linux-firmware.git* |
| Vulkan | 2022.Q4.2 | c6db4556012115e05246ca70ef9238444bcef0b1 | *https://github.com/GPUOpen-Drivers/AMDVLK/commits/v-2022.Q4.2* |
| **Supported Applications** | | | |
| LunarG Vulkan SDK | 1.2.182 | NA | *https://vulkan.lunarg.com/sdk/home#linux* |
| Vulkan CTS | 1.2.2.2 | | *https://github.com/KhronosGroup/Vulkan-CTS.git* |
| RGP | 1.10 | NA | *https://github.com/GPUOpen-Tools/radeon_gpu_profiler/tree/v1.10* |

# Chapter 5 Features Supported on Ryzen™ Embedded processors

Supported features are shown in the following table.

| Feature Group | Feature Supported | R1600 | V1500 | R2000 | V3000 |
|---|---|---|---|---|---|
| **2D** | 2D acceleration | NA | NA | Yes | NA |
| **3D** | EGL 1.4, 1.5, EGL extensions. | NA | NA | Yes | NA |
| **3D** | OGL 4.5,<br>OGL 4.6 | NA | NA | Yes | NA |
| **3D** | GLX 1.4 | NA | NA | Yes | NA |
| **3D** | DRI3 support | NA | NA | Yes | NA |
| **3D** | DRI3 updates (VDPAU, VAAPI) | NA | NA | Yes | NA |
| **3D** | Vulkan Open Source | NA | NA | Yes | NA |
| **2D** | 10 bit Display | NA | NA | No | NA |
| **Audio** | DP Audio supports for standard | NA | NA | Yes | NA |
| **Audio** | I2S Audio | NA | NA | Yes | NA |
| **Display** | EDID (Basic) | NA | NA | Yes | NA |
| **Display support** | X and Desktop support | NA | NA | Yes | NA |
| **Display support** | Tear Free Desktop | NA | NA | Yes | NA |
| **Display support** | Partial support RandR 1.4 capabilities | NA | NA | Yes | NA |
| **Display support** | Kernel Mode Setting | NA | NA | Yes | NA |
| **Display support** | 4K60Hz display support | NA | NA | Yes | NA |
| **Display support** | Multi-GPU support (see table below for dGPU pairing) | NA | NA | No | NA |
| **Display support** | Number of displays supported (see display support table below) | NA | NA | - | NA |
| **Display support** | 4K cinema | NA | NA | No | NA |
| **Display support** | DP MST | NA | NA | Yes | NA |
| **Display support** | Single Large Surface (SLS) | NA | NA | No | NA |
| **Play back** | Play back support MPV player using VAAPI / VDPAU | NA | NA | Yes | NA |
| **Play back** | Play back support for Gstreamer using VAAPI, gstomx (not recommended) | NA | NA | Yes | NA |
| **Play back** | 1080p 24fps, 30 fps and 60fps video play back | NA | NA | Yes | NA |
| **Play back** | 4k 30fps video play back | NA | NA | Yes | NA |
| **Play back** | 4k 60fps video play back | NA | NA | Yes | NA |
| **Power Management** | Power Play support to re-clock | NA | NA | Yes | NA |

| Feature Group | Feature Supported | R1600 | V1500 | R2000 | V3000 |
|---|---|---|---|---|---|
| | Initial GPU reset support | NA | NA | Yes | NA |
| | Power Play sysfs interface for manually selecting clock speeds | NA | NA | Yes | NA |
| | S3 | Yes | Yes | Yes | Yes |
| | S5 | Yes | Yes | Yes | Yes |
| **VDPAU Post Processing** | Deinterlace | NA | NA | Yes | NA |
| **VDPAU Post Processing** | Edge Enhancement | NA | NA | Yes | NA |
| **VAAPI Postprocessing** | Deinterlace | NA | NA | Yes | NA |
| **Transcode** | 4k Encode | NA | NA | No | NA |
| **Video Quality** | Scaling and color space conversion (CSC) | NA | NA | Yes | NA |
| **Video Quality** | Pull down detection and Deinterlacing | NA | NA | Yes | NA |
| **Video Quality** | Support for software scaling | NA | NA | Yes | NA |
| **Video Quality** | Support for hardware scaling | NA | NA | Yes | NA |
| **Video Quality** | 10-bit Decode with 10-bit render | NA | NA | Yes | NA |
| **Compute** | OpenCL | NA | NA | No | NA |
| **dGMA –OpenGL** | | NA | NA | NA | NA |
| **dGMA - OpenCL** | | NA | NA | NA | NA |
| **fTPM** | | Yes* | Yes* | Yes | Yes |
| **RJ45-10G-Base-T (Marvell PHY)** | 10M | No | No | No | Yes |
| | 100M | No | No | No | Yes |
| | 1G | Yes | Yes | No | Yes |
| | 2.5G | Yes | Yes | No | Yes |
| | 10G | Yes* | Yes* | No | Yes |
| **SFP+ (connector)** | 10M | No | No | No | Yes |
| | 100M | No | No | No | Yes |
| | 1G | Yes* | Yes* | No | Yes |
| | 10GBASE_KR [AN=OFF, ON] | NA | NA | NA | Yes |
| | 2.5G [AN=OFF] | NA | NA | NA | Yes |
| | 10G | Yes* | Yes* | No | Yes |
| **AIC1 – Inphi CS4223 Optical Fiber PHY (SFP+)** | 10M/100M/1G/10G | NA | NA | NA | Yes |
| **AIC1 – TI DS125 Series Re-Timer (SFP+)** | 10M/100M/1G/10G | NA | NA | NA | Yes |
| **AIC2 – 1G-Base-T (Marvell 88E1512P)** | 10M/100M /1G | NA | NA | NA | Yes |
| **AIC2 – 10G-Base-T (Marvell AQR113C)** | 10M/100M/1G/2.5G/10G | NA | NA | NA | Yes |
| **AIC3 – 1G-Base-T** | 10M/100M /1G | NA | NA | NA | Yes |

| Feature Group | Feature Supported | R1600 | V1500 | R2000 | V3000 |
|---|---|---|---|---|---|
| **(Broadcom BCM54220)** | | | | | |
| **AIC3 – 10G-Base-T (Broadcom BCM84892)** | 10M/100M/1G/2.5G/10G | NA | NA | NA | No |
| **eMMC** | BC | Yes | Yes | Yes | No |
| | HS200 | Yes | Yes | Yes | No |
| | HS400 | Yes | Yes | Yes | No |
| | (USB/PCIe to eMMC bridge) | No | No | No | Yes |
| **SD Card** | SD UHS I – SDR50 | Yes | Yes | Yes | No |
| | SD UHS I – SDR104 | Yes | Yes | Yes | No |
| | SD UHS I – SDR104 | Yes | Yes | Yes | No |
| **Peripherals (I/O)** | I2C | Yes | Yes | Yes | Yes |
| | USB | Yes | Yes | Yes | Yes |
| | USB 4.0 | No | No | No | Yes |
| | SATA | Yes | Yes | Yes | Yes |
| | UART | Yes | Yes | Yes | Yes |
| | WDT | Yes | Yes | Yes | Yes |
| | SMBUS | Yes | Yes | Yes | Yes |
| | SPI Kernel Driver | Yes** | Yes** | Yes** | Yes |

*****Bilby platform only

******To use the SPI kernel driver on Bilby platforms, the BIOS which has enabled SPI Entry in the ACPI table is required. The default BIOS does not have this feature. Please contact your FAE for the required BIOS.

# Chapter 6 Features Supported on Ryzen™ Embedded processors with iGPU

The 2023.10 Linux driver is **not supported** by any AMD Embedded dGPUs.

HW codec and display support is only applicable to Ryzen Embedded processors with integrated graphics.

## 6.1 Display Support:

| **Platform** | **Max Number of external display(s)** | |
|---|---|---|
| R2000 | R2312<br>R2314<br>R2514 | 3 |
| | R2544 | 4 |

## 6.2 HW Codec Support

| Codec | API | Middleware/Framework |
|---|---|---|
| H.264 decode | VAAPI, OMX | ffmpeg-VAAPI,<br>gst-VAAPI,<br>gst-OMX |
| H.265 decode | VAAPI, OMX | ffmpeg-VAAPI,<br>gst-VAAPI,<br>gst- OMX |
| H.265 10bit->8bit decode (PF & V1000 only) | VAAPI | ffmpeg-VAAPI |
| MPEG2 decode | VAAPI, OMX | ffmpeg- VAAPI,<br>gst-VAAPI,<br>gst- OMX |
| VC1 decode | VAAPI | ffmpeg- VAAPI,<br>gst- VAAPI |
| H.264 encode | VAAPI, OMX | gst-VAAPI,<br>gst- OMX, |
| VP9 decode | VAAPI | Ffmpeg-VAAPI |

# Chapter 7 Platforms Supported

- Ryzen Embedded R2000 Series with AMD Radeon Graphics
  - **Models:** R2314, R2312, R2514, R2544
  - **AMD Customer Reference board:** BILBY
- Ryzen Embedded V1500
  - **OPN:** YE1500C4T4MFH, YE1500C4T4MFB
  - **AMD Customer Reference board:** BILBY
- Ryzen Embedded V3000 Series
  - **Models:** V3C48, V3C44, V3C18I, V3C18, V3C16, V3C14
  - **AMD Customer Reference board:** FOX

# Chapter 8 Tested Platform Configurations

The following tables show the system configuration that was used for testing the driver package.

| **R2000 Series** | |
|---|---|
| APU | R2000 |
| OPN’s | R2312, R2314, R2544. R2514 |
| APU TDP | 12-25W (R2312), 12-35W (R2314, R2514), 35-54W (R2514) |
| BIOS version | RBP1001A |
| VRAM setting | 4GB |
| RAM | 16GB |
| Display Convertors / Dongles Used | DP to HDMI, HDMI |
| Storage disk | SSD, M.2 |

| **V1500** | |
|---|---|
| CPU | V1500 |
| OPNs | YE1500C4T4MFH, YE1500C4T4MFB |
| TDP | 16-25W |
| BIOS version | RBB1208A_RV_PCO |
| RAM | 16GB (2x8GB DDR4 2400) |
| Storage disk | M.2 SATA |

| **V3000 Series** | |
|---|---|
| CPU | V3000 |
| OPNs | Latest Revision:<br>AIC1; AIC2 ; AIC3;<br>B1-DVT Sampels:<br>V3C48;V3C18i;V3C44; V3C14; V3C16;V3C18; |
| Board Type | Fox, Direct Mount |
| TDP | V3C48 (8-core 45W CPU)<br>V3C44 (4-core 45W CPU)<br>V3C18I (8-core 15W CPU extended temperature)<br>V3C18 (8-core 15W CPU)<br>V3C16 (6-core 15W CPU)<br>V3C14 (4-core 15W CPU) |
| BIOS version | RFX1004B |
| Memory (DDR5) | 2x16 GB [Direct Mount] |
| DIMMs | DDR5, 4800 MT/s |
| Storage disk | Samsung M.2 NVME 500 Gb and SATA SSD Crucial 250 Gb |
| Ethernet connectors | • 10G SFI Optical: Finisar (FTLX8574D3BCV and FTLX8574D3BCL), Intel (FTLX8574D3BCV-IT)<br>• 10G Optical DAC: Fiberstore (SFPP-A020)<br>• 10G KR (Backplane): Molex DAC cable (747521101) and AMPHENOL SFP DAC CABLE (571540002)<br>• 1G Bel SFP [SFP-1GBT-06] and Finisar [FCLF8520P2BTL] |

# Chapter 9 Issues Fixed

# Chapter 10 Known Issues/Limitations

**R2000 Issues:**

1. Stutter observed for video playback through chromium browser.
2. Glitches observed with zoom calls on 3x4k/1080p display configuration.
3. Lag observed with Microsoft Teams® video conference, PPT, browser on 3x4k display configuration.
4. Stutter and lag observed with 4k videoplay back with thin client config.
5. Stutter observed at times on secondary displays with 3x4k config.
6. One of the displays goes blank after boot with 3xTrue 2K MST configuration.
7. Sporadically Type C to Type C Hot plug fails.
8. Minor stutter observed at times with vaapi playback with MST-4K@30hz.

**V3000 Issues:**

1. Use Ethernet DAC cable of length <= 5 meters.
2. UART provisioned for 1 x4 wire and 4 x2 wire modes only
3. On Fox RJ45 and 2.5G or 1G speed selection in BIOS, hot-plug and hot-insert of cable always triggering speed switching to 10G. Issue specific to V3C18i OPN.
4. Ethernet feature not supported in this release:
   a. PPS not enabled.
5. Ethernet stability issues
   a. AIC1 InPhi Phy 10G link stability issue in P2P mode only; mitigating with switch as link partner instead of another Fox
   b. Link detection issues on SFP Port 0/1 for 1G speed with FS copper module (SFP-GB-GE-T 1000BASE-T) with Cat 5 UTP cable
   c. Link up failure issue after S3 on SFP+ Connector, with 1G/100M/10M as speed and 1G Bel modules connected on both the ports
   d. Link up issues after S3 on AIC2-1G-BaseT phy ports
6. Refer “FOX Platform User Guide (ID: 57102)” from *https://devhub.amd.com/reference-platform/fox/* for USB-C J60 port, RJ45, AIC1, AIC2 and AIC3 rework details

**Common Issues:**

1. Few of the display blank out with MST hub in 5.4 kernel.
2. Few of the VulkanCTS 1.2 test cases fails with error of VK_ERROR_OUT_OF_HOST_MEMORY.
   [Workaround]: Vulkan CTS 1.1.3 works fine.
3. IO Page fault logs observed while loading the I2S module.
4. HP Z27s monitor resolution change does not take effect sometimes.
   *Recommendation*: Not to use the monitor since the monitor issues HPD pulse during

Changing resolution causing to revert to previous/native resolution sometimes.

5. Hotplug root node of DP MST monitors in daisy chain or via Hub fails.
   *Workaround*: To always connect or disconnect monitors in MST configuration one by one and not at root node level.
6. All MST displays goes blank while booting with MST Hub and MST off on the monitors.
7. Tearing/Stutter observed during 4k@60fps playback on 2x4k monitors.
   *Workaround*: Use zaphord Head configuration to play 4k@60fps video on multi monitor setup.
8. Hard hang observed for Piglit tests.
   *Workaround*: Piglit test passed without arb_tessellation_shader-tes-gs-max-output test cases.
9. Stuttering observed with glmark2 on mGPU config.
   *Workaround*: Use multi screen configuration to resolve the stutter.
10. [BE]: Observed Issues with HotPlug on Bald Eagle.
11. [BE]: S3 Fails randomly on BaldEagle with IOMMU enabled.
12. Issues with refresh rate change/rotate using xrandr command.
13. Export MESA_GLES_VERSION_OVERRIDE=3.2 to run OGL ES 3.2 CTS.
14. Hot plug results in blank display of one of the monitors when using startx mode.
15. B-frame support is not available in vaapi encode.
16. MF has limitation of displaying 2 – 4K monitors, 3rd 4 K monitor will not get displayed.
17. Following OGL CTS test cases do not work
    a. GL45-CTS.stencil_texturing.functional
    b. GL45-CTS.multi_bind.dispatch_bind_textures
    c. GL45-CTS.multi_bind.dispatch_bind_image_textures
    d. GL45-CTS.arrays_of_arrays_gl.SubroutineFunctionCalls2
    e. GL45-CTS.sparse_buffer_tests.BufferStorageTest
    f. GL45-CTS.shader_atomic_counters.basic-usage-fs
    g. GL45-CTS.shader_atomic_counters.basic-usage-vs
    h. GL45-CTS.shader_atomic_counters.basic-usage-gs
    i. GL45-CTS.shader_atomic_counters.basic-usage-tes
    j. GL45-CTS.shader_atomic_counters.basic-usage-cs
    k. GL45-CTS.parallel_shader_compile.CompilationCompletionNonParallelTest
    l. GL45-CTS.parallel_shader_compile.CompilationCompletionParallelTest
    m. GL45-CTS.enhanced_layouts.ssb_member_offset_and_align
    n. GL45-CTS.enhanced_layouts.vertex_attrib_locations
    o. GL45-CTS.parallel_shader_compile.MaxShaderCompileThreadsTest

**XGBE:**

1. [XGBE]: Force mode(Auto negotiation disabled) is not supported in RJ45.
2. Can’t concurrently enable SFP+ and RJ45 interfaces.
3. No receive Split header support.

Below is the type of SFP/RJ45 modules used in the XGBE validation of this release.

| Type | Model | Part Number |
|---|---|---|
| 1G SFP - RJ45 | BEL | SFP-1GBT-06 |
| 1G SFP - RJ45 | Finisar | FCLF8521P2BTL |

| | | |
|---|---|---|
| 10G SFP+ passive direct cable | Finisar | F17CC004893 |
| 10G SFP optical | Finisar | FTLX8574D3BCL |
| 10G SFP optical | Finisar | FTLX851D3BCL |
| 10G SFP optical | Intel | E10G42BTDABLK |
| 10G SFP optical | Intel | AFBR-709DMZ-IN2 |

**Third Party Issues/Limitations:**

1. Terminal switching results in hard hang randomly. Issue root caused gnome which is third party component.
   *https://bugs.launchpad.net/ubuntu/+source/gdm3/+bug/1758512* .
2. Switching to console mode upon hotplug results in soft hang. Issue root caused gnome which is third party component.
   *https://bugs.launchpad.net/ubuntu/+source/gdm3/+bug/1758512* .
3. Stutter can be observed when stream framerate and monitor refresh rate are different. This is expected phenomenon. Stutter cab be minimized with interpolation option in mpv. But it can introduce corruption and other side effects.

## Troubleshooting

The user-space components are selected with the best possible availability of stable components at the time of release.

The user-space components are available to the users through open source policy. Please be adviced to upgrade the open source user-space components as per need and resolution through latest user-space.

The Embedded release for open source component is based on Ubuntu 18.04.1 distribution.

Here are a few troubleshoot pointers for resolution for non-amdgpu components.

1. In multi-GPU use-case, a monitor connected to APU doesn’t come up while boot during multiscreen rendering. The monitor connect to dGPU loads correctly.
   This issue happens because of gnome desktop environment used by 18.04.1. The gnome desktop environment does not support multi-screen configuration. To fix this issue, use XFCE desktop environment.
2. dmesg points to “Bandwidth validation fails”, one of the monitors gets blackout after connecting more than 2 - 4K monitors on MF
   When display load fails the bandwidth validation, there is no fallback mechanism provided through the Linux OS. Under such situation, customers can reduce the refresh rates or resolution of monitor for the getting the monitor lightup.
3. Unigine Heaven Pro shows white screen
   Follow the following steps to allow GLSL #extension directives in the middle of shaders

| |
|---|
| 1. Install driconf (sudo apt-get install driconf)<br><br>2. Run driconf (sudo driconf)<br><br>3. In application settings add Unigine heaven if it does not exist (application name: Unigine Heaven, Executable name: heaven_x64)<br><br>4. Add: Allow GLSL #extension directives in the middle of shaders: Yes (using "add setting" button. You can remove all other settings if present)<br><br>5. Retry unigine heaven |

4. Suspend/Resume with and without playback
   Use systemctl suspend rather than pm-suspend.

   Below link suggests the usage of systemctl suspend.
   ***https://askubuntu.com/questions/1792/how-can-i-suspend-hibernate-from-command-line***
   More details on why systemd is preferred over other tools
   *https://wiki.archlinux.org/index.php/Systemd*

# Chapter 11 Support

Please contact your Field Applications Engineer for support on this release.