

AMD Embedded Linux Driver 2023.40 Release Notes

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Contents

Contents	3
Chapter 1	Overview 4
Chapter 2	Linux® Kernel Support 4
Chapter 3	Linux Distribution Support 4
Chapter 4	Component Versions 5
Chapter 5	Features Supported on Ryzen™ Embedded processors 6
Chapter 6	Features Supported on Ryzen™ Embedded processors with iGPU 9
6.1	Display Support: 9
6.2	HW Codec Support 10
Chapter 7	Platforms Supported 11
Chapter 8	Tested Platform Configurations 12
Chapter 9	Issues Fixed 15
Chapter 10	Known Issues/Limitations 15
Chapter 11	Support 20

Chapter 1 Overview

Note: This Ubuntu software package shall be used for evaluation purposes only. Customers using this package in production environments or using this package for further distribution must ensure that Ubuntu license terms are adhered to. Contact your AMD FAE for more information.

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 6.1.61 LTS support.
- GBE ethernet PTP and PPS feature enablement
- Migrated to source package(rbh.sh) installation method, from Debian installation
- V3G18i, V3G48 OPN enablement
- Bug fixes.

Chapter 2 Linux® Kernel Support

- 6.1.61 LTS

Chapter 3 Linux Distribution Support

- Ubuntu 22.04.3

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	6.1.61 LTS	4a61839152cc3e9e00ac059d73a28d148d622b30	https://github.com/gregkh/linux/commits/v6.1.61
Libdrm	2.4.117	ee558cea20d1f9d822fe1a28e97beaf365bf9d38	https://gitlab.freedesktop.org/ mesa/drm/-/tree/libdrm-2.4.117
Mesa	23.3.0	65109bc8ac33e24af77c1b28b712dae414111ebb	https://gitlab.freedesktop.org/ mesa/ mesa/-/tree/ mesa-23.3.0-rc3
Ddx	23.0.0	7025aefcdf9673665588cf291c5d71beb39cce89	https://gitlab.freedesktop.org/ xorg/ driver/xf86-video-amdgpu/-/tree/xf86-video-amdgpu-23.0.0
Gstomx	1.0.0.1	5c4bff4a433dff1c5d005edfcef727b6214bb74	git://people.freedesktop.org/~leoliu/gstomx
Wayland	1.22.0	b2649cb3ee6bd70828a17e50beb16591e6066288	https://gitlab.freedesktop.org/ wayland/ wayland
libva	2.20.0	907b2b5405ca1091b4360bf35060e143bd704b62	https://github.com/intel/libva.git
LLVM	17.0.4	309d55140c46384b6de7a7573206cbeba3f7077f	https://github.com/llvm/llvm-project
Firmware	Master	312c61f5a6c9c6a313383a8f0c2b02711ec15262	https://git.kernel.org/pub/scm/linux/kernel/git/firmware/linux-firmware.git
Vulkan	2023.Q4.1	0a6c4a3db6f6a0efb644e164b14b53047e4003fd	https://github.com/GPUOpen-Drivers/AMDVLK/tree/v-2023.Q4.1
Supported Applications			
LunarG Vulkan SDK	1.3.268.0	NA	https://vulkan.lunarg.com/sdk/home#linux
Vulkan CTS	1.3.6.0		https://github.com/KhronosGroup/VK-GL-CTS/tree/vulkan-cts-1.3.6.0
RGP	1.16	NA	https://github.com/GPUOpen-Tools/radeon_gpu_profiler/tree/v1.16

Chapter 5 Features Supported on Ryzen™ Embedded processors

Supported features are shown in the following table.

Feature Group	Feature Supported	V1000/ R1000/ R1000LP	V1500	V2000	R2000	V3000
2D	2D acceleration	Yes	NA	Yes	Yes	NA
3D	EGL 1.4, 1.5, EGL extensions.	Yes	NA	Yes	Yes	NA
	OGL 4.5, OGL 4.6	Yes	NA	Yes	Yes	NA
	GLX 1.4	Yes	NA	Yes	Yes	NA
	DRI3 support	Yes	NA	Yes	Yes	NA
	DRI3 updates (VDPAU, VAAPI)	Yes	NA	Yes	Yes	NA
	Vulkan Open Source	Yes	NA	Yes	Yes	NA
2D	10 bit Display	No	NA	No	No	NA
Audio	DP Audio supports for standard	Yes	NA	Yes	Yes	NA
Audio	I2S Audio	Yes	NA	Yes	Yes	NA
Display	EDID (Basic)	Yes	NA	Yes	Yes	NA
Display support	X and Desktop support	Yes	NA	Yes	Yes	NA
	Tear Free Desktop	Yes	NA	Yes	Yes	NA
	Partial support RandR 1.4 capabilities	Yes	NA	Yes	Yes	NA
	Kernel Mode Setting	Yes	NA	Yes	Yes	NA
	4K60Hz display support	Yes	NA	Yes	Yes	NA
	Multi-GPU support (see table below for dGPU pairing)	No	NA	No	No	NA
	Number of displays supported (see display support table below)	-	NA	-	-	NA
	4K cinema	No	NA	Yes	No	NA
	DP MST	Yes	NA	Yes	Yes	NA
	Single Large Surface (SLS)	No	NA	Yes	No	NA
Play back	Play back support MPV player using VAAPI / VDPAU	Yes	NA	Yes	Yes	NA
	Play back support for Gstreamer using VAAPI, gstomx (not recommended)	Yes	NA	Yes	Yes	NA
	1080p 24fps, 30 fps and 60fps video play back	Yes	NA	Yes	Yes	NA
	4k 30fps video play back	Yes	NA	Yes	Yes	NA

AMD Embedded Linux Driver 2023.40 Release Notes

Feature Group	Feature Supported	V1000/ R1000/ R1000LP	V1500	V2000	R2000	V3000
	4k 60fps video play back	Yes	NA	Yes	Yes	NA
Power Management	Power Play support to re-clock	Yes	NA	Yes	Yes	NA
	Initial GPU reset support	Yes	NA	Yes	Yes	NA
	Power Play sysfs interface for manually selecting clock speeds	Yes	NA	NA	Yes	NA
	S3	Yes	Yes	Yes	Yes	Yes
	S5	Yes	Yes	Yes	Yes	Yes
VDPAU Post Processing	Deinterlace	Yes	NA	Yes	Yes	NA
VDPAU Post Processing	Edge Enhancement	Yes	NA	Yes	Yes	NA
VAAPI Postprocessing	Deinterlace	Yes	NA	Yes	Yes	NA
Transcode	4k Encode	No	NA	Yes	No	NA
Video Quality	Scaling and color space conversion (CSC)	Yes	NA	Yes	Yes	NA
	Pull down detection and Deinterlacing	Yes	NA	Yes	Yes	NA
	Support for software scaling	Yes	NA	Yes	Yes	NA
	Support for hardware scaling	Yes	NA	No	Yes	NA
	10-bit Decode with 10-bit render	Yes	NA	NA	Yes	NA
Compute	OpenCL	No	NA	No	No	NA
dGMA –OpenGL		NA	NA	Yes	NA	NA
dGMA - OpenCL		NA	NA	No	NA	NA
fTPM		Yes	Yes*	Yes	Yes	Yes
RJ45-10G-Base-T (Marvell PHY)	10M	NA	Yes*	NA	NA	Yes
	100M	NA	Yes*	NA	NA	Yes
	1G	NA	Yes*	NA	NA	Yes
	2.5G	NA	No	NA	NA	Yes
	10G	NA	Yes*	NA	NA	Yes
SFP+ (connector)	10M	NA	No	NA	NA	Yes
	100M	NA	No	NA	NA	Yes
	1G	NA	Yes*	NA	NA	Yes
	10GBASE_KR [AN=OFF, ON]	NA	NA	NA	NA	Yes
	2.5G [AN=OFF]	NA	NA	NA	NA	Yes
	10G	NA	Yes*	NA	NA	Yes
AIC1 – Inphi CS4223 Optical Fiber PHY (SFP+)	10M/100M/1G/10G	NA	NA	NA	NA	Yes
AIC1 – TI DS125 Series Re-Timer (SFP+)	10M/100M/1G/10G	NA	NA	NA	NA	Yes
AIC2 – 1G-Base-T	10M/100M /1G	NA	NA	NA	NA	Yes

AMD Embedded Linux Driver 2023.40 Release Notes

Feature Group	Feature Supported	V1000/ R1000/ R1000LP	V1500	V2000	R2000	V3000
(Marvell 88E1512P)						
AIC2 – 10G-Base-T (Marvell AQR113C)	10M/100M/1G/2.5G/10G	NA	NA	NA	NA	Yes
AIC3 – 1G-Base-T (Broadcom BCM54220)	10M/100M /1G	NA	NA	NA	NA	Yes
AIC3 – 10G-Base-T (Broadcom BCM84892)	100M/1G/2.5G/10G	NA	NA	NA	NA	Yes
eMMC	BC	Yes	Yes	Yes	Yes	No
	HS200	Yes	Yes	Yes	Yes	No
	HS400	Yes	Yes	Yes	Yes	No
	(USB/PCIe to eMMC bridge)	No	No	No	No	Yes
SD Card	SD UHS I – SDR50	Yes	Yes	Yes	Yes	No
	SD UHS I – SDR104	Yes	Yes	Yes	Yes	No
	SD UHS I – SDR104	Yes	Yes	Yes	Yes	No
Peripherals (I/O)	I2C	Yes	Yes	Yes	Yes	Yes
	USB	Yes	Yes	Yes	Yes	Yes
	USB 4.0	No	No	No	No	Yes
	SATA	Yes	Yes	Yes	Yes	Yes
	UART	Yes	Yes	Yes	Yes	Yes
	WDT	Yes	Yes	Yes	Yes	Yes
	SMBUS	Yes	Yes	Yes	Yes	Yes
	SPI Kernel Driver	Yes**	Yes**	Yes**	Yes**	Yes**
eSPI	No	No	No	No	No	

*Bilby platform only

**To use the SPI kernel driver on Bilby/Fox 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 2023.40 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 4K display(s)	
R2000	R2312	3
	R2314	
	R2514	
	R2544	4
R1000	3	
R1000 LP	R1305	2
	R1102	1
V2000	4	
V1000	4	

6.2 HW Codec Support

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

Chapter 7 Platforms Supported

Embedded SoC Version	Models/OPN's	AMD Customer Reference board
Ryzen Embedded V3000 Series	V3C48, V3C44, V3C18I, V3C18, V3C16, V3C14, V3G18i, V3G48	FOX
Ryzen Embedded V2000 Series with AMD Radeon Graphics	V2748, V2546, V2718, V2516	CELADON
Ryzen Embedded V1500	YE1500C4T4MFH, YE1500C4T4MFB	BILBY
Ryzen Embedded V1000 with AMD Radeon Graphics	V1807, V1605	BILBY
Ryzen Embedded R2000 Series with AMD Radeon Graphics	R2314, R2312, R2514, R2544	BILBY
Ryzen Embedded R1000 with AMD Radeon Graphics	R1606, R1505	BILBY
Ryzen Embedded R1000 LP with AMD Radeon Graphics	R1305, R1102	BILBY

Chapter 8 Tested Platform Configurations

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

V3000 Series	
CPU	V3000
OPNs	Latest Revision: AIC1; AIC2 ; AIC3; B1-DVT Sampels: V3C48;V3C18i;V3C44; V3C14; V3C16;V3C18, V3G18i, V3G48;
Board Type	Fox, Direct Mount
TDP	V3C48 (8-core 45W CPU) V3C44 (4-core 45W CPU) V3C18I (8-core 15W CPU extended temperature) V3C18 (8-core 15W CPU) V3C16 (6-core 15W CPU) V3C14 (4-core 15W CPU) V3G18I (8-core 15W CPU) V3G48 (8-core 45W CPU)
BIOS version	RFX1008B
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	<ul style="list-style-type: none"> • 10G SFI Optical: Finisar (FTLX8574D3BCV and FTLX8574D3BCL), Intel (FTLX8574D3BCV-IT) • 10G Optical DAC: Fiberstore (SFPP-A020) • 10G KR (Backplane): Molex DAC cable (747521101) and AMPHENOL SFP DAC CABLE (571540002) • 1G Bel SFP [SFP-1GBT-06] and Finisar [FCLF8520P2BTL]

V2000	
APU	V2000
APU TDP	10-25W, 35-54W
BIOS version	RCO1008A
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	RBB120BA_RV_PCO
RAM	16GB (2x8GB DDR4 2400)
Storage disk	M.2 SATA

V1000/NPU	
APU	V1000
APU Frequency	B10 45W (3350 MHz), B8 45W(3250 MHz), B8 15W(2000 MHz), B3 15W(2000 MHz)
BIOS version	RBB120BA
VRAM setting	4GB
RAM	16GB
Display Convertors / Dongles Used	DP to HDMI, DP to VGA, DP to DVI, mDP
Storage disk	HDD, SSD, M.2

R2000 Series	
APU	R2000
APU TDP	12-25W (R2312), 12-35W (R2314, R2514), 35-54W (R2514)
BIOS version	RBP1003A
VRAM setting	4GB
RAM	16GB
Display Convertors / Dongles Used	DP to HDMI, HDMI
Storage disk	SSD, M.2

R1000	
APU	R1000
APU Frequency	B2 15W, B4 15W/25W
BIOS version	RBB120BA
VRAM setting	4GB
RAM	16GB
Display Convertors / Dongles Used	DP to HDMI, HDMI
Storage disk	HDD, SSD, M.2

R1000 LP	
APU	R1000 LP
APU Frequency	B2 6W, B4 8W/10W
BIOS version	RBB120BA
VRAM setting	4GB
RAM	16GB
Display Convertors / Dongles Used	DP to HDMI, HDMI
Storage disk	HDD, SSD, M.2

Chapter 9 Issues Fixed

V3000 Issues:

1. SPI0 NAND/NOR read and write not working with mtd support

Chapter 10 Known Issues/Limitations

Generic Issues

1. SW installation time increased due to transition from Debian(install.sh) installation to source build(rbh.sh) installation.

Steps	Time Taken				
	R2000	V2000	V1000/R1000	V1500P	V3000
sudo ./rbh.sh --prep kernel_source 2>&1 tee rbh_prepkernel.log	4m 51s	2m 54s	4m 12s	3m	2m 32s
sudo ./rbh.sh --build kernel_source 2>&1 tee rbh_buildkernel.log	55m 35s	23m 11s	47m 52s	1hr 16m 2s	29m 47s
sudo ./rbh.sh --builddall 2>&1 tee rbh_builddall.log	55m 33s	32m 26s	49m 9s	1hr 20m 40s	32m 22s
sudo ./rbh.sh --postinstall 2>&1 tee rbh_postinstall.log	8s	7s	8s	9s	8s
Total Time taken	1hr 56m 7s	58m 38s	1hr 41m 13s	2hr 39m 51s	1hr 4m 49s

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. V3000 is cpu variant, so make sure to add “nomodeset” in grub param

3. V3000 need to use in headless mode. If display is needed, then use E9175 dGPU
4. UART provisioned for 1 x4 wire and 4 x2 wire modes only
5. 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.
6. 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
 - e. AIC3 BCM 10G phy has link stability issues for 100M/2.5G/1G speed modes, when using “ifconfig <i/f> down” command
 - i. For any BCM related phy issues, get in touch with BCM support
7. Sporadically (3/5) Hard Hang Observed with S3 with eSPI driver
 - a. Blacklist “espi_amd” driver will work as workaround for this issue
8. 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
18. AMDupprof installations fails.
- a. **Workaround:** Need to copy asm & uapi to `usr/src/linux-headers-6.1.61-amd/arch/x86/include/` from `/<driver>/build_scripts/BUILD/linux-stable_emb/arch/x86/include`

```
sudo cp -r asm /usr/src/linux-headers-6.1.61-amd/arch/x86/include/
```

```
sudo cp -r uapi/ /usr/src/linux-headers-6.1.61-amd/arch/x86/include/
```

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 can 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 advised 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)
2. Run driconf (sudo driconf)
3. In application settings add Unigine heaven if it does not exist (application name: Unigine Heaven, Executable name: heaven_x64)
4. Add: Allow GLSL #extension directives in the middle of shaders: Yes (using "add setting" button. You can remove all other settings if present)
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.