

## ArgusCore™ SC1

### OpenGL® SC 1.0.1 Graphic Drivers for Safety Critical Systems

#### FEATURES AND BENEFITS

- A driver, which is a safety critical implementation of the Khronos' OpenGL SC 1.0.1 API, designed and developed from the ground up for high performance, resource constrained devices, and safety critical certification (including RTCA DO-178C / EUROCAE ED-12C Level A)
- Configurable and scalable power and performance management
- Ideal for multi-core applications - supports multicore partitions, hypervisor and Guest OS configurations
- Specialized BIT support integrated into driver; monitors registers and GPU integrity
- Integrated and compatible with popular safety critical HMI tools such as ANSYS® SCADE, ENSCO® iData®, DiSTI GL Studio®, and Presagis VAPS XT
- Customizable display controller interface to support variable sync modes and custom resolutions
- Contains no open source and no 3rd party software
- Supports RTOS, including Wind River® VxWorks®, SYSGO® PikeOS™, QNX® OS, Green Hills® INTEGRITY®, DDC-I Deos™, Lynx Software Technologies LynxOS®, Automotive Grade Linux and configurable for proprietary RTOS and bare metal
- Supports plug-in drivers for video decode and encode, DecodeCore® and EncodeCore®
- Supports TrueCore™ GPU safety monitor library
- Available with CertCore™ 178 (Avionics DO-178C / ED-12C Level A, C and D) safety certification packages
- EGL\_EXT\_compositor extension supported
- Solutions aligned with latest Future Airborne Capability Environment (FACE™) Technical Standard

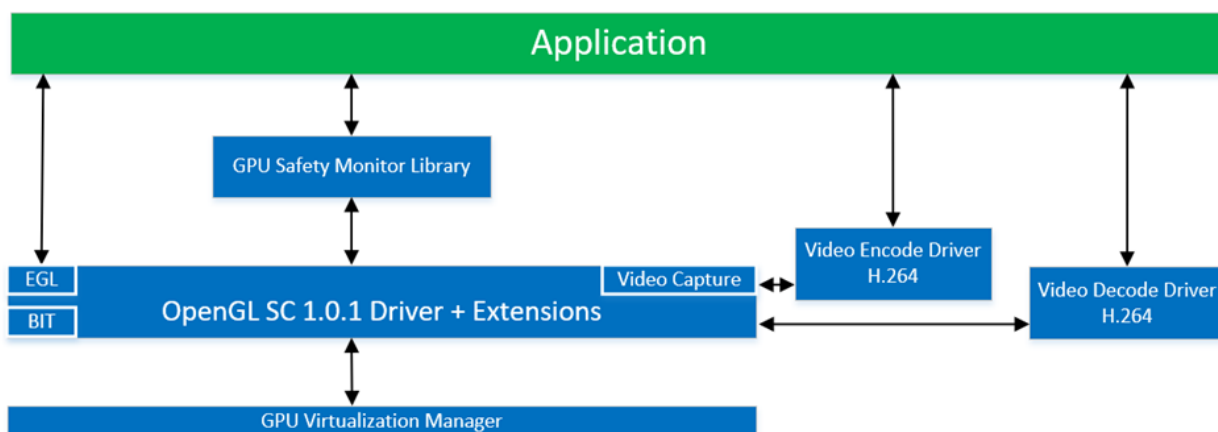


Figure 1: ArgusCore Graphics Framework

## INTRODUCTION

CoreAVI's ArgusCore™ SC1 is a real time OpenGL SC 1.0.1 graphics driver that is designed to both enable the best performance capabilities of lower and higher powered graphics processors and achieve the highest levels of safety critical certifications, including FAA DO-178C / EASA ED-12C Level A. ArgusCore SC1 drivers are a superset of Khronos' OpenGL SC 1.0.1 API specification (OpenGL for safety critical applications). The OpenGL SC 1.0.1 graphics libraries are implemented to support a fixed function graphics rendering pipeline. ArgusCore SC1 is an industry proven solution that has successfully achieved rigorous avionics FAA/EASA certifications and is deployed extensively in certified avionics display systems in civil, commercial and defense aircraft worldwide.

Hardware video encode and decode acceleration engines are supported with plug-in drivers to encode framebuffers as well as decode a video stream into a texture. Together these drivers enable video distribution, recording, and playback. CoreAVI also provides a built-in API to simplify capturing video data directly into textures to minimize latency. To ease initialization of any graphics/video hardware external to a GPU, CoreAVI includes a mechanism to perform initialization after basic GPU initialization and before the GPU is driving its display outputs.

Safety certification concerns such as detecting Hazardously Misleading Information and GPU over-utilization are also addressed with CoreAVI's TrueCore™ GPU software safety monitor application. For avionics applications, safety certification kits are available to support DAL A, C and D.

ArgusCore SC1 and related products are typically delivered as Off-The Shelf (OTS) standard products with customization services available. In addition to the User Manual, a User Integration Manual (Safety Manual) is also provided which describes how to deploy safely.

## INCLUDED FEATURES

ArgusCore SC1 is provided with a variety of features detailed below.

### *Display Controller Driver*

ArgusCore SC1 includes an integrated display controller driver which enables the configuration of the display controller ports and other display controller function settings. A means to define a fully custom video mode by defining resolution and timing details is also provided. In addition, there is a mechanism to display a "splash screen" once the display controller is initialized.

### *GPU Virtualization Manager*

ArgusCore SC1 is available with a GPU virtualization manager, HyperCore™, to enable multiple graphics rendering partitions to drive single, or multiple, GPU(s). Specifically, ArgusCore SC1 supports a Multi-Threaded Multi Partition (MTMP) architecture providing support for single-threaded or multi-threaded applications in the same or different address spaces as well as sharing of a single GPU by applications residing in different Guest OSs.

### *Security*

Security features of ArgusCore SC1 add in full boundary protection on memory assigned to each partition such that each partition only has access to their assigned resources through the utilization of virtual memory management hardware when supported on the target GPU hardware.

## VIDEO ENCODER

CoreAVI's EncodeCore is a real time and safety critical H.264 video encode driver that enables built-in hardware video encoders. The driver architecture and API ensure high efficiency and low latency between a frame buffer and the video encode hardware to capture the graphics output being sent to a display. The resulting compressed video is made available on the host SBC as raw H.264 data. The raw encoded data can then be packaged by the application into a desired format that can be transmitted, recorded and played back on video players supporting the packaged format.

## VIDEO DECODER

CoreAVI's DecodeCore is a real time and safety critical H.264 video decode driver that enables built-in hardware video decoders. The driver architecture and API ensure high efficiency and low latency between the video decode hardware and the graphics hardware. The decompressed video is made available as a texture, enabling complex hardware accelerated image manipulation and integration with 2D or 3D graphics.

## TRUECORE™

TrueCore is a COTS Graphical Processor (CGP) software safety monitor library that interfaces to a CGP through CoreAVI's ArgusCore SC1 OpenGL SC-based graphics drivers to assist applications in providing a comprehensive solution to address Hazardously Misleading Information (HMI) safety requirements.

TrueCore is a suite of tests designed to monitor the graphics rendering operations of a CGP and detect design errors addressing CAST 29 section 2.2 and CM-SWCEH-001 section 10.3.1 related to CGP design errors that may lead to HMI. This is an effective software alternative to hardware monitoring solutions providing Size, Weight and Power as well as Cost (SWaP-C) benefits. By providing effective CGP design error detection, TrueCore can eliminate the need for dissimilar CGP solutions in DAL A systems.

CoreAVI has reviewed the details of TrueCore with Federal Aviation Administration (FAA) chief scientists who concur that TrueCore addresses the identified certification concerns with the use of a CGP in systems requiring level A compliance.

### *Built-In-Test*

ArgusCore SC1 contains a common API to run included Built-In-Tests (BIT) for the GPU. The BIT tests cover basic GPU functionality as well as providing GPU status information for developing additional BIT functions.

### *Sample Software*

There is sample software demonstrating the use of the CoreAVI video capture assist API and custom hardware initialization sequencing with GPU initialization, providing a reference for your custom video hardware driver.

### *Extensions*

The following are supported extensions and additional functions:

- Supported Extensions: GL\_ARB\_multisample, GL\_ARB\_multitexture, GL\_ARB\_vertex\_buffer\_object, GL\_EXT\_blend\_color, GL\_NV\_blend\_square, GL\_EXT\_copy\_texture, GL\_EXT\_draw\_range\_elements, GL\_SGIS\_texture\_edge\_clamp
- Additional Functions (from OpenGL 1.3): glBlendFunc, glDepthFunc, glReadBuffer, glCallList, glDeleteAllLists, gl\_DeleteAllTextures, glTexCoord2f, glTexCoord2fv, glVertex4f

### *Supported Graphics Processors*

ArgusCore SC1 supports a number of popular graphics and system on chip processor families. OpenGL applications are now being supported on newer GPUs by CoreAVI's VkCoreGL® SC1 OpenGL application library running on VkCore® SC Vulkan®-based driver. CoreAVI's R&D and certification teams continue to evaluate GPUs available on the market in order to add new graphics processors to its growing list of supported platforms.

- Temperature Screened AMD Embedded Radeon™ E4690, E8860 GPUs, G Series SoC
- NXP i.MX 6 SoC Processor Family
- VIVANTE GC880 to GC3000 GPU Cores
- Intel HD 4000, HD 5000 GPU families Atom™, Core™ i3, Core™ i5, and Core™ i7 CPUs and SoCs

### *Supported Configuration*

ArgusCore SC1 is available for the generic Power Architecture™, Arm® or x86 instruction set architectures supporting 64-bit operation and hardware floating point in a Symmetric Multi-Processing environment and is built using the RTOS vendor qualified compiler.

### *Certification Data*

CoreAVI provides complete DO-178C/ED-12C certification data packages called CertCore 178, which support the use of ArgusCore SC1 graphics drivers in any FAA DO-178C / EASA ED-12C avionics safety certification. CertCore 178 can be licensed for DAL A, C or D and used to meet program requirements while managing costs. The DAL D evidence kit is ideal for programs with requirements to show safety certifiability.

### *User Integration Manual (Safety Manual)*

In addition to a User Manual and Porting Guide, a User Integration Manual is also available to describe usage, assumptions and issues to put ArgusCore SC1 into context. The User Integration Manual describes requirements to be considered by the application developer, such as:

- Potential safety requirement fulfilled by ArgusCore SC1
- How ArgusCore SC1 must be configured and integrated
- Any post-integration testing of ArgusCore SC1
- Any known safety impacting issues with ArgusCore SC1

## ORDERING

The following ArgusCore SC1 optional add-in products can be ordered from CoreAVI:

- DecodeCore H.264 video decode driver
- EncodeCore H.264 video encode driver
- TrueCore library
- CertCore178 DO-178C/ED-12C Level A Data Kit for each of the drivers, libraries and layers.
- ArgusCore SC1 User Integration Manual

For more information on CoreAVI's ArgusCore SC1, contact [Sales@CoreAVI.com](mailto:Sales@CoreAVI.com).