**Motivation**

- Safety Critical Systems require higher performance to support new advanced functionalities
- Certification: Need to comply with safety standards: ISO26262 / DO178
- Very conservative in terms of hardware and software: simple processors, mainly single core

**Embedded GPUs can provide the required performance**

- Massively parallel architectures, high computational power and high energy efficiency, in thermally limited systems
- OpenCL and CUDA dominate the market of GPGPU programming in HPC
- Easily programmable APIs
- Cannot be used in safety critical systems because of pointers and dynamic memory allocation
- In this Bachelor’s thesis [1] awarded with a Technology Transfer Award we:
  - Analyze their differences compared to desktop graphics APIs
  - Demonstrate how a safety-critical application written in a non-certifiable programming model can be converted to use safety-critical APIs.
  - Evaluate performance and programmability trade-offs

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**Visual output of the Avionics Application**

- Aircraft’s mesh
- Compute Shader
- 3D Image
- Processed Image
- Screen (output)

The display is divided in four regions:
- The application uses both graphics and general purpose computations
- The first region is the upper left zone of the screen with a rotating 3D model of a plane. We load the mesh, then apply a basic shader and finally we draw it in a frame buffer.
- The second region is the upper right zone of the screen with a plane image obtained from a camera. The image is processed with general purpose computations and the result is written to the framebuffer.
- Finally, we draw the framebuffer to the output screen.

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- CoreAVI provided the certified OpenGL SC 2 driver and an avionics-grade AMD E8860 GPU

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**References**

[2] Trompouki et al, Towards General Purpose Computations on Low-End Mobile GPUs. DATE’16
[3] Trompouki et al, Optimisation Opportunities and Evaluation for GPGPU applications on Low-End Mobile GPUs. DATE’17

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