



## Demo1: UAV supervision of critical structures

UC Leader: PROINTEC



### UC description

The objective of **Demo 1** is to systematize the visual inspection of concrete structures, such as bridges and viaducts. To do this, a UAV will be used to take images of the structure under analysis and the AI model will detect in near-real-time the cracks and families of cracks that may pose a future hazard to the integrity of the structure.

To obtain: Geometric data from cracks, location of cracks, comparison between two spaces of time of the evolution of the detected cracks.

Outputs: Original images, Masks with cracks, Report.

Challenge: Replace the current visual inspection methods that require costly auxiliary machinery, traffic interruptions and can be a source of accidents.



### FRACTAL Components

Platform: Versal

Relevant Components in UC1 DEMO1

WP3T32-10 Versal Accelerator Building Blocks	(IKER)
WP3T34-03 Versal Model Deployment Layer	(PLC2)
WP4T42-02 Versal RPU Access to AI acceleration	(PLC2)
WP6T61-01-03 Petalinux	(OULU)
WP6T61-01-04 Vitis AI	(OULU)

Technical aspects to be addressed:

- HW acceleration:
  - Are there any components developed for adapting our model, developed in Tensorflow 2, so it can make use of the HW accelerators of the VCK190?
  - Do we have to test the acceleration modules of the VCK190 on our own? Are they going to be tested separately or joint tests or theoretical collaboration?



### UC Components

Developed specifically for the use case: An algorithm used to extract information from the images. The model's task consists of the segmentation of the cracks from the images of the concrete structures. It is based on a deep-CNN with U-Net architecture. In addition, we have built a new dataset with images taken on the construction site. As well, these images have been augmented with classical image augmentation techniques and overlapping of textures.

Programming language: Python

Libraries: TensorFlow 2, OpenCV and NumPy

Relevant Components:

- Versal Inference Component
- Report Generation Component

Dependencies with components provided by WPs: HW acceleration

Technical aspects to be addressed:

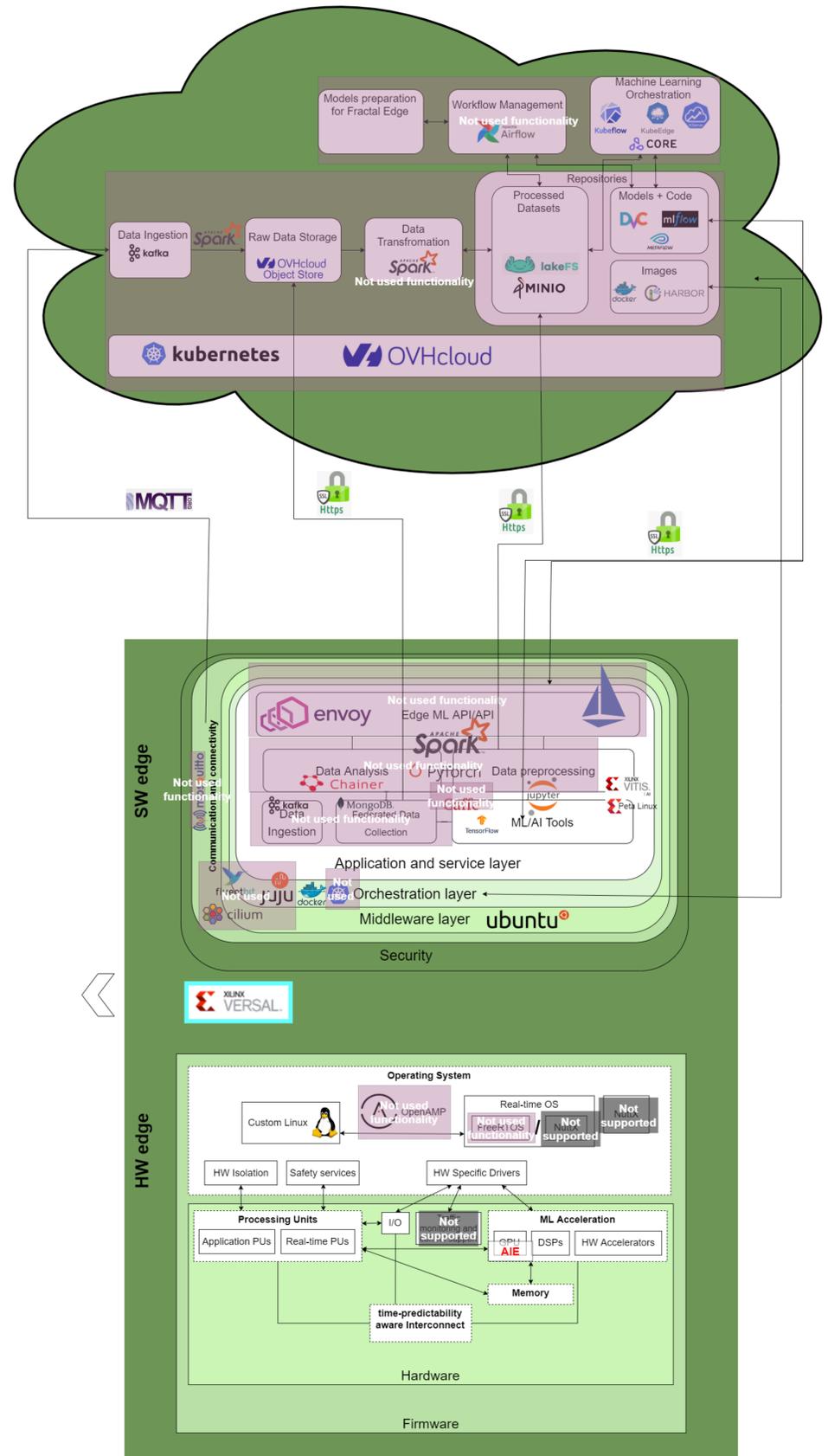
- Does the model, programmed in TensorFlow 2, has to be adapted so it can make use of the accelerators of the VCK190?
- Or will we receive support from a partner for this?



### KPIs

Technical KPI:

Percentage of the number of cracks detected by the algorithm with respect to those detected by an expert > 95%



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