Exercise 2: Change detection on Sentinel-1 data product

Objective: Find all the changes over the Torun city (Poland) after the windstorm that happened during the night between August 11th and 12th, 2017.

In this exercise, all needed functions are regroup in the folder *Hackaton/Exercise2* in your work space, which is organized as follows:
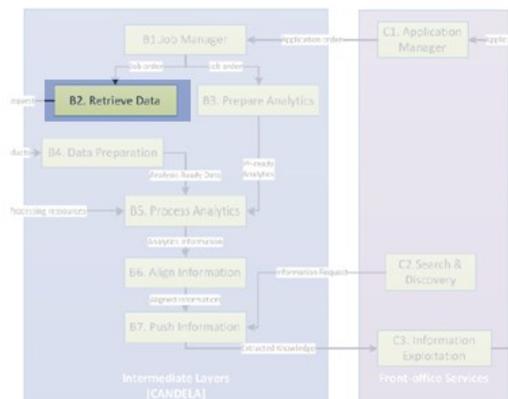
- *S1_ChangeDetection.ipynb*
- *S1_pipe.py*

And, all needed data are regroup in the folder *DATA/Exercise2* in the folder *SHARED* of the public space, which is organized as follow :

- 2 GeoTiff images

Step 1: Find the images of interest

Objective : Create a folder that contains the Sentinel-1 data products of interest

Open the jupyter-notebook named ***S1_ChangeDetection*** (Part 1)

1/ Search all the Sentinel-1 GRDH data products, which have been acquired between the 5th of August 2017 and the 20th of August 2017 that represent the area of Torun affected by the disaster

2/ Select the products ending with *66F0*, acquired on August 5th, and *77D0*, acquired on August 17th.

These two products are sensed with the same orbital path (ascending). This is a condition imposed by SAR systems side-looking geometry, which introduces shadowing effects and other geometric distortion depending on the topography of the sensed scene.

3/ Store the products to analyze in a folder. Do not forget to delete any pre-existing links in the input folder

Step 2 : Prepare the image of interest

Objective: Apply corrections on Sentinel-1 data products and export them as GeoTiff images
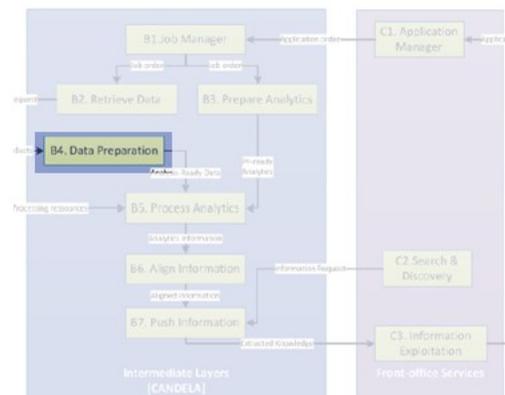
Open the jupyter-notebook named ***S1_ChangeDetection*** (Part 2)

1/ Since the Sentinel-1 data products cover a very large area, boundaries must be set to limit the region of interest. The chosen boundaries (lat/lon in decimal degrees) to define the Torun forest are :

- NORTH = "53.20"
- SOUTH = "52.80"
- EAST = "18.85"
- WEST = "17.85"

2/ Before to be analyzed, Sentinel-1 data products require some pre-processing operations :

- ➢ Pixel values must be converted from intensity of the received radar signal to backscatter, in order to retrieve the quantitative information needed for change detection comparison
- ➢ A terrain correction operation is applied on the image in order to correct geometric distortions introduced by the topography

Pre-process Sentinel-1 data products and convert each of them into GeoTiff images (one image by polarization)

Step 3 : Run the SAR change detection tool

Objective : Generate change detection map that shows the areas where a change was detected
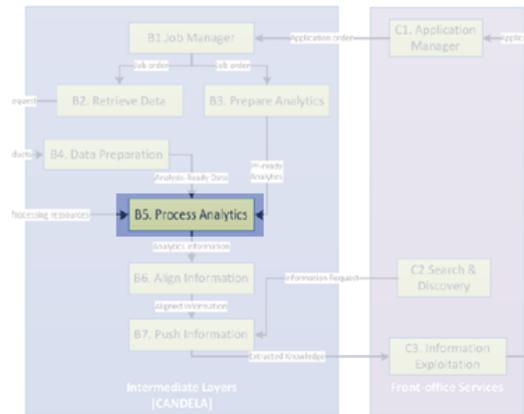
Open the jupyter-notebook named ***S1_ChangeDetection*** (Part 3)

In the current configuration of the platform, the *SAR_ChangeDetection* module can take several hours to run, depending on the size of the area selected. It is better to skip this module and use the change detection results ready in the *Data* folder.

The current version of the module writes change detection maps in a RGBA GeoTiff, where the Green channel (Band2) highlights 10x10 pixel areas in which a change has been detected by the tool, while the most recent SAR image is stored in the Red channel (Band1).

Once the results are generated, it is possible to visualize them