The Coastal Thematic Exploitation Platform
A Single Step from software prototyping to massive processing

Nicolas Gilles
ACRI-ST

26/09/2017 - EO Open Science 2017, ESRIN
The Coastal Thematic Exploitation Platform

- The CTEP is a project funded by ESA, developed by a consortium of 9 European companies and institutions, led by ACRI-ST
- The CTEP is the ESA Thematic Exploitation Platform devoted to the study of coastal areas
- The project started in April 2015 and is now in pre-operation phase
  - 17 registered users (excluding CTEP team)
  - 120 processors uploaded so far
The Coastal Thematic Exploitation Platform

• The exploitation platform concept is now mainstream: many similar initiatives exist today...
• CTEP is not the only exploitation platform that covers coastal areas...
• What can we bring to the table?
The Coastal Thematic Exploitation Platform

Data Processing Algorithm

Actionable Information
The Coastal Thematic Exploitation Platform

Data Processing Algorithm

Actionable Information

Data

Copernicus, Globcolour, Altimetry (CTOH), ...
The Coastal Thematic Exploitation Platform

Data

Data Processing Algorithm

Actionable Information

Partners:
- ACRI-ST
- Catalysts
- CNES
- DLR
- Planetek Italia
- Thales Alenia Space
- Terrasigna
- UCC

European Space Agency
The Coastal Thematic Exploitation Platform

Data → Magic Sauce → Actionable Information
Coastal TEP design approach

• The CTEP has been designed to offer a user experience as close as possible to what users already know and expect
  – Each user has his/her own private data area where files can be saved, uploaded and downloaded
  – Their software shouldn’t required extensive modifications to run on the platform.
Coastal TEP design approach

• Minimizing the learning curve
  – (Almost) no API to learn
  – No need to create a docker container
  – No complicated configuration files
  – Integration is performed through a simple web interface
  – No intervention from platform operators required
How does it work?

- Integrating a software on the platform requires the following steps
  - **STEP 1**: Make sure that output files are copied in the `$CTEP_OUTPUT_DIR` folder

Example in python:

```python
# save file
outdir = os.getenv('CTEP_OUTPUT_DIR', '.')
outfile = outdir+ '/watermask.tif'
CreateGeoTiff(outfile, np.int8((mask<6.5)*255), 1, geot, proj)
print outfile+' created'
```
• Integrating a software on the platform requires the following steps
  – STEP 2: Create a processor on the CTEP and describe it
How does it work?

- Integrating a software on the platform requires the following steps
  - STEP 3: List all input parameters using the GUI
How does it work?

- Integrating a software on the platform requires the following steps:
  - STEP 4: Specify the command to be run
• Integrating a software on the platform requires the following steps
  – STEP 5 : upload the processor files (tar-gzipped)
How does it work?

- Integrating a software on the platform requires the following steps
  - The processor is now ready to run on the platform
Implementation Details

• The solution is based on a combination of specific developments
  – A specific WPS server with a dynamic data base of processors: WISPY
  – A processor integration web interface
  – A script to create a docker image from the uploaded tar-gz file
  – A specific back-end to manage the CTEP cluster: DPMC

• NB: all our software is (going to be) open-source(d, pending licensing cleanups)
Other Tools

• Once the data is generated, we need to tools for:
  – Visualization
  – Analysis
  – Validation

These are provided as mix of web based and (seamless) remote desktop solutions, also reachable within a few clicks.
<table>
<thead>
<tr>
<th>Tool</th>
<th>Description</th>
<th>Start new</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNAP</td>
<td>Sentinel Toolbox</td>
<td></td>
</tr>
<tr>
<td>Ubuntu</td>
<td>Virtual Desktop</td>
<td></td>
</tr>
<tr>
<td>QGIS</td>
<td>Free and Open Source GIS</td>
<td></td>
</tr>
<tr>
<td>Jupyter</td>
<td>Python Notebook</td>
<td></td>
</tr>
</tbody>
</table>
Other Tools
The Coastal TEP: thematic scope

• Theme 1: Coastal Altimetry
• Objectives
  – development and validation of satellite coastal altimetry products
  – Development of services for storm-surge monitoring
• Partners / network
  – LEGOS/CTOH
  – CNR
  – Former eSurge project: CGI Italy
  – Parameter Space / Tech Works Ireland
The Coastal TEP: thematic scope

- Data fusion tools for satellite altimetry and tidal gauge measurements, with application to storm surge monitoring
  - Collaboration with CNR Italy
The Coastal TEP: thematic scope

• Theme 2: Water Quality

• Objectives
  – development and validation of satellite water quality processors
  – Development of services for water quality monitoring and environment assessment (fisheries & aquaculture)

• Partners / network
  – Planetek
  – ACRI-HE
The Coastal TEP: thematic scope

- Processing and tools: thematic processing
  - Atmospheric correction over water and water constituent retrieval with Sentinel 2 data
The Coastal TEP: thematic scope

Chlorophyll P90 - 2013

Water Transparency Mean - 2013
The Coastal TEP: thematic scope

- SAFI project: use of information extraction tools to generate a service to support fisheries and aquaculture
The Coastal TEP: thematic scope

• Theme 3: Bathymetry and coastal erosion
• Objectives
  – development and validation of EO-based processors
  – Development of services for monitoring coastal environment
• Partners / network
  – U. Tartu
  – ACRI-HE
  – International Union for Conservation of Nature (IUCN)
  – Individual contacts in Ireland and Italy
The Coastal TEP: thematic scope

- Bathymetry and benthic classification with Sentinel 2 data
  - Collaboration in preparation with T. Kutser (U. Tartu)
The Coastal TEP: thematic scope

- Theme 4: Change detection and classification
- Objectives
  - Development and validation of EO-based processors
  - Development of services for monitoring of coastal environment
- Partners / network
  - Planetek
  - CNES
  - Italian Carabinieri (Cultural Heritage)
  - DLR
• Integration of a semantic feature database
  – Collaboration with DLR, Germany
Change detection example

Probable construction site/activity in the area:
already built-up increased brightness +
vegetated area removed
Probable being-built spot in previously vegetated area (in this case it is an extension of already existing buildings)
The End

Thanks you!

Questions?

Come see us in the demo area!