G-CORE

2. G-core

Description

G-CORE is a production-ready technology used as a service at ESA's and national programs led by INDRA for the acquisition, storage, cataloguing and processing data from several Earth Observing (EO) System missions. G-CORE provides two main functionalities:

- A Data Manager for spatial and non-spatial purposes.
- A Processing framework to host external processors developed by third parties to generate added value products based on Satellite imageries.

The objective of the adaptation of the thematic service is to explore the sustainability of the EOS services exposed through the creation of added-value products through the integration of G-CORE as a data manager. With this in mind, the G-CORE cloud capabilities will provide a processing environment with capabilities for deploying processing prototypes following the SaaS models, without investing in dedicated hardware resources. The ability to deploy new processing frameworks will allow external users to conveniently deploy them to validate their developments. It means that the G-CORE can be offered as a Payload Data Ground Segment (PDGS) in the cloud for future ground segment space missions to be implemented with the dedicated modifications for each mission, or as a processing framework to plug in different processors that can make use of the Copernicus resources or private data in order to produce different levels of products to be delivered to the users.

Architecture

The G-CORE is defined as a system that fulfils most of the Ground Segment needs related to the creation of a scalable and elastic processing systems, including the capability to manage distributed and multiplatform deployments of all their components. The G-CORE is composed of a set of common components that are able to deploy different instances that will offer the functionality of the components that compose a Ground Segment (specially indicated for processing systems). Figure 6 represents a typical GCORE structure with a marketplace where different services are offered from third parties. The GCORE will offer different GCORE Instances types that can be deployed according to the user requests. Each user can request a specific service that implies the deployment of a GCORE Instance to perform the activities for the services. The capability of GCORE to integrate different processors and to deliver its results allows creating new services in an easy way.
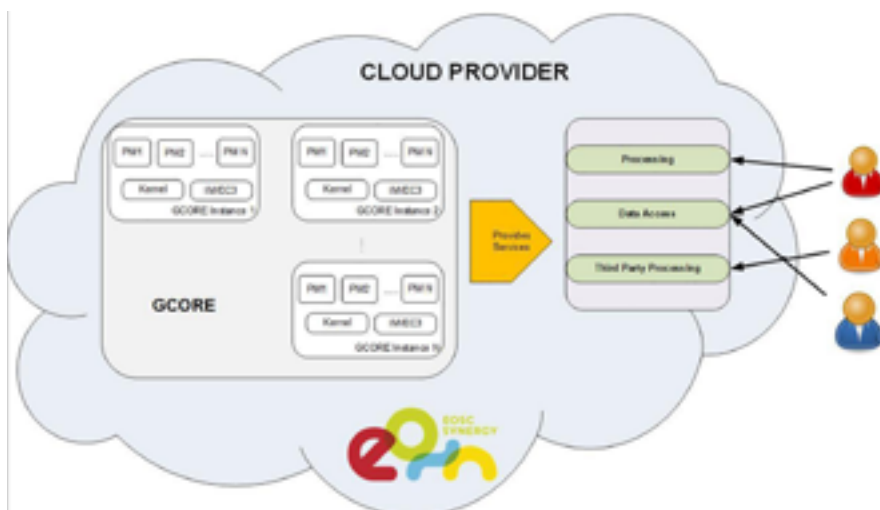

Figure 6 - High level architecture for GCORE as EO thematic services

In addition, all services available would benefit from the elastic and scalable up and down capacity of GCORE in order to reduce the operational costs of a third-party project.

This framework will be offered as a component to be included in complex system to implement the processing chain or as a processing framework to create hybrid infrastructures for processing activities on demand or could be published as SaaS to publish the services in the market place to be used by companies/entities or institutions focused to create added value services/products over satellite imageries.

The G-CORE is composed of a set of common components that are able to deploy different instances that will offer the functionality of the components that compose a Ground Segment (specially indicated for processing systems).

In this way, the deployment of the CDPS, shown in figure 7, is based in the following elements:

G-CORE Central that compose the common elements necessary to support the automatic deployment of the GCORE Instances and that is composed by:

- An Infrastructure Manager service: composed by the Infrastructure Manager (IM) and CLUES provided by the UPV will allow to deploy and contextualize a set of VM instances and containers in different cloud providers that allows to deploy the G-CORE Instances.
- Generic Analysis Resources: This component is used to configure the deployment and auto-deployment features depending on the user needs. Also, it includes the monitoring of the jobs deployed.
- Log System: System in charge to receive the logs of the system in order to show to the operator an unique entry point.

GCORE Instances that include the deployment of a specific function that a specific project requires. Each instance is composed by:

- Kernel services: The Kernel micro-services include all services associated to the GCORE that compose the core and that enable the basic functions.
- Processing Services: These are a set of services that allow the execution of different processes or processors in order to transform a specific input into an elaborated output.
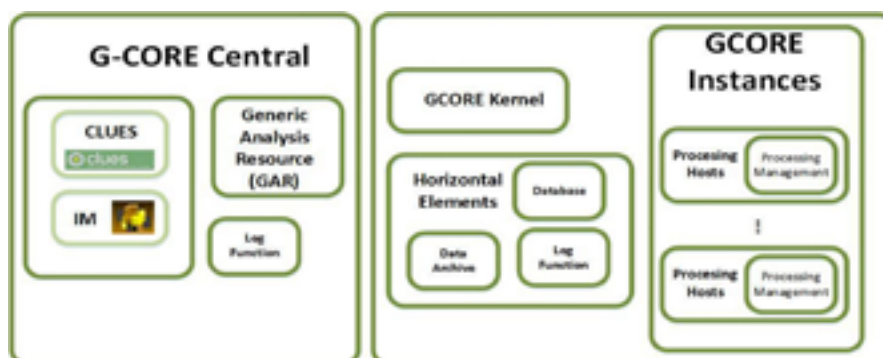

Figure 7 - High level architecture components for GCORE

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EOSC Services

The G-Core service targets the following three user profiles:

- EO data for the science community to use the satellite data in the scientific studies.
- EO data for public organizations to use the satellite imageries as background data.
- EO data for value adders to create added value products from satellite images.

G-Core will help to define new products and services mixing Earth Observation data with other types of data for scientific and social environments. The expected impact of the adaptation of the service is to democratize the usage of EO data out of the scope of nominal fields. It will help to define new products and services mixing Earth Observation data with other types of data for scientific and social environments.

In addition to the proposed services G-CORE makes use of the next common services:

- EGI check-in for authentication. G-CORE makes use of this method in addition to its own login and authentication methodology based in a platform-SSO.
- IM and CLUES. Composed by the Infrastructure Manager (IM) and CLUES provided by the UPV will allow to deploy and contextualize a set of VM instances and containers in different cloud providers that allows to deploy the GCORE Instances.

Service Endpoint

The initial web page will ask for the user credentials, the EGI checking will be used for such purpose. After that, a viewer screen (figure 8) will be shown to the user in order to enter the selection criteria for the data imagery search. It is possible to select an Area of Interest (AOI) over the globe and a period of time to perform the search of products over the specified criteria.

Figure 8 - Viewer for AOI selection

For the presented example, a direct search is performed to the ESA's data hub of Sentinel 2 imagery and the results of the search are shown in figure 9.

Figure 9 - AOI selection and consultation

The user can select the scene or desired scenes in order to send them to the processor. This is a simple example but the system is thought to be used for processing more advanced and complex processing of valued added products. The bottom of the screen shows the list of selected scenes and the button to command the processing.

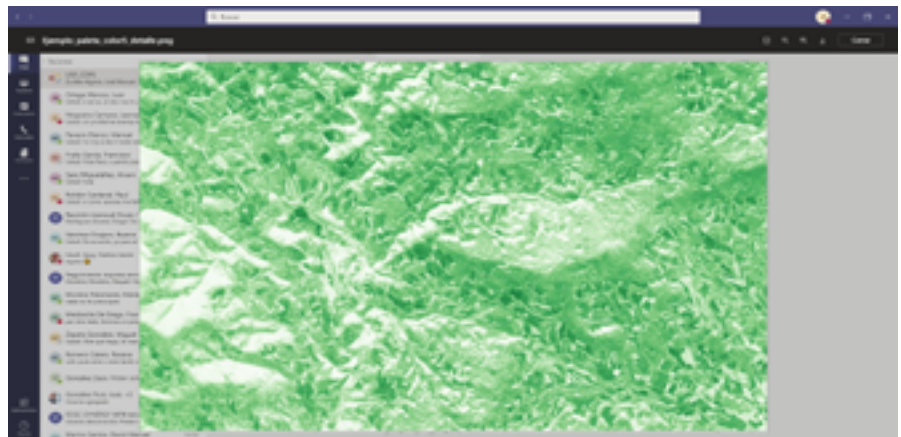Finally the user can retrieve the image locally and display it with the final result, as shown in figure 10.

Figure 10 - NDVI processing result

Demonstration Video

The vídeo for G-CORE shows briefly a SaaS case to be offered in the EOSC market place for EO processing using G-CORE. The video is divided into two parts. The first shows a brief introduction of the functionalities available in G-CORE and the second is the video itself. The video shows the selection of an Area of Interest (AOI) area in order to select a scene to command the processing of a simple NDVI over that scene. After processing the scene the user displays and downloads the final product as a result of the processing.

Click the image to view the video