RUS Copernicus: an Expert Service for New Sentinel Data Users

E Guzzonato¹ B Mora¹ S Remondièr² F Palazzo²
¹ Communications & Systèmes, 5 rue Brindejonc des Moulinais, 31506 Toulouse, France
² Serco Italia S.p.A., Via Sciadonna, 24, 00044 Frascati RM, Italy

E-mail: eric.guzzonato@c-s.fr

Abstract. With an unprecedented amount data acquired continuously, the Copernicus satellite constellations provide essential information for analysing and monitoring the Earth’s surface and atmosphere. However, technical and knowledge barriers may affect user’s uptake of such datasets. The Copernicus Research and User Support (RUS) Service (funded by the EC and managed by ESA) began operations in October 2017 and aims to support overcoming such issues. Provision of scalable, preconfigured cloud environments offers users the possibility to remotely store and process data. The platform relies on Free and Open-Source Software (FOSS). In addition, technical and scientific support (including training sessions) is provided to facilitate exploitation of Copernicus data. The RUS Service is specially addressed to users from European countries that are willing to discover and use Copernicus core products and datasets. The service is free for the eligible end users. Commercial and operational activities cannot be carried out through the RUS Service.

1. Introduction
In 2018 the 10-millionth Copernicus data product was published on the Open Hub, and by 30 November 87 PB of data products were downloaded. Concomitantly, several infrastructures and platforms such as the Data and Information Access Services (DIAS) have been proposed to facilitate the access and processing of satellite data. Very performant computing power is needed to process such data which size, in the case of Sentinel-1 might be larger than 1 GB/product and 500 MB/product for Sentinel-2. Several users may not have the proper local resources to handle such datasets. Finally, besides “physical barriers” there may be “knowledge barriers” related to the complexity of the image information, understanding of the formats, and the applicability of the data to specific applications.

The Research and User Support (RUS) Service was launched with the purpose of helping to overcome these barriers. The service is offered at no cost for the end user and addresses the needs in terms of technical and scientific support, computing resources and disk space identified by ESA.

The RUS Service is funded by the EC (contract 4000119093/17/I-LG), managed by the European Space Agency, and operated by Communications & Systèmes – Systèmes d’Informations (CS SI) and its partners: Serco SPA, Noveltis, Along-Track, and CS Romania.

2. ICT Solutions, Data and Access Conditions
To overcome physical issues such as downloading, storing and processing, the RUS Service exploits Infrastructure as a Service (IaaS) and Platform as a Service (PaaS). IaaS includes network access, Virtual Machines (VM) with scalable Computing Processing Units (CPU) and storage capacity. The
PaaS, based on an Ubuntu distribution, includes data access (direct access to Copernicus Hub) [1], communication tools (mail, chat, audio-conference and video-conference with the Helpdesk), processing and viewing tools, development tools, collaboration tools, as well as all necessary and relevant documentation and internet links. Free Open Source Software (FOSS) is pre-installed on demand on the VM, however users are free to install their own Commercial Off-The-Shelf (COTS) software on their machine. Default Processing libraries account for: GDAL, Sentinel Toolboxes, Orfeo Toolbox and SNAPHU; pre-installed processing tools include QGIS 2.18 and SNAP 6, whereas current software development utilities are: Oracle JDK 1.8, Apache Ignite, Eclipse, GCC, CMAKE, Maven, GIT, Python 2.7/3.5, and R 3.4. The ICT for the user is defined following an analysis of the received service request; such analysis defines the scaling of the work environment in terms of service duration, disk space and size (number of VM, number of cores per machine, RAM per core).

The infrastructure relies on several types of virtual environments:

• Collaboration environments hosting a platform to offer collaboration services such as video-conference and chat, the Front Desk, the Administration Desk and the Service Management Desk.

• User environments hosting the development and processing platform: each RUS user could have access to a dedicated cluster of user environments.

Thanks to this environment, RUS users can access Sentinel data, develop algorithms and process this data using their dedicated cluster and benefit from interactive support from RUS operators through services offered by the collaboration platform. Use of Sentinel Copernicus datasets as the main source of information is a prerequisite to access the RUS Service, but Copernicus Contributing Missions datasets as well as non-Copernicus data (EO and other data) can also be freely used and imported by the users.

Considering resource constraints, the RUS Service can be offered to every European user for a specific amount of time and including ICT/Expert/Data resources compatible with declared uptake objectives and current user demand. Three pre-defined work environments are typically proposed:

1-4 cores with disk space up to 1 TB for 3 months, 1-10 cores with disk space up to 10 TB for 6 months or up to 40 cores with disk space up to 50 TB for 6 months.

3. Building Knowledge

Training and outreach activities aiming to create a critical mass of Copernicus data users and focusing on a large portfolio of applications are side-supporting activities surrounding the RUS Service. Use of the preconfigured RUS VMs facilitates handling of such events. The use of the same configuration for each VM in fact discards any pre-existing difference between the used laptops, facilitating the smooth running of the event. Face to face events are organized to meet the requirements of small groups of users which receive specific training on EO theory and then are guided by the trainers, in the application of the case studies. VM remains accessible to the user for several months after the training, so as to allow repeating or completing the exercises (or performing other processing activities).

Monthly webinars aim to attract new potential users providing the instructions to perform some basic processing steps to exploit Sentinel data for a specific application. They are closed by Q&A sessions. The recorded webinars are made publically available for re-play on a dedicated YouTube channel. Users interested in repeating the exercise can either use FOSS installed on their computer or ask RUS for access to a VM with all the material needed to perform the exercise.

The theory lectures given during the face to face events are recorded and assembled with questions and multiple-choice answers and are made available on an E-learning portal. Scores are assigned for each completed course and badges are given to the users.

Tutorials to reproduce the results described above are being made freely available on the dedicated YouTube channel. Upcoming training events are announced on Twitter (@RUS_Copernicus) and Facebook. More information is available on RUS Training Resources portal.

References

[1] Knowelden R 2019 Sentinel Data Access - Annual Report 2018, 116 p.  
https://scihub.copernicus.eu/twiki/do/view/SciHubWebPortal/AnnualReport2018