BEYOND Ground Segment
The Hellenic Mirror Site Initiative

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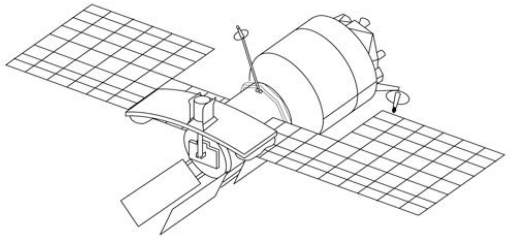
National Observatory of Athens



BEYOND

http://beyond-eocenter.eu/

https://sentinels.space.noa.gr/

ESA National Observatory of Athens Agreement
The Hellenic Sentinel Data Hub

The 1st Collaborative Ground Segment (Mirror Site) for Sentinel satellite missions was signed between ESA and NOA on 12 May 2014

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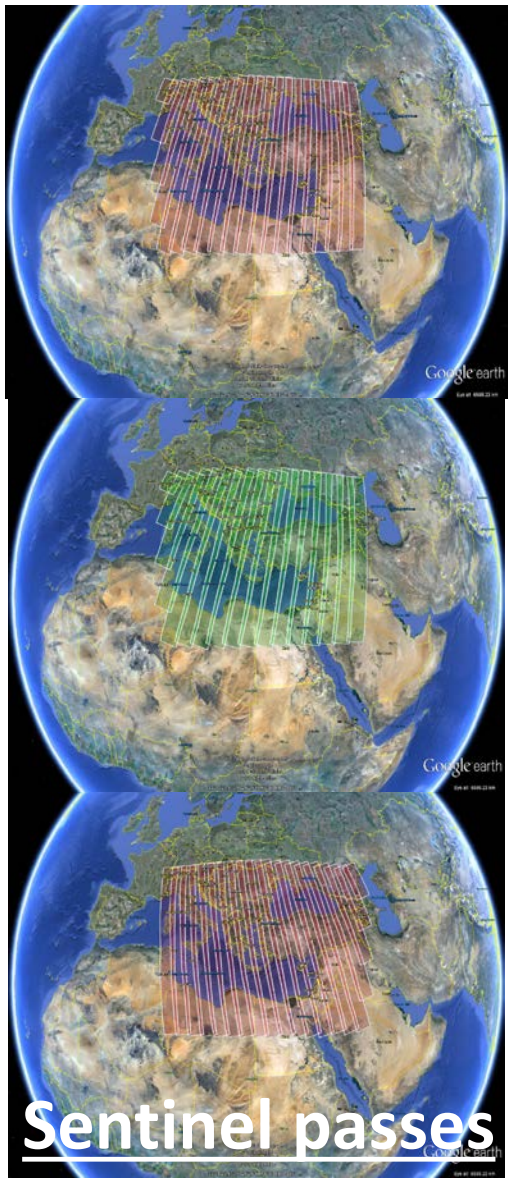
Scope of the Collaborative Ground Segment
The Hellenic Sentinel Data Hub (Greek Mirror Site)

- Built up an **additional pick up point** (Mirror Site) of Sentinel data at the premises of the **National Observatory of Athens (NOA)** in collaboration with the **Greek Research and Technology Network GRNET S.A.** the Greek Partner of the GEANT network.

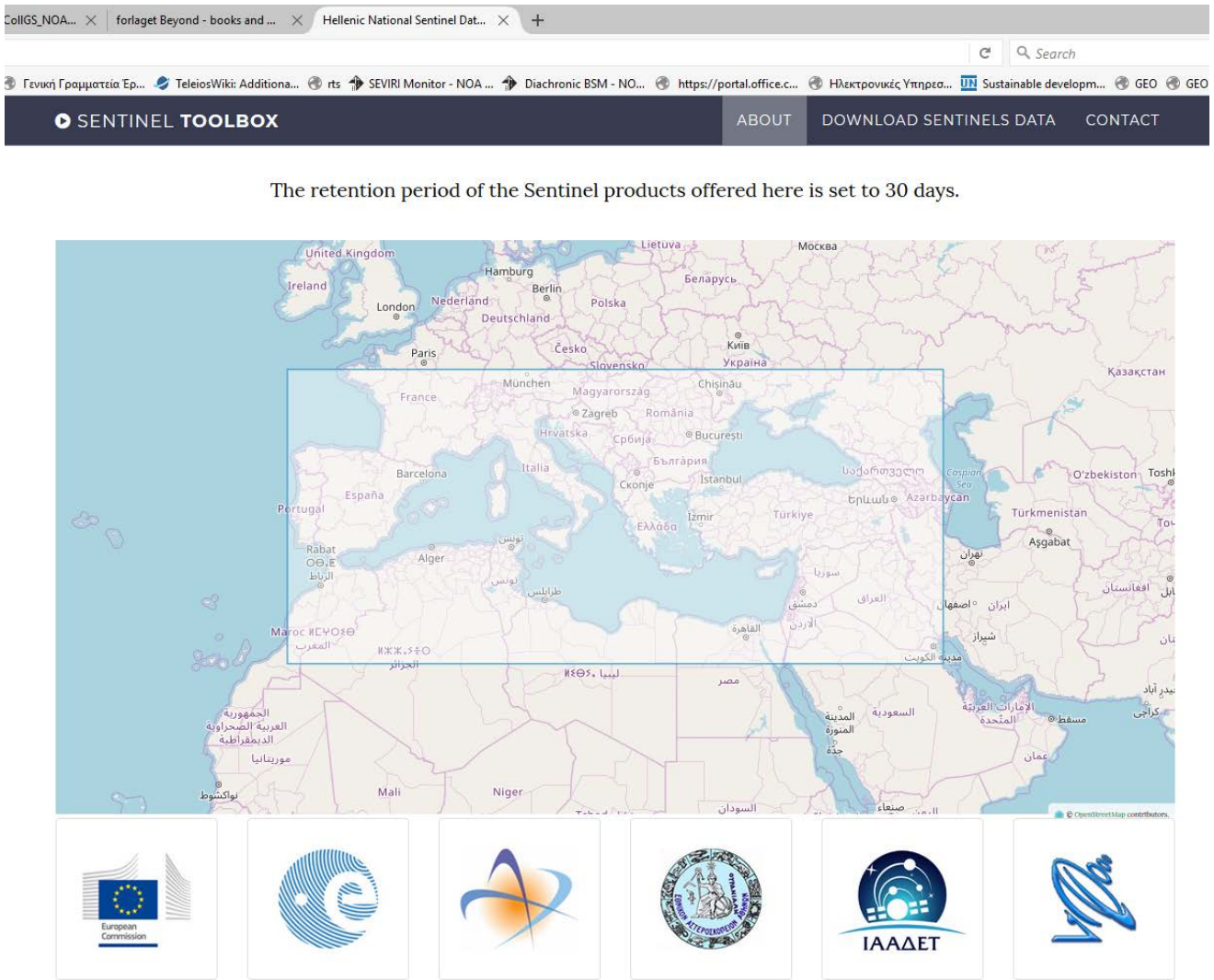
- **Disseminate Sentinel data and higher level Copernicus products** to the End User & scientific communities mainly at national level, but also to neighboring **South Eastern Mediterranean and Balkan countries** on the basis of the existing and/or future transnational needs and cooperation.

- The whole project is in line with the ongoing initiatives and strategic objectives for building at NOA a **Center of Excellence** for EO based monitoring of the Environment and Natural Disasters and processing of Space Data.

Geographic Area of Interest (AOI)



Sentinel passes



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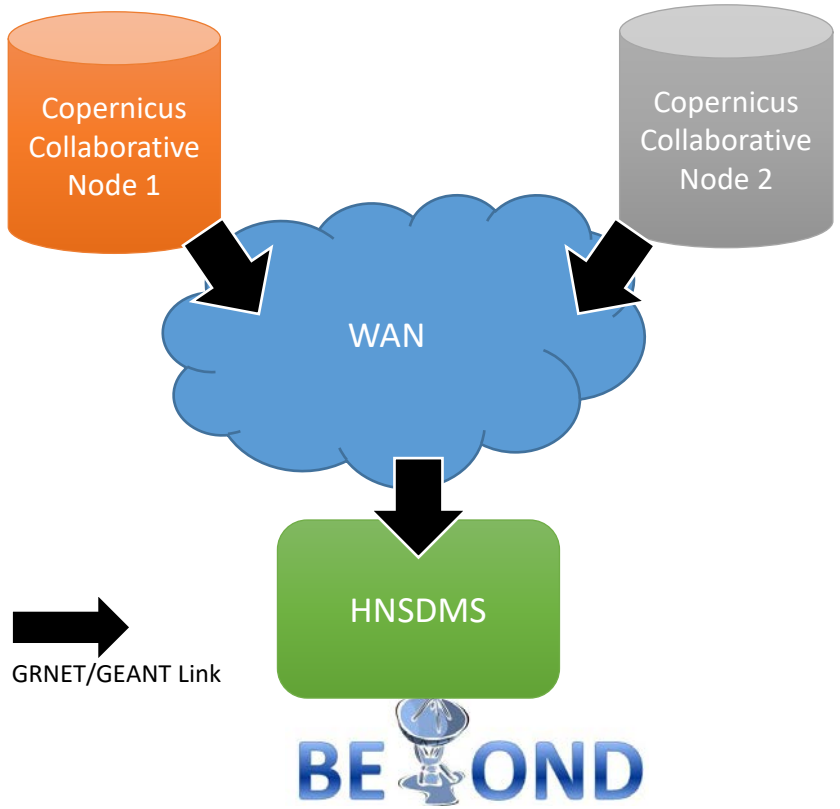
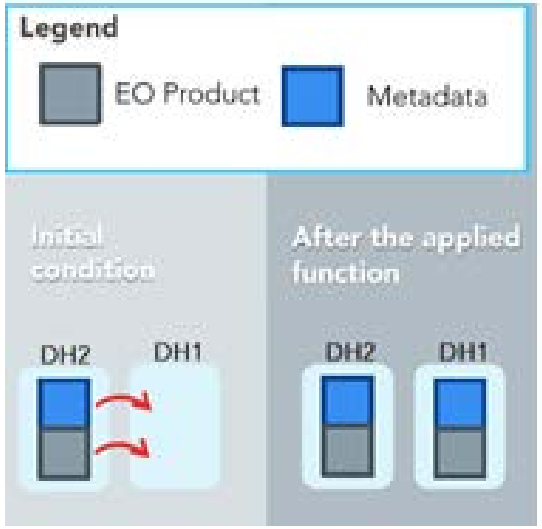
- HNSDMS is running on a high performance VM provided by GRNET with the following characteristics:
  - 10 Gbit/s NIC to connect with the Copernicus Collaborative Nodes
  - Debian Jessie 8.5, 64bit OS
  - 16 CPU cores
  - 16 GB RAM
  - 44 TB disk
  - Static, dedicated IPV4 & IPV6 addresses

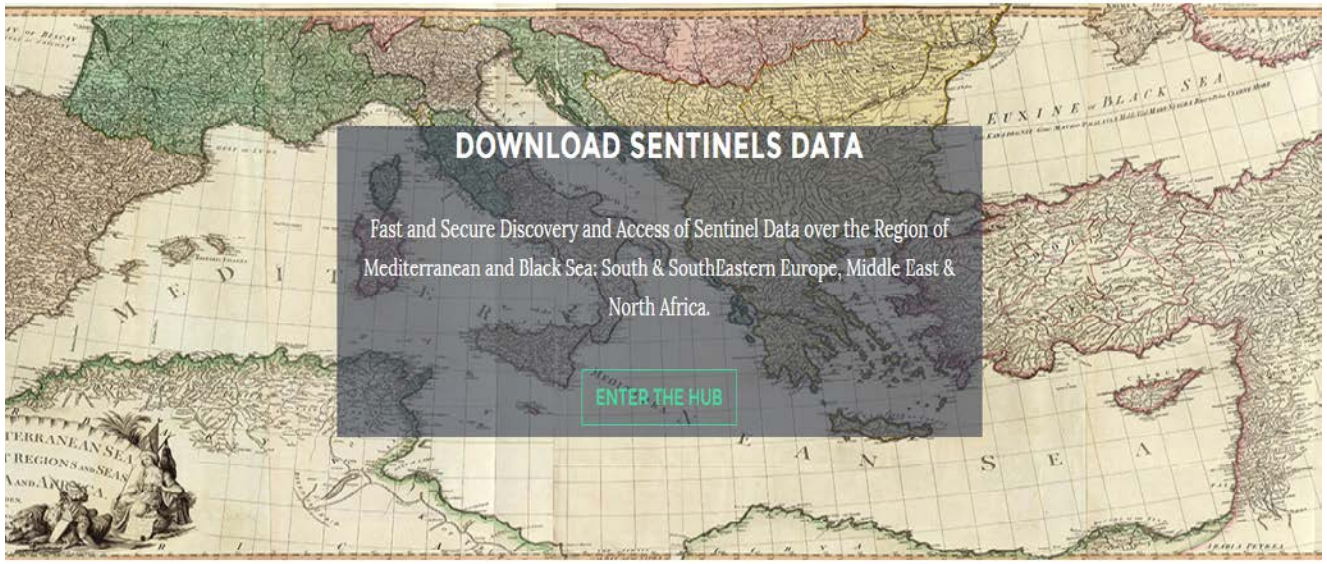


- HNSDMS is now based on the **DHuS software** developed by a Serco and GAEL Systems consortium under a contract with the European Space Agency - Funded by the EU and ESA.
- HNSDMS is now f**ederated with the Copernicus Collaborative Nodes**, making one step forward towards the recommended architecture for the Copernicus **IGS**, the so-called "Copernicus Integrated Ground Segment Data Access".
- HNSDMS synchronizes products from the Collaborative Nodes using the **OData Synchronizers** provided by the DHuS software.



The image above, that is taken from the manual of the DHuS software, shows the product synchronization between two Data Hubs.

HNSDMS
Landing Page



The Download section of the Landing page where the user can enter the data hub.

- HNSDMS is using the one page site design paradigm to provide its users with a simple and user friendly landing page with the basic information of the project and link to the data hub.
- The Landing page was build using state of the art frameworks such as:
  - Bootstrap
  - Bootstrap effects
  - OpenLayers

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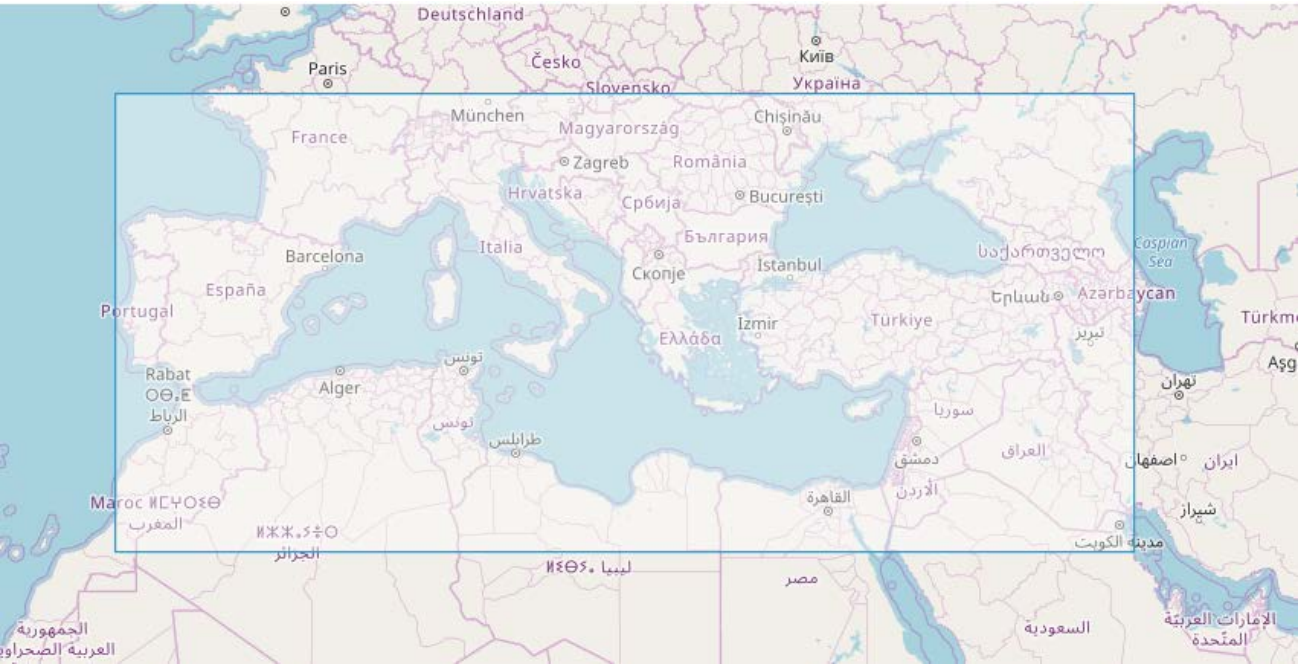
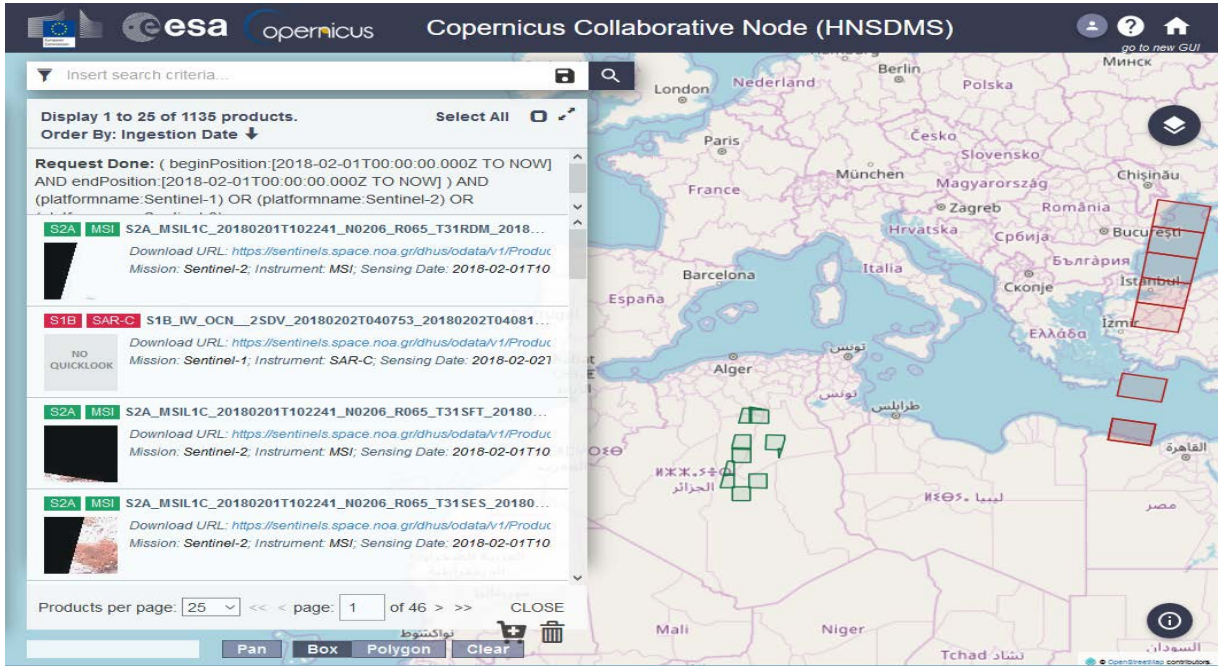
HNSDMS

- **DHuS upgrade** from a modified v0.10.3-4 to the **official v1.0 (31 Oct 2017)**
- **Synchronizes** products with remote copy from **ColHub Node 1 & 2** for a specified Area of Interest (below)
- **Rolling archive of 30 days** using a **44TiB NAS storage**
- **Plans to add Shibboleth** support for academic user authentication





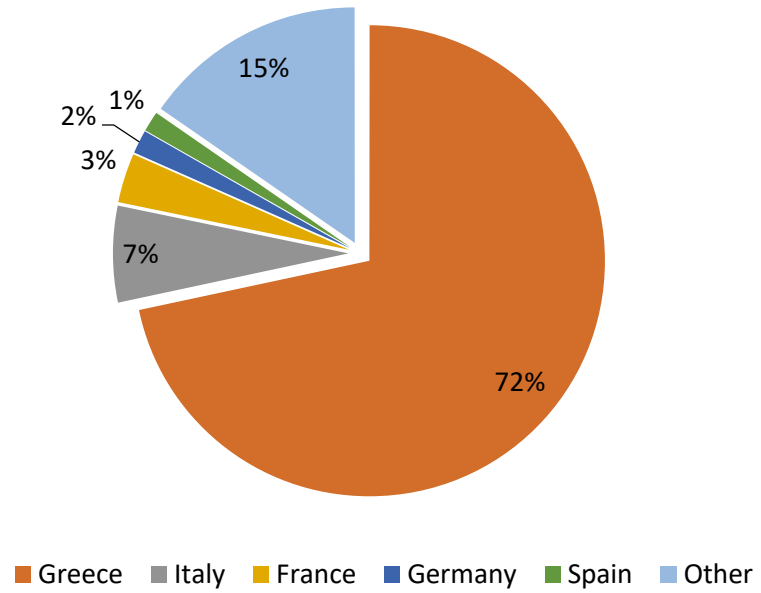
HNSDMS
Data Dissemination Statistics

In the last 6 months of operations

- New user registrations: **52**
- Total registered users: **501**

The Greek Mirror Site is advertised through the ESA portal to be known in larger audiences

Distribution of users per Country



- Most registered users are from Greece but also a number of mostly European countries such as Italy, France, Germany, Spain etc.

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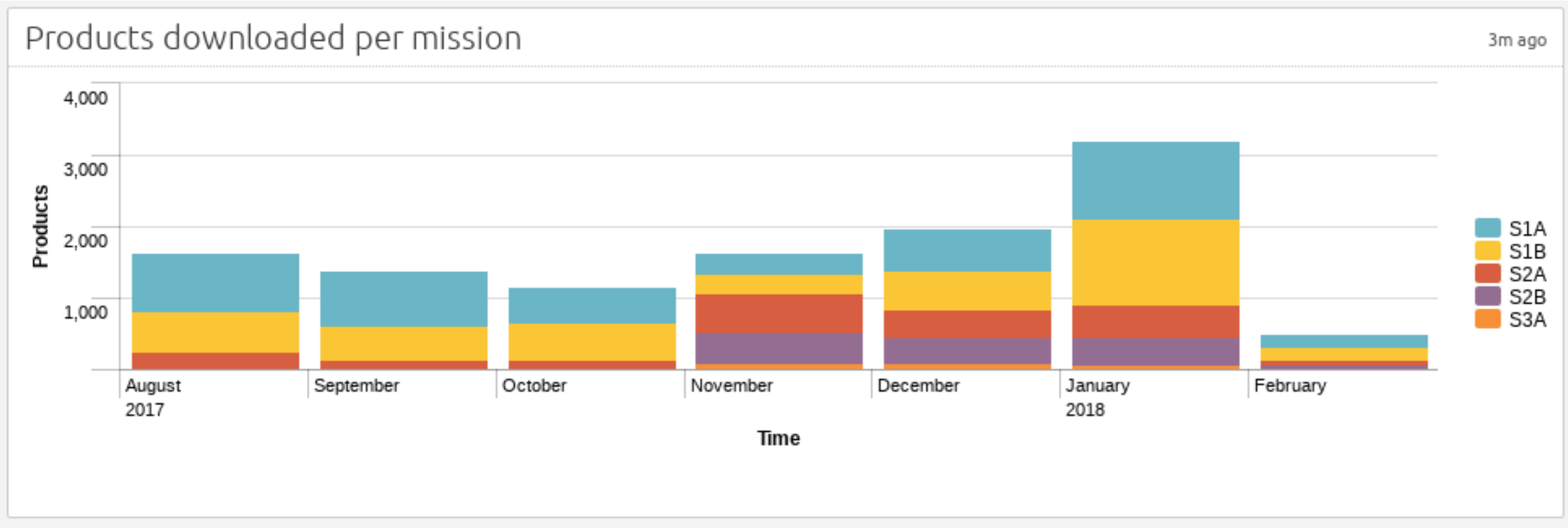
Mission interest over time for the past 6 months



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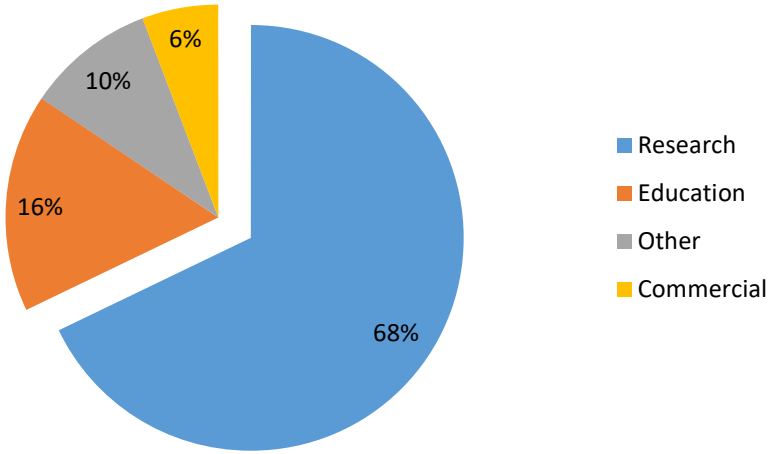
HNSDMS
Usage & Domain Distributions

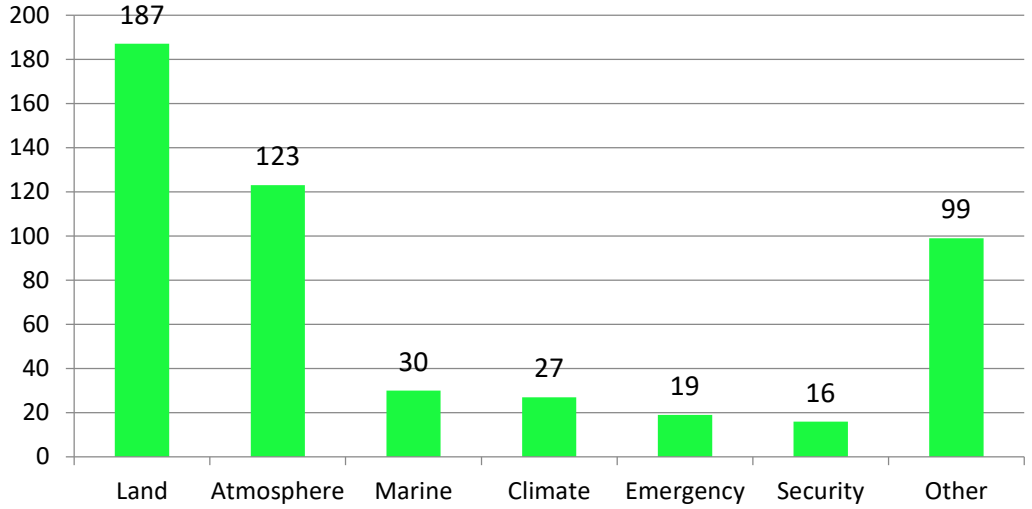
- The Hellenic Sentinel Data Hub is **popular** amongst the members of the **scientific community**

- **Atmosphere and Land application domains** are ranked between the main fields of Sentinel data use

Distribution of users per usage purposes



Distribution of users per domain of expertise



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HNSDMS Monitoring

- Using "**Splunk**" for the daily monitoring of HNSDMS.
- "Splunk" collects, indexes, and correlates real-time data from which it can generate graphs, reports, alerts, dashboards, and visualizations.

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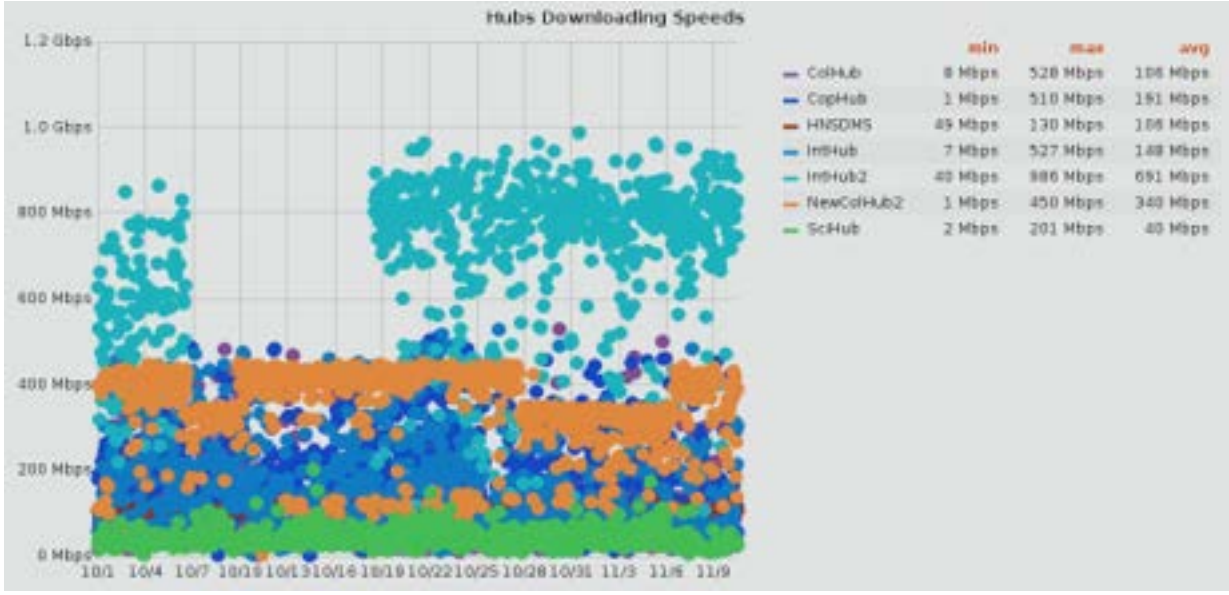
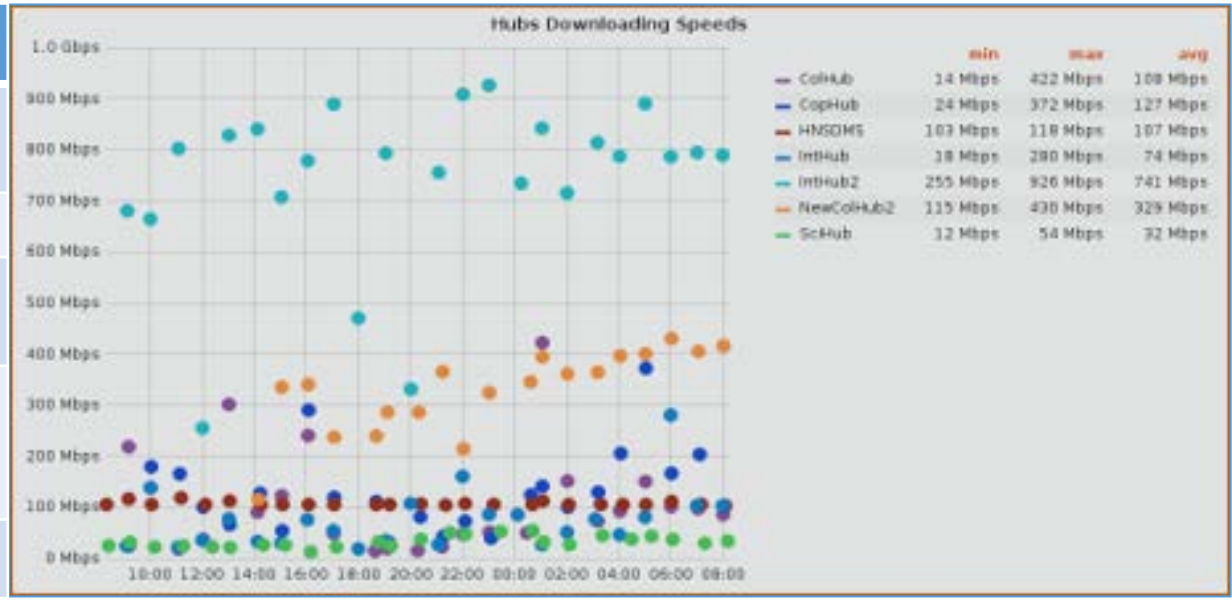
- A set of Python scripts running on a VM for monitoring key aspects of the following Data Hub services:
  - **HNSDMS**
  - IntHub2
  - ColHub Node 1 & 2
  - CopHub
  - OpenHub & APIHub
- Requests are made through GEANT.

What do we monitor?

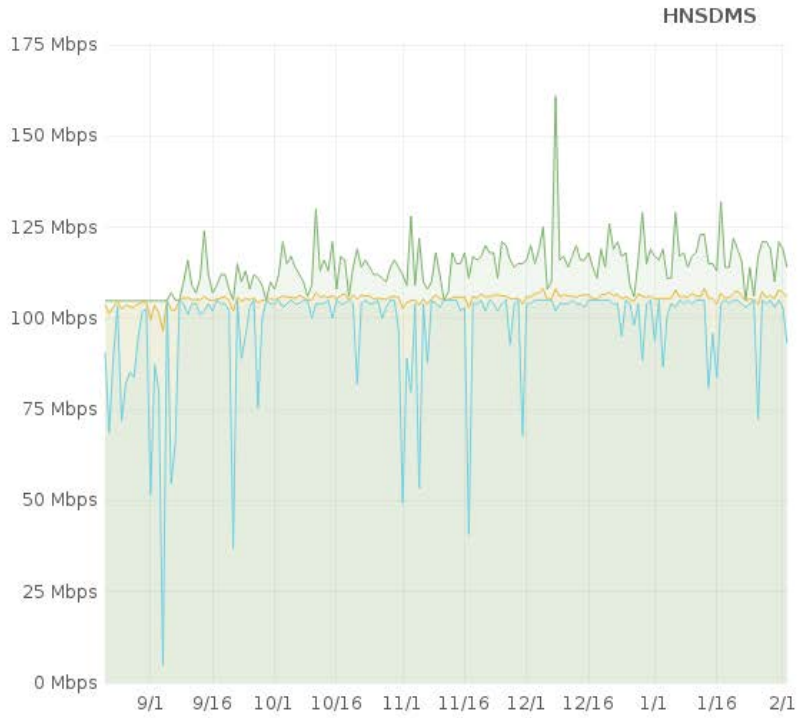
- Downloading Speed
- Integrity
- Number of published products
- Response times
- Availability
- Product Latency



Measurement	Frequency	Sample
Downloads & Integrity	Every hour	one download
Response times	Every three hours	one hundred requests of each type
Availability	Every half an hour	two requests for each interface (OData, Opensearch, Web interface)
No of published products	Every day	all the products published from the previous day until the current day based on the creation date
Product latency	Every two hours	five products from each product type

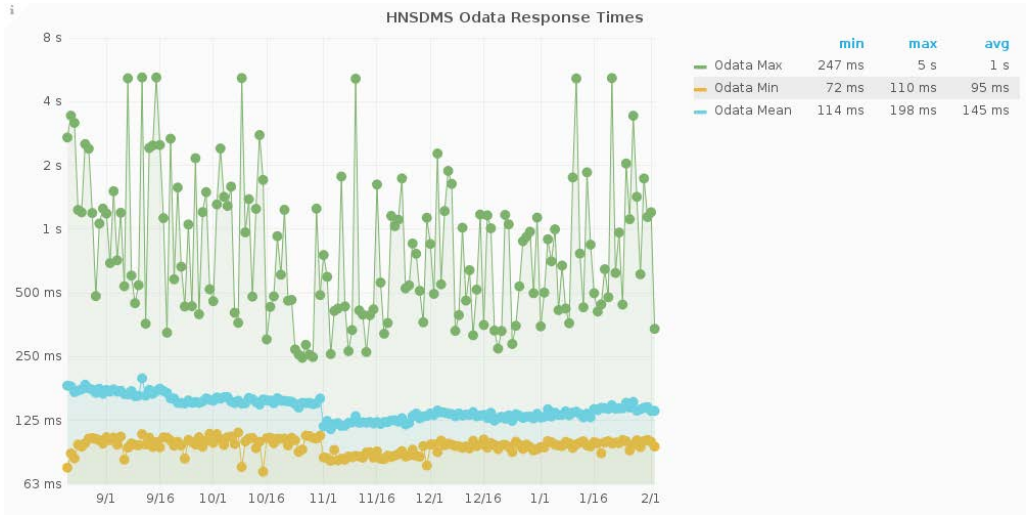


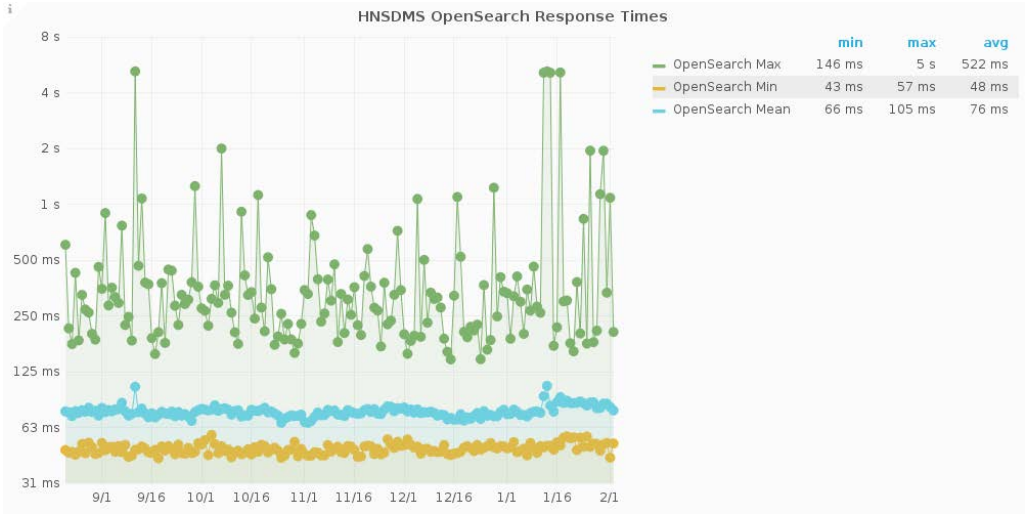
Measured downloading rates from HNSDMS

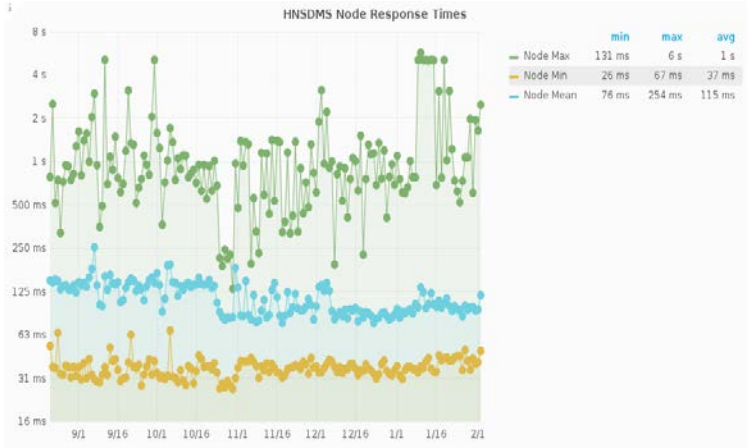


	min	max	avg
Max Speed	104.8 Mbps	161.0 Mbps	114.0 Mbps
Mean Speed	96.5 Mbps	108.3 Mbps	105.4 Mbps
Min Speed	5.0 Mbps	105.0 Mbps	97.9 Mbps

Response times of OData and OpenSearch APIs over time (HNSDMS)







The **EO Toolkit** Linux image

The EO Toolkit Linux image on okeanos

okeanos

- **okeanos** is GRNET's IaaS cloud service. It enables users from the Greek Research and Academic Community to create VMs with only a few clicks.
- A custom Linux image named **EO Toolkit** was created on the okeanos service
- **EO Toolkit** is a customized Ubuntu Linux image, preloaded with multiple powerful GIS tools and scientific libraries.
- okeanos has a global version of the service for the rest of the European Academic Community. EO Toolkit will be also included in okeanos-global.

Benefits of using EO Toolkit

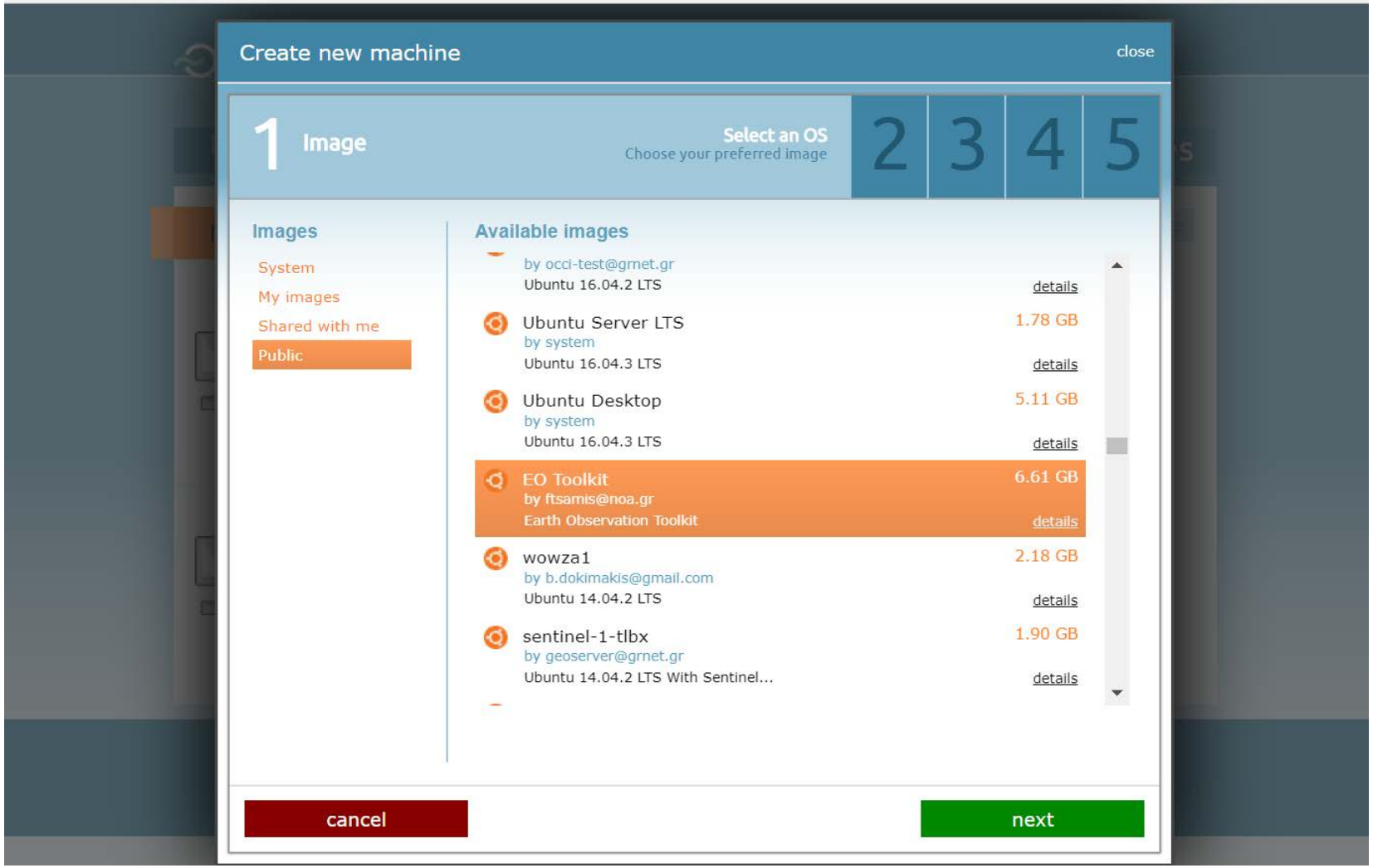
- Easy and fast deployment with only a few clicks required
- Multiple tools already configured and ready to use
- VMs can be resized dynamically according to the project needs
- Fast downloading speeds from HNSDMS and other hubs, independently of the user's computer connection speed
- Fast processing directly on the cloud, without the need of a fast local computer
- User can delete and create a fresh EO Toolkit VM within minutes

The EO Toolkit Linux image on okeanos

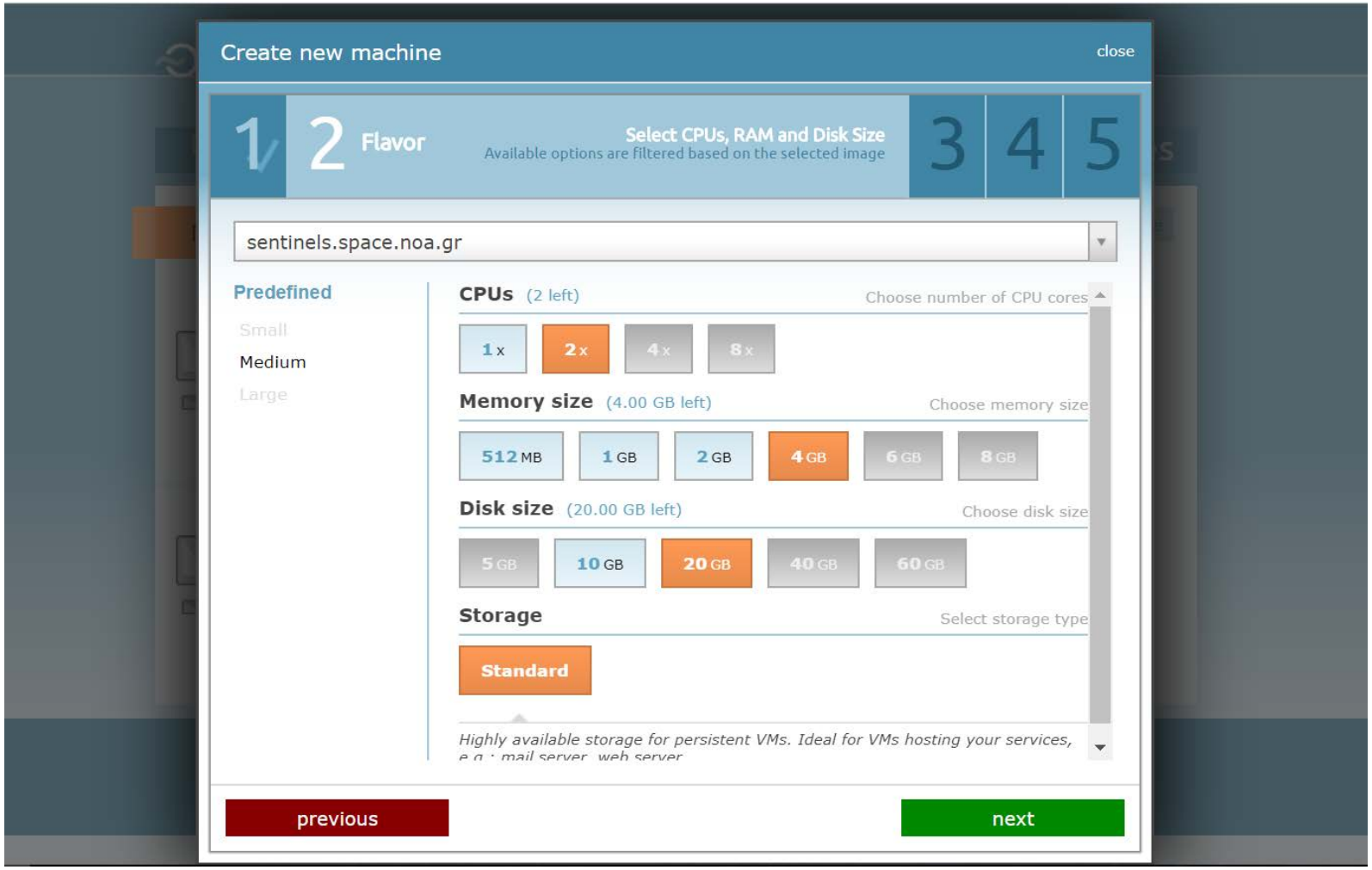
- EO Toolkit is preloaded with a set of powerful free and open source GIS tools such as:
  - **ESA SNAP v6.0 (with all available toolboxes)**
  - QGIS
  - GRASS
  - SAGA
  - GDAL utilities
  - Python bindings for the above (where available) and other Python libraries
- Desktop shortcuts to the HNSDMS and the OpenHub
- The example product downloading script provided by the OpenHub page is included

EO Toolkit VM creation procedure

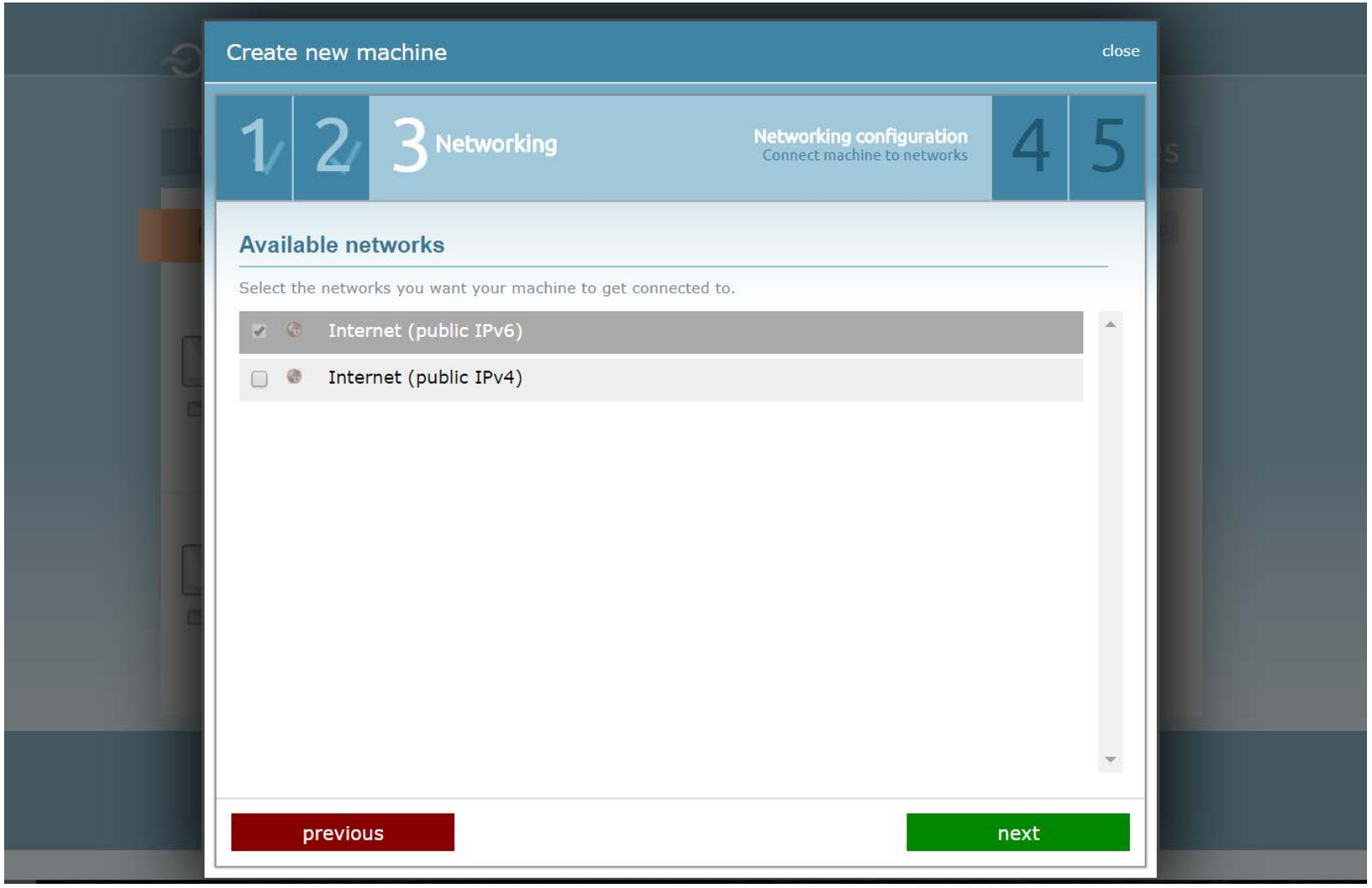
User selects to install the EO Toolkit image



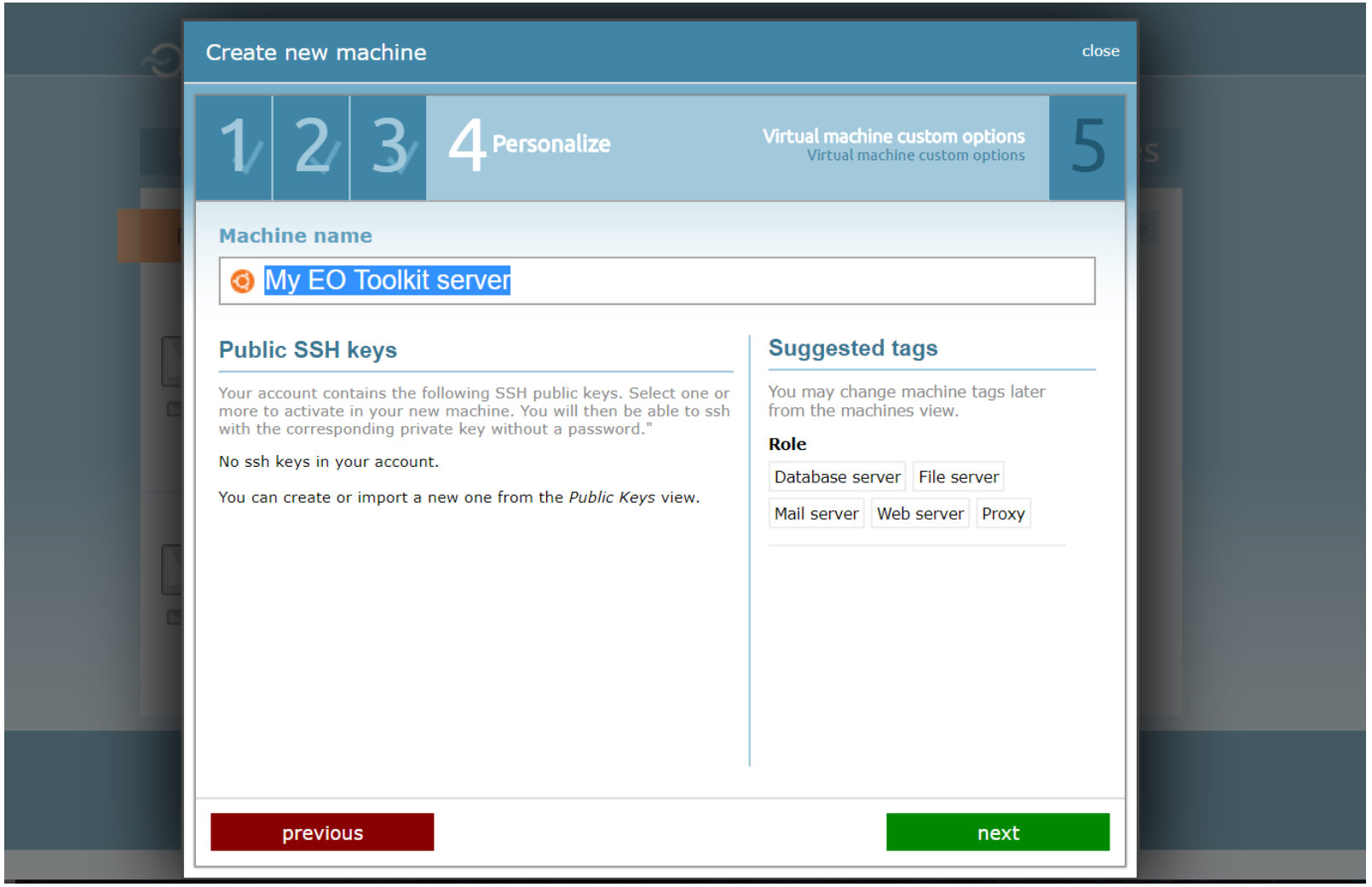
User chooses the resources of the new VM



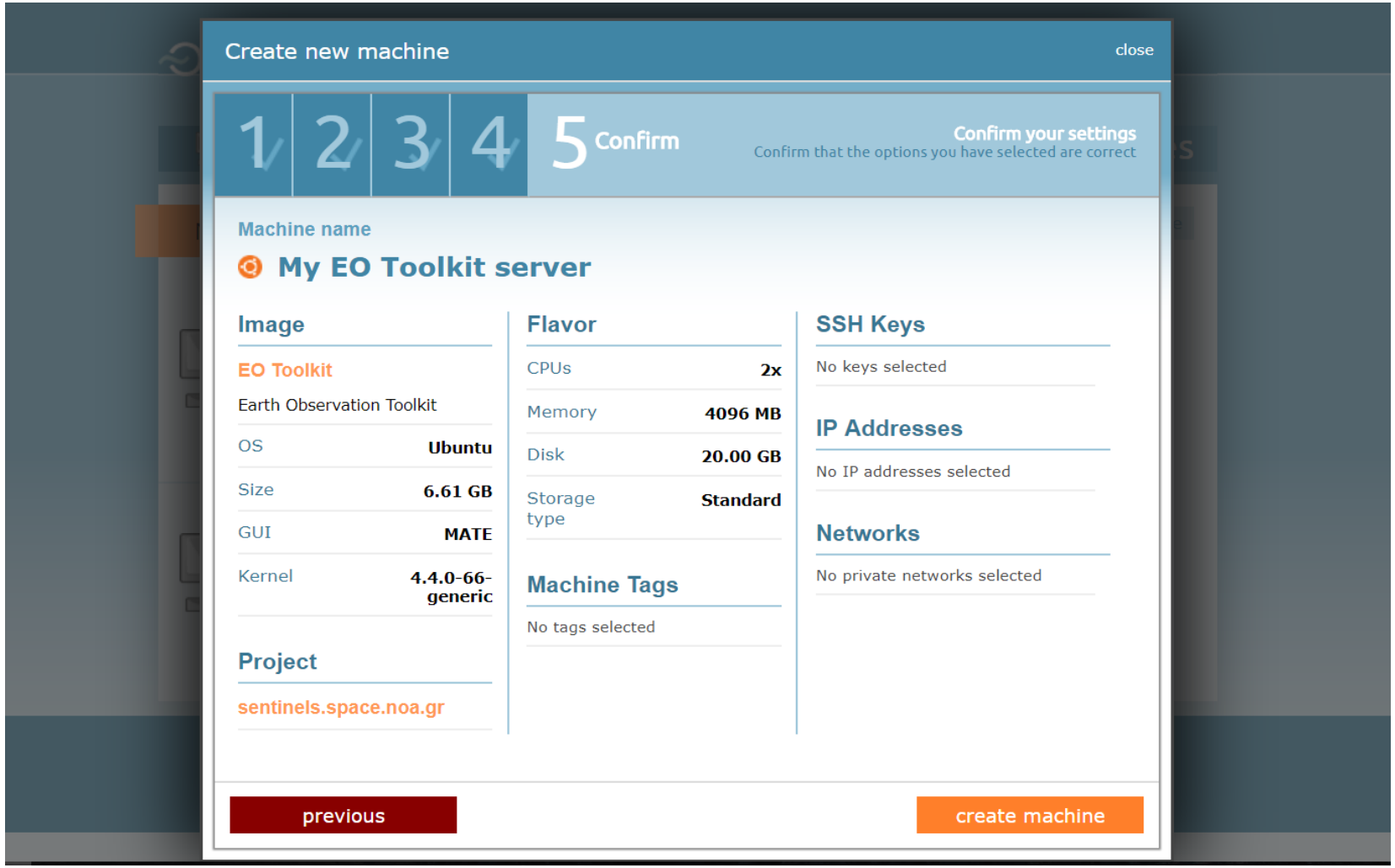
User assigns IP addresses to the new VM



User selects the name of the new VM

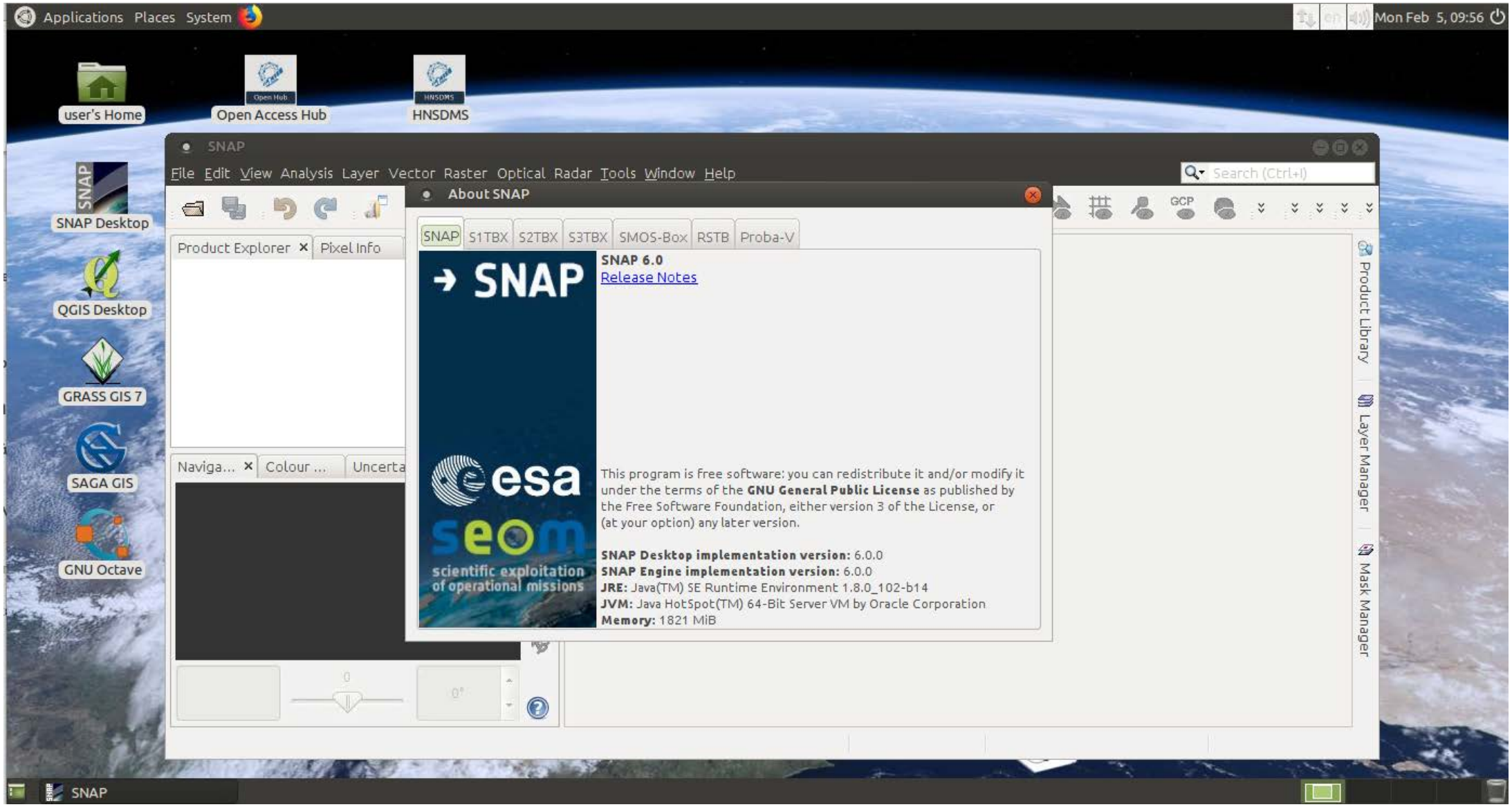


Final step to create the VM



The newly created VM can then be directly accessed through SSH or X2GO

The EO Toolkit Linux image on okeanos



- Integrate again the remaining **extra functionalities** of the “old” Mirror Site such as:
  - Shibboleth, the world's most widely deployed federated identity solution
  - The Luciad environment
- Increase the Mirror Site’s **archive** in order to provide a bigger rolling archive. Introduce a **multiple granularity** rolling archive policy (e.g. different rolling archive policy for different geographical location).
- Introduce a more distributed architecture, with more than one VMs, in order to increase availability and allow for seamless maintenance activities.

Thank you and

any questions?