

**APPLICATION PROPAGATION ENVIRONMENT (APEX)**

Communication & Outreach Report

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# Introduction

# APEx Community Engagement

This section outlines the strategy developed for engaging with the EO community and promoting the APEx services. It covers the objectives, target audiences, and communication channels employed to optimize outreach efforts.

## APEx Portal

The APEx portal, developed as part of WP3, serves as the primary access point for the community to engage with APEx and utilize its services. This website provides comprehensive information about the project’s goals and offers access to the services provided by APEx. The portal includes detailed information on:

* **Project Overview**: An introduction to the APEx project, including its objectives and goals.
* **Service Overview**: A detailed description of the instantiation and propagation services provided by APEx. Each service has a dedicated page with additional information.
* **Data and Algorithm Catalogue**: Access to a catalogue containing the results of onboarded APEx projects.
* **User Forum**: A space for community interaction and discussion.
* **Technical Documentation**: Access to comprehensive technical resources, including tutorials, manuals, and other relevant materials.

In addition to these features, the APEx website includes a dedicated news section for disseminating important updates on the project, such as new features, scheduled maintenance, project onboarding, and showcases.

A use cases section will also be integrated into the website, highlighting the APEx onboarded projects. The purpose of these use cases is not only to provide deeper insights into a project’s outcomes but also to demonstrate how APEx services were utilized, with the aim of encouraging the reuse of project results and promoting the APEx services.

To monitor user engagement on the APEx portal, the consortium has implemented Google Analytics. This tool allows the project team to track visitor activity, including the most visited pages, providing valuable insights for improving the overall user experience and APEx service offering.

# Project Interactions

## EarthCODE

The EarthCODE project (<https://earthcode.esa.int/>) focuses on advancing FAIR and Open Earth System Science by leveraging existing technology and platforms. This initiative aims to foster innovation and collaboration within ESA Science projects by providing collaborative development tools, resources, community guidelines, and documentation. One of the key objectives of EarthCODE is to establish a mechanism that ensures the long-term availability and continuous updating of geophysical products developed through ESA Science Clusters.

Although EarthCODE primarily targets projects centred on generating scientific results, it shares significant conceptual and operational similarities with APEx. Both projects prioritize the long-term preservation of project outcomes and share common elements such as catalogues, algorithms, workflows, processing environments, and reusable building blocks.

Recognizing this overlap, both EarthCODE and APEx have identified an opportunity for collaboration and knowledge exchange. By aligning their efforts, the projects aim to enhance support for participating initiatives and facilitate a seamless transition between the two frameworks. This collaboration could lead to several interesting potential use cases, including:

* **Transition from science to service**: Algorithms developed with EarthCODE tools and resources could be easily adapted into APEx-compatible services, thanks to conceptual and technological compatibility.
* **Integration of EarthCODE and APEx results**: By standardizing the storage and processing of project results across both platforms, outcomes from EarthCODE and APEx onboarded projects could be integrated within a unified processing environment.

To further strengthen this collaboration, the APEx, EarthCODE, and EOEPCA+ consortia have established a bi-weekly meeting schedule. These meetings serve as a forum for in-depth discussions on common topics, allowing for potential alignment and the exchange of knowledge and experiences. Key discussion topics include:

* **Algorithm Definition**: Exploring the use of metadata and protocols, such as OGC Records versus STAC, for defining algorithms.
* **Common Building Blocks**: Investigating the usage of shared components as defined by EOEPCA+.

This collaborative approach aims to improve project support and create a more integrated ecosystem, ultimately benefiting the user communities of both EarthCODE and APEx.

## EOEPCA+

EOEPCA+ (https://eoepca.org/) envisions streamlining access to and processing of EO data across multiple platforms and diverse networks. The project aims to enhance interoperability by developing a complementary set of innovative Building Blocks (BB). These Building Blocks utilize open-source technologies from initiatives such as OpenEO, EOEPCA, and Pangeo. By using standardized geospatial interfaces and open standards, EOEPCA+ seeks to consolidate and harmonize a federated EO cloud and platform offering that can support common use cases within the EO Science, Research and Development (R&D), and applications communities. The central objective of EOEPCA+ is to "bring the user to the data," by moving user exploitation to hosted environments with co-located computing and storage.

EOEPCA+’s emphasis on open standards and the reuse of existing cloud-based platforms aligns closely with the goals of APEx. As EOEPCA+ focuses on defining Building Blocks across EO projects, APEx sees great value in establishing bidirectional communication between the two initiatives. This collaboration ensures that APEx can leverage Building Blocks, thereby maximizing interoperability. Additionally, it also allows APEx to provide direct feedback on the usage and definition of these Building Blocks, benefiting not only both projects but also other initiatives interested in integrating existing Building Blocks or becoming APEx-compliant algorithm hosting platforms.

The collaboration between EOEPCA+ and APEx is supported through two key channels. Firstly, both VITO and Terradue are actively involved in both projects, facilitating the exchange of knowledge and experience. Terradue, with its extensive participation in EOEPCA initiatives, has a comprehensive understanding of the existing Building Blocks and their future development, ensuring alignment between EOEPCA+ and APEx. Secondly, APEx maintains a dedicated bi-weekly meeting with the EarthCODE and EOEPCA teams to align on common concepts and technologies. Further details on this collaboration can be found in the previous section.

## Stakeholder Engagement Facility

The Stakeholder Engagement Facility (SEF; <https://esa-sef.eu/>), funded by ESA, aims to expand stakeholder engagement for projects supported through the Applications Element of the Science for Society programme. The SEF's primary role is to implement a systematic knowledge and capacity-sharing service across various ESA-funded Applications projects, enhancing and extending engagement with diverse stakeholder communities through tailored approaches.

Collaboration between SEF and APEx is both logical and beneficial on multiple fronts. Firstly, both initiatives target similar types of projects. Secondly, the services provided by each project are highly complementary. While APEx offers technical and conceptual support to help projects create their results and ensure long-term availability, SEF focuses on engaging stakeholders and promoting the reuse of these results within the broader community. SEF is therefore considered crucial for the successful uptake of the project outcomes onboarded onto APEx.

Throughout the APEx project, the consortium will support SEF activities by offering instantiation and propagation services. APEx will ensure that application algorithms remain available as on-demand services and will provide the necessary tools and services to facilitate knowledge sharing and management.

### User Categories

APEx offers a comprehensive suite of services that significantly enhances SEF's ability to engage stakeholders, improve decision-making support, ensure operational efficiency, and promote sustainable impact. The value proposition of APEx to SEF can be articulated through three defined user categories: Data Visualization/Exploration Users, Data Analytics Users, and Data Processing Users. Each category benefits from APEx’s tailored services, ensuring SEF can effectively engage a broad spectrum of stakeholders.

#### Data Visualization / Exploration Users

This user group is mainly interested in exploring EO data, primarily through visualizing datasets and enabling interactive exploration. These features are designed to spark interest and introduce users to the available datasets.

Users in this category can possess a wide range of expertise, both thematically and technically. Given the focus on data exploration, the solution should provide a user-friendly and intuitive interface catering to the skill levels of the users. While some EO datasets may require more thematic knowledge to fully understand their purpose, the solution should also offer contextual information, enabling users to easily comprehend what is being visualized.

The APEx Dashboard service largely supports this user category. It provides an interactive visualization of EO data (both raster and vector), allowing users to explore data and perform basic interactions. These interactions may include visualizing multiple layers on a map, displaying charts with pre-calculated data, engaging with curated storytelling, and exploring data over time.

#### Data Analytics Users

Users who find an EO dataset of interest, either through prior experience or as a Data Visualization/Exploration User, may wish to perform their own analytics on the dataset. This could include executing custom statistical analyses and manipulating data to extract meaningful insights.

This category of users is typically more experienced, possessing both basic to advanced thematic and technical expertise. Understanding the data being analysed requires a solid foundation in EO data, as well as technical knowledge of how to process and analyse common EO data formats. These users are often familiar with programming languages like Python and R, and tools such as Jupyter Notebooks and QGIS.

APEx can support these users through the Interactive Development Environment (IDE) and User Workspace services. The IDE provides an online coding environment, offering both cloud resources and necessary tools for processing and analysing EO datasets. The User Workspace complements this by providing a centralized space for storing results and facilitating collaboration with others.

#### Data Processing Users

The final category comprises data processing users, who aim to use existing algorithms or workflows to generate their own products using a cloud processing platform. This differs from data analytics, as these users intend to create entirely new datasets. This could be useful when existing datasets are limited in geographical or temporal extent, or when specific parameters need adjustment.

These users are considered the most advanced, requiring not only a deep understanding of the data but also of the underlying algorithms and technical expertise to execute them. APEx supports these users by providing access to the tools needed to execute algorithms, as well as ensuring these algorithms adhere to interoperability standards that allow for consistent and user-friendly execution. The APEx IDE and User Workspace services offer a cloud-based environment that includes the necessary tools and storage for data processing activities and fosters collaboration.

Additionally, through its Interoperability and Compliance guidelines, APEx ensures that onboarded algorithms can easily be executed via openEO or as Application Packages. Both technologies offer a wide range of tools that support algorithm execution on existing cloud platforms optimized for large-scale data processing.

## Other ESA projects

# Outreach Activities

This section provides an overview of the various outreach activities carried out by the APEx project, as detailed in Table X.

Table 1. Overview of APEx outreach activities

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| **Date** | **Type** | **Description** | **Reference** |
| 30/04/2024 | Blog post | Introduction of the APEx project. | <https://remotesensing.vito.be/news/new-esa-apex-initiative-will-boost-reusability-eo-based-research-outcomes> |

