

# Envisat User Services

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## Introduction

Envisat will be the first ESA Earth-observation mission to offer dedicated user-community services via the Internet. Individual users, distributing entities and value-adding companies will have easier and faster access to Envisat products, data and information (catalogue meta-data, browse images, processing algorithms, product descriptions, etc). The reduction in manual intervention will also improve the efficiency of both the Envisat Order Desk and Envisat Mission Planning operators.

\* SERCO SpA support to ESRIN

**The User Services will play a major role within the Envisat Payload Data Segment (PDS). Based on Internet technologies and a distributed architecture, they provide efficient access to Envisat products and information and offer a wide variety of on-line services to the user community.**

The Envisat User Services have been developed and tested via an industrial contract by Datamat, under the responsibility of the Envisat PDS Prime Contractor Alcatel Space. The system integration and validation has been tested both at Datamat's premises and at ESRIN. Additionally, ESA has conducted its own testing with the help of the Belgian company RHEA.

## The User Services

### User and distribution policy

There are two categories of use defined in the Envisat Data Policy, as laid down in February 1998:

#### Category 1

- Research and applications development supporting the mission objectives
- Research on long-term issues of Earth-system sciences
- Research in preparation for future use
- ESA internal use for calibration, validation, and quality assurance.

#### Category 2

- All uses not falling under Category 1, including operational and commercial use

The Product Distribution Policy is illustrated in Figure 1, which shows the data flow for orders and the product-distribution flow depending on the category of use.

The implementation of the Envisat User Services has been driven both by the Envisat Data Policy and the high-level requirements of the High-Level Operations Plan (HLOP).

### Available services

Table 1 provides a list of services offered to users, some of which are freely accessible,



Figure 1. Envisat product distribution policy

Table 1. List of User Services

Category	Service	Description	Availability
Information Gathering	• Directory & Guide	• Products & services information	• free
	• News & Bulletin Board	• What's new, messages from users	• free
Product Search and Preview	• Inventory	• Catalogue of archived products	• free
	• Browse	• On-line preview for AATSR, ASAR, MERIS	• free
	• Software tools	• Local inventory & browse	• free
Product Order	• Archived products	• All products already in archive	• registered
	• On-demand products	• Child products, scenes	• registered
	• Future products	• Products to be acquired and processed	• registered
	• Auxiliary data	• For reprocessing and quality control	• registered
	• Subscription	• Systematic reception over a given timeframe	• registered
Other Orders	• Special acquisition	• For Stations only	• registered
	• Software tools	• Product visualisation	• registered
	• Directory & Guide updates	• For local consultation	• free
User Administration	• Inventory updates	• For local consultation	• free
	• User registration	• Request for a registered account	• free
	• Account information	• Personal data, user quota, ...	• registered
	• Order information	• Order status, cost, ...	• registered

while others are reserved for registered users. In particular, product ordering is restricted in order to respect the Envisat Data Policy.

**Distributed User Services architecture**

The Envisat User Services are characterised by a distributed architecture, offering the same services to the users through several access points in a fully transparent manner. There are three types of facilities:

Facility name	Function
USF (User Service Facility)	Web access point from the Internet
USCF (User Service Coordination Facility)	User and order management; coordination of the USFs
INV (Inventory)	Catalogue of products archived in the PDS

There is one of each facility in every Payload Data Section Centre and Ground Station, except the USCF which is installed only in the Payload Data Control Centre at ESRIN, Frascati, Italy. The USFs and INV are currently installed in several centres distributed across Europe (Fig. 2):

- Processing and Archiving Centres (PACs)
- Payload Data-Handling Stations (PDHSs)
- Payload Data Control Centre (PDCC).

The USCF makes the exchange of information relating to the user and order management between User Services Facilities possible. Because information is exchanged between the User Services Facilities and the Inventories, the user has a complete view of the payload data section regardless of which he/she is connected to. Users may access any USF and will have access to exactly the same services.

Those facilities have multiple interfaces with several other PDS facilities: the Monitoring and Control Facility, which is in charge of the

mission planning, the various processing and archiving facilities (PFHS, ARF, and instruments processors), the Centre Monitoring and Control facilities, the Dissemination Facility and the Product Quality Facility. The order requests are automatically sent by the USF to the Monitoring and Control Facility via the USCF for the production of the Payload Exploitation Plan, which is transmitted to the FOS Mission Planning facility at ESOC. This data flow is illustrated in Figure 3.

**User interfaces**

In addition to the traditional communication media between the users and the Envisat Order Desk, users may access the User Services via the USF in two ways (Fig. 4):

- Interactively, with a Web browser
- Non-interactively, using a dedicated program on his/her computer to exchange information with the USF over the Internet ('computer-to-computer' access).

In terms of catalogue queries and order requests, both the interactive and non-interactive methods of access offer the user community exactly the same services.

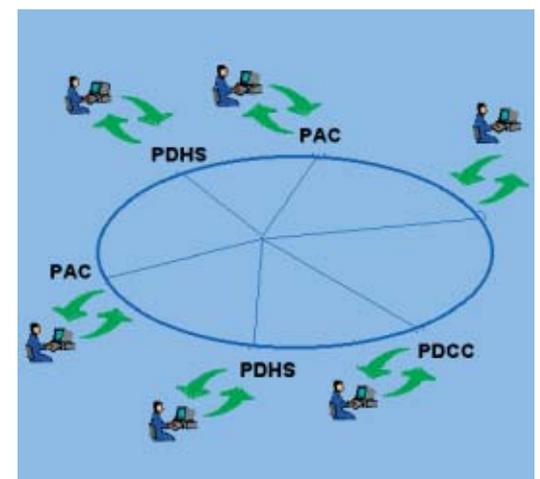


Figure 2. The distributed architecture

*The interactive user interface*

This man/machine interface has been developed using the latest web technologies, allowing on-line users to access the Envisat User Services via their Web browsers. It has also been harmonised with two other existing user interfaces, 'EOLI' and 'EOWEB', which are the front-ends to the ESA MUIS (on-line multi-mission catalogue) and DLR ISIS information systems, respectively. Currently, 17 ESA and non-ESA mission instruments are referenced by the MUIS catalogue, to which the Envisat mission instruments will be added. MUIS contains more than 7 million entries, 200 000 passes of browse images, and provides access to this information within a few seconds. MUIS is accessible via <http://odisseo.esrin.esa.it/eoli/>.

The core of the user interface is the EOLI Java applet. In operation for several years, this software module has been refined and improved significantly with the help of feedback from the user community. In the same spirit, the Principal Investigators participating in the rehearsal of the Envisat Calibration and Validation campaign also tested the Envisat user interface, and many of their comments and ideas have already been implemented.

The interface has been designed to allow the user to perform almost all operations through a single WWW window, using one of two interface levels provided:

- 'Advanced' for advanced users, which has features specific to Envisat instruments
- 'Standard' for most users, which is fast and easy to use.

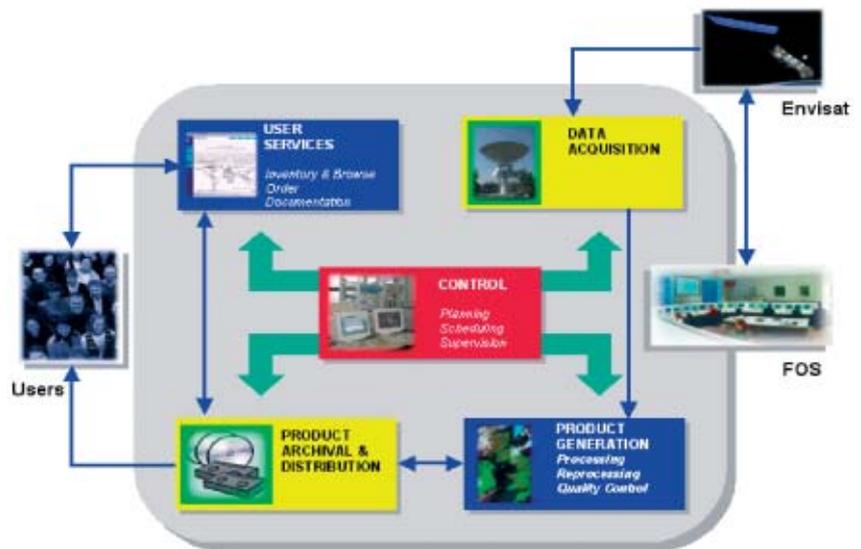


Figure 3. Interface overview

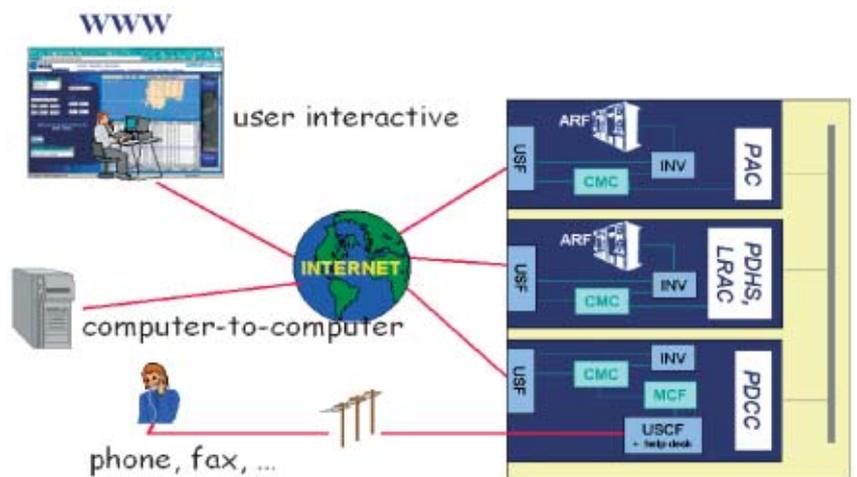


Figure 4. The user interfaces



Figure 5. The harmonised user interfaces of Envisat and MUIS

*The non-interactive computer-to-computer interface*

The USF architecture allows computer programs running on the client's platform to automatically send catalogue queries, receive answers from the USF, and submit requests for orders. The dialogue between the client's computer and the USF is established via the Internet. The Belgian company RHEA has developed a library of routines, written in PERL, that can be run on the user's side. This library software package is available on request and can also be downloaded via the interactive user interface. Using this PERL library is quite simple, as the user specifies the query parameters inside an ASCII text file, using the 'parameter = value' formalism (PVL). Responses to queries are sent back to the calling client platform either as an HTML or an ASCII file.

**User Services functions**

*Directory and Guide*

This service provides information on the Envisat products (availability, format, location, algorithms, auxiliary data, best images) as well as information on the Centres (addresses, telephones, faxes, e-mails, activities descriptions, links to WWW home pages), as indicated in Figure 6.

images. Within each PDS Centre and ground station, the INV facility contains meta-data describing the products stored in the Local Archive Facility. The Inventory at the Payload Data Control Centre in Frascati has a particular role in that it duplicates the contents of all the other Payload Data Segment INVs. A query issued from a single USF is passed to all of the inventories. The responses from all of the INVs are then grouped and presented to the user in a single HTML or ASCII file.

In fact, when issuing a query through the USF, the user can access not only the INV meta-data corresponding to the archived products, but also information on future acquisitions already planned, or ones that could be scheduled on user request. This allows the user to formulate in his/her query time-windows that overlap both the past and the future. Query parameters may be standard (product type, time, geographical area) or specific, and more detailed parameters are contained within the MPH and SPH products, such as swath and polarisation for ASAR. Figure 8 shows the Catalogue Query and Responses window.

Browse products (AATSR, ASAR and MERIS) are systematically converted into browse JPEG images when received by the ARF. These browse images are then forwarded to all the PDS User Service Facilities. Each facility carries up to six months of browse images on-line.

*Browsing*

Browse images for the three Envisat imagers (AATSR, ASAR and MERIS) are available on-line, and Figure 9 shows part of the Browse window.

*Product ordering*

The ordering service access is restricted to authorised users according to the Envisat

**Figure 6. The Directory and Guide**

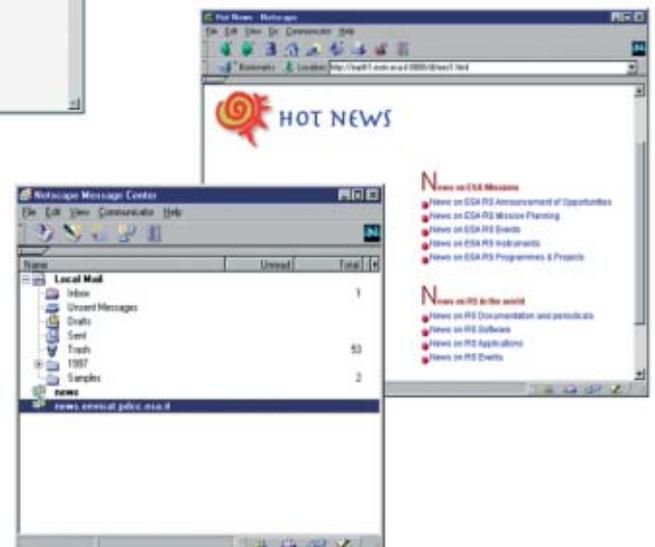


*News and Bulletin Board*

The News and Bulletin Board gives the latest news on Envisat in terms of products, algorithms, services, centres, conferences, etc. (Fig. 7). It is a discussion forum in which users can exchange mission-related information.

*Catalogue - Inventory*

One of the numerous free services offered to users is access to Catalogue (INV) and Browse



**Figure 7. The News and Bulletin Board**

Distribution Policy. Users may order existing and future products, but each order needs to be validated with respect to:

- the user profile (class, priority, quota)
- the order requests previously planned
- the mission and instrument constraints.

The Order Desk might therefore propose alternatives in the event of a conflict with existing requests. Order requests are used by both the Payload Data Segment and the FOS to build up the mission-operations plan. Users can check the status of their own orders on-line at any time.

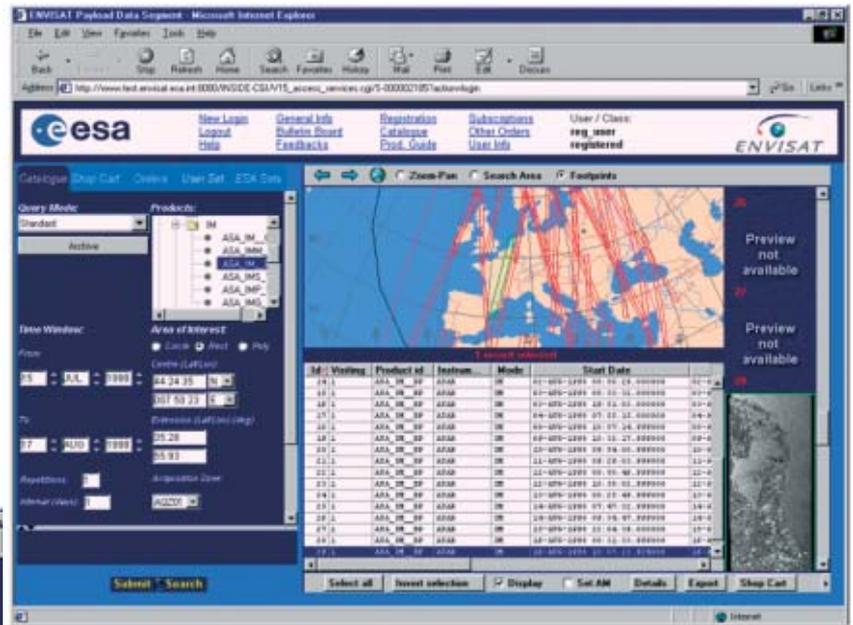


Figure 8. The USF interactive user interface based on the EOLI applet



product type, and the scene may be located anywhere along-track for the three imagers. The scene always has the same width as the original AATSR or ASAR product. The MERIS scenes that can be ordered are square in format (287 x 287 km<sup>2</sup> quarter or 575 x 575 km<sup>2</sup> half scenes). The user can specify the location of a MERIS full-resolution scene across-track within the product boundaries.

Figure 9. An Envisat Browse image

**Child products**

In addition to full products, users may order a subset of existing products, so-called 'Child Products'. The aim of this function is to reduce the product's size in order to ease its distribution. A full product may be too large for a user to download, while a subset of it could be downloaded easily. This is a very flexible approach, as the user can define child products from an existing product stored in one of the PDS archive facilities, specifying any combination of child extraction parameters: time, band, star name, or data set. For example, instead of ordering a full Level-1 MERIS product (e.g. MERIS geo-located and calibrated TOA radiance), a user may also request the extraction of just a few of the 15 bands and for a shorter time window. An example is shown in Figure 10.

**Other orders**

In addition to the above data products, users may also order software tools (e.g. product handling and visualisation, and local inventory access tools), directory and guide update files, and inventory update files. This list is not exhaustive and will grow during the Envisat mission.

Figure 10. Child-product parameter specifications

**Scene products**

The user may also request the extraction of scenes from a larger strip-line product (AATSR, ASAR and MERIS Level-1b and -2). Such a request can be made for future products as well as for existing archived products. The size of a scene is pre-defined and depends on the





Figure 11. Web mapping

**User administration: registration and account information**

There are two types of users: unregistered, without a personal account; and registered, with a personal account. Any user can be registered, and there is no fee for registration. A user can also have several accounts for different purposes. The account information contains various data on the user: personal data (e.g. name, address, telephone/fax/e-mail) and account data (e.g. user name, password, priority, quota). The user may access these account parameters at any time and may change some of them (e.g. personal data or password), whilst some others may only be changed by the Envisat User Services operators (e.g. quota, priority).

**User Services status and possible evolution**

Around fifty users have already tested the Envisat User Services during the first rehearsal exercise with Calibration/Validation Principal Investigators in November 2000. The facilities were subsequently upgraded based on their

comments, collected after that rehearsal. The User Services were then opened up again in February 2001 for familiarisation purposes. The Calibration/Validation Principal Investigators may access the User Services before Envisat's launch in order to prepare for the Commissioning Phase.

Already today there are some plans and on-going activities to improve the User Services, involving:

- improvement of the user interface following remarks from users
- integrating of the Envisat User Services with existing MUIS services
- multi-mission querying and ordering
- faster catalogue access
- making Envisat visible from non-ESA information systems worldwide
- incorporating the most recent features of MUIS EOLI, like web mapping and 3-D VRML (virtual-reality) visualisation of Browse image products. Web-mapping features allow the user to select the background thematic layers that best fit the missions/sensors being queried. This allows easier interpretation of the products visualised via the EOLI interface.

New ideas for improvements will doubtless emerge as the Envisat mission gets fully underway.

**Acknowledgment**

The work described in this article was performed by several technicians and engineers from both ESA and Industry. 

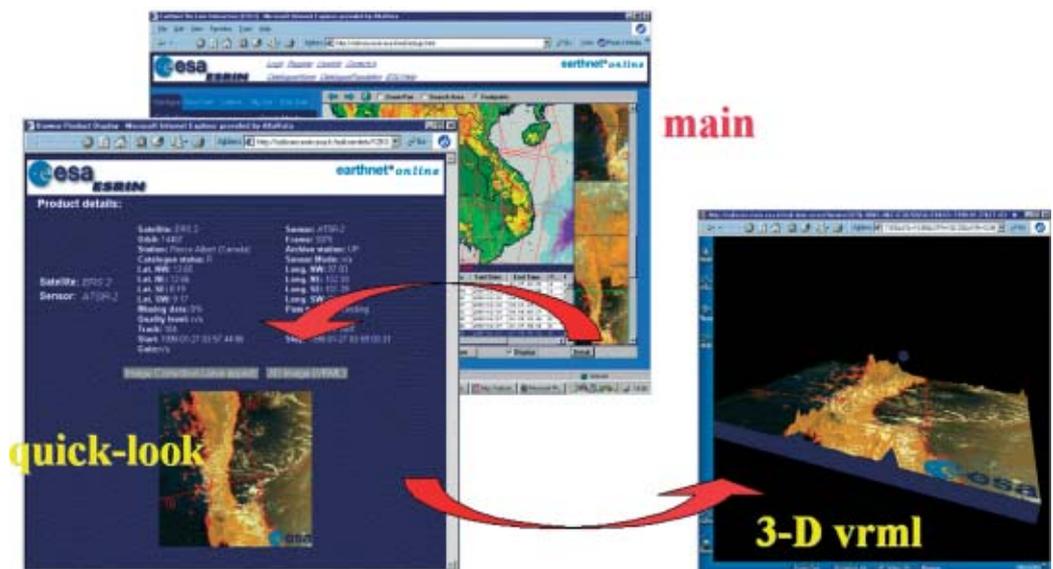


Figure 12. A 3-D VRML visualisation of a browse product