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Prepared by EUMETSAT
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EUMETSAT PRODUCT DEVELOPMENT APPROACH

In response to CGMS action/recommendation Action WGII 36.20…

EUMETSAT products are developed in the EUMETSAT Central Facility and the Satellite Application Facilities (SAFs) or implemented in these facilities through external studies. EUMETSAT provides operational geostationary and low earth orbit satellite services with a consistent approach with respect to services levels and quality, independently of the origin of the service.

To develop new products or to perform significant major changes in a consistent way, the SAFs and the Central Facility have defined the EUMETSAT product life cycle which is composed by the following phases:

- Product Definition
- Product Development
- Engineering Verification
- Product Validation
- Product Implementation into Operations
- Continuous Improvement

To reflect the scientific maturity, the level of commitment and the status of validation, EUMETSAT has defined a set of product status categories. The Product status are:

- In Development
- Demonstrational
- Pre-Operational
- Operational

This facilitates the monitoring of the EUMETSAT products status and its evolution and enables a coherent reporting to users and EUMETSAT delegate bodies and forms a basis for future evolutions and improvements.

The Product Status terminology has become a common reference for EUMETSAT and the Users. The definition of the same product status terminology has provided the users with a common understanding of what can be expected from the product at each moment in terms of availability, completeness, timeliness and quality.

EUMETSAT product development approach

1 INTRODUCTION

EUMETSAT products are developed in the EUMETSAT Central Facility and the Satellite Application Facilities (SAFs) or implemented in these facilities through external studies. EUMETSAT provides operational geostationary and low earth orbit satellite services with a consistent approach with respect to services levels and quality, independently of the origin of the service

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2 EUMETSAT product development

2.1 Product Definition

EUMETSAT requires the authorisation of the EUMETSAT Council to proceed with the development of a new product service or to perform significant major changes in an existing one. The Council is the decision-making body of EUMETSAT and is comprised of a delegate and a number of advisers from each Member State, supported by technical, financial and policy advisory groups.

The meteorological product Development & Operations Plan describes the proposed new/improved products, together with its scientific relevance. Accompanied by the scientific validation aspects, this plan is submitted to the EUMETSAT delegate bodies for approval. The approval of a new/improved product to be developed triggers the generation/update of the Algorithm Theoretical Baseline Document (ATBD), a product prototype and a scientific oriented validation. Similarly the Meteorological Product Medium Term Implementation Plan, describing the timeline for the implementation of the Meteorological Product Development Plan and other identified product improvements, is submitted to the EUMETSAT delegate bodies. The approval of this plan forms the baseline of the operational product implementation.

Already at this stage, the **product purpose** and **product audience** need to be identified (a product can be defined only for training or research purposes to be used by a very limited set of users or can be used operationally by a wide audience). The product purpose and product audience are key criteria to complete the definition of the EUMETSAT services (2.5).

2.2 Product Development

As input from the Product Definition phase, the scientific definition of the ATBD and the product prototype are used to specify the implementation aspects of the product algorithm. This Product Algorithm Specification is used to integrate the new/updated product into the overall application ground segment.

To support the technical implementation, the Software Review Board (SRB) provides appropriate guidance and support. An important outcome from this board is to identify the impact on the related Products and Services in order to assess the complexity of the proposed implementation work.

The product processing facility development is performed in a dedicated environment. This environment is also used to first test whether the product facility fulfils the expected specifications.

During this phase the relevant documentation required for the following phases are created or updated. These include the Product User Manual, the Product Algorithm Specification and the first Verification & Product Validation results.

2.3 Engineering Verification

Before proceeding to further verification and integration testing, the modified or new product has to be integrated into the Validation Ground Segment. The validation Ground Segment is part of the overall Operational Ground Segment and is therefore governed by the same process as any other operational entity with formal Configuration Management Processes, including Configuration Change Requests, and Validation Test Reports (VTR) attached with the results of the engineering verification and validation activities previously performed.

The main objective of the Engineering Verification is to demonstrate that the changed or new processing instance interacts in a stable and expected manner with the rest of the operational environments and that all appropriate operational functions are supported like monitoring and control as well as reporting. Furthermore the new and changed products are verified from an engineering point of view.

2.4 Product Validation

The Product Validation aims to ensure that the specified and agreed User Requirements are achieved. The activities performed during the Product Validation are explicitly defined for each product and level of product status (section 2.5). The validation period and extent of the validation depends of the complexity and severity of the changes. The validation activities specifically include

Status tracking of relevant anomalies
Generation of long term statistics on quality, availability, completeness and timeliness

User evaluation of the new/changed product
Confirmation of overall performance and interactions with other products and services

The results of the Product Validation are compiled to a Product Validation Report, which is also made available for the users for reference.

Product Validation Inputs	Product Validation Outputs
Operations Service Specifications (OSS) Product Requirements (Engineering Change Proposal (ECP), Anomaly Report (AR), Release Notes Product Data taken as reference (e.g. unification, monitoring). Product SW to be Validated (New, Modified) Updated & New Documentation related to the Modified/New Product. Product Validation Test Specification ATBD Any external Validation or user's feedback Any relevant Delegate Body decision	Iteration with the Dissemination, User Services and Archive Teams when relevant. PVR (Product Validation Report) for New Products or with Major Changes, VTR (Validation Test Report) for Small Changes Identification of New Anomalies after Validation Any Product Validation Support Documentation (logs, test proofs and results…) Validated New/Modified Products Validated New/Updated Documentation Product Quality Indicators, Statistics and Monitoring Results. Operations Service Specification

Table 2.4-1 Product Validation process Inputs & Outputs

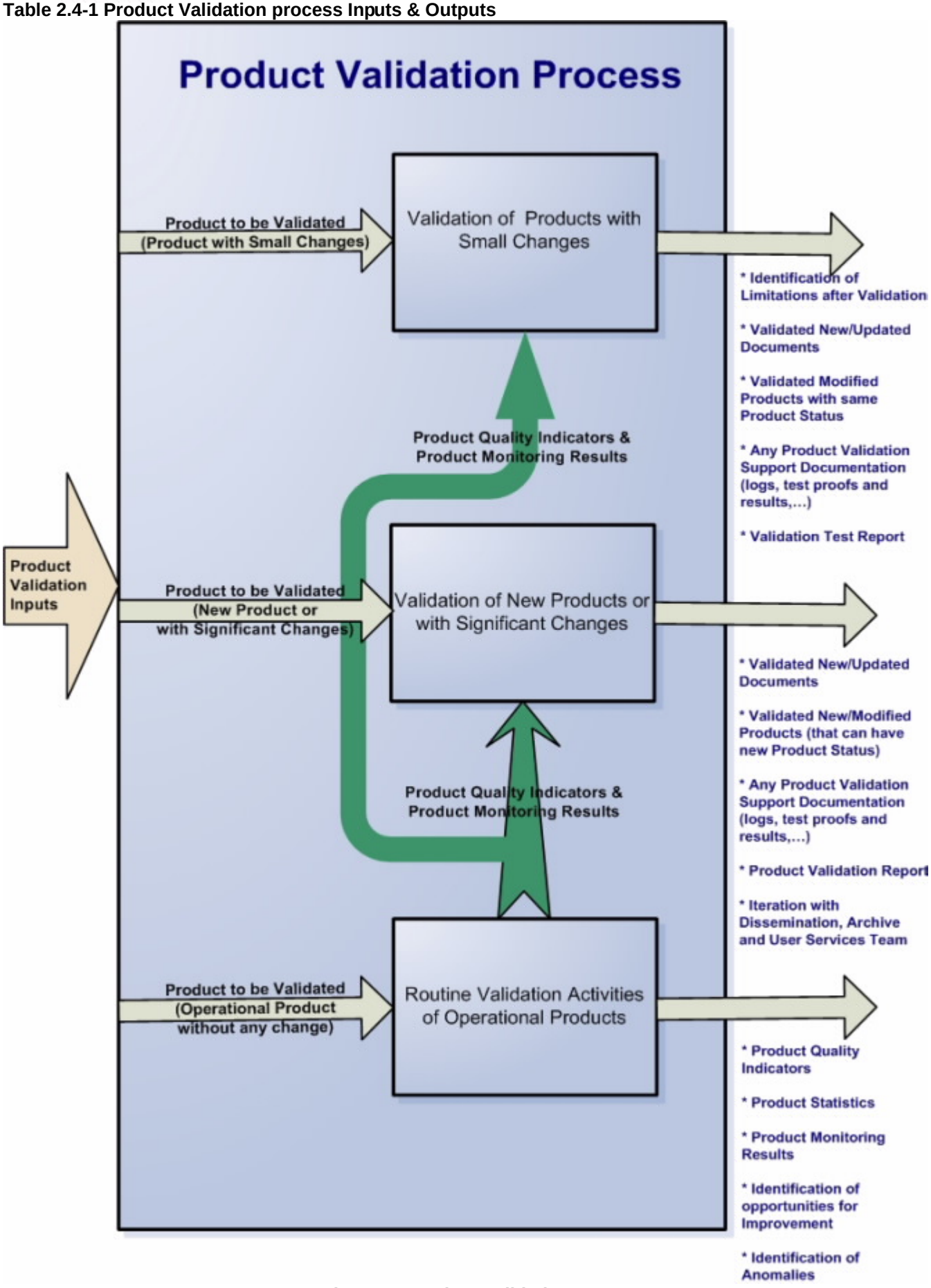

Fig. 2.4-1 Product Validation Process

Product Validation Review Board

The results from the Product validation are assessed by the Product Validation Review Board (PVRB) that defines the status of the Product, assesses the impact on other facilities and the actions to be performed until being operational, including the notification to the users.

The expected inputs to the Product Validation Review (PVR) are a product validation report and the formal document(s) specifying the requirements for the product. As an outcome of the Product Validation review the PVRB defines the release schedule of the changes, agrees on user notifications and the Product Status.

Product Status

The product status categories reflect the compliance with the operations service specifications, which include scientific maturity, the level of commitment, the status of validation and serve the classification of large number of products. This facilitates the monitoring of the EUMETSAT products status and its evolution and enables a coherent reporting to users and EUMETSAT delegate bodies. The following categories are defined in order to address the status of the EUMETSAT products:

In development: Products or software packages that are in development and not yet available to users.

Demonstrational: Products or software packages that are provided to users without any commitment on the quality or availability of the service and have been considered to be useful to be disseminated in order to enabling users to test the product, their operational interfaces and to provide feedback.

Pre-operational: Products or software packages with documented limitations that are able to satisfy the majority of applicable requirements and/or have been considered suitable for distribution to users.

Operational: Products or software packages with documented non-relevant limitations that largely satisfy the requirements applicable and/or have been considered mature enough for operational exploitation by the users.

Released: Data sets that are made available to users, satisfying largely the applicable requirements, with documented characteristics, validations results and limitations, and that are considered mature enough for the targeted applications.

Superseded: Products, data sets or software packages that have been (pre-) operationally provided to users but are not (pre-) operational anymore because the information of same or superior quality and/or coverage is provided and considered as not useful for being provided to the users.

Discontinued: Products or software packages that have been previously (pre-) operationally provided to users but are not (pre-) operational anymore and are considered by the relevant Steering Group as not useful for further dissemination or distribution.

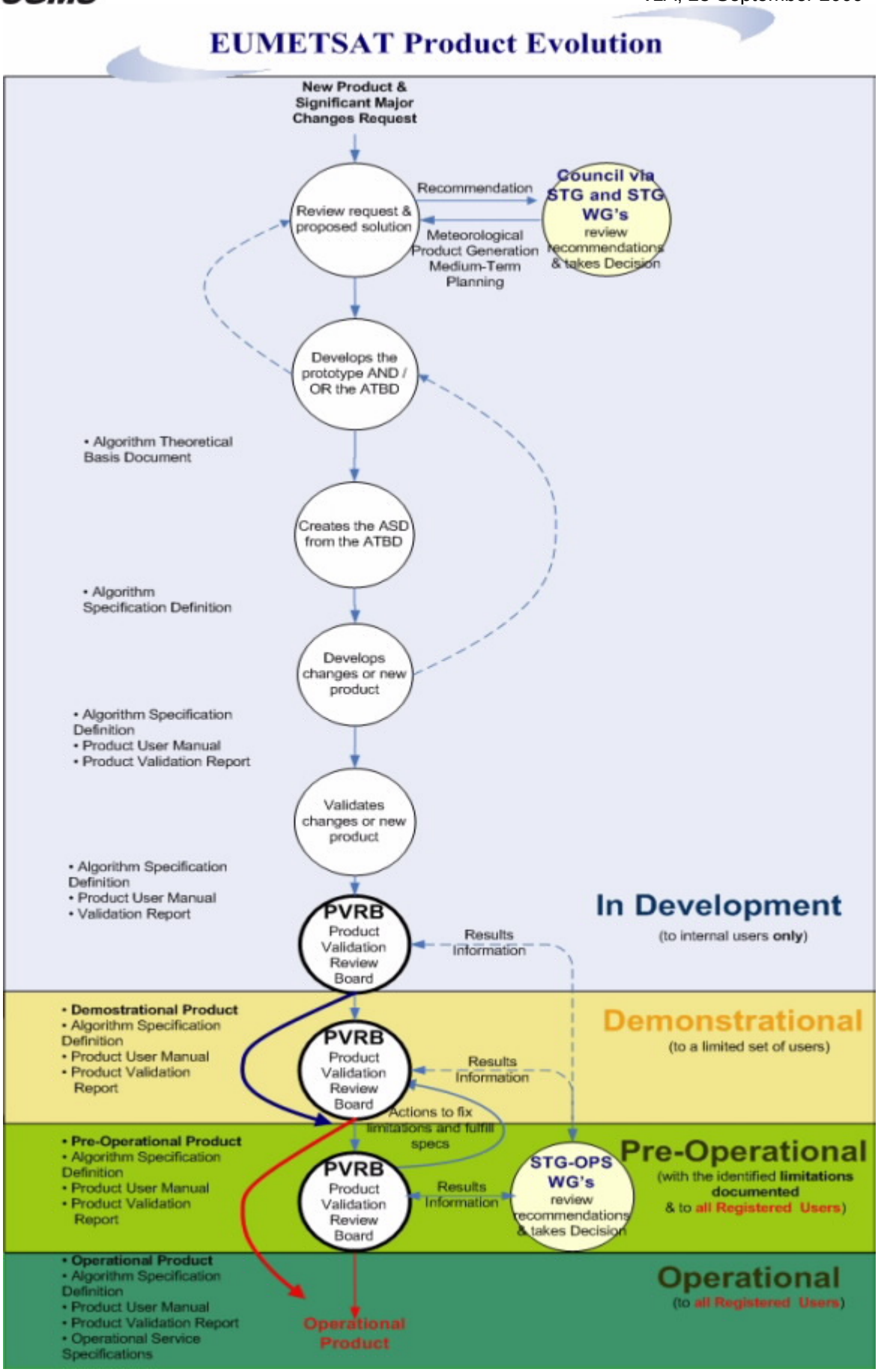

Fig. 2.4-2 Product Evolution

2.5 Product Implementation into Operations

A Service is the end to end combination of a set of products, with one or several delivery mechanisms, complemented by the Service-specific requirements (typically Timeliness, Availability).

EUMETSAT Product Services are characterised by:

- Product Description;
- Product Quality (Timeliness, Accuracy & Coverage);
- Dissemination, Format and Archiving;
- Availability.

The operational services delivered by EUMETSAT to its user community are documented in the Operations/SAF Services Specification documents.

The Operations/SAF Services Specification documents describe the characteristics of products and services resulted from the implementation of the User Requirements. The initial User Requirements are described in the End User Requirements document. The implementation of the new requirements from Delegate Bodies are directly described in the Services Specification document

Therefore, any meteorological product or service entering operations shall be compliant to with the Operations/SAF Service Specification.

As already introduced in the Product Definition (chapter 2.1), the **product purpose** and **product audience** drive the implementation of the EUMETSAT Product Services. Each product status decided by the PVRB has a recommended product audience which implies a different delivery mechanism solution:

Fig. 2.5-1 Audience per Product Status

The new/modified product is only a part of the Product Service, requiring from the correct development of the rest of the elements (delivery mechanism, archive and user support) to become fully Operational. This will imply that the Users can successfully access the new/modified product and complete supporting documentation as described in the Service Specifications.

EUMETSAT has established different Boards to coordinate internally and externally all the elements involved until reaching the expected Product Service Specifications.

2.6 Continuous improvement

The routine validation activities on the already operational products and the feedback received from the users of the EUMETSAT Product Services are inputs for the EUMETSAT Product improvement process.

Routine Validation Activities of Operational Products

The purpose of this process is to monitor the Operational Product, obtaining and analysing Quality indicators to identify how well the Products meet their specifications and opportunities for improvements. The meaningful Data is also used as reference in the Validation of Product changes. Statistics results are used to improve the Quality Indicators.

User feedback

User Feedback falls into the following broad categories:

Unsolicited Feedback:

Correspondence received via the Helpdesk or via any other entry point at EUMETSAT.

The EUMETSAT Web: via “Contact us” - Compliments and Complaints

Suggestions Box: Available at any EUMETSAT event, conference, or working group. A "Feedback Card" is available for users to complete.

Actions and suggestions from the Delegate Bodies included in the Minutes of Meetings.

Verbal feedback received by EUMETSAT personnel: Those attending working groups, meetings and conferences, may receive feedback. Whenever such feedback is received upon return to EUMETSAT they complete a External User Feedback form.

Solicited Feedback:

Feedback received via training event feedback forms. Training attendees can provide “general” user feedback via the online training feedback form.

Customer Surveys - surveys target to a specific service or user group and general user satisfaction surveys which are performed as required.

Type of Users	Typical mechanisms for acquiring feedback

EUMETSAT Member States –National Meteorological Services (NMS)	Delegate Body Meetings, Working Groups, Training, Conferences/Events, Customer Survey, Helpdesk, Web Feedback
Other NMS of WMO, ECMWF, WMO	Working Groups, Training, Conferences/Events, Customer Survey, Helpdesk, Web Feedback
Research Communities	Working Groups, Customer Surveys, Conferences/Events, Helpdesk, Web Feedback
Private Users	Customer Surveys, Helpdesk, Web Feedback
General Public	Customer Surveys, Web Feedback

Table 2.6-1 Typical mechanisms for acquiring feedback per type of Users

The appropriate body will analyse the results of the Routine Validation Activities and the User feedback received and will decide whether to:

1. Perform a corrective action
2. Develop a service enhancement
3. Provide justification for declining a request (only for User feedback)

For a corrective action or a service enhancement, EUMETSAT will define the change recommendation or the new product requirements.

If the product change is minor, it will be implemented as a maintenance activity with no impact in the current product status. In case it is a Significant Major Change or a new product, it will require another iteration of the EUMETSAT product life cycle previously described in this chapter.

3 CONCLUSIONS

EUMETSAT has as a strategic goal to improve the quality, availability and completeness, timeliness of its products and services and to maximise the benefits of its satellite data through the utilisation of the operational geostationary and low earth orbit satellite services. In this improvement effort, EUMETSAT has developed a strong user orientation, establishing processes to better identify and implement user's necessities and interests.

EUMETSAT Product Development is one of the processes benefited from this continuous improvement. EUMETSAT has achieved a mature and homogeneous Product development approach that is equally applied by the Central Facility and the SAFs. EUMETSAT users receive geostationary and low earth orbit satellite services with equal characteristics and quality.

The Product Status terminology has become a common reference for EUMETSAT and Users. The definition of the same product status terminology has provided the users with a common understanding of what can be expected from the product at each moment in terms of scientific maturity, level of commitment, or status of validation; and of what is the way forward until it fully satisfies user's requirements.