IDIS User Requirements

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1 Introduction

1.1 Purpose

This User Requirements Document defines the requirements for the design and development of an Integrated and Distributed Information Service (IDIS) providing access to the full set of data sources produced by the complementary fields of Planetary Sciences. As part of the European Planetology Network project under the European Commission's Sixth Framework Programme "Structuring the European Research Area" / Specific Programme "RESEARCH INFRASTRUCTURES ACTION " the intention of IDIS is to integrate most of the European planetary exploration and supporting scientific work.

The document is one of the deliverable items defined in this contract, number 001637, and will be used for the implementation of the EuroPlaNet information service. The user requirements form the basis for the model-implementation of the IDIS system used to demonstrate the usefulness of the proposed system.

1.2 Scope

The *IDIS*-related community can be divided into three groups:
- Users who will access the system to retrieve information.
- Developers who as part of the IDIS team set up and develop a system for information search and retrieval.
- Resource providers who are willing and able to make the information available on-line

This User Requirements Document collects the requirements the user community, represented by active members of the EuroPlaNet consortium, defined towards the developer group. The resource providers are affected only so far as some minimum requirements for connectivity can be derived from these user requirements.

These user requirements are intended for the specification and implementation of a fully functional Integrated and Distributed Information Service for planetary research, optimized for the European research community. They are divided into three parts

- requirements applicable to the whole service network functionality,
- requirements applicable only to specific thematic nodes, compiled from the user requirements documents for these nodes,
- requirements related to the verification of the complete information system or parts thereof.

A representative sub-set of these requirements is being used for the specification and implementation of the demonstration version of such a service in the framework of the EuroPlaNet project under the 6th Framework Program of the European Commission. These requirements are marked in this document.

1.3 Definitions, acronyms and abbreviations

EuroPlaNet	European Planetology Network project under the EU Commission's FP6
FP6	European Commission's Sixth Framework Programme "Structuring the European Research Area" / Specific Programme "RESEARCH INFRASTRUCTURES ACTION "
IDIS	Integrated and Distributed Information Service
IPDA	International Planetary Data Alliance
Node	Network coordination center providing user access to resources and keeping the resource information up to date
Resource	Any information accessible via IDIS: contact names, addresses, laboratory or instrument descriptions, observation data, modeling results, algorithms, internet link addresses, etc.
Science Case	A scientific topic or collection of related themes adopted by the EuroPlaNet community as a basis for the generation of the user requirements document
SPASE	Space Physics Archive Search and Extract data model
Technical node	Coordination center providing management of and access to the IDIS network
Thematic node	Coordination center responsible for the resource information related to a given scientific field related to planetary sciences.
Use Case	A series of actions a user intends to perform with the described system to achieve a goal related to one or more of the science cases or a subset thereof.
Virtual Observatory	An interactive facility allowing combining related data from different archives

1.4 References

AD1 Commission of the European Communities, Research Directorate-General Contract No 001637 European Planetology Network

AD2 Contract 001637, Annex 1 Description of Work

RD1   ESA PSS-05-02 'Guide to the User Requirements Definition Phase'
RD2   ANSI/IEEE Std 830-1984 'Software Requirements Specifications'
RD3   IDIS-SP-11-000 'IDIS Interface Specification'

1.5 Overview

The user requirements in this document are derived from three information sources
- requirements derived from the EuroPlaNet contract
- requirements derived from the analysis of the selected *Science Cases*
- requirements derived from the selected *Use Cases*

Chapter 2 provides the general background and purpose of the *IDIS* system as derived from the *EuroPlaNet* contract clauses.

Chapter 3 lists detailed requirements derived from the Description of Work, annexed to the contract, and from the analysis of the selected *Science Cases* and *Use Cases*. *Science Cases* and *Use* Cases are listed in the appendix to this document. The list of requirements relevant to IDIS as a whole is followed by requirements related to specific nodes only. These are specific to the science subjects related to that thematic node and the way scientists working on these subjects are accessing relevant information.

Terms defined in section 1.3 are given in *Italics* in this document.

2 General Description

The envisioned data system will support the planetary science community with a wide range of resource information and resources deemed important for the research in the connected fields. The information is related to the following six building blocks:

1. Earth-based observations, including both ground and space telescopes in all spectral domains;
2. Space missions (remote and in situ observations);
3. Planetary models: physical concepts and numerical simulations;
4. Laboratory experiments: fundamental processes of interest and experimental simulations;
5. Databases and information systems dedicated to given sub-fields;
6. Public outreach effort and educational products.

The resource information will facilitate the co-operation between teams working in the same field or different areas, but could support the research about a specific topic. The accessible resources should increase the availability of a wide range of observational and modeling data and facilitate contacts between teams working on related subjects or being able to perform supporting tasks related to the interpretation of these data.

2.1 Product Perspective

It is not the intention of the system to collect independent copies of original data maintained at other sites, but rather to provide user friendly access to these data via a standardized access system. While it is the responsibility of the *IDIS* maintainers to keep the access information up-to-date, the validation and archiving of the observational and modeling data themselves resides with the facilities and institutions which agree to be connected to *IDIS*. Any information or data source related to the list of topics mentioned in the introduction to this chapter may be added on request if it fulfills the minimum connectivity requirements derived from this document. *IDIS* itself may be referenced and accessed by other information systems if this does not interfere with the main tasks and the capabilities of the system.

2.2 General Capabilities

IDIS should provide a keyword-based search possibility which leads in an intuitive way to the requested information. More detailed keyword lists related to specific scientific topics may be kept and maintained at the related thematic nodes, to which the request will be forwarded automatically. The information exchange between the *IDIS* nodes should be defined in a way that additional resources can be easily added. Besides information about the availability of *Resources* including contact addresses the user may be forwarded to another internet site providing the related information including links to *Virtual Observatories*.

2.3 General Constraints

The inclusion of resources depends on the willingness and capability of the resource providers to make the resources available with enough information for the *IDIS* team to allow the integration into the structure of *IDIS*. The decision about the inclusion of new resources may be coordinated by a dedicated group inside *EuroPlaNet*. Given enough resources certain additional format adaptation or support in generating the interface details may be provided by the *IDIS* team. Detailed validation of the resource contents like address details or data quality is outside the scope of *IDIS*.

Data access right related issues have to be defined in a general policy statement. Access restrictions for certain data may be handled by technical implementation means or delegated to a direct interaction between the user and the data provider

2.4 User Characteristics

The user community of *IDIS* can be divided into the following groups:
- Scientist working in any research field related to planetary sciences. The science cases selected in the reference list were compiled by a number of scientists interested in the success of the *EuroPlaNet* concept, representing many different disciplines in Europe and beyond.
- Scientists, administrative and technical staff preparing new missions, planning support activities in laboratory or modeling facilities or looking for co-operation partners for a new research topic.
- The public including decision makers and the media who need access to up-to-date information about new findings and ongoing research.

2.5 Operational Environment

IDIS will be implemented as a distributed information system with five coordinating centers, interconnected via public data networks. Each of these five *nodes* will maintain links to a variety of data archives, institutions and laboratories, which are willing to automatically or interactively make information and/or data available to the user community. To facilitate the information access, search engines will be implemented in the *nodes*.
The interface between the five *nodes* will be described in a separate document [RD3].

2.6 Assumptions and Dependencies

This document assumes that following the realization of the *IDIS* demonstration version sufficient resources are available to implement a wider system which implements all the user requirements in this document. For the demonstration version only a sub-set of the requirements will be used.

IDIS depends on the willingness of a wide range of data owners to make their information available to this system and to provide sufficient feed-back to keep all resource information up-to-date.

3 Specific Requirements

Each user requirement in this paragraph defines exactly one clearly defined requirement for which a successful implementation into *IDIS* can be objectively demonstrated.

Each user requirement is identified by a unique label in the format Xmm.nn y followed by an optional marker:

X may be
'C' for contract-derived requirements [AD2]
'S' for *Science Case* or
'U' for *Use Case*.
mm gives the paragraph inside [AD2] or the *Science Case* / *Use* Case number the requirement is derived from. In case of a *Use Case* it takes the extended form
        ss/uu with

ss being the 2-digit *Science Cas*e number
uu the 2-digit sequential *Use Case* number related to that *Science Case*
nn is a two-digit sequential number to identify different requirements derived from the same source.
Y may be
a   Mandatory Requirement (from the Contract)
b   Highly advisable
c   Desirable

The optional marker '*' indicates that this requirement is not implemented under the current contract but is suggested for future extensions

The complete identifier is enclosed in brackets [..]

Examples:
[S01.01 a*] *<requirement>* specifies the first requirement derived from *Science Case* number 1. The requirement is considered essential, but will not be implemented in the demonstration version due to resource and mandate constraints.
[U02/10.01 c] *<requirement >* specifies the first requirement derived from the 10th *Use Case* related to *Science Case* number 2. The requirement is considered "desirable", its implementation in the current *IDIS* version or only in the future is undecided.

3.1 General Requirements

3.1.1 Conceptual Requirements

[C01.01 a*] IDIS should include every kind of available resources related to the scientific themes of the nodes and supply the users with the possibility to specify which kind of resources they want to search for and to restrict the search range;

[C08.01 a] Support the EuroPlaNet participants in accessing and sharing of both data and information;

[S13.01 a] IDIS has to be a web based service which provides interactive access to distributed and integrated information;

[C08.02 a] Work in close collaboration with international Organizations involved in data archiving, providing and accessing;

[S03.01 b*] Inter-operability with other data archives and Virtual Observatories (VOs) should be promoted.

[C08.03 a] Prepare for an evolution towards a future Planetary Virtual Observatory;

[S13.02 a] Each node should provide a list of the researchers and the centers involved in their thematic fields, completed by contact information and geographical localization;

[S03.02 c*] Maintain compatibility with the ongoing development of key visualization and manipulation tools as determined by the IDIS Management.

3.1.2 Implementation Requirements

[C08.04 a] Provide a more unified access to the information, especially for European scientists and to the benefit of the dissemination of data produced in Europe;

[C08.05 a] Be compatible with, and complementary to data services existing in and outside Europe;

[S03.03 b] IDIS should conform and take benefit from international standards and cooperate to their development;

[C08.06 a] Link the *IDIS* web sites to the main EuroPlaNet web page;

[S21.01 b] IDIS web service should be operated in both interactive and workflow mode;

[S13.03 b*] IDIS should identify and adopt a data system/model adherent to international scientific standards to be used in creating the resource databases;

[S13.04 c] to ensure future maintenance and to minimize ownership and maintenance costs, IDIS should adopt an open standard;

[S13.05 c] IDIS development and maintenance should be based on free and/or open source software (FLOSS) in order to:
* minimize the cost of development and maintenance;
* minimize the dependency from close or proprietary standards;
* have the possibility to access the source code to implement the capabilities needed;
* minimize transfer costs in case the institute in charge of the node should change;
* favor the eventual participation of the community and the general public to the expansion and update of the node (see "Community and public involvement requirements" section);

[S13.06 c] to ensure the maximum availability of the IDIS services, all the web pages and tools should be developed granting the compatibility with all the main platforms;

[S03.04 b*] In order to ensure the continuity of the service, IDIS will employ recovery procedures to be applied in case of system failures;

3.1.3 Service Requirements

[C08.07 b] IDIS should be organized as a searchable catalogue of resources to complement the service offered by international providers;

[C01.02 a] The user access has to be registered according to country of origin. Statistics have to be made available to the EU-commission as part of the project reporting.

[S03.05 b*] The science user must be able to browse data sources via catalogues identifying data available by time, instrument, its spacecraft or ground facility, resolution and science product (*i.e.*, the dataset or collection);

[S13.07 b] IDIS must supply a list of typical keywords for the different resources, in order to help first-time users and in general to speed up the search process;

[S13.08 b*] to ensure interoperability and future expansions, IDIS should provide the community with a reference document on the procedures and the rules used to implement its data system;

[S03.06 c*] Support Format conversion for data providers to facilitate delivery of data products, to respond to changing software needs and constraints and for the long term archive;

[S13.09 c] IDIS should provide a notification, dissemination and communication service to inform the community of general (e.g. call for proposals, relevant funding opportunities and deadlines)

and scientific (e.g. ongoing projects, searches for collaborations, relevant accomplishments) news;

[S13.10 b*] IDIS should ensure a reliable service of dissemination of results and information within the European scientific community;

[S13.11 b*] IDIS should provide the community with the means to report feedbacks on their services, e.g. by WikiMedia contents;

[S03.07 c*] It is desirable for users to be able to register an interest in data that is awaiting processing, and to be informed when it is available;

[S03.08 c*] It is desirable to support the use of interactive graphics facilities to support data selection;

[S03.09 b*] It is desirable to provide interactive visualization tools able to combine different datasets;

[S03.10 b*] Querying other VOs and requesting their data should be supported;

[S03.11 c*] Various science based data manipulation tools are available in the space physics community. Support should be provided for inter-operability with approved tools at the user site;

[S03.12 c*] Provide online information on science tools available, and web links. Provide reasonable information on the tasks supported by each tool and platform;

[S03.13 b*] Generate a list of approved science tools which will be able to read at least one supported data format;

3.1.4 Data related Requirements

[C08.08 a] Provide a general platform for exchanging data and information;

[C08.09 a] Provide a general platform for accessing data and information;

[C08.10 b*] Provide a general platform with relevant tools for integrating and linking relevant data centers, data bases and information systems;

[S03.14 b] Participating EuroPlaNet data sites must make available resources, documentations and other information as agreed with the IDIS Management board;

[S13.12 a] Each node should analyze the existing resources and inquire the needs for the scientific community;

[S13.13 b] IDIS should ensure the update and the maintenance of its contents and coordinate with the service/data providers where possible;

[S03.15 b] Data must be accompanied by sufficient metadata to render it scientifically usable (e.g. units, reference frame, array descriptions, bin boundaries etc). Such metadata must be attached to the delivered data products;

[S03.16 b] Online documentation must be available which describes usage of the system with simple examples. This must also be available for download in a platform independent format such as PDF, html or xml;

[S03.17 b*] Online documentation must be available for all provided data describing the data product, its units and other scientific metadata and any relevant processing information. This must be available for download in a platform independent format;

[S03.18 b] The data model and description being developed by the International Planetary Data Allianeshould be promoted as far as possible;

3.1.5 Communication and Outreach Requirements

[C08.11 a] Provide access to adequate pedagogical and outreach materials;

[C08.12 a] Plan clear and accessible public information to explain what EuroPlaNet participants do in their laboratories and to promote interest for sciences in Europe;

[S13.14 b] IDIS should host public outreach contents aiming at explaining its nature and the aims of IDIS effort to the general public;

[S13.15 a] IDIS should provide both general and thematic mailing lists to promote contacts between scientists from different communities and help the insertion of new research groups and the dissemination of information;

[S03.19 b*] Provide general online information for the public on available data and science tools, including web links.

3.2 Node specific Requirements

(to be completed in the final delivery version)

3.2.1 Interiors and Surfaces

Implementation Requirements

Service Requirements

Data related Requirements

Communication Requirements

3.2.2 Atmospheres

Implementation Requirements

Service Requirements

Data related Requirements

Communication Requirements

3.2.3 Plasma Science

Implementation Requirements

Service Requirements

Data related Requirements

Communication Requirements

3.2.4 Small Bodies and Dust

Implementation Requirements

Service Requirements

Data related Requirements

Communication Requirements

3.3 Verification Requirements

[S13.16 b] at completion of FP6, each node science case should be used to create a tutorial/demonstrator to illustrate the system use/potentiality to new users and the scientific community in general;

[S13.17 b] at completion of FP6, report on the missing services which could optimize and enhance the scientific value and relevance of the already available ones;

[S13.87 c*] IDIS should evaluate the possibility to extend the democratic approach to the general public for the creation of outreach material and teaching supplements for educational support;

[S03.20 b*] Perform an IDIS end to end test with external science users;

[S13.19 b*] Each Node should implement prototypes to evaluate the opportunity and feasibility of future extensions in response to the community needs with the available resources.

Appendix

Science Cases

Science Cases List as approved by the EuroPlaNet N2-group.
These science cases may partly overlap or be thematically related to another science case on this list.

SC1   Understanding super-rotation
SC2   Titan Ion Chemistry
SC3   Solar wind interaction with Jupiter and Saturn aurorae
SC4   What is the origin of the planetary modulated (quasi-periodic) signatures at Saturn?
SC5   Investigation of the interaction of magnetospheric plasma with icy moons in the Saturnian system an other giant planet systems
SC6   Definition and archiving of ground-based observations in support of space missions
SC7   Catalogue of IR and Raman spectra of gas CH_4 coefficients, organics
SC8   Dating planetary surfaces from cratering processes: formation of the solar system
SC9   Quantifying the Martian geochemical reservoirs
SC10 Exchange processes between surface and interior of icy moons
SC11 What are the relative contributions of asteroidal dust, cometary dust, meteor streams, interstellar dust and circumplanetary dust to the structure of zodiacal cloud as a function of heliocentric distance, latitude and time
SC12 What is the dynamical and morphological structure of the Kuiper belt
SC13 Comet C-G outgassing
SC14 Solar wind-comet surface interaction
SC15 Surface material composition
SC16 Distant activity, outbursts, splitting and disruption of cometary nuclei
SC17 Planets under extreme stellar conditions
SC18 Tectonics on Mars
SC19 Terrestrial analogues in studies of the Martian surface
SC20 Enceladus
SC21 Mars atmosphere measured by Spicam and GCM visualisation tool
SC23 IR and RAMAN Spectroscopy of Methane

Use Cases