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## Table of Contents

### Index

Document Information .....	2
Disclaimer .....	3
Table of Contents .....	4
Index.....	4
Tables .....	5
Log of Changes .....	6
1. Summary .....	7
2. Terms and Abbreviations .....	8
3. Implementation Contents .....	9
3.1. General Concepts .....	9
3.2. DL Functionalities.....	10
3.2.1. User Interface .....	10
3.2.2. Services .....	10
3.2.2.1. Integration with external portals .....	10
3.2.2.2. Statistics .....	10
3.3. DL Contents .....	12
3.3.1. Information Sources integrated by BELIEF-II .....	12
3.3.2. Information Sources integrated by BELIEF-I.....	12
3.3.3. Document Types .....	15
3.3.4. Interest Areas .....	15
3.4. Basic HW and SW Configuration .....	17
4. References.....	18
5. Appendix A – BELIEF DL Functions Summary.....	19
6. Appendix B – BELIEF DL Metadata Definition .....	21
6.1. DL Metadata list.....	21
6.2. DL Metadata details .....	22
7. Appendix C – BELIEF DL Feeding .....	28
7.1. Submission of Documents and Metadata to the BELIEF DL.....	28
7.2. Data and Metadata Harvesting .....	28
7.3. Batch Submission.....	33
8. Appendix D – Collections and Document Types Cross-reference .....	37
9. Appendix E – Areas of Interest.....	39
9.1. Implemented Collections .....	39
9.2. Suggested Collections .....	40
9.3. Suggested Subjects.....	42



## Tables

Table 1 – Terms and Abbreviations .....	8
Table 2 - Harvesting modes and tools.....	30
Table 3 - Collections and document types cross-reference.....	37



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## 1. Summary

This document describes the implementation of the BELIEF Digital Library (hereafter DL) in terms of:

- DL Functionalities
- DL Content

The BELIEF DL is a customisation of OpenDLib, a Digital Library Management System (hereafter DLMS) comprising of a federation of services that can be customised to meet the requirements for a target user community. This federation can be expanded at any time by adding other community specific services. The entire set of services can be managed and hosted either by a single or by a multitude of organisations collaborating on the maintenance of the shared digital library, each according to their own computational and human resources.

For more detailed information on OpenDLib see [OpenDLib].

## 2. Terms and Abbreviations

Term/Abbreviation	Definition
<b>Collection</b>	A set of metadata and documents characterised by a common semantics
<b>DL</b>	Digital Library A (potentially virtual) organisation that comprehensively collects, manages, and preserves for the long term rich digital content and offers to its user communities specialised functionality on that content, of measurable quality, and according to prescribed policies
<b>DLMS</b>	Digital Library Management System A software system that incorporates all functionality that is considered foundational for Digital Libraries and provides the appropriate software infrastructure to both produce a basic Digital Library and integrate additional software offering more refined, specialised, or advanced functionality
<b>Information Content</b>	Is the whole set of metadata and documents of a DL; not yet structured/organised
<b>Information Source</b>	An Entity (Project, Initiative, Organisation, NREN or NoE) contributing to the Information Content
<b>Information Space</b>	The collections of metadata and documents that a user can access; i.e. the logical and rights-controlled organisation of the Information Content
<b>Metadata</b>	The descriptive data associated to a document (e.g. title, author, abstract, subject, etc.) used for the effective store and retrieval of the document.
<b>NREN</b>	National Research and Education Network
<b>NoE</b>	Network of Excellence

**Table 1 – Terms and Abbreviations**





### 3. Implementation Contents

#### 3.1. General Concepts

The BELIEF DL is an instance of OpenDLib [OpenDLib], a Digital Library Management System (DLMS) comprising a federation of services that can be customised to meet the requirements of a target user community. This federation can be expanded at any time by adding other community-specific services. The entire set of services can be managed and hosted either by a single or by a multitude of organisations collaborating on the maintenance of the shared digital library, each according to their own computational and human resources.

The main services offered by an OpenDLib based system are:

- Submission, description, searching, browsing, retrieval, access, preservation and visualisation of multimedia documents;
- Definition of user-specific Information Space for searching/browsing in terms of collections selected from those managed by the DL. Collections can be created interactively;
- Different search/browse options: Google-like or fielded (with fields selected from a variety of known metadata formats), with or without relevance feedback.

Different methods for feeding the DL with new metadata and documents are supported:

- Harvesting from existing Information Sources implemented by specific modules and interfaces.
- On-line submission via Document Models.
- Batch submission via an XML Schema.
- Native repository integration.

These methods are described in “Appendix C – BELIEF DL Feeding”.

Details on the metadata used by the DL are reported in “Appendix B – BELIEF DL Metadata Definition”.

BELIEF classifies the DL Collections in terms of:

- Document Types
- FP6 Projects
- FP7 Projects
- Initiatives and Organisations
- Networks of Excellence
- National Research and Education Networks
- Interest Areas

All of them are continuously increasing, to cope with the emerging needs of the e-Infrastructure community.



## 3.2. DL Functionalities

### 3.2.1. User Interface

The DL's User Interface (UI) has been dramatically redesigned from BELIEF to BELIEF-II to reflect the most recent advances in UI usability:

- The new look and feel let users have a more comfortable access to functionality and content.
- The overall navigation structure has been simplified to minimise the number of clicks the users need to access any content.
- All most common functions can be easily accessed via one-click commands.
- Most of the relevant information related to a document are shown in the same window.
- A new On-line User Guide has been implemented by means of a friendly Wiki capability.

A summary of the new UI organisation and functions is given in “Appendix A – BELIEF DL Functions Summary”.

### 3.2.2. Services

#### 3.2.2.1. Integration with external portals

A real integration with external portals was implemented for document Submission and Search operations (e.g. D4Science at <http://d4science.eu/digitallibrary> and <http://d4science.eu/resources> ). This allows projects to save on the implementation and operation of their own repository, fully relying on BELIEF provided facilities.

#### 3.2.2.2. Statistics

To effectively implement adequate statistical reports for the DL, statistics implementation was moved from Webalizer 2.0.1 (used in BELIEF 2005-2007) to AWStats 6.7 [AWS] thus supporting more in-depth and customisable analysis of the access data to the DL.

The following statistics are currently available at

<http://belief02.isti.cnr.it/awstats/awstats.pl?config=BeliefDL>

- **When:**
  - Monthly report
  - Days of the month
  - Days of the week
  - Hours
- **Who:**
  - Countries
    - ◆ Full list
  - Host
    - ◆ Full list
    - ◆ Last visit
    - ◆ Unresolved IP addresses
  - Accesses from robots and spiders



- ◆ Full list
- ◆ Last visit
- **Navigation:**
  - Visit duration
  - File types
  - Accesses
    - ◆ Full list
    - ◆ Start page
    - ◆ Exit page
- **Provenance:**
  - Search engines
  - Sites
- **Other:**
  - HTTP error codes
    - ◆ Page not found
- **Extras/Marketing:**
  - Digital Library - Top Organisations
  - Digital Library - Top Articles



### 3.3. DL Contents

#### 3.3.1. Information Sources integrated by BELIEF-II

The following Information Sources have been included in the BELIEF DL by the current BELIEF-II project:

##### FP7 Projects

- BSI  
(Black Sea Interconnection)  
<http://www.blacksea-net.org/>
- D4Science Project  
(DIgital Library Infrastructure on Grid ENabled Technology for Science)  
<http://www.d4science.eu>
- DRIVER-II Project  
Digital Repository Infrastructure Vision for European Research – Phase II  
<http://www.driver-repository.eu/>
- GLOBAL  
(Global Linkage Over BroadbAnd Links)  
<http://www.global-project.eu/>
- GridTalk Project  
<http://www.gridtalk.org/>
- SEE-GRID-SCI  
(SEE-GRID eInfrastructure for regional eScience)  
<http://www.see-grid-sci.eu/>

##### Initiatives and Organizations

- OASIS Organization  
(Organization for the Advancement of Structured Information Standards)  
<http://www.oasis-open.org>
- OGF Organization  
(Open Grid Forum)  
<http://www.ogf.org>
- W3C Organization  
(World Wide Web Consortium)  
<http://www.w3.org>

#### 3.3.2. Information Sources integrated by BELIEF-I

The following Information Sources were included in the BELIEF DL during the first project's lifespan (2005-2007):

##### FP6 Projects

- 6DISS Project



- (IPv6DISSemination and Exploitation)  
<http://www.6diss.org/>
- BIOINFOGRID Project  
Bioinformatics Grid Application for life science  
<http://www.bioinfogrid.eu/>
  - CONDOR Project  
<http://www.cs.wisc.edu/condor>
  - DANTE Organisation, which actually means:
    - ALICE Project  
(America Latina Interconectada Con Europa)  
<http://alice.dante.net>
    - DANTE  
(Delivery of Advanced Network Technology to Europe)  
<http://www.dante.net>
    - EUMEDCONNECT Project  
(EUro-MEDiterranean CONNECTION)  
<http://www.eumedconnect.net>
    - GEANT Project  
<http://www.geant.net/>
    - GEANT2 Project  
<http://www.geant2.net>
    - TEIN2 Project  
(Trans-Eurasia Information Network)  
<http://www.tein2.net>
  - DILIGENT Project  
(DIGital Library Infrastructure on Grid ENabled Technology)  
<http://www.diligentproject.org>
  - DRIVER Project  
Digital Repository Infrastructure Vision for European Research  
<http://www.driver-repository.eu/>
  - e-IRG Organisation and e-IRGSP Project  
(e-Infrastructure Reflection Group)  
<http://www.e-irg.org/>
  - EGEE Project  
(Enabling Grids for E-science)  
<http://www.eu-egee.org/>
  - EGEE Library (New Training Repository)  
<http://egee.lib.ed.ac.uk/>
  - EELA Project  
(E-Infrastructure shared between Europe and Latin America)  
<http://www.eu-eela.org/>
  - ETICS Project  
(eInfrastructure for Testing, Integration and Configuration of Software)



<http://etics.web.cern.ch/etics/>

- EUChinaGRID Project  
<http://www.euchinagrid.org/>
- EUIndiaGRID Project  
<http://www.euindiagrid.eu/>
- EUMEDGRID Project  
<http://www.eumedgrid.org/>
- EuQoS  
(End-to-end Quality of Service support over heterogeneous networks)  
<http://www.euqos.org/>
- Grid@Asia Project  
Advanced Grid Research Workshops through European and Asian Co-operation  
<http://www.gridatasia.net/>
- GRIDCC Project  
(Grid Enabled Remote Instrumentation with Distributed Control and Computation)  
<http://www.gridcc.org/>
- ICEAGE Project  
(The International Collaboration to Extend and Advance Grid Education)  
<http://www.iceage-eu.org/> and  
<http://baillie.lib.ed.ac.uk/> (the training library)
- int.eu.grid Project  
(Multi Partner European Testbeds for Research Networking)  
<http://www.interactive-grid.eu/>
- ISSeG Project  
Integrated Site Security for Grids  
<http://isseg.web.cern.ch/ISSeG/>
- LOBSTER Project  
(Large-scale Monitoring of Broadband Internet Infrastructures)  
<http://www.ist-lobster.org/>
- MUPBED Project  
(Multi Partner European Testbeds for Research Networking)  
<http://www.ist-mupbed.org/>
- SEE-GRID Project and SEE-GRID-2 Project  
(South Eastern European GRid-enabled eInfrastructure Development)  
<http://www.see-grid.eu/>
- SEEREN2 Project  
(South Eastern European Research & Education Network)  
<http://www.seeren.org/>

### **Initiatives and Organisations**

- eConcertation Initiative  
<http://www.geant2.net> (as far as the 2<sup>nd</sup> eConcertation Workshop is concerned)



- iSGTW Organization weekly e-newsletter (International Science Grid This Week)  
<http://www.isgtw.org/>
- Research Infrastructure Unit Initiative  
<http://cordis.europa.eu/infrastructures/home.html>

### **NoEs - Networks of Excellence**

- AIM@SHAPE  
(Advanced and Innovative Models And Tools for the development of Semantic-based systems for Handling, Acquiring, and Processing knowledge Embedded in multidimensional digital objects)  
<http://www.aimatshape.net/>
- DELOS  
Network of Excellence on Digital Libraries  
<http://www.delos.info/>

### **3.3.3. Document Types**

This collection contains all public documents accessible through the BELIEF DL organised according to the most relevant Document Types as reported in “Appendix D – Collections and Document Types Cross-reference”.

This collection is organized in the following sub-collections:

- Articles
- Case Studies
- Conferences and Meetings
- Deliverables
- Dissemination and Training
- eCourses
- Manuals and User Guides
- Outreach
- Presentations
- Proceedings
- Project Management (Documents and Meetings)
- Publications
- Reports
- Software
- Technical Documents
- Wiki
- Working Notes

### **3.3.4. Interest Areas**

This collection contains all public documents accessible through the BELIEF DL organised according to the most relevant Areas of Interest as reported in “Appendix E – Areas of Interest”.



This collection is further organised in sub-collections, one for each Area of Interest. The following 12 sub-collections have been defined so far:

- AAI (Authentication and Authorisation Infrastructure)
- Applications
- Business
- Bioinformatics
- Digital Libraries
- Interoperability
- IPV6
- Network Monitoring
- Quality of Service
- Security
- Testbeds
- Virtual Organisations





### 3.4. Basic HW and SW Configuration

#### Supporting Hardware

The following hardware is used to support the BELIEF DL:

- Sun Fire V20z 1U Rack Mount x86 Opteron 250 Server with:
  - 2x 2.4GHz CPUs
  - 4GB Memory (4x1GB DDR1/400 DIMMs)
  - 2x 73GB 10K RPM Ultra320 SCSI disk
  - 2x 10/100/1000 Ethernet ports
  - 1x Full-Height/Full-Length 64 bit/133 MHz PCI-X slot
  - 1x Half-Height/Half-Length 64 bit/66MHz PCI-X slot
  - CD/floppy incl.
  - 1x Internal AC Power Supply

#### Software Configuration

The following software is used to support the BELIEF DL:

- Basic:
  - Red Hat Enterprise Linux Ver. 3, WS Edition, (for x86 32bit) Workstation/Client Partner with 2 CPU maximum
- Environment:
  - PERL (Ver. 5.8.6)
  - Apache (Ver. 1.3.34)
  - Perl interpreter (Ver. 5.8.0)
  - GCC compiler (Ver. 3.0)
  - Mod\_Perl (Ver. 1.29)
  - EmbPerl Framework (Ver. 2.1.0)
  - BerkeleyDB (Ver. 4.2.52)
  - ImageMagick (Ver. 6.2.6)
  - Expat (Ver. 2.0.0)
  - libxml2 (Ver. 2.5.10)
  - libxslt (Ver. 1.0.33)
  - pdftohtml (Ver. 0.36)
  - Xpdf (Ver. 3.01)
- DL specific:
  - OpenDLib (Ver. 2.0)
- User specific:
  - Microsoft Internet Explorer (Ver. 6.0 or higher)
  - Mozilla Firefox (Ver. 2.0 or higher)
  - Netscape (Ver. 6.0 or higher)
  - Any other Mozilla-based browser



## 4. References

- [AWS] Advanced Web Statistics  
<http://awstats.sourceforge.net/>
- [BBCODE] Bulletin Board Code  
<http://en.wikipedia.org/wiki/BBCode>
- [BELIEF] BELIEF Portal  
<http://www.beliefproject.org/>
- [BELIEFDL] BELIEF Digital Library  
<http://belief-dl.isti.cnr.it/>
- [D3.3.1] BELIEF-II DL User Guide & Wiki  
<https://userguide.wiki.belief.research-infrastructures.eu/>
- [DCMI] The Dublin Core Metadata Initiative Open Forum  
<http://www.dublincore.org/>
- [DCMIMT] DCMIMT Metadata Terms  
<http://dublincore.org/documents/dcmi-terms/>
- [DCT1] DCMIMT Type Vocabulary. DCMIMT Recommendation  
<http://dublincore.org/documents/dcmi-type-vocabulary/>
- [DES97] “The role of classification schemes in Internet resources description and discovery” - DESIRE Project Deliverable 3.2.3, 19 Feb 1997, M. Day et al., UKOLN, University of Bath, UK.
- [DoW] Project BELIEF-II Annex I – “Description of Work”
- [ISO639] ISO 639-2 - Codes for the representation of names of languages  
<http://www.loc.gov/standards/iso639-2/langhome.html>
- [RFC3066] Tags for the Identification of Languages, Internet RFC 3066.  
<http://www.ietf.org/rfc/rfc3066.txt>
- [OpenDLib] OpenDLib Official Site  
<http://opendlib.research-infrastructures.eu/>
- [TGN] Getty Thesaurus of Geographic Names  
<http://www.getty.edu/research/tools/vocabulary/tgn/index.html>
- [W3CDTF] Date and Time Formats, W3C Note  
<http://www.w3.org/TR/NOTE-datetime>
- [WikiUG] BELIEF Digital Library Wiki User Guide  
<https://userguide.wiki.belief.research-infrastructures.eu/>



## 5. Appendix A – BELIEF DL Functions Summary

The overall work area of the DL (the *DL Desktop*) is clearly organised into three parts [BELIEFDL]:

- On the left side are the Login/Logout & Register functions. According to the specific account permissions, a number of functions is also accessible there: "Submit News", "Personal Profile", "Users & Groups Management", "Documents Management", "Information Space Management" and "Options".  
Hence, this part of the Desktop shows all the actions that users belonging to the BELIEF "*Community*" may perform depending on their rights.
- On the right side, the content access functions (Browse, Search) are accessible. A "News" section is also shown, presenting relevant information about the DL from different points of view (events, user services, technical, etc.).  
Hence, this part of the Desktop is the "*Content Access*" section of the interface.
- In the middle is the area where Collections are shown and the content resulting from Browse and Search operations is shown.  
Hence, this is the "*Information Space*" part of the Desktop.

### Community Section

- **Personal Profile**
  - **View & Edit** to modify personal profile data.
  - **Unregister** to unregister from the Community.
- **Documents Management**
  - **Create** to create a new document.
  - **Submit** to submit requests of new documents for publication, new editions of documents already published, correction of documents already published, withdrawal requests.
  - **Review** to process new publication requests before approval.
  - **Admin** to manage all submission requests.
- **Information Space Management**
  - **Create & Modify Sets** to create/edit/delete sets of data on which collections are then created.
  - **Create & Modify Collections** to create/edit/delete public and/or personal collections.
- **Users & Groups Management**
  - **View & Modify Users** to create/delete users and manage their access rights.
  - **View & Modify Groups** to create/modify/delete groups of users and manage their access rights.



## Content Access Section

- **Browse**
  - **Browse** to browse the content of the current Information Space according to a selected Term.
  - **Print** to print the result of a Browse operation.
- **Simple & Combined Search**
  - **Search** to search the content of the current Information Space as a whole or according to a structured condition on multiple Terms.
  - **Print** to print the result of a Search operation.

## Information Space Section

- **Collection Selection** (via a check-box) to modify the actual scope of the Information Space.
- **Print** (via an icon) to print the information associated to a specific item of the Information Space.

Please refer to [D3.3.1] and [WikiUG] for details, or access directly [BELIEFDL].



## 6. Appendix B – BELIEF DL Metadata Definition

With OpenDLib, resources can be catalogued with multiple metadata formats. The BELIEF DL uses Dublin Core Qualified (DCQ) encoding for the purpose of interoperability since DCQ enables the enhanced sharing of information between Information Sources adopting different coding with no loss of semantics [DCMI].

The following (17, 9 of which qualified) DCQ metadata are currently supported by the BELIEF DL:

### 6.1. DL Metadata list

- 1) (\*) **Title** (*qualified*)
- 2) (\*) **Creator**
- 3) (\*) **Subject**
- 4) (\*) **Description** (*qualified*)
- 5) (\*) **Publisher**
- 6) - **Contributor** (*qualified*)
- 7) (\*) **Date** (*qualified*)
- 8) (\*) **Type** (*qualified*)
- 9) - **Status**
- 10) - **Format**
- 11) - **Identifier** (*qualified*)
- 12) - **Source** (*qualified*)
- 13) (\*) **Language**
- 14) - **Relation** (*qualified*)
- 15) - **Coverage** (*qualified*)
- 16) - **Rights**
- 17) (\*) **Provenance**

The 9 (nine) metadata marked with (\*) have to be considered mandatory for an effective classification in the DL.



## 6.2. DL Metadata details

The following definitions are given in [DCMI].

### 1) Title

A name given to the resource.

Typically, Title will be a name by which the resource is formally known.

In the BELIEF DL this element may be used with the following qualifiers:

- **Qualifiers**

- **Alternative**

- Any form of the title used as a substitute or alternative to the formal title of the resource.

- This qualifier can include Title abbreviations as well as translations.

### 2) Creator

An entity primarily responsible for making the content of the resource.

Examples of Creator include a person, an organisation or a service. Typically, the name of a Creator should be used to indicate the entity.

It is strongly recommended to follow the <Surname, Firstname> convention (this is mandatory when submitting to the DL via submission form).

The following are examples of BELIEF DL typical values:

- Von Braun, Werner
- BELIEF, Project
- ACME, Partner

### 3) Subject

A topic of the content of the resource.

Typically, Subject will be expressed as keywords, key phrases or classification codes that describe a topic of the resource. Recommended best practice is to select a value from a controlled vocabulary or formal classification scheme.

### 4) Description

An account of the content of the resource.

Examples of Description include, but is not limited to: an abstract, table of contents, reference to a graphical representation of content or a free-text account of the content.

In the BELIEF DL this element may be used with the following qualifiers:

- **Qualifiers**

- **abstract**

- A summary of the content of the resource.

- **fulltext**

- A summary of the content of the resource.

- **tableOfContents**

- A list of subunits of the content of the resource.



## 5) **Publisher**

An entity responsible for making the resource available.

Examples of Publisher include a person, an organisation or a service. This should be used to indicate the Information Source (i.e. the name of the Project, Organisation or Initiative which owns the resource).

## 6) **Contributor**

An entity responsible for making contributions to the content of the resource.

Examples of Contributor include a person, an organization, or a service. Typically, the name of a Contributor should be used to indicate the entity.

In the BELIEF DL this element may be used with the following qualifiers:

- **Qualifiers**
  - **Coordinator**
  - **Organiser**
  - **Participants**

## 7) **Date**

A date of an event in the lifecycle of the resource.

Typically, Date will be associated with the creation or availability of the resource. Recommended best practice for encoding the date value is defined in a profile of ISO 8601 [W3CDTF] and includes (among others) dates of the form YYYY-MM-DD.

In the BELIEF DL this element may be used with the following qualifiers:

- **Qualifiers**
  - **Available**

Date (often a range) that the resource will become or did become available.
  - **Created**

Date of creation of the resource.
  - **Issued**

Date of formal issuance (e.g., publication) of the resource.
  - **Modified**

Date on which the resource was changed.
  - **Valid**

Date (often a range) of validity of a resource.

## 8) **Type**

The nature or genre of the content of the resource.

Type includes terms describing general categories, functions, genres or aggregation levels for content. Recommended best practice is to select a value from a controlled vocabulary (for example, the DCM1 Type Vocabulary [DCT1]). To describe the physical or digital manifestation of the resource, use the FORMAT element.

In BELIEF DL this element is used with a subset of the values provided in [DCT1] plus a new set of new types that may be given as values for this element.

The following are the BELIEF specific defined possible values (this list is extendible):

- Article
- Audio
- Authored Book
- Brochure
- Case Study



- Conference & Meeting
- Deliverable
- Dissemination
- eCourse
- Edited Volume
- Manual & User Guide
- Handbook
- Module
- News
- Poster
- Presentation
- Proceeding
- Project Management Document
- Project Management Meeting
- Publication
- Report
- Software
- Summer School
- Technical Document
- Thesis
- Training
- Tutorial
- Video
- Wiki
- Working Notes

In the BELIEF DL this element may be used with the following qualifiers:

- **Qualifiers**

- **Informationsource**

The types of the content used in the information source repositories.

In BELIEF the following values are accepted (this list is extendable):

- Article(s)
- Audio
- Book
- Brochure(s)
- Case Study(ies)
- Code Exemplar
- Conference(s)
- Contribution(s)
- Course(s)
- Deliverable(s)
- Discussion Document
- Documentation
- EGEE Document
- EU Deliverable
- Event(s)
- Exercise
- Guideline(s)
- Information Sheet(s)





- Leaflet(s)
- Manual(s)
- Map(s)
- Meeting(s)
- (Meeting) Minute(s)
- Module
- News
- News Releases
- Newsletter(s)
- Paper
- Phone Conference(s)
- Poster(s)
- Presentation-Publication
- Presentation(s)
- Publication(s)
- Press
- Research Publication(s)
- Series
- Slide Presentation(s)
- Talk(s)
- Technical Document(s)
- Technical Note(s)
- Technical Report(s)
- Training
- Training material
- Tutorial(s)
- User Guide(s)
- Video
- Website
- White Paper(s)
- Wiki
- Workgroup(s)
- Workshop(s)

## 9) Status

The working status of the content of the resource.

In the BELIEF DL this element is used with the following values:

- In Work
- Under Approval
- Approved
- Released
- Obsolete

## 10) Format

The physical or digital manifestation of the resource.

Typically, Format may include the media-type or dimensions of the resource. Format may be used to identify the software, hardware or other equipment needed to display or operate the resource. Examples of dimensions include size and duration. Recommended best practice is to select a value



from a controlled vocabulary (for example, the list of Internet Media Types [MIME] defining computer media formats).

### 11) Identifier

An unambiguous reference to the resource within a given context.

Recommended best practice is to identify the resource by means of a string or number conforming to a formal identification system. Formal identification systems include but are not limited to the Uniform Resource Identifier (URI) (including the Uniform Resource Locator (URL)), the Digital Object Identifier (DOI) and the International Standard Book Number (ISBN).

In the BELIEF DL this element may be used with the following qualifiers:

- **Qualifiers**
  - **URL**  
The Uniform Resource Locator.

### 12) Source

A Reference to a resource from which the present resource is derived.

The present resource may be derived from the Source resource in whole or in part. Recommended best practice is to identify the referenced resource by means of a string or number conforming to a formal identification system.

In the BELIEF DL this element may be used with the following qualifiers:

- **Qualifiers**
  - **Activity**  
A value from a controlled vocabulary (RTD Innovation, Training, Demonstration, Management, Functional Design, Architectural Design, Implementation, Test, Dissemination, Exploitation, Project Management, etc.).
  - **Event**  
A value from a controlled vocabulary (Meeting, Review, Conference, etc.).

### 13) Language

A language of the intellectual content of the resource.

Recommended best practice is to use RFC 3066 [RFC3066] which, in conjunction with ISO639 [ISO639]), defines two- and three-letter primary language tags with optional subtags. Examples include "en" or "eng" for English, "akk" for Akkadian", and "en-GB" for English used in the United Kingdom.

### 14) Relation

A reference to a related resource.

Recommended best practice is to identify the referenced resource by means of a string or number conforming to a formal identification system.

In the BELIEF DL this element may be used with the following qualifiers:

- **Qualifiers**
  - **isPartOf**  
The described resource is a physical or logical part of the referenced resource.

### 15) Coverage

The extent or scope of the content of the resource.

Typically, Coverage will include spatial location (a place name or geographic coordinates), temporal period (a period label, date, or date range) or jurisdiction (such as a named administrative



entity). Recommended best practice is to select a value from a controlled vocabulary (for example, the Thesaurus of Geographic Names [TGN]) and to use, where appropriate, named places or time periods in preference to numeric identifiers such as sets of coordinates or date ranges.

In the BELIEF DL this element may be used with the following qualifiers:

- **Qualifiers**
  - **Spatial**  
Spatial characteristics of the intellectual content of the resource.
  - **Temporal**  
Temporal characteristics of the intellectual content of the resource.

## 16) **Rights**

Information about rights held in and over the resource.

Typically, Rights will contain a rights management statement for the resource, or reference a service providing such information. Rights information often encompasses Intellectual Property Rights (IPR), Copyright, and various Property Rights. If the Rights element is absent, no assumptions may be made about any rights held in or over the resource.

## 17) **Provenance**

A statement of any changes in ownership and custody of the resource since its creation that are significant for its authenticity, integrity and interpretation.

The statement may include a description of any changes successive custodians made to the resource.

The following are examples of BELIEF DL typical values:

- ProjectX Repository
- NameX Website
- ArticleX in MagazineY, IssueZ
- Etc.



## 7. Appendix C – BELIEF DL Feeding

### 7.1. Submission of Documents and Metadata to the BELIEF DL

Different methods for submitting documents and metadata to the DL are supported:

- On-line submission via Document Models (Web forms).
- Harvesting from existing Information Sources, implemented by specific modules and interfaces.
- Batch submission via an XML file.
- Native repository integration.

The on-line submission is described in the BELIEF Wiki User Guide [WikiUG] and is easily accessible both via the BELIEF Portal [BELIEF] or the BELIEF DL UI [BELIEFDL]. The on-line submission is available only for registered users of the BELIEF community.

The following sections show respectively:

- How documents and metadata can be harvested by the DL from an existing repository.
- How documents and metadata can be easily submitted to the DL in a batch mode using an XML file.

### 7.2. Data and Metadata Harvesting

#### Supported Standard Protocols and Formats

The DL can harvest metadata and documents from existing repositories using a combination of the following protocols and formats.

The following metadata encoding protocols are presently supported:

- DC
- DCQ (recommended)
- MARC, UNIMARC, MARC21, MARCXML

The following protocols for metadata harvesting are presently supported:

- OAI-PMH - Open Archives Initiative Protocol for Metadata Harvesting (recommended)
- Any API call returning an XML file containing metadata encoded in one of the above mentioned encoding

The following file formats are presently supported:

- XML (recommended)
- RSS

The following character encoding is strongly recommended (virtually mandatory):

- UTF-8 (Unicode Transformation Format-8)

#### Implemented Procedures and Tools

At the present time, the automatic harvesting process has been implemented for the following Information Sources:

- EELA
- EGEE
- AIM@SHAPE (via batch submission capability)
- BSI



- DANTE and related projects:
  - ALICE
  - EUMEDCONNECT
  - GEANT2
  - GEANT
  - TEIN2
- DILIGENT
- ETICS
- EuQoS (via batch submission capability)
- ICEAGE
- iSGTW
- MUPBED (via batch submission capability)
- SEE-GRID
- SEE-GRID-2
- SEE\_GRID\_SCI
- SEEREN2

Among them, a daily automatic harvesting has been scheduled for the following:

- BSI
- DANTE (and related projects)
- iSGTW
- SEE-GRID
- SEE-GRID-2
- SEE-GRID-SCI
- SEEREN2

Documents are collected also from the following repositories, although automatic harvesting has not yet been implemented on these:

- 6DISS
- CONDOR
- DRIVER
- DRIVER-II
- e-IRGSP
- EUChinaGRID
- EUIndiaGRID
- EUMEDGRID
- GLOBAL
- Grid@Asia
- GridCC
- OASIS
- OGF
- W3C

The following Entities perform direct submission of their documents to the DL:

- BioinfoGRID
- DELOS
- DILIGENT
- D4Science



- eConcertation
- GridTalk
- int.eu.grid
- ISSeG
- LOBSTER
- Research Infrastructure Unit, European Commission

Finally, the following repository are also natively integrated within the DL, relying on a OpenDLib based repository:

- DELOS
- DILIGENT
- D4Science

The table below shows how the documents and metadata are collected from each Entity, highlighting specific actions to be performed either by individual Entities or BELIEF as appropriate.

**Table 2 - Harvesting modes and tools**

Provider	Harvesting protocols and coding formats	Actions to be performed		Tools developed by BELIEF
		On Provider side	On BELIEF side	
6DISS	Proprietary	None	Temporarily manually performed by DL Administrator	Models for submission
AIM@SHAPE	Proprietary, XML	XML file for batch submission	XML file processing	Specific Harvester
BIOINFOGRID	None – Hosting of the DL on BELIEF	None – Direct submission	None – Native support	Models for submission
BSI	RSS, XML	RSS access implementation	RSS access	Specific Harvester
CONDOR	OAI, DCQ	None	Temporarily manually performed by DL Administrator	Models for submission
D4Science	OAI, DCQ	None	None	Implementation of native integration within the provider's portal
DANTE <i>ALICE</i> <i>EUMEDCONNECT</i> <i>GEANT2</i> <i>GEANT</i> <i>TEIN2</i>	Proprietary, XML	None	API invocation	Specific Harvester
DRIVER	Proprietary	None	Manually performed by DL Administrator	Models for submission and style sheet for visualisation on the provider's portal
DRIVER-II	Proprietary	None	Manually performed by DL Administrator	Models for submission and style sheet for visualisation



Provider	Harvesting protocols and coding formats	Actions to be performed		Tools developed by BELIEF
		On Provider side	On BELIEF side	
				on the provider's portal
e-IRGSP	None	None	Temporarily manually performed by DL Administrator	Models for submission
EELA	Proprietary, XML	None	API invocation	Specific Harvester
EGEE Training	OAI, DC	None	WS invocation	Specific Harvester
EGEE Conferences	Proprietary, MARCXML (alternatively OAI, DC)	None	API invocation	Specific Harvester
EGEE Public	Proprietary, XML	None	API invocation	Specific Harvester
ETICS	Proprietary, XML	None	API invocation	Specific Harvester
DELOS	OAI, DCQ	None	Direct access	None
DILIGENT	OAI, DCQ	None	Direct access	None
eConcertation	None – Hosting of the DL on BELIEF	None – Direct submission	None – Native support	Models for submission
EUChinaGRID	OAI, DCQ	None	Temporarily manually performed by DL Administrator	Models for submission
EUIndiaGRID	OAI, DCQ	None	Temporarily manually performed by DL Administrator	Models for submission
EUMEDGRID	OAI, DCQ	None	Temporarily manually performed by DL Administrator	Models for submission
EuQoS	Proprietary, XML	XML file for batch submission	XML file processing	Specific Harvester
GLOBAL	Proprietary	None	Temporarily manually performed by DL Administrator	Models for submission
Grid@Asia	Proprietary	None	Temporarily manually performed by DL Administrator	Models for submission
GridCC	Proprietary	None	Temporarily manually performed by DL Administrator	Models for submission
GridTalk	None – Hosting of the DL on BELIEF	None – Direct submission	None – Native support	Models for submission
ICEAGE	OAI, DC	None	WS invocation	Specific Harvester
iSGTW	RSS, XML	None	RSS access	Specific Harvester
int.eu.grid	None – Hosting of the DL on BELIEF	None – Direct submission	None – Native support	Models for submission
ISSEG	None – Hosting of the DL on BELIEF	None – Direct submission	None – Native support	Models for submission
LOBSTER	None – Hosting of the DL on BELIEF	None – Direct submission	None – Native support	Models for submission
MUPBED	Proprietary, XML	XML file for batch submission	XML file processing	Specific Harvester
OASIS	Proprietary	None	Temporarily manually performed	Models for submission
OGF	Proprietary	None	Temporarily manually performed	Models for submission



Provider	Harvesting protocols and coding formats	Actions to be performed		Tools developed by BELIEF
		On Provider side	On BELIEF side	
Research Infrastructure Unit	None – Hosting of the DL on BELIEF	None – Direct submission	None – Native support	Models for submission
SEE-GRID	RSS, XML	None	RSS access	Specific Harvester
SEE-GRID-2	OAI, XML, DCQ	Mapping from proprietary to standard protocols	API invocation	Specific Harvester
SEE-GRID-SCI	RSS, XML	RSS access implementation	RSS access	Specific Harvester
SEEREN2	RSS, XML	None	RSS access	Specific Harvester
W3C	Proprietary	None	Temporarily manually performed	Models for submission





### 7.3. Batch Submission

#### Sample XML file

The file is designed to contain:

1. A list of documents enclosed between the `<ListDocuments>...</ListDocuments>` tags.
2. Each element of the list is delimited by the two `</document>...</document>` tags.

With regard to the parameters in

```
<document id="xxxxxxx" version="yy" status="created|updated|deleted">
```

note that:

- “id” is the "unique identifier" (if any) that can be associated to the document by the source system/repository and which is supposed not to change all along document's life.
- “version” identifies different versions of the same document.
- “status” is used to specify if the document identified by the couple “id + version” is a new one, is intended to replace an existing one, or simply identify a document which must be removed. In this last case none of the other infos (see 2.1 and 2.2 below) need to be specified.

Each element of the list consists of two sub-elements:

- 2.1) The `<manifestations>...</manifestations>` sub-element, which is used to associate one or more different manifestations (Word, PDF, etc.) to the same document. For details on the content type to be specified for each manifestation, please refer to the following Section.
- 2.2) The `<metadata>...</metadata>` sub-elements, for which only some of the possible terms are shown in the example (they can be added/modified according to specific needs, following what is defined above).

Finally, this file can be either automatically or manually produced simply using an editor like WordPad on Windows or Kedit on Linux. In both cases it is mandatory to use always UTF-8 encoding to avoid inappropriate characters mapping on particular local characters.



## Sample file structure

```
<?xml version="1.0" encoding="UTF-8"?>
<ListDocuments>
  <document id="xxxxxxx" version="yy" status="created|updated|deleted">
    <manifestations>
      <manifestation uri="http://xxx" content_type="content-type-of-file-1"/>
      <manifestation uri="http://xxx" content_type="content-type-of-file-N"/>
    </manifestations>
    <metadata>
      <dc:ol xmlns:dc="http://dublincore.org/documents/dcmi-terms/">
        <dc:title>Full-title-of-the-document</dc:title>
        <dc:creator>Surname,Name-of-the-author-1</dc:creator>
        <dc:creator>Surname,Name-of-the-author-N</dc:creator>
        <dc:subject>Subject-of-the-document-1</dc:subject>
        <dc:subject>Subject-of-the-document-N</dc:subject>
        <dc:description>Text-of-the-abstract-of-the-document</dc:description>
        <dc:publisher>Name-of-the-entity-responsible-for-publishing-the-
document</dc:publisher>
        <dc:date.available>aaaa-mm-dd</dc:date.available>
        <dc:date.created>aaaa-mm-dd</dc:date.created>
        <dc:date.issued>aaaa-mm-dd</dc:date.issued>
        <dc:date.modified>aaaa-mm-dd</dc:date.modified>
        <dc:date.valid>aaaa-mm-dd - aaaa-mm-dd</dc:date.valid>
        <dc:type>Type-of-the-document-1</dc:type>
        <dc:type>Type-of-the-document-N</dc:type>
        <dc:language>Language-of-the-document-1</dc:language>
        <dc:language>Language-of-the-document-N</dc:language>
        <dc:identifier>ISBN-or-other-identifier</dc:identifier>
        <dc:identifier.url>URL-of-the-document</dc:identifier.url>
        <dc:provenance>Provenance-of-the-document</dc:provenance>
      </dc:ol>
    </metadata>
  </document>
</ListDocuments>
```



## Content-type list for BELIEF DL

The following is the list of the content-types used in BELIEF DL.

Each item is in the form <name, extension, content-type>.

```
name="postscript" ext="%s.ps" content-type="application/postscript"
name="xml" ext="%s.xml" content-type="text/xml"
name="xsd" ext="%s.xsd" content-type="text/xml"
name="wsdl" ext="%s.wsdl" content-type="text/xml"
name="sh" ext="%s.sh" content-type="application/x-sh"
name="quicktime" ext="%s.mov" content-type="video/quicktime"
name="pdf" ext="%s.pdf" content-type="application/pdf"
name="WindowsMediaVideo" ext="%s.wmv" content-type="video/x-ms-wmv"
name="mpeg" ext="%s.mpeg" content-type="video/mpeg"
name="mpg" ext="%s.mpg" content-type="video/mpeg"
name="mp3" ext="%s.mp3" content-type="audio/mpeg"
name="windowsmetafile" ext="%s.wmf" content-type="video/x-msvideo"
name="html" ext="%s.html" content-type="text/html"
name="mht" ext="%s.mht" content-type="text/html"
name="php" ext="%s.php" content-type="text/html"
name="ram" ext="%s.ram" content-type="audio/x-pn-realaudio"
name="jpg" ext="%s.jpg" content-type="image/jpeg"
name="realmedia" ext="%s.rm" content-type="application/vnd.rn-realvideo"
name="doc" ext="%s.doc" content-type="application/msword"
name="xls" ext="%s.xls" content-type="application/vnd.ms-excel"
name="pps" ext="%s.pps" content-type="application/vnd.ms-powerpoint"
name="ppt" ext="%s.ppt" content-type="application/vnd.ms-powerpoint"
name="pot" ext="%s.pot" content-type="application/vnd.ms-powerpoint"
name="rtf" ext="%s.rtf" content-type="application/rtf"
name="dvi" ext="%s.dvi" content-type="application/x-dvi"
name="avi" ext="%s.avi" content-type="video/x-msvideo"
name="gif" ext="%s.gif" content-type="image/gif"
name="inline" ext="inline/%04d.gif" content-type="image/gif"
name="inline-part" ext="inline/%04d.gif" content-type="image/gif"
name="composite" ext="Composite/%04d.gif" content-type="image/gif"
name="auto-html" ext="%s.html" content-type="text/html"
name="streamedwindowsmedia" ext="%s.asf" content-type="video/x-msvideo"
name="smil" ext="%s.smil" content-type="text/xml"
name="png" ext="%s.png" content-type="image/png"
name="xif" ext="%s.xif" content-type="image/vnd.xif"
name="text" ext="%s.txt" content-type="text/plain"
name="txt" ext="%s.txt" content-type="text/plain"
name="ocr" ext="%s.ocr" content-type="text/plain"
name="xdoc" ext="xdoc/%04d.xdoc" content-type="text/plain"
name="MPEG-4" ext="%s.mp4" content-type="video/mp4"
name="mdi" ext="%s.mdi" content-type="text/plain"
name="sxw" ext="%s.sxw" content-type="application/vnd.sun.xml.writer"
name="rpm" ext="%s.rpm" content-type="application/x-rpm"
name="cpf" ext="%s.cpf" content-type="application/octet-stream"
```



```
name="py" ext="%s.py" content-type="text/plain"  
name="java" ext="%s.java" content-type="text/plain"  
name="ai" ext="%s.ai" content-type="application/postscript"  
name="windowsmediafile" ext="%s.wmf" content-type="video/x-msvideo"  
name="zip" ext="%s.zip" content-type="application/x-zip-compressed"  
name="Visio" ext="%s.vsd" content-type="application/vnd.visio"  
name="MS-Project" ext="%s.mpp" content-type="application/vnd.ms-project"  
name="tar" ext="%s.tar" content-type="application/x-tar"  
name="TeX" ext="%s.tex" content-type="application/x-tex"  
name="dot" ext="%s.dot" content-type="application/x-dot"  
name="gzip" ext="%s.gz" content-type="application/x-gzip"  
name="sxi" ext="%s.sxi" content-type="application/vnd.sun.xml.impress"  
name="sti" ext="%s.sti" content-type="application/vnd.sun.xml.impress.template"  
name="tgz" ext="%s.tgz" content-type="application/x-gzip"  
name="smi" ext="%s.smi" content-type="audio/x-pn-realaudi
```



## 8. Appendix D – Collections and Document Types Cross-reference

Table 3 - Collections and document types cross-reference

<b>BELIEF Collections</b>	<b>BELIEF Document Types</b>	<b>Information Sources Document Types</b>
<b>Articles</b>	<b>Article</b>	Article(s)
<b>Case Studies</b>	<b>Case Study</b>	Case Study
<b>Conferences and Meetings</b>	<b>Conference and Meeting</b>	Conference(s), Event(s), Events &/and Meetings, Meeting(s), Workgroup(s) Workshop(s),
<b>Deliverables</b>	<b>Deliverable</b>	EU Deliverable, Deliverable(s),
<b>Dissemination and Training</b>	<b>Dissemination</b>	Dissemination
	<b>Summer School</b>	Summer School
	<b>Training</b>	Course(s), EGEE Training Resource, Exercise, Module(s), Series, Training, Website
	<b>Tutorial</b>	Tutorial(s)
<b>eCourses</b>	<b>eCourse</b>	eCourse(s)
<b>Manuals and User Guides</b>	<b>Handbook</b>	Handbook(s)
	<b>Manual and User Guide</b>	Manuals, Manuals &/and User Guides, User Guides
<b>News</b>	<b>News</b>	Bulletin(s) News, News Releases, Newsletters, Press
<b>Outreach</b>	<b>Brochure</b>	Brochure(s), Flyers, Information Sheets, Leaflets
	<b>Poster</b>	Maps, Poster(s)
<b>Presentations</b>	<b>Audio</b>	Audio
	<b>Presentation</b>	Audio, Contribution(s), Presentation(s), Presentation-Publication, Slide Presentations, Talk(s)
	<b>Video</b>	Video(s)
<b>Proceedings</b>	<b>Proceedings</b>	Proceedings



<b>BELIEF Collections</b>	<b>BELIEF Document Types</b>	<b>Information Sources Document Types</b>
<b>Project Management Documents</b>	<b>Project Management Document</b>	(Meeting) Minute(s), Project Management Document, Quality Plan(s)
<b>Project Management Meetings</b>	<b>Project Management Meeting</b>	Project Management Meeting
<b>Publications</b>	<b>Authored Book</b>	Authored Book(s), Book(s)
	<b>Edited Volume</b>	Edited Volume(s)
	<b>Publication</b>	eInfrastructures Roadmap, Book(s), Opportunities List, Publication(s), Research Publication(s), White Paper(s)
	<b>Thesis</b>	Thesis
<b>Reports</b>	<b>Report</b>	Report(s)
<b>Software</b>	<b>Software</b>	Code Exemplar, Software
<b>Technical Documents</b>	<b>Technical Document</b>	EGEE Document, Technical Document(s), Technical Note(s), Technical Report(s)
<b>Wikis</b>	<b>Wiki</b>	Wiki
<b>Working Notes</b>	<b>Working Note</b>	Working Note(s)



## 9. Appendix E – Areas of Interest

This appendix reports the implemented areas of interest and suggests a number of areas of interest to be proposed to BELIEF Community members as “Area of Application Interest” and “Area of Topic Discussion Interest” for which corresponding collections could be defined.

At present, these areas of interest are shown in the on-line Community registration form of the BELIEF Portal. Each area hereafter is described in terms of its most relevant subjects.

Both areas and related descriptions can be extended and/or modified based on the suggestions made by Community member through the Portal.

### 9.1. Implemented Collections

Collections & sub-collections	Details	
• <b>Interest Areas</b>	Name	Interest Areas
	Image/Logo	<BELIEF Project Logo>
	Description	This collection contains all public documents accessible through the BELIEF DL organised according to the most relevant Areas of Interest. This collection is further organised in sub-collections, one for each Area of Interest.
	Sub-collections	<ul style="list-style-type: none"> <li>• AAI (Authentication and Authorisation Infrastructure)</li> <li>• Applications</li> <li>• Business</li> <li>• Bioinformatics</li> <li>• Digital Libraries</li> <li>• Interoperability</li> <li>• IPV6</li> <li>• Network Monitoring</li> <li>• Quality of Service</li> <li>• Security</li> <li>• Testbeds</li> <li>• Virtual Organisations</li> </ul>
○ <b>(for each Area)</b>	Name	<Area’s Name>
	Description	<short description>

## 9.2. Suggested Collections

Collections & sub-collections	Details	
<ul style="list-style-type: none"> <li>• <b>Application Areas</b></li> </ul>	Name Description  Sub-collections	Application Areas This collection contains the application areas to which the DL contents belong. Each application area is in turn qualified by a set of specific subjects. <ul style="list-style-type: none"> <li>• Astrophysics</li> <li>• Business</li> <li>• Bioinformatics</li> <li>• Biophysics</li> <li>• Chemistry</li> <li>• Digital Libraries</li> <li>• Earth Science</li> <li>• Financial</li> <li>• Geophysics</li> <li>• Mathematical and computer methods in mechanics</li> <li>• Material processing &amp; Sciences</li> <li>• Medicine &amp; Biology</li> <li>• Physics</li> <li>• Etc.</li> </ul>
<ul style="list-style-type: none"> <li>○ <b>Application Areas (for each)</b></li> </ul>	Name  Description Subject	<Application Area Name>  <short description> <main topics>
<ul style="list-style-type: none"> <li>• <b>Discussion Topic Areas</b></li> </ul>	Name Description  Sub-collections	Discussion Topic Areas This collection contains the discussion topic areas to which DL the contents belong. Each discussion topic area is in turn qualified by a set of specific subjects. GRID/Middleware: <ul style="list-style-type: none"> <li>• AAI (Authentication and Authorisation Infrastructure)</li> <li>• Applications of parallel/distributed/GRID computing</li> <li>• Data Management</li> <li>• Dependable networks &amp; middleware</li> <li>• GRID &amp; eInfrastructure in Industry</li> <li>• Grid Access</li> <li>• GRID On Demand</li> <li>• Information &amp; Monitoring</li> <li>• Interoperability &amp; Interfaces</li> <li>• Methods and tools for</li> </ul>





Collections & sub-collections	Details	
		<p>dependable distributed systems</p> <ul style="list-style-type: none"> <li>• Metrics for trustworthiness</li> <li>• Middleware Security</li> <li>• Performance Monitoring, Analysis &amp; Prediction</li> <li>• Resources Management &amp; Allocation</li> <li>• Scheduling, mapping, load balancing</li> <li>• Virtual Organisation(s)</li> <li>• Workload Management</li> <li>• Etc.</li> </ul> <p>Networking:</p> <ul style="list-style-type: none"> <li>• Advanced Network Monitoring</li> <li>• Bandwidth on Demand</li> <li>• End to End Service Provision</li> <li>• IPV6</li> <li>• Layer 2 VPN</li> <li>• Multicast</li> <li>• Network Security</li> <li>• Performance Measurement and Monitoring</li> <li>• Quality of Service</li> <li>• Testbed, technology testing</li> <li>• Etc.</li> </ul>
<ul style="list-style-type: none"> <li>○ <b>Discussion Topic Areas (for each)</b></li> </ul>	<p>Name</p> <p>Description</p> <p>Subject</p>	<p>&lt;Discussion Topic Area Name&gt;</p> <p>&lt;short description&gt;</p> <p>&lt;main topics&gt;</p>

### 9.3. Suggested Subjects

Subject	Description
<b>Area of Application Interest in e-Infrastructures/GRID</b>	
Astrophysics	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Active Galactic Nuclei</li> <li>○ Air Showers</li> <li>○ Cosmic Background Radiation Field</li> <li>○ Gamma Ray Bursts</li> <li>○ High Energetic Primary Cosmic Rays</li> <li>○ High Energy Gamma Rays</li> <li>○ High Energy Neutrinos</li> <li>○ Imaging Atmospheric Cherenkov Telescope (IACT)</li> <li>○ Large Area Water Cherenkov Detector</li> <li>○ Microwave Sky</li> <li>○ Etc.</li> </ul>
Business	<List of issues>
Bioinformatics	<List of issues>
Biophysics	<List of issues>
Chemistry	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Chemical Systems Dynamics</li> <li>○ Molecular Modelling</li> <li>○ Simulation of Complex Chemical Systems</li> <li>○ Etc.</li> </ul>
Digital Libraries	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Application Specific Management</li> <li>○ Content and Metadata Management</li> <li>○ Digital Library Creation and Management</li> <li>○ Grid Protocol Architecture</li> <li>○ Index and Search Management</li> <li>○ Open Grid Service Architecture</li> <li>○ Open Grid Service Infrastructure</li> <li>○ Process Management</li> <li>○ Scalable Virtual Organisations</li> <li>○ Web Services Architecture</li> <li>○ Web Service Definition Language (WSDL)</li> <li>○ Etc.</li> </ul>
Earth Science	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Climatology</li> <li>○ Earth Observation</li> <li>○ Earthquake Simulation</li> <li>○ Environmental Modelling</li> <li>○ Flood Forecasting</li> <li>○ Hydrology</li> <li>○ Meteorology</li> <li>○ Ozone Profiles</li> <li>○ Solid Earth Physics</li> <li>○ 3D Geological Models</li> <li>○ 3D Density-dependant Groundwater Flow and Salt Transport Models</li> <li>○ Etc.</li> </ul>

Subject	Description
Financial	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Authorisation and Accounting</li> <li>○ Best Quote Data</li> <li>○ Data Management</li> <li>○ Econophysics</li> <li>○ High Frequency Data</li> <li>○ Transaction Data</li> <li>○ Virtual Organisation</li> <li>○ Etc.</li> </ul>
Geophysics	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Seismic Inversion</li> <li>○ Seismic Processing</li> <li>○ Seismic Tools</li> <li>○ 3D Surface-related Multiple Modelling</li> <li>○ 3D Tomography Modelling</li> <li>○ Etc.</li> </ul>
Mathematical and computer methods in mechanics	<List of issues>
Material processing & Sciences	<List of issues>
Medicine & Biology	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Clinical Decisions Support</li> <li>○ Contrast Transfer Function (CTF)</li> <li>○ DNA Sequences Similarities</li> <li>○ Drug Discovery</li> <li>○ Electron Microscopic Images Manipulation</li> <li>○ Genome Sequencing</li> <li>○ Human Genetic Development</li> <li>○ Mammography</li> <li>○ Molecular Docking Analysis</li> <li>○ Molecular Interactions Screening</li> <li>○ MRI Simulation</li> <li>○ Protein Analysis</li> <li>○ Radio Therapy Planning</li> <li>○ Spatial and Temporal Coalescences</li> <li>○ Tomographic Emission</li> <li>○ Etc.</li> </ul>
Physics	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Energy Particle Accelerator</li> <li>○ Hydrogen Plasma Torus</li> <li>○ High Energy Particle Collisions</li> <li>○ High Energy Physics (HEP)</li> <li>○ Large Hadron Collider (LHC)</li> <li>○ Particle Accelerator</li> <li>○ Physics of Strongly Interacting Matter</li> <li>○ Plasma Physics</li> <li>○ Etc.</li> </ul>

Subject	Description
<b>Area of Topic Discussion Interest in e-Infrastructures (GRID/Middleware)</b>	
AAI (Authentication and Authorisation Infrastructure)	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Interworking AAIs</li> <li>○ Scalability</li> <li>○ Management of federations and confederations</li> <li>○ Legal issues: privacy of user attributes, liability, etc.</li> <li>○ Attribute-based authorisation in Grids</li> <li>○ Full Single-Sign-On</li> <li>○ Roaming and AAI</li> <li>○ Etc.</li> </ul>
Applications of parallel/distributed/GRID computing	<List of issues>
Data Management	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Data Catalogues</li> <li>○ Data granularity</li> <li>○ Data movement</li> <li>○ Data naming</li> <li>○ Data scheduling</li> <li>○ File placement</li> <li>○ File transfer</li> <li>○ Indexing</li> <li>○ Metadata</li> <li>○ Replication</li> <li>○ Storage resource management</li> <li>○ Storage element</li> <li>○ Transfer service</li> <li>○ Etc.</li> </ul>
Dependable networks & middleware	<List of issues>
GRID & e-Infrastructure in Industry	<List of issues>
Grid Access	<List of issues>
GRID On Demand	<List of issues>
Information & Monitoring	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Grid applications status</li> <li>○ Grid Monitoring Architecture</li> <li>○ Resources availability</li> <li>○ Service discovery</li> <li>○ Etc.</li> </ul>
Interoperability & Interfaces	This subject concerns the essential interfaces between the various stakeholders in the Network-Grid-Application community. It addresses the following issues: <ul style="list-style-type: none"> <li>○ Grid interface to network resources</li> <li>○ Coordination of network resources with Grid resources (e.g. CPU, storage)</li> <li>○ Interoperability among different Grid infrastructures</li> <li>○ Standardisation of application interfaces to different grids</li> <li>○ Etc.</li> </ul>
Methods and tools for dependable distributed systems	<List of issues>
Metrics for trustworthiness	<List of issues>
Middleware Security	<List of issues>
Performance Monitoring, Analysis & Prediction	This subject covers the role of performance monitoring in and between different e-Infrastructure environments. It addresses the following

Subject	Description
	issues: <ul style="list-style-type: none"> <li>○ Multi-domain network monitoring</li> <li>○ Grid monitoring</li> <li>○ Tools for measurement collection and visualisation</li> <li>○ Summarisation of the monitoring information</li> <li>○ Sharing monitoring information: policies, anonymisation, privacy</li> <li>○ End-to-end performance</li> <li>○ Definition of operational procedures in case of a fault</li> <li>○ Etc.</li> </ul>
Resources Management & Allocation	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Job prioritisation (between grid and non-grid jobs and between grid-jobs)</li> <li>○ Advance reservation tools</li> <li>○ Routing and scheduling for dynamic bandwidth control</li> <li>○ Bandwidth on Demand</li> <li>○ Developments in lower layer technology</li> <li>○ Developments in integrated control planes (optical/SDH/SONET/Ethernet/IP)</li> <li>○ Time frame possible applicability</li> <li>○ Vision of place of pure optical networking</li> <li>○ Etc.</li> </ul>
Scheduling, mapping, load balancing	<List of issues>
Security	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Certification Authority</li> <li>○ Global security architecture</li> <li>○ Incident handling</li> <li>○ Incident response</li> <li>○ Intrusion detection</li> <li>○ Operational security</li> <li>○ Public Key Infrastructure</li> <li>○ Grid security event</li> <li>○ Grid security incident</li> <li>○ Security infrastructure</li> <li>○ Security policies</li> <li>○ Site access control</li> <li>○ Site usage control</li> <li>○ VO systems</li> <li>○ Web services security</li> <li>○ Etc.</li> </ul>
Virtual Organisation(s)	<List of issues>
Workload Management	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Computing elements</li> <li>○ Grid accounting</li> <li>○ Job provenance</li> <li>○ Logging and bookkeeping</li> <li>○ Scheduling policies</li> <li>○ Etc.</li> </ul>

Subject	Description
<b>Area of Topic Discussion Interest in e-Infrastructures (Networking)</b>	
Advanced Network Monitoring	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Bandwidth</li> <li>○ Delay measurement</li> <li>○ Delay variations (jitter)</li> <li>○ Multi-domain Monitoring</li> <li>○ Packet loss</li> <li>○ Trend analysis</li> <li>○ Etc.</li> </ul>
Bandwidth on Demand	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Dedicated “light paths”</li> <li>○ Layer 1 wavelengths on fibre (native)</li> <li>○ Layer 2 channels (native and emulated)</li> <li>○ MPLS label-switched paths (LSPs)</li> <li>○ Packet-based QoS</li> <li>○ Time-division multiplexing (TDM) channels</li> <li>○ Etc.</li> </ul>
End to End Service Provision	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Automatic network elements configuration</li> <li>○ Multi-domain provisioning</li> <li>○ Etc.</li> </ul>
IPv6	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Addressing plan</li> <li>○ Dual-stack network</li> <li>○ IPV4 and IPV6 coexistence</li> <li>○ Migration policy</li> <li>○ Network interoperability</li> <li>○ Network reliability</li> <li>○ Network stability</li> <li>○ Routing policy</li> <li>○ Service continuity</li> <li>○ Etc.</li> </ul>
Layer 2 VPN	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Point-to-point connections</li> <li>○ Tunnelling</li> <li>○ Multi-Protocol Label Switching (MPLS)</li> <li>○ Label Switched Paths (LSPs)</li> <li>○ Resource Reservation Protocol (RSVP)</li> <li>○ Etc.</li> </ul>
Multicast	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Access circuits</li> <li>○ Broadcast</li> <li>○ Distribution trees</li> <li>○ Multicast topology</li> <li>○ Unicast</li> <li>○ Protocol Independent Multicast-Sparse Mode (PIM-SM)</li> <li>○ Multi-Protocol Border Gateway Protocol (MBGP)</li> <li>○ Etc.</li> </ul>
Network Security	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Anomaly detection</li> <li>○ Detection and mitigation of denial of service (DoS) attacks</li> <li>○ Proactive security services</li> <li>○ Security policies</li> </ul>



Subject	Description
	<ul style="list-style-type: none"> <li>○ Service security</li> <li>○ Etc.</li> </ul>
Performance Measurement and Monitoring	Addresses the following issues: <ul style="list-style-type: none"> <li>○ End-to-end management</li> <li>○ End-to-end service</li> <li>○ Monitoring metrics</li> <li>○ Etc.</li> </ul>
Quality of Service	Addresses the following issues: <ul style="list-style-type: none"> <li>○ Differentiated Services Model</li> <li>○ IP Performance Metrics</li> <li>○ Network congestion</li> <li>○ Network performance level</li> <li>○ Service differentiation</li> <li>○ Etc.</li> </ul>
Testbed, technology testing	<List of issues>