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Information and Communication Technology**



**Tagging Tool based on a Semantic Discovery
Framework**



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Table of Contents

| | |
|--|------------|
| 1. Management summary | 8 |
| 1.1. Purpose of this document | 8 |
| 1.2. Intended audience | 9 |
| 1.3. Changes in Version 2 | 9 |
| 1.4. Structure of the document | 11 |
| 1.5. Requirement table usage | 12 |
| 1.6. References to user requirements | 12 |
| 1.6.1 Needs & Gaps Analysis – V1 | 13 |
| 1.6.2 Needs & Gaps Analysis – V2 | 14 |
| 1.6.3 Analysis of WP5 Scenario Definitions Deliverables | 16 |
| 2. Abbreviations and acronyms | 17 |
| 2.1. Acronyms for project partners | 19 |
| 2.2. Acronyms for the technical requirement’s categories | 20 |
| 3. Strategic positioning requirements related to SISE | 21 |
| 4. General enterprise requirements | 23 |
| 4.1. Architectural design | 23 |
| 5. Discovery and harvesting | 28 |
| 5.1. Search and discovery | 28 |
| 5.2. Harvesting | 38 |
| 6. Semantics | 44 |
| 6.1. Ontologies | 44 |
| 6.2. Meta-information | 51 |
| 7. Tagging and annotation | 56 |
| 7.1. Tagging of resources | 56 |
| 8. Access | 68 |
| 8.1. Access to TaToo meta-information | 68 |
| 8.2. Access to external resources | 72 |
| 9. Security | 75 |
| 9.1. Access control | 75 |
| 10. Archiving / Storage | 79 |
| 11. Data quality | 84 |
| 12. User components | 86 |
| 12.1. Web-Portal | 86 |
| 12.2. Clients and tools | 89 |
| 13. Visualisation | 96 |
| 13.1. Data representation | 103 |
| 14. System administration | 106 |
| 14.1. User management | 107 |



| | | |
|------------|-------------------------------|------------|
| 15. | Conclusion | 110 |
| 16. | Acknowledgements | 110 |
| 17. | References | 111 |

Index of Figures

| | |
|--|----|
| Figure 1.1: Approach to the definition of TaToo requirements | 8 |
| Figure 1.2: TaToo technical requirements categories (functional building blocks) | 11 |

Index of Tables

| | |
|--|----|
| Table 1.1: Requirements table usage..... | 12 |
| Table 1.2: Requirements from Needs & Gaps analysis V1..... | 13 |
| Table 1.3: Requirements from Needs & Gaps analysis V2..... | 16 |
| Table 1.4: Requirements from Validation Scenarios Analysis | 17 |
| Table 2.1: Abbreviations and acronyms..... | 19 |
| Table 2.2: Acronyms for project partners | 19 |
| Table 2.3: Acronyms for requirements | 20 |

1. Management summary

1.1. Purpose of this document

The requirements document represents a consolidation point in the process of the TaToo requirements analysis. It describes what TaToo shall do for the Users and it is the reference for various downstream tasks, like:

- the design of the TaToo framework architecture;
- the specifications of the services and tools offered by TaToo;
- the verification and exploitation of the TaToo results.

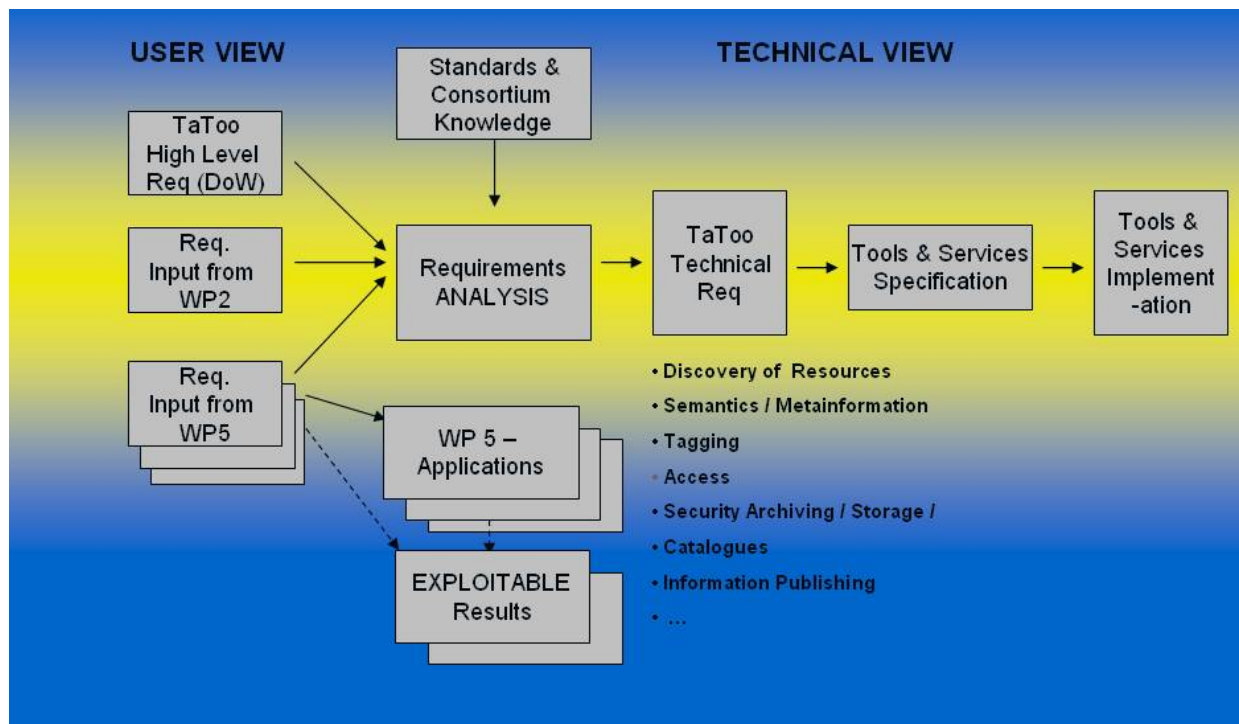


Figure 1.1: Approach to the definition of TaToo requirements

Technical requirements are the result of a consolidation process (as shown in Figure 1.1) which was subdivided into four steps, as follows.

- (1) Discerning analysis of the applications oriented requirements documented during the process of deliverables preparation of WP 5 (Validation Scenarios), in order to identify the potential link with the technologies to be used in the project.
- (2) Analysis of the user needs and translation into **relevant** technical requirements.
- (3) Analysis of other useful sources of complementary requirements derived from: the knowledge and experience of the TaToo team, other FP7 projects, standardization bodies,

and user communities.

- (4) Addressing high level project requirements as described in the DoW as TaToo measurable objectives.
- (5) Classification and formal documentation into the deliverable D2.3.2 Requirements Document (this document) describing the scope (function), the realisation time (for example implementation in version 1) as well as the trace-back to the origin of the requirement.

This Requirements Document will serve as the reference for the preparation of the Architectural Design and Specifications of Tools and Services.

1.2. Intended audience

The target readers are Workpackages and Tasks Leaders of TaToo. In particular this document provides input to partners working in WP3 and on the TaToo Framework Architecture and Service Specification. Feedbacks are supposed to be provided by all of them in order to achieve the Architecture Specification in WP3. This feedback process will happen through successive and iterative cycles.

1.3. Changes in Version 2

In this revision of the document the goal was to provide an updated and revised list of requirements. This means that we reviewed the requirements from version 1 and updated them to meet the current state of the project. Also some new requirements and where necessary additional requirement categories have been introduced. Some requirements have become obsolete and have been removed.

Revision and updates of requirements have been performed related to:

- User-friendly semantic search
- Open Tagging
- Tagging of Tags
- Proposing new Tags
- Access control to internal system data
- Alternative service bindings
- Community Building

- Personalisation
- Tagging Portlet for Web Portal
- Search Portlet for Web Portal
- Search Client for Web Browser
- Tagging Client for mobiles
- Search Client for mobiles
- Web Interface
- Visualisation & Filtering

Furthermore, the following changes have been made:

- Introduction of a new row in the Requirement Template for specifying how a requirement is going to be validated,
- Description of how to provide the information in the new validation row,
- General improvements and updates of the document content (especially requirements based on the needs and gaps analysis).

1.4. Structure of the document

Within the first chapter of the requirements document we address the most important TaToo high-level and generic requirements driven by the project objectives.

The second part of this document lists requirements coming out of the analysis of the use cases of WP 5 and the first results of questionnaires conducted by WP 2. This leads to a set of requirements categories shown in the building blocks in the figure below. (Note: the ordering of the blocks does not have any specific meaning and additional blocks are expected to be added in the next version of this document. Further on, these categories might get extended as requested by the WP3 during the foreseen feedback loop- related to the preparation of the architectural point of view).

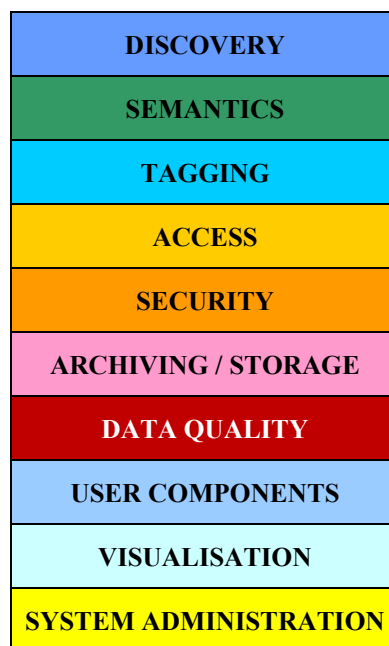


Figure 1.2: TaToo technical requirements categories (functional building blocks)

1.5. Requirement table usage

How to read and use the requirements table!

| | |
|----------------------------------|--|
| ID | Unique categorisation of the requirements in the form of TR.CATEGORY.NNN, where TR means Technical Requirement; CATEGORY denotes the major requirement categories and NNN is a unique number within each TR category |
| Name | Short name for the technical requirement |
| Scope | Description of the scope and constraints of this requirement. |
| Optional | If something might be used instead of above or as a substitute. |
| Open Issues | Explanations about unsolved or unclear issues up to now or issues that need further discussions. |
| Trace | This field lists the IDs of the User Requirements (listed in WP5 and WP2 Deliverables) which relate to this Technical Requirement. Note: this field may be empty if the Technical Requirement has been set, for example, based on good practice, even though not explicitly mentioned in the available User Requirements. |
| Architectural Level | |
| Specification Level | |
| Implementation Level | |
| Relevance/ Importance / Priority | H-M-L (i.e. high – medium – low) |
| Validation | Description of how and where the requirement is planned to be validated. The proof of fulfilment can be reached based on the evaluation report from WP5. |

Table 1.1: Requirements table usage

1.6. References to user requirements

For better traceability of requirements this chapter provides an overview on the expressed user requirements that are referenced by the trace row in tables describing requirements.

1.6.1 Needs & Gaps Analysis – V1

The following short cuts are used: Sn for Scenario n expressed in the user questionnaires Wn for Workflow n described in the same user questionnaire.

| ID | Name | Partner |
|---------------|---|------------|
| S1 | ClimateTwins | AIT |
| S1W1 | Discovery of ClimateTwins tool and data | |
| S1W2 | Tagging of ClimateTwins tool and data | |
| S1W3 | Find additional information on a particular climate twin region | |
| S1W4 | Add additional information on a particular climate twin region | |
| S2 | Agro-environmental management | JRC |
| S2W1 | Resources tagging | |
| S2W2 | Resources discovery | |
| S2W3 | Resources evaluation | |
| S3.1 | Find, validate and qualify of epidemiology data sources (cancer registry) | MU |
| S3.1W1 | Discovery of compliant data sources | |
| S3.1W2 | Checking the validity of the data source | |
| S3.1W3 | Finding eccentricity in the data source | |
| S3.2 | Find, validate and qualify of POPs data source | |
| S3.2W1 | Discovery of compliant data sources | |
| S3.2W2 | Checking the validity of the data source | |
| S3.3 | Find relationships between discovered data sources | |
| S3.3W1 | Managing a relationship ontology | |
| S3.3W2 | Discover and compare data sources | |

Table 1.2: Requirements from Needs & Gaps analysis V1

1.6.2 Needs & Gaps Analysis – V2

The following short cuts are used for users' requirements collected from a public online survey carried out in the Needs & Gaps Analysis task of the project, whereby n is a 2 digit decimal integer which is unique within each category.

| ID | Name | Description of the requirements category |
|-------------------------|-------------------------------|---|
| RTn | Resource Types | Resource types to consider according to interviewed users. |
| RT01 | Geospatial Data | |
| RT02 | Structured Raw Data | |
| RT03 | Processed Data | |
| RT04 | Highly Aggregated Data | |
| RT05 | Software and Models | |
| RT06 | Legal Documents | |
| RT07 | Knowledge Formalizations | |
| EDn | Environmental Domains | Environmental domains that were mentioned by the interviewed users. |
| ED01 | Environmental Domains | |
| RDn | Resource Discovery | Requirements related to the resource discovery in general and to overcome common resource discovery problems. |
| RD01 | User-friendly Semantic Search | |
| RD02 | Environmental Catalogues | |
| RD03 | Online Databases and Indexes | |
| RD04 | Community Building | |
| RD05 | OGC Services | |
| RD06 | Web Services | |
| RD07 | Websites | |
| RD08 | Avoid Over Inclusion | |
| RD09 | Avoid Under Inclusion | |
| RD10 | Enhanced Expressiveness | |
| RD11 | Query Syntax | |

| ID | Name | Description of the requirements category |
|-------------------------|------------------------------------|---|
| RD12 | Navigation | |
| RD13 | Iterative Search Refinement | |
| RD14 | Resource Type Discovery | |
| RD15 | Context Dependent Discovery | |
| RD16 | Geospatial and Time related Search | |
| RD17 | Multilingual Search | |
| RD18 | Similarity Discovery | |
| RD19 | Resource Usage | |
| RAn | Resource Access | Requirements related to facilitate the access to and usage of discovered resources. |
| RA01 | Resource Meta-Information | |
| RA02 | Quality Meta-Information | |
| RA03 | Access Meta-Information | |
| RA04 | Public Resources | |
| RA05 | Online Resources | |
| TRn | Tagging of Resources | Requirements related to the tagging of resources. |
| TR01 | Open Tagging | |
| TR02 | Closed Tagging | |
| TR03 | Public Tags | |
| TR04 | Editing of Tags | |
| TR05 | Public Tag Ownership | |
| TR06 | Tagging of Tags | |
| TR07 | Proposing new Tags | |
| UIn | User Interaction | Requirements related to the perceived interaction methods with the TaToo system. |
| UI01 | TaToo Web Portal | |
| UI02 | Services Access | |
| UI03 | TaToo API | |
| UI04 | Browser Plug-in | |

| ID | Name | Description of the requirements category |
|------|--------------------------------|--|
| UI05 | OGC Services | |
| UI06 | Register new Domain Ontologies | |
| UI07 | Register new Resources | |
| UI08 | Meta-Information extraction | |

Table 1.3: Requirements from Needs & Gaps analysis V2

1.6.3 Analysis of WP5 Scenario Definitions Deliverables

The following abbreviations are used: *VDS_n* for Validation Scenario – Case n; *UC_n* for Use Case n and *CT_n* for Custom Tool n.

| ID | Name | Partner |
|--------------|--|------------|
| VDS1 | Climate Change Twin Regions – Discovery Platform ("Climate Twins") | AIT |
| UC1.1 | Discovery of climate twins | |
| UC1.2 | Tagging of Climate Twins | |
| UC1.3 | Find additional information on a particular Climate Twin region | |
| UC1.4 | Add additional information on a particular Climate Twin region | |
| VDS2 | Agro-environmental management | JRC |
| UC2.1 | Building a new resource metadata schema | |
| UC2.2 | Building a new resource description | |
| UC2.3 | Searching a resource | |
| UC2.4 | Accessing resources evaluated via TaToo tags | |
| UC2.5 | On searching the web highlight TaToo tagged resources | |
| UC2.6 | On the Resource Evaluation Viewer, enter evaluation | |
| UC2.7 | On the Resource Evaluation Viewer, view further information | |
| CT2.1 | Resource Metadata Builder / Software Tools / Section 5.1 | |
| CT2.2 | Resource Model Explorer / Software Tools / Section 5.2 | |
| CT2.3 | Resource Evaluation Viewer / Software Tools / Section 5.3 | |
| VDS3 | Anthropogenic impact and the influence of global climate change | MU |

| | |
|--------------|---|
| UC3.1 | Discover resources with existing tools |
| UC3.2 | Generic discovery |
| UC3.3 | Persistent Organic Pollutant Resource Discovery |
| UC3.4 | Oncological resource discovery |
| UC3.5 | Define resource uncertainty |
| UC3.6 | Compare resources |
| UC3.7 | Find similar resources |
| UC3.8 | Find related resources |

Table 1.4: Requirements from Validation Scenarios Analysis

2. Abbreviations and acronyms

| | |
|-------|--|
| ABAC | Attribute Based Access Control |
| ANNIE | A Nearly-New Information Extraction system |
| API | Application Program Interface |
| BB | Building Block |
| CRUD | Create, read, update and delete |
| CT | Custom Tool (related to use cases in the validation scenarios) |
| DO | Domain Ontology |
| DoW | Description of Work |
| ED | Environmental Domain |
| EPR | Endpoint Reference |
| GA | General Assembly |
| GOS | Gate Ontology Service |
| GUI | Graphical User Interface |
| HTML | HyperText Markup Language |
| IBAC | Identity Based Access Control |
| ISO | International Standardisation Organisation |
| JAR | Java Archive |
| JSON | JavaScript Object Notation |
| KB | Knowledge Base |
| KML | Keyhole Markup Language |
| LE | Language Engineering |

| | |
|--------|--|
| LIR | Linguistic Information Repository |
| LR | Language Resource |
| MERM | Minimal Environmental Resource Model |
| OAC | Open Annotation Collaboration |
| OASIS | Organization for the Advancement of Structured Information Standards |
| OGC | Open Geospatial Consortium |
| OWL | Web Ontology Language |
| OWL-S | Web Ontology Language for Services |
| OWL-WS | Web Ontology Language for Workflows and Services |
| OWLIM | OWL high performance Semantic Repository |
| OASIS | Organization for the Advancement of Structured Information Standards |
| PBAC | Policy Based Access Control |
| PCO | Project Control Officer |
| PM | Person Month |
| PMT | Project Management Team |
| PMO | Project Management Officer (Co-ordinator) |
| PR | Processing Resource |
| QA | Quality Assurance |
| QoS | Quality of Service |
| RA | Resource Access |
| RBAC | Role Based Access Control |
| RD | Resource Discovery |
| RDF | Resource Description Framework |
| RFC | Request For Comments |
| RSS | Really Simple Syndication |
| RT | Resource Type |
| SAC | Semantic Access Control |
| SAIL | Storage And Inference Layer |
| SISE | Single Environmental Information Space in Europe for the Environment |
| SOA | Service Oriented Architecture |
| SQL | Structured Query Language |
| SPARQL | Query language and protocol for RDF |
| SVOD | System for Visualizing of Oncological Data |
| SDR | Service Discovery Registry |
| Tbd | To be defined |
| TR | Tagging of Resources |

| | |
|----------------|---|
| TSP | Time Series Processor |
| UC | Use Case |
| UI | User Interaction |
| URI | Uniform Resource Identifier |
| URL | Uniform Resource Locator |
| UUID | Unique Universal Identifier |
| VDS | Validation Scenario |
| V _n | Version 1 to 3 of the TaToo realisation cycles/phases |
| VR | Visual Resource |
| WP | Workpackage |
| W3C | World Wide Web Consortium |
| WFS | Web Features Services |
| WMS | Web Map Services |
| WS | Web Service |
| WSMO | Web Service Modeling Ontology |
| XML | eXensible Markup Language |

Table 2.1: Abbreviations and acronyms

2.1. Acronyms for project partners

| | |
|-------|---|
| AIT | AIT Austrian Institute of Technology GmbH |
| ATOS | ATOS ORIGIN SOCIEDAD ANONIMA ESPANOLA |
| CIS | cismet GmbH |
| IDSIA | SCUOLA UNIVERSITARIA PROFESSIONALE DELLA SVIZZERA ITALIANA (SUPSI) |
| JRC | COMMISSION OF THE EUROPEAN COMMUNITIES - DIRECTORATE GENERAL JOINT RESEARCH CENTRE - JRC |
| MU | Masarykova univerzita |
| TPZ | Telespazio S.p.A. - A Finmeccanica / Thales Company |

Table 2.2: Acronyms for project partners

2.2. Acronyms for the technical requirement's categories

Acronyms used in the following sections are to be understood as following:

| Acronym | Technical Requirement's category long name |
|-----------|--|
| GENENT | General Enterprise |
| DISCOVERY | Discovery |
| ONTO | Ontologies |
| DAQ | Data Quality |
| SECURITY | Security |
| USERMGT | User Management |
| META | Meta-information |
| VISUAL | Visualisation |
| REPR | Data Representation |
| SYSADMIN | System Administration |
| PORTAL | Portal |
| TAGGING | Tagging |

Table 2.3: Acronyms for requirements

3. Strategic positioning requirements related to SISE

A constantly growing number of infrastructures in the SISE context offers more and more seamless access to environmental resources – information as well as services. Such services include model and simulation services, sensor services, and access to mathematical services like environmental statistics and information fusion algorithms. While scientific users may be capable to use such services directly (for instance by using a combination of tools, or by programming scientific analysis software themselves, for a given purpose), many decision makers in administration, including decision makers in cities, do either lack the computer skills and/or the resources to access the services.

Since decision makers have to deal with a multitude of decision scenarios while planning and designing policy decisions, it is obvious that they need more and more precise information within a reasonably short time frame. There is a considerable gap between the services becoming available and the use of such services in the every-day work in the user's semantic context and environment.

Hřebíček and Pillmann, 2010 are addressing two key requirements in their publication about SISE (Hřebíček and Pillmann, 2010): first, access to Environmental Information (related to the Directive 2003/4/EC on public access to environmental information), and second, public participation (regarding *Directive 2003/35/EC* (EC 2003-2)).

Furthermore, Hřebíček and Pillmann emphasise the importance of ICT tools that permit an easy discovery of environmental service nodes on the Web. Implementations should include generic semantics frameworks and dynamic ontology services for the discovery of and access to distributed environmental resources in a multilingual context.

The research of SISE has therefore to take into account enlarged challenges such as: *speed; rich content; interoperability; security; public access to information; public participation; spatial and cohesion standardization*. Therefore the SISE has to integrate all types of spatial and non spatial data and information, supports integration of structured and non structured information, and supports their interrelations. It has to enable dealing with analysis, modelling, visualisation environmental data, information and services.

In this context, semantics and interoperability will play in SISE an important role. SISE elements have to support discovering of data, information and services and their relationships by networking tools. There have to be defined metadata schemes (as first candidates could mentioned ISO19115/19119, the INSPIRE and Dublin Core profiles) and catalogue services for searching for meta-data (e.g. Catalogue Services for Web or Open Web Search).

TaToo's capability to link into its framework semantic context, to discover more precisely relevant resources indicating their usability and quality of information decision maker will be enabled to overcome task like long breathtaking, exhausting and expensive search and navigation through chaotic and dynamically growing information sources like the World Wide Web.

TaToo's open nature as both, the TaToo Tools and semantic framework will be based on open standards, perfectly contribute to the requirements of SISE, technically briefly summarised as:

- discovery of relevant resources;
- the integration and seamless access to data sources residing on a standard based infrastructure;
- repositories (e.g. databases, caches, inventories) for quality controlled and securely managed resources and their results;
- security integration in order to access resources (e.g. data sources, catalogues, own or third party resources);
- the possibility to publish results on the internet for public access;
- easy to use tools and user-friendly services and interfaces, e.g. access control, workflow management, delivery management, visualisation, data extraction, administration embedded in the users semantic context;
- finally, in order to enable the sharing of environmental information in an international scale, it is necessary to deal with interoperability, multilingualism and with translation of information.

All these (and even more) requirements are reflected within this requirements document related to different functional building blocks (see Figure 1.2) hereafter.

TaToo is inherently contributing to solve SISE challenges related to subspaces of SISE like the Content Space and Technical Space (incl. Tools) as defined in Hřebíček and Pillmann, 2010 as the following requirements sections will demonstrate.

4. General enterprise requirements

The following General Enterprise Requirements (GENENT) are mainly derived from the high-level objectives of TaToo as well as from requirements stemming from the Reference Model of ORCHESTRA (RM-OA, 2007) and SANY (SANY, 2009).

4.1. Architectural design

Context

This section addresses strategic approaches to the architectural design of a semantic framework architecture as well as service networks with the aim of maximising its flexibility and ability to adapt to changing technologies and functional requirements.

Note: As TaToo refers to the experience of both the ORCHESTRA project and the SANY project (e.g. DoW, WP3 and many others) it seems appropriate to check which of the ORCHESTRA and SANY high level requirements (RM-OA, 2007 and SANY-TR, 2008) have also to be applied for TaToo and which not, especially for the general enterprise requirements, thus resulting in a valid basic list to be completed by additional requirements specific to TaToo.

Terms and Definitions (*if applicable to explain terms used below e.g. in the description section*)

RM-OA: Reference Model for the ORCHESTRA Architecture (<http://www.eu-orchestra.org/TUs/RMOA/en/html/index.html>)

Requirements (*all, respectively the whole list of requirements, this is an example*)

| | |
|----------------------------------|---|
| ID | TR.GENENT.000 |
| Name | Use of concepts and standards |
| Scope | The TaToo architecture shall make use of proven concepts and standards in order to decrease dependence on vendor-specific solutions and help ensure the openness of the TaToo network and support the evolutionary development process of the architecture. |
| Optional | |
| Open Issues | Are there proprietary tools with interfaces not conform to a standard or an established concept? |
| Trace | Experience from ORCHESTRA and SANY and NeOn |
| Architectural Level | For the Service part and the interfaces to the system components. |
| Specification Level | Service and tools spec, to check for the “semantic components” |
| Implementation Level | Partly (V1-V3) |
| Relevance/ Importance / Priority | M |

| | |
|------------|--|
| Comment | |
| Validation | Validation in the context of WP3. The validation is done by manual testing for all services and applications. Responsible is the system architect. To validate this requirement it is needed to check the use of standards and concepts in the architecture. |

| | |
|--|--|
| ID | TR.GENENT.010 |
| Name | Loosely coupled components |
| Scope | <p>The components involved in a TaToo framework shall be loosely coupled, where loose coupling implies the use of mediation to permit existing components to be interconnected without changes.</p> <p>Note: In this stringency the requirement is restricted to the SOA part of a TaToo framework. Its application within the core system components is not needed and thus needs not to be guaranteed.</p> <p>Semantics (like ontologies) are loosely coupled via the merge of MERM and Bridge Ontologies.</p> |
| Optional | |
| Open Issues | |
| Trace | Experience from ORCHESTRA and SANY |
| Architectural Level | Partly in architecture (SOA) |
| Specification Level | Service and tools spec, to check for tools |
| Implementation Level | V1-V3 (partly) |
| Relevance/ Importance / Priority | M |
| Comment | |
| Validation | Validation in the context of WP3. The validation is done by manual testing for all services and applications. Responsible is the system architect. To validate this requirement it is needed to check the quality of the architecture and components definition. |

| | |
|----------------------------------|--|
| ID | TR.GENENT.020 |
| Name | Extensibility/Flexibility |
| Scope | <p>Extensibility/Flexibility is needed in different aspects:</p> <p>Extensibility of domains: the scope of TaToo shall not only be limited to a specific thematic domain dealt with in the validation scenarios. Thus TaToo must allow integrating new domains.</p> <p>Extensibility/Flexibility of functionalities: TaToo shall not be a “closed” system with a fixed set of functionalities: it must be possible plug-in new services with additional functionality into a TaToo semantic framework.</p> |
| Optional | |
| Open Issues | |
| Trace | Experience from ORCHESTRA and SANY, TaToo, DOW |
| Architectural Level | <p>The requirement has to be respected in the architectural process e.g. specific components are needed for integration of new functionality.</p> <p>Flexibility of use: TaToo must offer the possibility to access TaToo functionality by new third party applications (clients).</p> |
| Specification Level | Service and tools spec, check for tools, NeOn functionalities |
| Implementation Level | V1-V3 (partly) |
| Relevance/ Importance / Priority | H |
| Validation | Validation in the context of WP3. The validation is done by manual testing for all services and applications. Responsible is the system architect. To validate this requirement it is needed to check the quality of the architecture and non-functional requirements. |

| | |
|----------------------|--|
| ID | TR.GENENT.030 |
| Name | Component architecture independence |
| Scope | The TaToo architectural process shall be such that the TaToo architecture and the architecture of components are decoupled. This means that a component shall be seen as a black box, i.e., no assumptions about its inner structure are made when designing the architecture. This requirement facilitates the flexibility to exchange or replace components. |
| Optional | |
| Open Issues | To check, if the requirement can be maintained for any choice of a semantic framework (e.g. Jena) |
| Trace | Experience of ORCHESTRA and SANY |
| Architectural Level | Partly in architecture (SOA) |
| Specification Level | Service and tools spec |
| Implementation Level | V1-V3 (partly) |

| | |
|--|--|
| Relevance/ Importance / Priority | M/L |
| Comment | |
| Validation | Validation in the context of WP3. The validation is done by manual testing for all services and applications. Responsible is the system architect. To validate this requirement it is needed to check the quality of the architecture. |

| | |
|--|---|
| ID | TR.GENENT.040 |
| Name | Security |
| Scope | <p>The TaToo architecture shall be designed to allow security mechanisms to be incorporated. These mechanisms shall include user management (authentication, authorisation), as well as control of access to data, services and tools.</p> <p>These mechanisms are needed on different levels:</p> <ul style="list-style-type: none"> • access to tagging information (meta information) associated to resources • tagging of resources • integration of new services (e.g. a tagging service for a new domain, new discovery services, ...) • establishment of new domain ontologies |
| Optional | |
| Open Issues | |
| Trace | |
| Architectural Level | See security section |
| Specification Level | See security section |
| Implementation Level | See security section |
| Relevance/ Importance / Priority | M |
| Comment | |
| Validation | Validation in the context of WP3. The validation is done by manual testing for all services and applications. Responsible is the system architect. To validate this requirement it is needed to check the security aspects of the architecture. |

| | |
|--|--|
| ID | TR.GENENT.050 |
| Name | Scalability |
| Scope | <p>The TaToo Architecture shall be able to take scalability issues into account.</p> <p>Scalability aspects:</p> <ul style="list-style-type: none"> • Type and amount of concerned resources (for discovery and tagging) • Discovery and tagging services and tools • Domains (domain ontologies) • Size and level of detail of tagging information (meta information) |
| Optional | |
| Open Issues | Needs further discussion |
| Trace | AR |
| Architectural Level | V1-V3 (partly) |
| Specification Level | V1-V3 (partly) |
| Implementation Level | V1-V3 (partly) |
| Relevance/ Importance / Priority | M |
| Comment | |
| Validation | Validation in the context of WP3. The validation is done by manual testing for all services and applications. Responsible is the system architect. To validate this requirement it is needed to check the scalability aspects of the architecture. |

5. Discovery and harvesting

In general, we define the process of discovery and / or search as the retrieval by a system of a set of resources that satisfy an information need expressed by a user. In the scope of TaToo search is the process of expressing the need for information by the user, and discovery is the process performed by the system to retrieve the results.

In TaToo, we intend to use semantic search, a kind of search that makes extensive use of domain knowledge encoded in the form of ontologies. Ontologies are related to resources through annotations stored as metadata. It is for this reason that the search in TaToo will always be metadata-based.

A classic information retrieval system usually provides a crawling functionality in order to gather information from external resources in a (semi) automatic way. This process creates an inverted index on which the discovery is made later. In the same way TaToo harvests additional meta-information from known catalogues and repositories and consolidates the annotations in the system knowledge base, where the discovery is made afterwards.

5.1. Search and discovery

Context

TaToo is a semantic search engine, meaning that the search and discovery will be based on annotation of resources based on domain knowledge encoded in the form of ontologies.

Search in TaToo allows a user to express an information need. The user can express this need in several ways, such as selecting concepts or relations from the ontology, providing a resource that serves as a template for similar resources, establishing different criteria depending on the type of resources searched, by selecting criteria common to most of the resources, etc.

Discovery in TaToo allows the system to retrieve relevant resources for a particular need for information. Although this discovery is always based on semantic annotations and supported by domain ontologies, TaToo makes this discovery in response to different strategies: exact match, discovery of resources related to more specific concepts, finding resources related to more general concepts, resource discovery with similar comments, etc.

Terms and Definitions (*if applicable to explain terms used below e.g. in the description section*)

-

Requirements (*all, respectively the whole list of requirements*)

| | |
|----------------------------------|--|
| ID | TR.DISCOVERY.000 |
| Name | Discovery Component |
| Scope | <p>TaToo shall provide a discovery component. This component shall process users search requests and return a set of results relevant to a given query.</p> <p>The discovery component shall make use of the TaToo semantic metadata store (knowledge base) to perform the search.</p> |
| Optional | TR.VISUAL.000 |
| Open Issues | |
| Trace | S1W1; S2W1; S2W3 |
| Architectural Level | V1: discovery concepts and components |
| Specification Level | <ul style="list-style-type: none"> • V1: Basic navigation and simple keyword based search discovery portlet • V2: Portlets for other discovery strategies |
| Implementation Level | <ul style="list-style-type: none"> • V1: Basic navigation and simple keyword based search discovery portlets, • V2: Portlets for other discovery strategies |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | <p>Validation in the context of WP5. The validation is done by manual testing for discovery portlets and custom pilot applications. Responsible are WP5 members and end users. To validate this requirement it is needed to assess whether both the generic (through the portal) as well as the custom (integrated into the pilot's applications) search GUIs fit their needs.</p> |

| | |
|----------------------------------|---|
| ID | TR.DISCOVERY.010 |
| Name | Discovery strategies |
| Scope | <p>TaToo discovery component shall support multiple discovery strategies. Some examples (in brackets: priority from participants of the TaToo online survey):</p> <ul style="list-style-type: none"> - Iterative search refinement (medium) - Search generalisation - Navigation (high) - Similarity - Resource Type (low) - (Domain related) keywords <p>It should be possible to limit the results to a certain time span, region, domain, etc.</p> |
| Optional | |
| Open Issues | |
| Trace | VDS1.UC1.1; VDS3.UC3.4; RD08;RD09; RD10; RD11; RD12; RD13; RD14; RD15; RD16; RD17; RD18 |
| Architectural Level | V1: discovery concepts and components |
| Specification Level | V1 (partly) / V2 |
| Implementation Level | V1 (partly) / V2 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP5. The validation is done by manual testing for discovery tools. Responsible are WP5 members and end users. To validate this requirement it is needed to assess if the support discovery strategies fit their needs. |

| | |
|----------------------------------|--|
| ID | TR.DISCOVERY.020 |
| Name | Semantically supported content analysis of a current active web page |
| Scope | General search possibility for a user without precise search query formulation. |
| Optional | |
| Open Issues | To be discussed: - how to apply semantic interpretation rules. |
| Trace | VDS1.UC1.1;VDS3.UC3.2; VDS3.UC3.4; S3.1W1; S3.2W1 |
| Architectural Level | BTS / Might be beyond the scope of TaToo Project |
| Specification Level | |
| Implementation Level | |
| Relevance/ Importance / Priority | L |
| Comment | This requirement implies analysis of the current active page, which is not foreseen in the scope of TaToo. Has to be revised. |
| Validation | Validation in the context of WP5. The validation is done by manual testing for the discovery tool. Responsible are WP5 members and end users. To validate this requirement it is needed to provide social web plug-ins (i.e.: piece of TaToo html / javascript code, that can be included in arbitrary web pages => e.g. "TaToo Like Button") to enable users to validate semantically supported content on web pages. |

| | |
|----------------------------------|--|
| ID | TR.DISCOVERY.030 |
| Name | Similarity discovery |
| Scope | <p>The discovery component shall allow “similarity” search, which is for discovery of a resource that have been annotated in a similar way to the annotated resource provided as a “query parameter”. The resources could be e.g.:</p> <ul style="list-style-type: none"> - Written documents - Models - Services |
| Optional | |
| Open Issues | Define the similarity strategy, being an annotation similarity measure or explicit relations between resources. |
| Trace | VDS2; VDS3.UC3.1; VDS3.UC3.4; VDS3.UC3.7; S3.3W1; RD18 |
| Architectural Level | V1: discovery concepts and components |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | L |
| Comment | Note from VDS3.UC3.1 (Resource Consumer) TaToo will enable the user to search not only in records for the Czech republic but will provide the opportunity to discover similar time-trend analysis for other countries. |
| Validation | Validation in the context of WP5 in particular through the third Validation Scenario from MU. The validation is done by manual testing for the discovery tool. Responsible are WP5 members and end users. To validate this requirement it is needed to check if similar annotated resources can be found with “query parameters”. |

| | |
|--|---|
| ID | TR.DISCOVERY.040 |
| Name | Resource Type Discovery |
| Scope | The discovery component shall provide an overview of available resources and allow navigation/search according to the typology of the resource |
| Optional | |
| Open Issues | May not be supported by all search clients. Affects both server and client functionality. |
| Trace | VDS2.UT2.2; RD14 |
| Architectural Level | V1: discovery concepts and components |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | L |
| Comment | Resource (Model) explorer. According to the dimension of the knowledge base, this task can become increasingly difficult. Required technical and nontechnical functionality see CT2.2 |
| Validation | Validation in the context of WP4. The validation is done by manual testing for the discovery tool. Responsible are the developers. To validate this requirement it is needed to check the representation in the UI Portlet (Navigation Tree), the functionality provided by WP4 (Distributed Service), and the validation (Resource Model Explorer in the second Validation Scenario from JRC). |

| | |
|----------------------------------|--|
| ID | TR.DISCOVERY.050 |
| Name | Context dependent discovery |
| Scope | <p>The discovery component shall make use of the available context information to improve the relevance of the search results and aid user in choosing the most appropriate discovery strategy. Some examples of the context related information that can be used for these purposes include e.g.:</p> <ul style="list-style-type: none"> - User profile (explicit preferences) - User relationships (implicit preferences, e.g. through trust relationships) - Time & location information - Where the request is coming from (if initiated from external site) - Type of the Resource the user is looking for (e.g. web pages, services, models, time series of sensor data...) - General search possibility for a user without precise search query formulation. - Search history - Domain related information provided e.g. explicitly as a part of the search, in user profile, ... |
| Optional | |
| Open Issues | |
| Trace | VDS1.UC1.3; VDS3.UC3.4; S2W1; S3.1W1; S3.2W1; RD15 |
| Architectural Level | V1: discovery concepts and components |
| Specification Level | V2 / V3 |
| Implementation Level | V2 / V3 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by manual testing for the discovery service. Responsible are the developers. To validate this requirement it is needed to test the discovery service software to meet the scope (see scope field in this table). |

| | |
|----------------------------------|--|
| ID | TR.DISCOVERY.060 |
| Name | Geospatial and time related search |
| Scope | <p>TaToo discovery component and search GUI shall support geospatial and time dependent search.</p> <p>Examples:</p> <ul style="list-style-type: none"> - Search for resources based on spatial an data/time properties, e.g. select an area / a point in a map, choose a data / time span - Search for additional information on, for example, a particular climate twin region by providing spatial information (name or precise location, coordinates, regions, NUTS code, etc.) - Or for example for cancer discovery (in a country, region, city, etc.) in a specific period of time |
| Optional | |
| Open Issues | <p>To be discussed:</p> <ul style="list-style-type: none"> - Levels of spatial information - Ambiguous place names (-> manual selection) - Filters (setting of search or filter parameter) |
| Trace | VDS1.UC1.3; VDS3.UC3.4; S2W1; S3.1W1; S3.2W1, RT01; RD18 |
| Architectural Level | V1: discovery concepts and components (general MERM Concepts, Discovery Service & Processors) |
| Specification Level | <ul style="list-style-type: none"> - V1 (partially): MERM, Discovery Service & Processors and Portlets Specification - V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |
| Comment | Links should be provided to further information sources corresponding to the spatial unit and the theme defined by the user |
| Validation | <p>Validation in the context of WP4. The validation is done by automated testing (unit tests) for the tagging and discovery services. Responsible are WP4 developers. To validate this requirement it is needed to develop automated unit tests to add geo tags, search for geo tags and compare results.</p> <p>Validation in the context of WP4. The validation is done by manual testing for the geo tagging and geo search portlets. Responsible are WP4 developers. To validate this requirement it is needed to test geo tagging and geographical search through the respective GUIs (portlets).</p> <p>Validation in the context of WP5 in particular through the first Validation Scenario from AIT and the third Validation Scenario from MU. The validation is done by manual testing for custom client applications. Responsible are end users. To validate this requirement it is needed to test the portal (geo tagging and geo search portlet) and custom client applications (e.g. climate twins viewer).</p> |

| | |
|----------------------------------|---|
| ID | TR.DISCOVERY.070 |
| Name | Thematic or resource related search |
| Scope | TaToo discovery component and search GUI shall support thematic and resource related search for additional information on, for example, a particular climate twin region by providing thematic information (focusing on themes) |
| Optional | |
| Open Issues | To be discussed: Domain related information provided e.g. explicitly as a part of the search, in user profile |
| Trace | VDS1.UC1.3; VDS3:UC3.2; VDS3.UC3.4; S1W1; S2W1; S3.1W1; S3.2W1 |
| Architectural Level | V1: discovery concepts and components |
| Specification Level | V2 / V3 |
| Implementation Level | V2 / V3 |
| Relevance/ Importance / Priority | M |
| Comment | |
| Validation | Validation in the context of WP5 in particular through the first Validation Scenario from AIT and the third Validation Scenario from MU. The validation is done by manual testing for the discovery service. Responsible are WP5 members and end users. To validate this requirement it is needed to test the support of resource related search and discovery components and search GUI. |

| | |
|-------------------------|---|
| ID | TR.DISCOVERY.080 |
| Name | Multilingual search |
| Scope | Search should be expanded to other languages |
| Optional | Start with German, Czech, Spanish, Italian, ... |
| Open Issues | |
| Trace | VDS3:UC3.2; RD18 |
| Architectural Level | V1: discovery concepts and components |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / | H |

| | |
|------------|--|
| Priority | |
| Comment | VDS3.UC3.2 notes in its description: The search should not only deliver results in the language used to specify the search criteria it should also deliver results in foreign languages which match the domain context (by recognising the language domain and searching for documents in the proper language). |
| Validation | Validation in the context of WP5 in particular through the third Validation Scenario from MU. The validation is done by manual testing for the discovery service. Responsible are WP5 members and end users. To validate this requirement it is needed to provide the functionality by WP4 and to test the multilingual search in WP5. |

| | |
|--|--|
| ID | TR.DISCOVERY.090 |
| Name | Search result's highlighting |
| Scope | TaToo shall provide a mean to highlight and include links to relevant resources in the search results. |
| Optional | |
| Open Issues | |
| Trace | VDS2.UC2.5 |
| Architectural Level | V1: discovery concepts and components |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | M |
| Comment | Found results having a TaToo relationship (e.g. evaluated resource, links to TaToo entries, etc.) shall be highlighted and allow access (on click) to the respective resource. |
| Validation | Validation in the context of WP5 in particular through the second Validation Scenario from JRC. The validation is done by manual testing for the UI of the discovery service. Responsible are WP5 members and end users. To validate this requirement it is needed to test the highlighting of search results. |

| | |
|--|---|
| ID | TR.DISCOVERY.100 NEW |
| Name | User-friendly semantic search |
| Scope | To increase user acceptance of semantic search technologies TaToo shall aim for combining usability and simplicity of classical (keyword-based) search engines with the power and advanced features of a semantic discovery framework. |
| Optional | See also TR.VISUAL.000 |
| Open Issues | |
| Trace | RD01 |
| Architectural Level | V1: discovery concepts and components |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP5. The validation is done by manual testing for the discovery portlets and custom pilot applications. Responsible are WP5 members and end users. To validate this requirement it is needed to assess the usability and user-friendliness of the search GUIs. |

5.2. Harvesting

Context

One of the main objectives of a metadata-based system is the automatic or semiautomatic metadata acquisition starting from resources. However, this goal is far from being achieved due to the fact that (semi)automatic annotation acquisition is a very complex process and depends heavily on the resource itself. TaToo approaches this problem through the harvesting process.

TaToo harvesting process aims to generate metadata usable by TaToo starting from existing metadata stored in catalogues. Taking (semi)structured metadata as starting point will facilitate the automatic acquisition process, making it affordable in the scope of TaToo. Since the acquisition process depends on the structure of the catalogue, it is necessary to configure and programme specific harvesters for each catalogue.

With the harvesting process, TaToo aims to:

- Reuse pre-existing knowledge.
- Provide a mechanism for fast acquisition of a large amount of metadata.
- Initial data load.

Terms and Definitions (if applicable to explain terms used below e.g. in the description section)

-

Requirements (all, respectively the whole list of requirements)

| | |
|----------------------------------|--|
| ID | TR.HARVEST.000 |
| Name | Harvesting |
| Scope | The System should provide a way to harvest metadata from external resources. |
| Optional | |
| Open Issues | |
| Trace | AR; RD02; RD03; RD05; RD06; RD07 |
| Architectural Level | <ul style="list-style-type: none"> • V1: Core components building block, concepts of harvester connectors • V2: exemplary harvesting use case |
| Specification Level | <ul style="list-style-type: none"> • V1: Resource Harvester specification • V2: specification of specialised harvesters |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP5 and WP4. The validation is done by automated and manual testing for the harvester implementations. Responsible are WP4 developers and WP5 members. To validate this requirement it is needed to develop and tests harvesters to register WP5 resources. |

| | |
|--|--|
| ID | TR.HARVEST.010 |
| Name | Harvesting examples |
| Scope | <p>TaToo Project shall provide several examples of harvesters. The following data sources are considered important sources of environmental information and represent candidates for harvester examples:</p> <ul style="list-style-type: none"> • Environmental Catalogues (e.g. GRID, EEA, UDK, mis.cenia.cz) • Online data bases and indexes (e.g. Science Direct, FP6 projects ENSEMBLES & CECILIA, EEA project SENSE, ...) • OGC Services (WFS, SOS, WCS, ...) • Web Services (e.g. WISKI, YSI EcoNet, ...) • Websites (reports and papers, EEA, UNEP, OECD, ...) |
| Optional | |
| Open Issues | To be decided which example to implement |
| Trace | AR; RD02; RD03; RD05; RD06; RD07 |
| Architectural Level | V1: Core components building block, concepts of harvester connectors |
| Specification Level | V2 / V3 |
| Implementation Level | V2 / V3 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP5 and WP4. The validation is done by automated and manual testing for the harvester implementations. Responsible are WP4 developers and WP5 members. To validate this requirement it is needed to develop and tests examples of harvesters. |

| | |
|--|---|
| ID | TR.HARVEST.020 |
| Name | Harvesting extensibility |
| Scope | TaToo Project shall provide means (e.g. API or Service Interface) that allows adding of new harvesters. |
| Optional | |
| Open Issues | |
| Trace | AR |
| Architectural Level | V1 |
| Specification Level | V1 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by manual testing for the harvester. Responsible are WP4 developers. To validate this requirement it is needed to validate the existence of means for adding new harvesters. |

| | |
|----------------------------------|---|
| ID | TR.HARVEST.030 |
| Name | OGC standard meta-information for services |
| Scope | <p>TaToo shall provide mean to harvest capability documents from standard based services like the OGC services.</p> <p>Note: The meta-information is modelled according to standardised specification of the respective service, e.g. there are different capabilities document for WFS, WMS, SOS, etc.</p> |
| Optional | |
| Open Issues | |
| Trace | S2W1, S2W2, S3.1W1, S3.3W2, S3.2W1 |
| Architectural Level | V2 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | M |
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by manual testing for the harvester. Responsible are WP4 developers. To validate this requirement it is needed to validate that OGC standard meta-information for services has been implemented. |

| | |
|--|---|
| ID | TR.HARVEST.040 |
| Name | Automatic interpretation of content |
| Scope | TaToo should support the automatic harvesting of the content of a web page on user request. Only for available harvesters. |
| Optional | |
| Open Issues | |
| Trace | VDS1.UC1.1. |
| Architectural Level | V1 |
| Specification Level | V2 / V3 |
| Implementation Level | V2 / V3 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by automated or manual testing for the harvester. Responsible are WP5 members (Validation Scenario 1 from AIT). To validate this requirement it is needed to validate the automatic interpretation of the content. |

6. Semantics

In linguistics, semantics is the subfield that is devoted to the study of meaning, as inherent at the levels of words, phrases, sentences, and texts. In computer sciences, semantics is framed in the Semantic Web field that enforces a vision of the web in which data is semantically annotated so automatic agents can understand this data, enhancing its exploitation and automation capabilities. In the scope of TaToo, environmental resources will be semantically enriched to improve its exploitation capabilities (discovery, publishing, accessing, etc).

6.1. Ontologies

Context

Adding semantics is a very abstract process which is normally done by linking data with concepts described in ontologies. The most widely used definition for ontologies is that used by Gruber (Gruber, 1993): an ontology is a formal, explicit specification of a shared conceptualisation. More specifically, an ontology provides the tools to describe a domain in terms of classes, attributes and relationships. In TaToo, ontologies have a dual role, on one hand, they describe several domains related with each validation scenario, on the other, they provide a common conceptualization for TaToo tools and services on how to describe and manage resources, annotations, evaluations, etc

Terms and Definitions (*if applicable to explain terms used below e.g. in the description section*)

-

Requirements (*all, respectively the whole list of requirements*)

| | |
|----------------------------------|---|
| ID | TR. ONTO.000 |
| Name | Ontology Framework |
| Scope | TaToo shall provide an Ontology Framework for integrating ontologies and mapping of ontologies (e.g. to a bridge ontology). |
| Optional | |
| Open Issues | |
| Trace | S3.2W1; AR |
| Architectural Level | V1 |
| Specification Level | V1 + MERM |
| Implementation Level | V1 |
| Relevance/ Importance / Priority | H |
| Comment | Related to Management of Ontologies |
| Validation | Validation in the context of WP4. The validation is done by manual testing for the ontology framework. Responsible are WP4 developers. To validate this requirement it is needed to test the ontology integration and ontology mapping. |

| | |
|----------------------------------|---|
| ID | TR. ONTO.010 |
| Name | Ontology logic complexity |
| Scope | All ontologies loaded into TaToo system must be limited to a maximum of description logic expressiveness. |
| Optional | |
| Open Issues | Ontology architecture, Integration approach. |
| Trace | AR |
| Architectural Level | V1 |
| Specification Level | V2 + MERM |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |

| | |
|------------|--|
| Comment | The expressivity of the ontologies will be decided based on the final requirements and the available software (reasoners, repositories, etc.). OWL-DL is a ceiling, but probably a less expressive language could be appropriate. |
| Validation | Validation in the context of WP4. The validation is done by manual testing for the ontology framework. Responsible is WP5 (in collaboration with WP4). To validate this requirement it is needed to verify the logic complexity of ontologies. |

| | |
|----------------------------------|--|
| ID | TR.ONTO.020 |
| Name | Knowledge inference |
| Scope | <p>TaToo knowledge base will be expanded, in terms of axioms addition, as a result of the interaction of the user with the system.</p> <p>Note: The vision of TaToo is that of avoiding the use of complex semantics for annotation and discovery. The inference will be kept to the strict minimum to have a good trade-off between expressiveness and effectiveness.</p> |
| Optional | |
| Open Issues | Ontology architecture, Ontology Framework, Data Integration approach. |
| Trace | AR |
| Architectural Level | N/A |
| Specification Level | N/A |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | M |
| Comments | This is the typical functionality provided by a reasoner |
| Validation | Validation in the context of WP4. The validation is done by automated testing for the ontology framework. Responsible are WP4 developers. To validate this requirement it is needed to implement automated tests for the knowledge interface. |

| | |
|----------------------------------|--|
| ID | TR.ONTO.030 |
| Name | Multilingual Ontologies |
| Scope | As TaToo system is supposed to deal with multilingualism issues, also TaToo ontologies are supposed to do so. |
| Optional | |
| Open Issues | |
| Trace | AR |
| Architectural Level | V2 |
| Specification Level | V2 |
| Implementation Level | V3 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP4 and WP5 (in collaboration). The validation is done by manual testing for the ontology framework. Responsible are WP4 developers and evaluation scenarios. To validate this requirement it is needed to verify the existence and correctness of multilingual ontologies. |

| | |
|----------------------------------|--|
| ID | TR.ONTO.040 |
| Name | Ontology Integration |
| Scope | In despite of using several domain ontologies, TaToo must provide a common understanding for tools and services so domain ontologies must be in some way integrated. |
| Optional | |
| Open Issues | Ontology architecture, Ontology Framework, Data Integration approach. |
| Trace | AR; UI06 |
| Architectural Level | V1 (BRIDGE or MERM concept) |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |

| | |
|------------|--|
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by automated testing for the ontology framework. Responsible are WP4 developers. To validate this requirement it is needed to implement automated tests to verify ontology integration. |

| | |
|----------------------------------|---|
| ID | TR.ONTO.050 |
| Name | Domain Ontology |
| Scope | <p>Ontologies for example for:</p> <ul style="list-style-type: none"> - The chemistry domain of persistent organic pollutants - On health (e.g. cancer, etc) - And measurements (like time series, measurement values...) - and geographical locations (like regions) - on statistical relationships <p>have to be defined</p> |
| Optional | TR.META.010 |
| Open Issues | |
| Trace | S3.2W1; S3.2W2; S3.1W1; S3.3W2; S3.1W3; S3.3W1 VDS3.UC3.3; VDS3.UC3.4; ED01; UI07 |
| Architectural Level | V1: MERM Concepts, usage of ontologies, bridge ontology concepts, core components building block |
| Specification Level | V2 / V3 |
| Implementation Level | V2 / V3 |
| Relevance/ Importance / Priority | H |
| Comment | Domain Ontology engineering Tools are required. External to TaToo |
| Validation | <p>Validation in the context of WP4. The validation is done by automated testing for the tagging and discovery services. Responsible are WP4 developers. To validate this requirement it is needed to tag with concepts from domain ontologies, perform search, and compare results.</p> <p>Validation in the context of WP4. The validation is done by manual testing for the tagging and discovery portlets. Responsible are WP4 developers. To validate this requirement it is needed to select a domain ontology for tagging, tag resources with domain concepts, perform search, and compare results.</p> <p>Validation in the context of WP5. The validation is done by manual testing for the portal and custom pilot applications. Responsible are WP5 members and end users. To validate this requirement it is needed to tag and search with domain concepts.</p> |

| | |
|----------------------------------|--|
| ID | TR.ONTO.060 |
| Name | Semi-automatic/automatic ontology construction |
| Scope | Semi-automatic/automatic ontology construction from a simpler metadata structure (e.g.: XML schema) |
| Optional | |
| Open Issues | |
| Trace | S2W2 |
| Architectural Level | V2 |
| Specification Level | V3 |
| Implementation Level | V3 |
| Relevance/ Importance / Priority | L |
| Comment | Meta information will be produced and published on a web site by the JRC, in the form of an ontology or, better yet, in the form of an XML schema from which TaToo tools could semi-automatically/automatically construct the ontology itself. |
| Validation | Validation in the context of WP5 in particular through the second Validation Scenario from JRC. The validation is done by automated testing for the ontology framework. Responsible are WP5 members. To validate this requirement it is needed to test automatic/semi-automatic ontology creation. |

| | |
|----------------------------------|--|
| ID | TR.ONTO.070 |
| Name | Ontology exchange |
| Scope | TaToo shall provide a mean for exchanging ontologies over network. E.g. a service capable of serving ontologies on demand. |
| Optional | |
| Open Issues | |
| Trace | AR |
| Architectural Level | V2 |
| Specification Level | V3 |
| Implementation Level | V3 |
| Relevance/ Importance / Priority | L |

| | |
|------------|---|
| Comment | |
| Validation | Validation in the context of WP5 and WP4. The validation is done by automated testing for the ontology framework. Responsible are WP5 members and WP4 developers. To validate this requirement it is needed to test the ontology exchange over the network. |

| | |
|--|---|
| ID | TR.ONTO.080 |
| Name | Cross Domain Mapping |
| Scope | TaToo Ontology Framework shall allow mapping of ontologies. E.g. to support cross-domain discovery |
| Optional | |
| Open Issues | |
| Trace | AR |
| Architectural Level | V1 MERM/BRIDGE |
| Specification Level | V2 MERM/BRIDGE |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |
| Comment | The TaToo Ontology Framework will provide the procedure to add new domain ontologies and map with the existing ontologies (i.e. bridge ontology). Administrators (authorised users) will then make available the new ontology to be used by the system. |
| Validation | Validation in the context of WP4 and WP5 (during the implementation of the 3 ontologies in the Validation Scenarios). The validation is done by manual testing for the ontology framework. Responsible are WP5 members and WP4 developers. To validate this requirement it is needed to test the cross domain mapping of ontologies (cross-domain discovery). |

| | |
|----------------------------------|---|
| ID | TR. ONTO.090 |
| Name | Bridge Ontology |
| Scope | TaToo shall provide a bridge ontology other domain ontologies can be mapped too. |
| Optional | |
| Open Issues | |
| Trace | AR |
| Architectural Level | V1 |
| Specification Level | V1 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |
| Comment | TaToo will provide a mechanism for cross-domain search, probably based on using a hybrid ontology integration approach using a bridge ontology. However, this is an implementation issue that will be decided later. |
| Validation | Validation in the context of WP4 (possibly in collaboration with WP5). The validation is done by manual testing for the ontology framework. Responsible are WP4 developers (and WP5 members). To validate this requirement it is needed to test the existence and correctness of a bridge ontology. |

6.2. Meta-information

Context

Typically many information items or resources are available but have no accompanying meta-information. Therefore it is important for us to enable users to add additional descriptive information (tagging of resources – see relevant chapter in this doc thereafter). On the other hand, it is important that the user could easily extract existing metadata that already comes with the resources in order to use them for further interpretation of other resources.

A common structure for metadata / meta-information for TaToo resources for the evaluation process has to be made available (defined). Also a physical place where to store this information is needed.

Terms and Definitions (*if applicable to explain terms used below e.g. in the description section*)

-

Requirements (*all, respectively the whole list of requirements*)

| | |
|----------------------------------|--|
| ID | TR.META.000 |
| Name | Generic Information model for resource description |
| Scope | <p>TaToo shall define a generic meta-information model for describing resources.</p> <p>The most important resource types to be supported are:</p> <ul style="list-style-type: none"> • Geospatial data and services (WMS, WFS, any geotagged resource) • Raw and processed data (time series, ...) • Highly aggregated data (documents) • software and models • services in general • websites |
| Optional | |
| Open Issues | <p>To discuss and to define what must be contained: like</p> <ul style="list-style-type: none"> - The TaToo base info (e.g. ID, resource type, date, ...) - The common part for resources (e.g. name, date uploaded) and evaluation (e.g. name, date made, summary evaluation) - Quality information (e.g. relevant for assessment of quality) - Uncertainty (e.g. relevant for uncertainty information processing) - Geospatial location or extent of the resource (point or coverage) |
| Trace | VDS2, RT01, RT02, RT02, RT03, RT03, RT04; RA01 |
| Architectural Level | V1: D3.1.1 - Semantic Service Environment and Framework Architecture – V1, Section 6.4 - Minimum Environmental Resource Model |
| Specification Level | V1: D4.1.1 - Semantic Framework Implementation prototype – V1, Section 5.7.2 - MERM implementation |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |

| | |
|------------|---|
| Comment | This allows everyone to assess, evaluate, and comment, etc. on a resource in the same way with the same underlying metadata structure. See, for instance: dev.twitter.com/pages/annotations_overview) |
| Validation | <p>Validation in the context of WP5. The validation is done by manual testing for the generic information model for resource description. Responsible are WP5 members. To validate this requirement it is needed for WP5 to verify whether MERM supports elementary (domain independent) properties required to describe their resources.</p> <p>Validation in the context of WP3 and WP4. The validation is done by manual testing for the tagging and discovery services and tools. Responsible are WP members. To validate this requirement it is needed to verify that the meta-information (MERM) is sufficient to perform general domain independent tagging and discovery (time, geospatial location, keywords, etc.).</p> |

| | |
|----------------------------------|---|
| ID | TR.META.010 |
| Name | Specialized Information models for resource description |
| Scope | TaToo shall provide example of extended information models for describing resources relevant to the TaToo scenarios. For example Minimal data standard for epidemiology and persistent organic pollutants (POP) data sources |
| Optional | See also TR.ONTO.050 |
| Open Issues | |
| Trace | S3.1W1, RT02, RT03, RT03, RT04 |
| Architectural Level | V1: MERM & Bridge Ontology Concepts |
| Specification Level | V1 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | <p>Validation in the context of WP4. The validation is done by automated testing for the tagging and discovery services. Responsible are WP4 developers. To validate this requirement it is needed to tag with concepts from domain ontologies, perform search, and compare results.</p> <p>Validation in the context of WP4. The validation is done by manual testing for the tagging and discovery portlets. Responsible are WP4 developers. To validate this requirement it is needed to select domain ontology for tagging, tag resources with domain concepts, perform search, and compare results.</p> <p>Validation in the context of WP5. The validation is done by manual testing for the portal and custom pilot applications. Responsible are WP5 members and end users. To validate this requirement it is needed to tag and search with domain concepts.</p> |

| | |
|----------------------------------|---|
| ID | TR.META.020 |
| Name | Extraction of metadata |
| Scope | <p>TaToo should provide means to extract metadata from resources. E.g. any information that can be extracted from the data source itself should be used.</p> <ul style="list-style-type: none"> • Examples for resource formats to be supported: • XML formats (e.g. ABCD) • OGC & SWE XML formats (e.g. GML) • Microsoft Word and Excel • html (websites) |
| Optional | TR.HARVEST.000 |
| Open Issues | <p>Has to be further discussed with WP5: This depends heavily on the data source. Structure of data records can be derived from the headers of data source. Well structured data sources can contain definition of structure of data for example:</p> <ul style="list-style-type: none"> - Column names - WSDL + XML-Schema |
| Trace | S3.1W1, S3.3W2, S3.2W1; UI08 |
| Architectural Level | V1: Harvesting concepts |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | M |
| Comment | See TR.HARVEST.000 |
| Validation | <p>Validation in the context of WP4 and WP5. The validation is done by automated testing for metadata. Responsible are WP4 developers and WP5 members. To validate this requirement it is needed to prove that means for metadata extraction are there and working (see scope field).</p> |

7. Tagging and annotation

Tagging is understood as the process of adding information (as part of the metadata / meta-information of an item) to a certain artefact or piece of interest.

The users typically want to enrich resources (e.g. data, models, services) by adding additional data on the topic, e.g. hints for future users of the data or model; quality, usability, suitability or even links to other similar resources.

The practice of adding meta-information to resources allows the information enrichment process that is at the base of the TaToo project aim. This is because the information enrichment makes possible the improvement of the search and discovery process by considering meta-information associated with resources while performing the process.

Tagging is not only important for users wishing to add useful metadata to resources they can find in a second time, but it is considered one of the most important functionality the TaToo project is providing.

In TaToo we perform tagging using ontologies. According to the TaToo understanding and definition, the process of tagging with semantic information is called *annotation*. From the requirements perspective the term tagging is more generic. Therefore, in this section we use the term tagging to refer generically to the process of creating semantic metadata.

7.1. Tagging of resources

Context

Typically users wants to tag resources immediately when or while ‘accessing’ (e.g. visualising, reading or exploring) a resource. In some cases, first the user wants to explore a resource and then, later on, come back and add tags. This normally happens when the evaluation of the found resources can be done after an elaboration that is taking some time. If the resource is a simple picture, it can be possibly tagged as soon as it is displayed. In the case of a document or raw data, the tagging can be done only after having read the document or elaborated the raw data. Both flavours of tagging are described in the respective TaToo validation scenarios.

Flexible tagging can be allowed by an implementation of a tagging service. Applications (relevant in the context of the TaToo validation scenarios) can thus contact such a service for tagging.

Terms and Definitions (*if applicable to explain terms used below e.g. in the description section*)

Tagging: is a process of adding metadata to resources

Annotation: is tagging based on semantics.

Requirements (*all, respectively the whole list of requirements*)

| | |
|--|---|
| ID | TR.TAGGING.000 |
| Name | Tagging means |
| Scope | TaToo shall provide means to tag resources. |
| Optional | |
| Open Issues | |
| Trace | AR; TR01 |
| Architectural Level | V1: Tagging concepts and respective components |
| Specification Level | V1: Tagging Service & Tools |
| Implementation Level | V1: Tagging Service & Tools |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by automated testing for tagging service. Responsible are WP4 developers. To validate this requirement it is needed to implement automated unit tests for each operation of the service, creation and deletion of tags, comparison, etc. |

| | |
|--|--|
| ID | TR.TAGGING.010 DEPRECATED |
| Name | Meta-information on third party resources |
| Scope | TaToo allow users to add meta-information to third party resources. Those are resources that are not stored in the TaToo System. |
| Optional | TR.META.000 |
| Open Issues | |
| Trace | VDS1.UC1.4.;VDS3.UC3.2 |
| Architectural Level | V1: Tagging concepts and respective components, MERM concepts |
| Specification Level | V1: Tagging Service |
| Implementation Level | V1: Tagging Service (early prototype) |
| Relevance/ Importance / Priority | H |

| | |
|------------|---|
| Comment | It should be noted, that TaToo does not store any resource by itself, just meta-information about a resource. So all resources tagged are “third party resources”. This requirement is covered by TR.META.000. |
| Validation | <p>Validation in the context of WP5. The validation is done by manual testing for the generic information model for resource description. Responsible are WP5 members. To validate this requirement it is needed for WP5 to verify whether MERM supports elementary (domain independent) properties required to describe their resources.</p> <p>Validation in the context of WP3 and WP4. The validation is done by manual testing for the tagging and discovery services and tools. Responsible are WP members. To validate this requirement it is needed to verify that the meta-information (MERM) is sufficient to perform general domain independent tagging and discovery (time, geospatial location, keywords, etc.).</p> |

| | |
|--|---|
| ID | TR.TAGGING.020 |
| Name | Access to tags (TaToos) |
| Scope | TaToo shall provide a mean to allow users to access all the tags (TaToos) associated to searched resources. |
| Optional | TR.ACCESS.030 |
| Open Issues | |
| Trace | S1W2; S2W2;S2W3 |
| Architectural Level | V1: Tagging Concepts and respective components |
| Specification Level | V1: Tagging Service & Tools |
| Implementation Level | V1: Tagging Service & Tools |
| Relevance/ Importance / Priority | H |
| Comment | This requirement is covered by TR.ACCESS.030. |
| Validation | Validation in the context of WP4. The validation is done by automated testing for tagging service. Responsible are WP4 developers. To validate this requirement it is needed to implement automated unit tests for each operation of the service, creation and deletion of tags, comparison, etc. |

| | |
|----------------------------------|---|
| ID | TR.TAGGING.030 |
| Name | Postponed Tagging / Tagging of known resources |
| Scope | TaToo shall provide a means for already known resources without going back to the discovery process again. |
| Optional | TR.TAGGING.040 |
| Open Issues | Tagging Service(s) have to be implemented / provided so that validation scenarios can contact them and use them. |
| Trace | S1W2; S2W2;S2W3 |
| Architectural Level | V1: Concept of the layered architecture: custom clients may access service directly |
| Specification Level | V1: Tagging Service |
| Implementation Level | V1: Tagging Service |
| Relevance/ Importance / Priority | H |
| Comment | This requirement is covered by TR.TAGGING.040. |
| Validation | Validation in the context of WP4. The validation is done by automated testing for tagging service. Responsible are WP4 developers. To validate this requirement it is needed to implement automated unit tests for each operation of the service, creation and deletion of tags, comparison, etc. |

| | |
|----------------------------------|--|
| ID | TR.TAGGING.040 |
| Name | Tagging Service |
| Scope | TaToo shall define a service interface and implement a tagging service that allows integrating of tagging into third parties applications. The Tagging Service shall support all operations necessary to manage tags (CRUD). |
| Optional | |
| Open Issues | |
| Trace | S1W4; UI02 |
| Architectural Level | V1: Tagging Concepts and respective components |
| Specification Level | <ul style="list-style-type: none"> • V1: Basic Tagging Service • V2:Tagging Service refinement (editing & deleting tags, ...) |
| Implementation Level | <ul style="list-style-type: none"> • V1: Tagging Service • V2:Tagging Service refinement (editing & deleting tags, ...) |
| Relevance/ Importance / Priority | H |

| | |
|------------|---|
| Comment | Allows also tagging inside pilot specific or external applications |
| Validation | Validation in the context of WP4. The validation is done by automated testing for tagging service. Responsible are WP4 developers. To validate this requirement it is needed to implement automated unit tests for each operation of the service, creation and deletion of tags, comparison, etc. |

| | |
|----------------------------------|---|
| ID | TR.TAGGING.050 |
| Name | Tagging Client |
| Scope | TaToo shall provide at least one client for tagging service. The Tagging Client shall support all functions necessary to manage tags (CRUD). |
| Optional | |
| Open Issues | |
| Trace | S1W4; AR; VDS2.UC1.3. VDS2.UC1.4 |
| Architectural Level | V1: Tagging Concepts and respective components |
| Specification Level | <ul style="list-style-type: none"> • V1: Tagging Portlet • V2: extended Tagging Portlet (editing & deleting tags, ...) |
| Implementation Level | <ul style="list-style-type: none"> • V1: Tagging Portlet • V2: extended Tagging Portlet (editing & deleting tags, ...) |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP4 and WP5. The validation is done by manual testing for tagging tools and custom pilot applications. Responsible are WP4 developers, WP5 members, and end users. To validate this users shall test the tagging client applications, create, update, delete tags, compare the results, etc. |

| | |
|----------------------------------|--|
| ID | TR.TAGGING.060 |
| Name | Semantic Tags |
| Scope | TaToo tags (TaToos) shall be based on ontologies that support a generic and domain independent annotation of arbitrary resources. |
| Optional | TR.TAGGING.080 |
| Open Issues | |
| Trace | AR |
| Architectural Level | V1: General MERM Concepts |
| Specification Level | V1: generic part of the MERM |
| Implementation Level | V1: Tagging Service |
| Relevance/ Importance / Priority | H |
| Comment | Requirement is further extended by TR.TAGGING.080 to support also domain ontologies |
| Validation | Validation in the context of WP4. The validation is done by manual testing for tagging and discovery services and clients. Responsible are WP4 developers and ontology experts. To validate this requirement it is needed to test the enhanced functionalities supported by semantic tags, e.g. reasoning etc. |

| | |
|----------------------------------|---|
| ID | TR.TAGGING.070 |
| Name | Storing of Tags |
| Scope | TaToo shall provide a component (service) to store and manage tags. |
| Optional | TR.TAGGING.040; TR.TAGGING.050 |
| Open Issues | |
| Trace | |
| Architectural Level | V1: Tagging concepts and respective components |
| Specification Level | V1: Tagging Processor |
| Implementation Level | V1: Tagging Processor |
| Relevance/ Importance / Priority | H |
| Comment | Requirement covered by TR.TAGGING.040 and TR.TAGGING.050 |
| Validation | <p>Validation in the context of WP4. The validation is done by automated testing for tagging service. Responsible are WP4 developers. To validate this requirement it is needed to implement automated unit tests for each operation of the service, creation and deletion of tags, comparison, etc.</p> <p>Validation in the context of WP4 and WP5. The validation is done by manual testing for tagging tools and custom pilot applications. Responsible are WP4 developers, WP5 members, and end users. To validate this users shall test the tagging client applications, create, update, delete tags, compare the results, etc.</p> |

| | |
|-------------------------|---|
| ID | TR.TAGGING.080 |
| Name | Ontology supported tagging |
| Scope | In addition to the general requirement that TaToo tags shall be based on ontologies, TaToo shall also provide means to support users to annotate resources in accordance with their own domain ontologies |
| Optional | |
| Open Issues | |
| Trace | AR; TR02 |
| Architectural Level | <ul style="list-style-type: none"> • V1: MERM Concepts, domain ontology integration • V2: update of MERM and ontology integration concepts |
| Specification Level | <ul style="list-style-type: none"> • V1: MERM • V1: Domain ontologies |
| Implementation Level | <ul style="list-style-type: none"> • V1: Tagging Service supporting MERM; MU ontology (early) • V1: Tagging Service supporting domain ontologies • V2: integration of additional domain ontologies |
| Relevance/ Importance / | H |

| | |
|------------|--|
| Priority | |
| Comment | The user is forced to choose from a specific set of tags that relate to concepts from shared ontologies that can be selected by the user. |
| Validation | Validation in the context of WP4. The validation is done by manual testing for tagging and discovery services and clients. Responsible are WP4 developers and ontology experts. To validate this requirement it is needed to test the enhanced functionalities supported by semantic tags, e.g. reasoning etc. |

| | |
|--|--|
| ID | TR.TAGGING.090 |
| Name | Sharing of tags (TaToos) |
| Scope | Tags (TaToos) shall be shared between all users and publicly visible. Ownership of the Tags shall be publicly visible. |
| Optional | |
| Open Issues | |
| Trace | AR; TR05; |
| Architectural Level | V2: Security concepts |
| Specification Level | V2: User Context Manager |
| Implementation Level | V2: User Context Manager |
| Relevance/ Importance / Priority | H |
| Comments | Each tag has an owner. Note: limitation to certain user groups is currently not foreseen. |
| Validation | Validation in the context of WP4. The validation is done by manual testing for tagging clients. Responsible are WP4 developers. To validate this requirement it is needed to check whether all tags are publicly visible in the GUI. |

| | |
|----------------------------------|---|
| ID | TR.TAGGING.100 |
| Name | Editing of tags (TaToos) |
| Scope | TaToo shall provide a mean for editing, updating and deleting Tags (TaToos) by the owner or a privileged user (e.g. administrator). |
| Optional | |
| Open Issues | |
| Trace | AR; TR04 |
| Architectural Level | V2: Security concepts and respective |
| Specification Level | <ul style="list-style-type: none"> • V2: Extended Tagging Service • V2: User Context Manager, Security implementation |
| Implementation Level | <ul style="list-style-type: none"> • V2: Extended Tagging Service • V2: User Context Manager, Security implementation |
| Relevance/ Importance / Priority | H |
| Comments | Each tag has an owner. To be discussed: Can the owner be anonymous. |
| Validation | <p>Validation in the context of WP4. The validation is done by automated testing for tagging service. Responsible are WP4 developers. To validate this requirement it is needed to implement automated unit tests for each operation of the service, creation and deletion of tags, comparison, etc.</p> <p>Validation in the context of WP4 and WP5. The validation is done by manual testing for tagging tools and custom pilot applications. Responsible are WP4 developers, WP5 members, and end users. To validate this users shall test the tagging client applications, create, update, delete tags, compare the results, etc.</p> |

| | |
|----------------------------------|--|
| ID | TR.TAGGING.110 |
| Name | Derive the structure of data records of a data source |
| Scope | TaToo should support the process of identifying searching and tagging terms from already available data structures. E.g. Derive structures from data records of a data source (XML Schema, Table Headers, WSDL, ...) to be used for searching and tagging. This has to be done manually. |
| Optional | TR.HARVEST.000 |
| Open Issues | |
| Trace | S3.3W2, S3.2W1 |
| Architectural Level | <ul style="list-style-type: none"> • V1: Core components building block, concepts of harvester connectors • V2: Exemplary harvesting use case |
| Specification Level | <ul style="list-style-type: none"> • V1: Resource Harvester specification • V2: Specification of specialised harvesters |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | M |
| Comment | Requirement covered by TR.HARVEST.000 |
| Validation | Validation in the context of WP5 and WP4. The validation is done by automated and manual testing for the harvester implementations. Responsible are WP4 developers and WP5 members. To validate this requirement it is needed to develop and tests harvesters to register WP5 resources. |

| | |
|----------------------|--|
| ID | TR.TAGGING.120 |
| Name | (Automatic) geo-tagging of data sources |
| Scope | TaToo shall support standard metadata for semi-automatic geo tagging of resources, i.e. to automatically derive the geographical location from the data source's content. |
| Optional | TR.DISCOVERY.020 and META.020 |
| Open Issues | Standard geo metadata to be supported has to be defined (e.g. ICBM-Tags, GeoURL, ...). To be further elaborated. Feasibility of that requirement has to be further analysed. |
| Trace | S3.3W2, S3.2W1, RT01 |
| Architectural Level | - |
| Specification Level | - |
| Implementation Level | - |
| Relevance/ | - |

| | |
|-----------------------|---|
| Importance / Priority | |
| Comment | <p>Only relevant for Validation Scenario 3 – specific to a scenario – but not a common requirement. Client side req.</p> <p>See also TR.DISCOVERY.020 and META.020</p> |
| Validation | <p>Validation in the context of WP5. The validation is done by manual testing for custom WP5 applications (e.g. climate twins viewer). Responsible are WP5 members and end users. To validate this requirement it is needed to test the functionality developed for the custom pilot application.</p> |

| | |
|----------------------------------|---|
| ID | TR.TAGGING.130 NEW |
| Name | Open Tagging |
| Scope | Tags can be freely defined by the user |
| Optional | |
| Open Issues | |
| Trace | TR01 |
| Architectural Level | V2 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | M |
| Comments | <p>TaToo is considering close tagging. This means users can generally provide their tags as terms defined as concepts in the relevant Domain Ontologies. This allows taking advantage of semantics. Open Tagging i.e. free terms from users can also be allowed. Of course in this case semantics is not going to be exploited and only syntactic search is possible on free terms.</p> |
| Validation | <p>Validation in the context of WP4 and WP5. The validation is done by manual testing for tagging. Responsible are WP4 developers and WP5 members. To validate this requirement it is needed to make sure that users can define tags freely.</p> |

| | |
|--|--|
| ID | TR.TAGGING.140 NEW |
| Name | Tagging of Tags |
| Scope | It shall be possible to tag tags, e.g. to rate or comment on tags provided by other users. Tags itself are treated as resources. |
| Optional | TR.ARCH.050 |
| Open Issues | |
| Trace | TR06 |
| Architectural Level | V2 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | L |
| Comments | |
| Validation | Validation in the context of WP5. The validation is done by manual testing for archiving/storage. Responsible are WP5 members. To validate this requirement it is needed to provide means for evaluation of resources. |

| | |
|--|---|
| ID | TR.TAGGING.150 NEW |
| Name | Proposing new Tags |
| Scope | There must be a mechanism for proposing new tags. However, these must be duly considered and merged into the existing ontologies; otherwise multiple tags for the same meaning will emerge |
| Optional | TR.META.010 |
| Open Issues | |
| Trace | TR07 |
| Architectural Level | V2 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | L |
| Comments | Related to TR.META.010 and TR.TAGGING.130 |
| Validation | Validation in the context of WP4. The validation is done by automated testing for the tagging and discovery services. Responsible are WP4 developers. To validate this requirement it is needed to tag with concepts from domain ontologies, perform search, and compare results. |

| | |
|--|---|
| | Validation in the context of WP4. The validation is done by manual testing for the tagging and discovery portlets. Responsible are WP4 developers. To validate this requirement it is needed to select domain ontology for tagging, tag resources with domain concepts, perform search, and compare results. Validation in the context of WP5. The validation is done by manual testing for the portal and custom pilot applications. Responsible are WP5 members and end users. To validate this requirement it is needed to tag and search with domain concepts. |
|--|---|

8. Access

Discovery and tagging often goes hand in hand with facilitating access to the discovered resources on the one side and accessing the meta-information (“tags”) maintained by TaToo about the resource of interest on the other side.

Access to TaToo meta-information which involves besides reading also creating and updating meta-information will take place in a regulated environment, the TaToo Semantic Service Environment and Framework, featuring well defined service interfaces and supporting standards-based access control mechanisms. In contrast, accessing the resource itself, especially if it is an application, a mathematical model or a service, may be way more complex. TaToo has therefore to provide appropriate meta-information on how to access the resource, including information about specific security restrictions that may apply when requesting access.

8.1. Access to TaToo meta-information

Context

Access to TaToo meta-information is characterised by the fact that it is either performed through public interfaces (user interfaces and service interfaces) exposed by the TaToo Service Environment and Framework and/or within the framework or the framework components (e.g. the TaToo portal accessing the clearinghouse) itself.

Standards-based access control mechanisms at interface level for access performed through public interfaces have to be established at least for those operations that add new or modify existing meta-information.

Terms and Definitions *(if applicable to explain terms used below e.g. in the description section)*

Access: To interact with a system entity in order to manipulate, use, gain knowledge of, and/or obtain a representation of some or all of a system entity's resources. [RFC 2828] Note: Difference between Discovery and Access not always clear. Source: <http://www.w3.org/TR/2004/NOTE-ws-gloss-20040211/#access>

Tag: Meta-Information about a resource. In TaToo a Tag can represent:

semantic machine processable information about the resource (RDF, ...)

Requirements (all, respectively the whole list of requirements)

| | |
|----------------------------------|---|
| ID | TR.ACCESS.000 |
| Name | Access to stored meta-information |
| Scope | Access to meta-information (“tags”) about resources. It shall be possible to obtain meta-information that has previously been attached to a resource. For example, the user should have possibility to see a detailed description for every resource found during discovery. |
| Optional | |
| Open Issues | Access control may be required if some meta-information has to be protected from unauthorised access. However, at the moment there is no requirement for such “confidential” tags. |
| Trace | S3.1W2; S3.2W2; VDS2.UC2.2; VDS2.UC2.5; VDS2.UC2.7; VDS3.UC3.4: |
| Architectural Level | <ul style="list-style-type: none"> • V1: tagging service and respective core components • V2: access control mechanisms |
| Specification Level | <ul style="list-style-type: none"> • V1: Tagging Service and Core Component • Access control |
| Implementation Level | <ul style="list-style-type: none"> • V1: Tagging Service • Access control |
| Relevance/ Importance / Priority | H |
| Comment | <p>Strong relation to discovery and search: search results may consist of stored meta-information. Access either by TaToo components (Portal) and third-party or pilot-specific applications (e.g. SVOD, Climate Twins Viewer).</p> <p>Example from VDS2.UC2.4: If found resource has already been evaluated by other users, the publisher portal shows a link (to the TaToo server) with the already inserted evaluations</p> |
| Validation | <p>Validation in the context of WP4. The validation is done by automated testing for tagging service. Responsible are WP4 developers. To validate this requirement it is needed to implement automated unit tests for each operation of the service, creation and deletion of tags, comparison, etc.</p> <p>Validation in the context of WP4 and WP5. The validation is done by manual testing for tagging tools and custom pilot applications. Responsible are WP4 developers, WP5 members, and end users. To validate this users shall test the tagging client applications, create, update, delete tags, compare the results, etc.</p> |

| | |
|----------------------------------|---|
| ID | TR.ACCESS.010 |
| Name | Storing meta-information |
| Scope | It shall be possible to attach meta-information to resources and store them. |
| Optional | See all TAG requirements |
| Open Issues | Access control may be required if not everybody should be allowed to tag resources and store/save them. At least user management is required in order to trace <i>who</i> (the “owner” of the tag) tagged the resource. |
| Trace | See all TAG requirements |
| Architectural Level | V1: respective core components |
| Specification Level | V1: Tagging Service |
| Implementation Level | V1: Tagging Service |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | <p>Validation in the context of WP4. The validation is done by automated testing for tagging service. Responsible are WP4 developers. To validate this requirement it is needed to implement automated unit tests for each operation of the service, creation and deletion of tags, comparison, etc.</p> <p>Validation in the context of WP4 and WP5. The validation is done by manual testing for tagging tools and custom pilot applications. Responsible are WP4 developers, WP5 members, and end users. To validate this users shall test the tagging client applications, create, update, delete tags, compare the results, etc.</p> |

| | |
|----------------------------------|---|
| ID | TR.ACCESS.020 |
| Name | Manipulating stored meta-information |
| Scope | It shall be possible to manipulate (update/delete) meta-information previously attached to resources. |
| Optional | TR.TAGGING.100 |
| Open Issues | Access control is required. To be discussed, if the “owner” of the tag is allowed to edit/delete or just an administrator. |
| Trace | S3.3W1; |
| Architectural Level | V1 |
| Specification Level | V1 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |
| Comment | Example from S3.3W1: TaToo could provide an authorised tool for editing (modelling) the main ontology of epidemiology statistics. |
| Validation | <p>Validation in the context of WP4. The validation is done by automated testing for tagging service. Responsible are WP4 developers. To validate this requirement it is needed to implement automated unit tests for each operation of the service, creation and deletion of tags, comparison, etc.</p> <p>Validation in the context of WP4 and WP5. The validation is done by manual testing for tagging tools and custom pilot applications. Responsible are WP4 developers, WP5 members, and end users. To validate this users shall test the tagging client applications, create, update, delete tags, compare the results, etc.</p> |

8.2. Access to external resources

Context

An essential feature of TaToo is to not only provide access to meta-information about a resource but also the appropriate means to allow and ease the access to the resource itself. Uniform and transparent access to such disparate types of resources like databases, documents, services, models, etc. has to be supported and adequate meta-information about the various access mechanisms has to be provided.

Terms and Definitions (*if applicable to explain terms used below e.g. in the description section*)

-

Requirements (*all, respectively the whole list of requirements*)

| | |
|----------------------------------|---|
| ID | TR.ACCESS.030 |
| Name | Generic access to resources |
| Scope | <p>After the discovery of a resource TaToo shall facilitate the access to the actual content in various ways. Depending on the type of the resource concrete information on how to access the resource have to be provided to support various access mechanisms.</p> <p>Furthermore, access to the original resource might be required when the resource is initially registered in TaToo, either automatic (harvesting) or manually. See also TR.HARVEST.000</p> <p>Access methods to be supported are:</p> <ul style="list-style-type: none"> • through OGC service (WMS, WFS, ...); • through PyWrapper (a generic Python driven XML/CGI interface to heterogeneous databases); and • by download (e.g. http or ftp). |
| Optional | |
| Open Issues | <p>Security issues if the resource provider does not permit unauthorised access (e.g. downloading a paper from web of science). There might exist such access constraints like authentication, authorisation, payment etc. Implies also security constraints on TR.TAGGING.100 if meta-information contains confidential properties (e.g. usernames & passwords).</p> <p>Supported access methods shall be discussed. Examples that could be realised as visualisation portlets:</p> <ul style="list-style-type: none"> • PDF viewer (Browser Plug-in) • OGC Service Viewer (e.g. WMS & WFS) |
| Trace | VDS3.UC3.3; VDS3.UC3.4; VDS3.UC3.7; VDS3.UC3.7; RA03 |
| Architectural Level | <ul style="list-style-type: none"> • V1: MERM concepts, general description about visualisation of components |
| Specification Level | <ul style="list-style-type: none"> • V1: basic access info in MERM (URI) • V2: extended access info, visualisation component |
| Implementation Level | <ul style="list-style-type: none"> • V2 visualisation component |
| Relevance/ Importance / Priority | H |
| Comment | <p>In the simplest case this could mean, for example, to provide a direct link to the resource and download the found resources in well known manner. See also TR.HARVEST.000</p> |
| Validation | <p>Validation in the context of WP5. The validation is done by manual testing for tagging / visualisation tools and custom pilot applications. Responsible are WP5 members and end users. To validate this requirement it is needed to enable users to assess the supported access mechanisms (e.g. download link).</p> |

| | |
|----------------------------------|---|
| ID | TR.ACCESS.040 |
| Name | Registering new resources |
| Scope | <p>Besides the automatic registration of resources through crawlers, etc. users shall have the possibility to register resources with TaToo. The process of adding new resources to TaToo should automatically collect as much meta-information about the resources as possible without the need of further user intervention.</p> <p>Exemplified for resource types users want to register:</p> <ul style="list-style-type: none"> • geospatial data • model results • air – and water quality data • soil data • textual data and spreadsheets |
| Optional | TR.HARVEST.000 |
| Open Issues | To be discussed further: Security Issue: In some cases only authorised users should be allowed to add a new resource. |
| Trace | VDS UC.1.4; VDS2.UC2.1; VDS2.UC2.2; VDS3.UC3.8; UI07; UI08 |
| Architectural Level | V1 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |
| Comment | Strong relation to TAG and HARVEST requirements: A resource must be registered before it can be tagged. See also TR.META.020 and TR.HARVEST.000 |
| Validation | Validation in the context of WP5 and WP4. The validation is done by automated and manual testing for the harvester implementations. Responsible are WP4 developers and WP5 members. To validate this requirement it is needed to develop and tests harvesters to register WP5 resources. |

9. Security

Since TaToo will facilitate discovery and access of a wide range of environmental resources and web-based services we have to think about how security can be provided in such an environment. Some of those services or resources may require a registration or usage fee, may be subject to copyright or lawful restrictions or may not be available to the public for some reason (Dihé et.al, 2010).

A service provider who is willing to make non-public services discoverable, accessible and tag-able by TaToo should be offered the possibility to control who can do what with his services. But not only the external services and resources accessed by TaToo may require protection. Also the access to TaToo's public services (e.g. tagging and search) must be regulated to prevent potential misuse.

9.1. Access control

Context

TaToo services, especially those services having public interfaces and allowing manipulation meta-information have to be access controlled. Access control encompasses registration / management of identities ("users"), their authentication ("login") and the enforcement of the access restrictions (authorisation).

Terms and Definitions (*if applicable to explain terms used below e.g. in the description section*)

Access control: Ability to enforce a policy that identifies permissible actions on a particular resource by a particular subject.

Source: Specification of the Sensor Service Architecture V3

Authentication: Concerns the identity of the participants in an exchange. Authentication refers to the means by which one participant can be assured of the identity of other participants.

Source: OASIS Reference Architecture for Service Oriented Architecture Version 1.0, <http://docs.oasis-open.org/soa-rm/v1.0/soa-rm.pdf>

Authorisation: Concerns the legitimacy of the interaction. Authorization refers to the means by which an owner of a resource may be assured that the information and actions that are exchanged are either explicitly or implicitly approved.

Source: OASIS Reference Architecture for Service Oriented Architecture Version 1.0, <http://docs.oasis-open.org/soa-rm/v1.0/soa-rm.pdf>

Policy: Representation of a constraint or condition on the use, deployment, or description of a resource.

Source: derived from OASIS Reference Architecture for Service Oriented Architecture Version 1.0, <http://docs.oasis-open.org/soa-rm/v1.0/soa-rm.pdf>

Requirements (*all, respectively the whole list of requirements*)

| | |
|--|--|
| ID | TR.SECURITY.000 |
| Name | Access control to system web services |
| Scope | In order to avoid access to unauthorized users, access to all the web services making up the system shall be access controlled and appropriate identity management, authentication and authorisation mechanisms have to be provided. |
| Optional | |
| Open Issues | |
| Trace | S3.3W1, VDS3 |
| Architectural Level | V2 |
| Specification Level | V2 |
| Implementation Level | V3 |
| Relevance/ Importance / Priority | M |
| Comment | Currently no specific requirements for authentication and authorisation mechanisms requested. |
| Validation | Validation in the context of WP4. The validation is done by automated testing for public services and access control services. Responsible are WP4 developers. To validate this requirement it is needed to implement automatic unit tests for security policies and access control. |

| | |
|--|---|
| ID | TR.SECURITY.010 |
| Name | Identity and policy management |
| Scope | TaToo shall support different kinds of users (identities) having different levels of access rights. Management of users (identities) includes administration of user accounts and groups (create, update, delete) as well as the assignment of access rights (policies) and their management. |
| Optional | TR.USERMGT.000 and TR.USERMGT.010 |
| Open Issues | |
| Trace | VDS3 |
| Architectural Level | V2 |
| Specification Level | V2 |
| Implementation Level | V3 |
| Relevance/ Importance / Priority | M |
| Comment | <p>Refer VDS3 for a list of requested types of users. Example for user type “domain expert” from VDS3.UC3.5: “This use case should allow domain experts to define certain quality criteria for resources like the reputation of the publishing institute, the measurement methods, used norms and standards etc.”</p> <p>This requirement is overlaying with TR.USERMGT.000 and TR.USERMGT.010</p> |
| Validation | <p>Validation in the context of WP4. The validation is done by manual testing for the user management component. Responsible are WP4 developers. To validate this requirement it is needed to validate the functionality to create and manage different user types and the implementation of the contracts.</p> <p>Validation in the context of WP4. The validation is done by manual testing for the user management component. Responsible are WP4 developers. To validate this requirement it is needed to test the correct implementation of permissions.</p> |

| | |
|--|---|
| ID | TR.SECURITY.020 NEW |
| Name | Access control to internal “system” data (MERM, bridge ontologies, ...) |
| Scope | A procedure must be established defining how internal data underlying dynamic modifications are updated. This procedure must include the management of the corresponding access rights. |
| Optional | |
| Open Issues | |
| Trace | S3.3W1, VDS3 |
| Architectural Level | V2 |
| Specification Level | V2 |
| Implementation Level | V3 |
| Relevance/ Importance / Priority | M |
| Comment | Authentication and authorisation requirements have to be aligned with the defined procedure |
| Validation | <p>Validation in the context of WP4. The validation is done by manual testing for the user management component. Responsible are WP4 developers. To validate this requirement it is needed to validate the functionality to create and manage different user types and the implementation of the contracts.</p> <p>Validation in the context of WP4. The validation is done by manual testing for the user management component. Responsible are WP4 developers. To validate this requirement it is needed to test the correct implementation of permissions.</p> |

10. Archiving / Storage

All additional descriptive information provided for a specific resource (data, service, model, etc.) either via annotations, tagging of resources, ontologies etc. have to be stored at a central place and made available and accessible (if not secured) by everybody.

Context

The clearinghouse plays the role of organising the semantic information provided on environmental resources. It is a central component for accessing the semantic annotations storage and serves also as an information exchange support between the TaToo system components.

Terms and Definitions (*if applicable to explain terms used below e.g. in the description section*)

-

Requirements (*all, respectively the whole list of requirements*)

| | |
|--|---|
| ID | TR.ARCH.000 |
| Name | Storage facility for semantic annotations |
| Scope | A repository is needed to store all semantic annotations provided on a resource. |
| Optional | |
| Open Issues | |
| Trace | AR |
| Architectural Level | V1 |
| Specification Level | V1 |
| Implementation Level | V1 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by automated testing for the archiving/storage component. Responsible are WP4 developers. To validate this requirement it is needed to test storage facilities and repositories. |

| | |
|----------------------------------|---|
| ID | TR.ARCH.010 |
| Name | Use of standard API to access to the Semantic repository |
| Scope | The semantic repository shall be accessed through standard interfaces (rdf2go) |
| Optional | |
| Open Issues | |
| Trace | AR |
| Architectural Level | V1 |
| Specification Level | V1 |
| Implementation Level | V1 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by automated testing for the archiving/storage component. Responsible are WP4 developers. To validate this requirement it is needed to implement automated tests for standard API access to the semantic repository. |

| | |
|----------------------------------|--|
| ID | TR.ARCH.020 |
| Name | Managing annotations in the knowledge base (KB) |
| Scope | The Clearinghouse shall provide methods for adding, updating and deleting annotations. |
| Optional | |
| Open Issues | |
| Trace | AR |
| Architectural Level | V1 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |

| | |
|------------|---|
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by manual testing for the archiving/storage component. Responsible are WP4 developers. To validate this requirement it is needed to do manual tests for annotation management in the knowledge base. |

| | |
|----------------------------------|---|
| ID | TR.ARCH.030 |
| Name | Consistency of the knowledge base (KB) |
| Scope | The KB must be consistent after update/delete/insert operations. |
| Optional | |
| Open Issues | |
| Trace | AR |
| Architectural Level | V1 |
| Specification Level | V1 |
| Implementation Level | V1 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by manual testing for the archiving/storage component. Responsible are WP4 developers. To validate this requirement it is needed to do manual tests for consistency of the knowledge base. |

| | |
|-------------------------|---|
| ID | TR.ARCH.040 |
| Name | User profile and context |
| Scope | TaToo shall provide storage for semantic representation of the user profile and contextual relations (domain the user is working, etc.) |
| Optional | |
| Open Issues | |
| Trace | AR |
| Architectural Level | V1 |
| Specification Level | V1 |
| Implementation Level | V1 |
| Relevance/ Importance / | H |

| | |
|------------|---|
| Priority | |
| Comment | |
| Validation | Validation in the context of WP4 and WP5. The validation is done by manual testing for the archiving/storage component. Responsible are WP4 developers and WP5 members. To validate this requirement it is needed check user profile and context functionality. |

| | |
|--|--|
| ID | TR.ARCH.050 |
| Name | Evaluation of resources |
| Scope | The system shall provide storage of evaluation of resources that will be represented semantically |
| Optional | |
| Open Issues | |
| Trace | AR |
| Architectural Level | V1 |
| Specification Level | V1 |
| Implementation Level | V1 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP5. The validation is done by manual testing for archiving/storage. Responsible are WP5 members. To validate this requirement it is needed to provide means for evaluation of resources. |

| | |
|----------------------------------|---|
| ID | TR.ARCH.060 |
| Name | Storing/Archiving of tags |
| Scope | To store annotations of different users to a or the same resource. |
| Optional | |
| Open Issues | |
| Trace | AR |
| Architectural Level | V1 |
| Specification Level | V1 |
| Implementation Level | V1 |
| Relevance/ Importance / Priority | H |
| Comment | See also TR.ARCH.000 |
| Validation | Validation in the context of WP4. The validation is done by automated testing for the archiving/storage component. Responsible are WP4 developers. To validate this requirement it is needed to test storage facilities and repositories. |

| | |
|----------------------------------|--|
| ID | TR.ARCH.070 NEW |
| Name | Alternative Service bindings |
| Scope | TaToo shall support alternative bindings to SOAP bindings for Public Services, e.g. RESTful or OGC compliant |
| Optional | |
| Open Issues | |
| Trace | UI05 |
| Architectural Level | V3 |
| Specification Level | V3 |
| Implementation Level | V3 |
| Relevance/ Importance / Priority | L |
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by automated testing for public services and test clients. Responsible are WP4 developers. To validate this requirement it is needed to implement automated unit tests of the alternative bindings with test clients. |

11. Data quality

Context

In order to increase the quality of information, indicators about data quality and uncertainty should be provided to TaToo users. This information will inform all users about the applicability of the information for problems to solve.

The quality criteria have to come from domain expert and could be commented further on by other users.

Terms and Definitions (*if applicable to explain terms used below e.g. in the description section*)

-

Requirements (*all, respectively the whole list of requirements*)

| | |
|--|---|
| ID | TR.DAQ.000 |
| Name | Uncertainty Processing |
| Scope | TaToo should provide a mean to process uncertainty information associated with a resource and provide an indicator for overall level of uncertainty of this resource. |
| Optional | |
| Open Issues | Uncertainty values as search parameter |
| Trace | VDS3.UC3.4; VDS3.UC3.5 |
| Architectural Level | V2 |
| Specification Level | V2 |
| Implementation Level | V3 |
| Relevance/ Importance / Priority | H |

| | |
|------------|--|
| Comment | Note the description of VDS3.UC3.5: This use case should allow domain experts to define certain quality criteria for resources like the reputation of the publishing institute, the measurement methods, used norms and standards etc. The user should have the possibility to assess the different criteria with a value. Based on the different weighted criteria an uncertainty propagation level will be calculated and visualised in graphical and numerical way. |
| Validation | Validation in the context of WP3/4 and WP5 in particular through the third Validation Scenario from MU. The validation is done by manual testing for the data quality component. Responsible are WP5 members. To validate this requirement it is needed evaluate implemented means of uncertainty processing. |

| | |
|--|---|
| ID | TR.DAQ.010 |
| Name | Ranking Indicators |
| Scope | TaToo should provide a mean to process user (expert) information on a resource for providing a ranking indicator. |
| Optional | |
| Open Issues | |
| Trace | VDS3.UC3.4 VDS3.UC3.5 |
| Architectural Level | V2 |
| Specification Level | V3 |
| Implementation Level | V3 |
| Relevance/ Importance / Priority | L |
| Comment | |
| Validation | Validation in the context of WP4 and WP5. The validation is done by manual testing for the data quality component. Responsible are WP4 developers and WP5 members. To validate this requirement it is needed to evaluate usage and correctness of ranking indicators. |

12. User components

TaToo is providing tools user components (portal, tools, clients) to allow a set of functionalities. E.g. it allows the tagging functionality thus enabling the enrichment process, which in turn enables the semantically enhanced search and discovery process.

In the context of TaToo, the term tool is intended as a front-end component, generally with a graphical user interface, which allows the user (residing in the Presentation tier) to interact with the system taking advantage of the provided functionality. A TaToo tool acts as a (Web) client of a Server side TaToo (Web) services.

It is possible to consider a TaToo tool as a portal providing a set of functionality through a set of configurable portlets, or the single portlet itself. A TaToo tool can also be a browser plug-in (for instance, implementing a tool bar) or a client side application.

12.1. Web-Portal

TaToo framework shall be accessible and exploitable through a Web portal. This makes possible taking advantage of the provided functionality theoretically without any other need apart from a Web browser and an Internet connection.

Portlet technology allow us to develop applications by aggregation of pluggable user interface software components that are managed and displayed in a web portal and executed into a portlet container.

Terms and Definitions (*if applicable to explain terms used below e.g. in the description section*)

Portal: A web portal is a web based application that provides personalization, single sign-on, and content aggregation from different sources, and hosts the presentation layer of information systems.

A portlet container runs and contains portlets, provides them the appropriate runtime environment, manages their life cycles, provides them persistent storage mechanisms for the portlet preferences and receives requests from the portal to execute requests on them.

Requirements (*all, respectively the whole list of requirements*)

| | |
|----------------------------------|---|
| ID | TR.PORTAL.000 |
| Name | Web Portal |
| Scope | <p>TaToo shall provide a web portal and web-based client applications for all public TaToo services.</p> <p>This makes possible to take advantage of the provided functionality theoretically without any other need apart from a Web browser and an Internet connection.</p> |
| Optional | |
| Open Issues | |
| Trace | AR; UI01 |
| Architectural Level | V1 |
| Specification Level | V1 |
| Implementation Level | V1 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by manual testing for the web portal. Responsible are WP4 developers. To validate this requirement it is needed to do manual tests to validate web portal functionality. |

| | |
|----------------------------------|---|
| ID | TR.PORTAL.010 |
| Name | Web Portal Access Control |
| Scope | Access to the Web portal shall be controlled. User has to be authenticated and authorized before being able to take advantage of the functionality. |
| Optional | |
| Open Issues | |
| Trace | |
| Architectural Level | V1 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |

| | |
|------------|---|
| Comment | Different AuthN and AuthZ approaches can be considered / adopted |
| Validation | Validation in the context of WP4. The validation is done by manual and automated testing for the web portal. Responsible are WP4 developers. To validate this requirement it is needed to do manual and automated tests for verifying access control of TaToo web portal. |

| | |
|----------------------------------|---|
| ID | TR.PORTAL.020 |
| Name | Web Portal User Role |
| Scope | User access to portal functionality shall be granted depending on the user role. |
| Optional | |
| Open Issues | |
| Trace | |
| Architectural Level | V1 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | M |
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by manual and automated testing for the web portal. Responsible are WP4 developers. To validate this requirement it is needed to do manual and automated tests for verifying access control of TaToo web portal. |

| | |
|----------------------|---|
| ID | TR.PORTAL.030 NEW |
| Name | Community Building |
| Scope | Since personal contacts and conferences are mentioned very often as source for the discovery of new resources, TaToo should establish a platform for community building and exchange of experts' knowledge. |
| Optional | |
| Open Issues | |
| Trace | RD04 |
| Architectural Level | V2 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ | M |

| | |
|-----------------------|--|
| Importance / Priority | |
| Comment | |
| Validation | Validation in the context of WP5. The validation is done by manual testing for the web portal. Responsible are WP5 members and end users. To validate this requirement it is needed to enable users to assess the community building facilities of the portal. |

| | |
|----------------------------------|---|
| ID | TR.PORTAL.040 NEW |
| Name | Personalisation |
| Scope | The portal should be easily manageable by the end user, in order to create its personal environment. This involves authN and authZ aspects. |
| Optional | |
| Open Issues | |
| Trace | |
| Architectural Level | V2 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | M |
| Comment | |
| Validation | Validation in the context of WP5. The validation is done by manual testing for the web portal. Responsible are WP5 members and end users. To validate this requirement it is needed to enable users to assess the personalisation facilities of the portal. |

12.2. Clients and tools

Context

TaToo (Tagging Tools) is providing clients and tools to provide a set of functionalities. E.g. it provides the tagging functionality, thus enabling the enrichment process, which in turn enables the semantically enhanced search and discovery process.

In the context of TaToo, the term tool is intended as a front-end component, generally with a graphical user interface, which allows the user (residing in the Presentation tier) to interact with the system taking advantage of the provided functionality. A TaToo tool acts as a (Web) client of a Server side TaToo (Web) services.

It is possible to consider a TaToo tool as a portal providing a set of functionality through a set of configurable portlets, or the single portlet itself. A TaToo tool can also be a browser plug-in (for instance, implementing a tool bar) or a client side application.

Terms and Definitions (*if applicable to explain terms used below e.g. in the description section*)

Portlet: A portlet is a web component that processes requests and generates dynamic content. The content generated by a portlet is called a fragment, a piece of markup (e.g., HTML, XHTML, or WML (Wireless Markup Language)) adhering to certain rules. Web clients interact with portlets via a request/response paradigm implemented by the portal.

Requirements (*all, respectively the whole list of requirements*)

| | |
|----------------------------------|--|
| ID | TR.TOOL.000 |
| Name | Tagging Client for Web Browser (Plug-In) |
| Scope | TaToo shall develop a Tagging Client in order to provide tagging functionality directly from the Browser. (e.g. Similar to SideWiki) |
| Optional | |
| Open Issues | If it is realised as a plug-in has to be discussed further |
| Trace | S1W2; UI04 |
| Architectural Level | V2 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | M |
| Comment | We must have at least one client for tagging service (high priority). The priority for this kind (as a plug-in) of client is currently unclear. |
| Validation | Validation in the context of WP4 and WP5. The validation is done by manual and automated testing for the tagging client. Responsible are WP4 developers and WP5 members. To validate this requirement it is needed to perform automated and manual tagging client testing by developers (automated) and evaluation scenarios (manual). |

| | |
|----------------------------------|--|
| ID | TR.TOOL.005 NEW |
| Name | Tagging Portlet for Web Portal |
| Scope | TaToo shall develop a Tagging Portlet in order to provide tagging functionality within the Web Portal |
| Optional | |
| Open Issues | |
| Trace | S1W2; UI04 |
| Architectural Level | V1 |
| Specification Level | V1 |
| Implementation Level | V1 early prototype / V2 |
| Relevance/ Importance / Priority | M |
| Comment | There must be at least one portlet for the tagging within the Web Portal. More portlets can be designed in V2 |
| Validation | Validation in the context of WP4 and WP5. The validation is done by manual for the portal. Responsible are WP4 developers and WP5 members (and end users). To validate this requirement it is needed to test the tagging functionality of the portlet. |

| | |
|----------------------------------|--|
| ID | TR.TOOL.010 |
| Name | Resource Evaluation Viewer/Editor |
| Scope | GUI application for viewing the resource evaluation and entering resource evaluations (evaluation is a special type of TaToo?) <ul style="list-style-type: none"> - view information - enter evaluation - view further evaluation (e.g. links relevant TaToo classified resources or ontology relevant to the resource itself). |
| Optional | |
| Open Issues | |
| Trace | VDS2.UC2.6; VDS2.UC2.7 S1W2; S2W2; |
| Architectural Level | V2 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | M |

| | |
|------------|--|
| Comment | Similar to: - Arbitrary Web Sites- TaToo functionality embedded in arbitrary websites. Store or view tags in any web application, e.g. in search engine results pages or pilot websites: ClimateTwins Viewer http://foresight.ait.ac.at/projects/climatetwins/ AGRI4CAST http://agsys.cra-cin.it/tools/ |
| Validation | Validation in the context of WP5 in particular through the second Validation Scenario from JRC. The validation is done by manual testing for the resource evaluation viewer. Responsible is JRC. To validate this requirement it is needed to evaluate the functionality of the user component. |

| | |
|----------------------------------|--|
| ID | TR.TOOL.020 |
| Name | Resource Metadata Builder |
| Scope | TaToo shall provide a GUI application that allows users to manage/edit specialized information models for resource description |
| Optional | |
| Open Issues | <ul style="list-style-type: none"> - This means that we also need a service that allows managing/editing of the information models, not only the service that allows editing of TaToos according to existing information models! - For discussion: which level of flexibility is inherently available due to semantic technology used? Is it already “given” that users can add new fields to resource description model (for TaToos) when needed? |
| Trace | VDS2.UT2.1; |
| Architectural Level | V2 |
| Specification Level | V3 |
| Implementation Level | V3 |
| Relevance/ Importance / Priority | M |
| Comment | Required technical and nontechnical functionality of Validations Scenario 2 |
| Validation | Validation in the context of WP5 in particular through the second Validation Scenario from JRC. The validation is done by manual testing for the resource metadata builder. Responsible is JRC. To validate this requirement it is needed to evaluate the functionality of the user component. |

| | |
|----------------------------------|--|
| ID | TR.TOOL.030 |
| Name | System-Administration |
| Scope | Client (GUI) application for system administration is needed |
| Optional | |
| Open Issues | |
| Trace | |
| Architectural Level | V2 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | M |
| Comment | Similar to: - Arbitrary Web Sites- TaToo functionality embedded in arbitrary websites. Store or view tags in any web application, e.g. in search engine results pages or pilot websites: ClimateTwins Viewer http://foresight.ait.ac.at/projects/climatetwins/ AGRI4CAST http://agsys.cra-cin.it/tools/ |
| Validation | Validation in the context of WP5 in particular through the second Validation Scenario from JRC. The validation is done by manual testing for the client application. Responsible is JRC. To validate this requirement it is needed to test client application functionality. |

| | |
|----------------------------------|--|
| ID | TR.TOOL.040 NEW |
| Name | Search Client for Web Browser (Plug-In) |
| Scope | TaToo shall develop a Search Client in order to provide discovery functionality directly from the Browser. (e.g. Similar to SideWiki) |
| Optional | |
| Open Issues | If it is realised as a plug-in has to be discussed further |
| Trace | S1W2; UI04 |
| Architectural Level | V2 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | M |

| | |
|------------|--|
| Comment | We must have at least one client for discovery service (high priority). The priority for this kind (as a plug-in) of client is currently unclear. |
| Validation | Validation in the context of WP4 and WP5. The validation is done by manual testing for the search client. Responsible are WP4 developers and WP5 members. To validate this requirement it is needed to test the search client for web browser (plug-in). |

| | |
|--|---|
| ID | TR.TOOL.050 NEW |
| Name | Search Portlet for Web Portal |
| Scope | TaToo shall develop a Search Portlet in order to provide discovery functionality within the Web Portal |
| Optional | |
| Open Issues | |
| Trace | S1W2; UI04 |
| Architectural Level | V1 |
| Specification Level | V1 |
| Implementation Level | V1 |
| Relevance/ Importance / Priority | M |
| Comment | There must be at least one portlet for the discovery within the Web Portal. More portlets can be designed in V2 |
| Validation | Validation in the context of WP4. The validation is done by manual testing for the portal. Responsible are WP4 developers. To validate this requirement it is needed to perform discovery functionality tests for web portal. |

| | |
|----------------------|---|
| ID | TR.TOOL.060 NEW |
| Name | Tagging Client for mobiles |
| Scope | TaToo shall investigate over Clients that support mobiles, in order to provide tagging functionality to the end user. |
| Optional | |
| Open Issues | |
| Trace | S1W2; UI04 |
| Architectural Level | V2 |
| Specification Level | V3 |
| Implementation Level | V3 |
| Relevance/ | L |

| | |
|-----------------------|---|
| Importance / Priority | |
| Comment | Addresses review recommendation |
| Validation | Validation in the context of WP4 and WP5. The validation is done by manual testing for the tagging client. Responsible are WP4 developers and WP5 members. To validate this requirement it is needed to test tagging client functionality on mobile phones. |

| | |
|----------------------------------|---|
| ID | TR.TOOL.070 NEW |
| Name | Search Client for mobiles |
| Scope | TaToo shall investigate over Clients that support mobiles, in order to provide discovery functionality to the end user. |
| Optional | |
| Open Issues | |
| Trace | S1W2; UI04 |
| Architectural Level | V2 |
| Specification Level | V3 |
| Implementation Level | V3 |
| Relevance/ Importance / Priority | L |
| Comment | Addresses review recommendation |
| Validation | Validation in the context of WP4. The validation is done by manual testing for the portal. Responsible are WP4 developers. To validate this requirement it is needed to perform discovery functionality tests for web portal. |

13. Visualisation

In order to evaluate resources and then provide appropriate tags / annotations for them, the user should be supported by tools, applications, or other types of user components, able to provide for the discovered resources a ‘representation’ the user is able to understand / process.

Context

The resources that TaToo is considering are usually identified by URIs. Once discovered, the resource URI has to be dereferenced and the obtained resource representation has to be either visualised (e.g. a picture, diagrams, or a document), or somehow elaborated (e.g. a set of raw data).

Some tools for visualizing resources are commonly available and they are pre-installed on the user machine, e.g. applications to display MS Word documents or PDF files. Some others have to be created from scratch as they are supposed to be used with custom or proprietary file formats.

In general, TaToo will take care about specific requirements the Validation Scenarios may have regarding the visualisation of the resources they need to access.

Note: It is nearly impossible to design and implement a web-based application able to visualise any resources and to let, at the same time, the user apply tags and semantic annotations to that resource. For this reason, the major strategy will be to design the visualisation part of the TaToo system as an extensible application that could be enhanced in its functionalities, e.g. by specific plug-ins.

Terms and Definitions (*if applicable to explain terms used below e.g. in the description section*)

-

Requirements (all, respectively the whole list of requirements)

| | |
|----------------------------------|---|
| ID | TR.VISUAL.000 |
| Name | Search & Discovery User Interface |
| Scope | <p>Search and discovery user interface (shall support the discovery strategies listed in “Discovery Strategies” requirement.</p> <p>Examples:</p> <ul style="list-style-type: none"> - entry field for discovery query - pull-down menu for choosing domain (e.g. cancer discovery) - map for choosing geospatial area of interest - slider for choosing time range, uncertainty range - check buttons for similarity and/or relationship search. <p>The search results should contain information about:</p> <ul style="list-style-type: none"> - Name of the found resource - Type of the found resource (e.g. word doc, pdf, web-service, etc) - Uncertainty indicator - Relevance indicator - Action control bar (for related action on a result) |
| Optional | |
| Open Issues | <p>For discussion:</p> <ul style="list-style-type: none"> - The final list of supported discovery strategies - GUI elements used (e.g. control buttons, pull-down menus, maps, etc.) - Type of implementation (e.g. Portal, Toolbar, Embedded in specialized applications) <p>To be further discussed with WP5 partners.</p> |
| Trace | VDS3.UC3.4 (stemming from cancer discovery mock-up Validations Scenario 3); RD01 |
| Architectural Level | <ul style="list-style-type: none"> • V1: concepts and building blocks for discovery tools, -services and -processors |
| Specification Level | <ul style="list-style-type: none"> • V1: Basic navigation and simple keyword based search discovery portlet • V2: Portlets for other discovery strategies |
| Implementation Level | <ul style="list-style-type: none"> • V1: Basic navigation and simple keyword based search discovery portlets, • V2: Portlets for other discovery strategies |
| Relevance/ Importance / Priority | H |

| | |
|------------|--|
| Comment | <p>TaToo should offer a search tool for general as well as more advanced search (e.g. search categories, logical filters) with explicit focus on environmental resources. -> TaToogle!</p> <p>Note: VDS3.UC4 indicates uncertainty, relevance, and similarity of resources.</p> <p>Note: GUI for Portal in WP3 and WP4. All other GUIs to be implemented in WP5 (as needed)</p> |
| Validation | <p>Validation in the context of WP5. The validation is done by manual testing for the discovery portlets and custom pilot applications. Responsible are WP5 members and end users. To validate this requirement it is needed assess whether both the generic (through the portal) as well as the custom (integrated into the pilot's applications) search GUIs fit their needs.</p> <p>Validation in the context of WP5. The validation is done by manual testing for the discovery portlets and custom pilot applications. Responsible are WP5 members and end users. To validate this requirement it is needed to assess the usability and user-friendliness of the search GUIs.</p> |

| | |
|----------------------------------|--|
| ID | TR.VISUAL.010 |
| Name | Action (Resource) Controls in Application GUI |
| Scope | <p>TaToo GUI applications shall provide context-dependent handles for triggering actions depending e.g. on the resource type returned by discovery process. Actions can be triggered (for example via control buttons, control keys), e.g. in order to:</p> <ul style="list-style-type: none"> - Bookmark a resource - Add Resource to Compare List - Related Resource Discovery - Similar Resource Discovery - Annotate a resource |
| Optional | |
| Open Issues | |
| Trace | VDS3.UC3.4 (stemming from cancer discovery mock-up Validations Scenario 3) |
| Architectural Level | |
| Specification Level | GUI for Portal in WP3 and WP4. All other GUIs to be specified in WP5 (as needed) |
| Implementation Level | GUI for Portal in WP3 and WP4. All other GUIs to be implemented in WP5 (as needed) |
| Relevance/ Importance / Priority | M |

| | |
|----------------------------------|--|
| Comment | |
| Validation | Validation in the context of WP5 in particular through the Validation Scenario 3 from MU. The validation is done by manual and automated testing for the visualisation component. Responsible are WP5 members. To validate this requirement it is needed to provide automated tests for controls, function checks (test plan), usability tests, and feedback from Validation Scenarios. |
| ID | TR.VISUAL.020 |
| Name | Resource Description Presentation |
| Scope | <p>TaToo GUI applications shall provide means to present the resources (e.g. the resources found in discovery process) in a resource-type dependent manner. : the type-invariant part of the presentation could for instance contain textual information on:</p> <ul style="list-style-type: none"> - General Description - Domain Description - Uncertainty Information - Validation Information - link to application(s) capable of presenting/processing/manipulating this type of resources <p>The resource type dependent part of the presentation could be e.g.</p> <ul style="list-style-type: none"> - bar- or linegraph diagram for time series; - Statistics or polar diagrams for uncertainty visualisation; Map presentation for resources with geo-spatial context |
| Optional | |
| Open Issues | To be discussed: <ul style="list-style-type: none"> - type-invariant part of the presentation - Visualisation options in the portal |
| Trace | VDS3.UC3.4; VDS3.UC3.5; VDS3.UC3.6; |
| Architectural Level | V1 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP4 and WP5. The validation is done by manual and automated testing for the GUI of WP4 portal and GUI of WP5 applications. Responsible are WP4 developers and WP5 members. To validate this requirement it is needed to provide automated tests, check correctness (test plan), and get feedback from Validation Scenarios. |

| | |
|----------------------------------|---|
| ID | TR.VISUAL.030 |
| Name | Tagging User Interface |
| Scope | This user interface shall provide frames with entry fields for annotation on discovered resources. |
| Optional | TR.TAGGING.050 |
| Open Issues | <p>How to present the annotation to the end user within the TaToo Portal:</p> <ul style="list-style-type: none"> • Resource information visualisation • Annotation form <p>Other issues similar to TR.VISUAL.010 issues.</p> |
| Trace | AR |
| Architectural Level | V1 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |
| Comment | Requirement covered by TR.TAGGING.050 |
| Validation | Validation in the context of WP4 and WP5. The validation is done by manual testing for tagging tools and custom pilot applications. Responsible are WP4 developers, WP5 members, and end users. To validate this users shall test the tagging client applications, create, update, delete tags, compare the results, etc. |

| | |
|----------------------------------|--|
| ID | TR.VISUAL.040 |
| Name | Tag Visualisation |
| Scope | Tags shall be visualised on the portal |
| Optional | |
| Open Issues | |
| Trace | VDS2.UC1.3; VDS2.UC1.4 |
| Architectural Level | V2 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |

| | |
|------------|--|
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by manual testing for the visualisation component. Responsible are WP4 developers. To validate this requirement it is needed to perform correctness tests for different kinds of tag visualisation. |

| | |
|----------------------------------|--|
| ID | TR.VISUAL.050 |
| Name | Data Quality, Ranking and Uncertainty Representation |
| Scope | The discovery tool shall offer the possibility to display data quality information by using an appropriate symbology. |
| Optional | |
| Open Issues | |
| Trace | AR; VDS3; RA02 |
| Architectural Level | <ul style="list-style-type: none"> • V1: general discovery concepts and components, initial evaluation and validation use case • V2: revised evaluation and validation use case |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by manual testing for the visualisation component. Responsible are WP4 developers. To validate this requirement it is needed to test the correctness of displayed data. |

| | |
|--|---|
| ID | TR.VISUAL.060 NEW |
| Name | Web Interface |
| Scope | Web interface to TaToo providing a User Access Point to the system. The User should be able to access TaToos without the need of installing a GUI client application. |
| Optional | |
| Open Issues | |
| Trace | AR; VDS3; RA02 |
| Architectural Level | |
| Specification Level | Web Interface for Portal in WP3 and WP4. All other Web Interfaces to be specified in WP5 (as needed) |
| Implementation Level | Web Interface for Portal in WP3 and WP4. All other Web Interfaces to be implemented in WP5 (as needed) |
| Relevance/ Importance / Priority | M |
| Comment | |
| Validation | Validation in the context of WP4 and WP5. The validation is done by automated testing for the visualisation component. Responsible are WP4 developers. To validate this requirement it is needed to provide automated tests for controls, function checks (test plan), usability tests, and feedback from Validation Scenarios. |

| | |
|--|---|
| ID | TR.VISUAL.070 NEW |
| Name | Visualisation & Filtering |
| Scope | <p>The Visualisation and Filtering Tagging Processor is one of the components, which are defined as Tagging Processors and are responsible for processing different kinds of tags. It belongs to the TaToo Core Component Building Block, as defined in the TaToo Framework Architecture Overview.</p> <p>The main objectives of this component are:</p> <ul style="list-style-type: none"> - Visualisation of tags to the user. - Filtering operations requested by the user. - Support for input of meta-information in XML format |
| Optional | |
| Open Issues | |
| Trace | VDS2.UC1.3; VDS2.UC1.4 |
| Architectural Level | V2 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by manual and automated testing the visualisation component. Responsible are WP4 developers. To validate this requirement it is needed to perform manual tests for visualisation and automated tests for filtering functionality. |

13.1. Data representation

Context

Data obtained from search results must be presented in a proper and attractive way for the TaToo users,. The representation of such data in the TaToo Portal has to provide a context sensitive view on the information to be investigated. This involves issues such as:

- Representation of semantic environment (available ontology)
- Representation of tags
- Representation of meta-information (e.g. expert comments)

- Representation of time series of tags
- Representation of quality or/and uncertainty information

Terms and Definitions (*if applicable to explain terms used below e.g. in the description section*)

Requirements (*all, respectively the whole list of requirements*)

Note: To be discussed further on and more precise requirements will be include in the next version of this document.

| | |
|--|--|
| ID | TR.REPR.000 |
| Name | Evaluation of annotations |
| Scope | It should be possible to evaluate Tags related to a resource at a specific point in time or over a period of time |
| Optional | |
| Open Issues | To be discussed: Use of Time Series Processing for Tags e.g. for input to visualisation of time series of annotations. |
| Trace | |
| Architectural Level | Client side |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | M |
| Comment | |
| Validation | Validation in the context of WP5. The validation is done by manual testing for the data representation. Responsible are WP5 members. To validate this requirement it is needed to perform checks to guarantee that evaluation has been performed correctly and the right tag has the right evaluation. |

| | |
|----------------------------------|---|
| ID | TR.REPR.010 |
| Name | Results analysis support |
| Scope | TaToo should assist the user to identify from the discovered set of resources the more relevant ones. (E.g. refined search, faceted search). |
| Optional | |
| Open Issues | |
| Trace | S3.1W3 |
| Architectural Level | Client side |
| Specification Level | V3 |
| Implementation Level | V3 |
| Relevance/ Importance / Priority | M |
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by manual testing for the data representation. Responsible are WP4. To validate this requirement it is needed to provide usability tests and automated tests to check the relevance. |

14. System administration

Context

TaToo should provide functionalities for administrating the system, together with a simple client side component (GUI) or a specific portlet accessible only to authorized users. Administration functionalities includes: system general maintenance, monitoring, configuration, management of users or user groups, etc.

Terms and Definitions (*if applicable to explain terms used below e.g. in the description section*)

Requirements (*all, respectively the whole list of requirements*)

| | |
|----------------------------------|--|
| ID | TR.SYSADMIN.000 |
| Name | Remote System Administration |
| Scope | A specific TaToo installation (a deployed system) shall be remotely administrated. This include: <ul style="list-style-type: none"> - start, stop, restart services e.g. tagging service, discovery service and the portal server - monitor system resource information (e.g. server load, disc space etc.) |
| Optional | |
| Open Issues | |
| Trace | AR |
| Architectural Level | V1 |
| Specification Level | V1 |
| Implementation Level | V1 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by manual testing for the system administration. Responsible are WP4 developers. To validate this requirement it is needed to test and validate the accessibility and availability of the system, as well as start, stop, restart of services. |

| | |
|----------------------------------|--|
| ID | TR.SYSADMIN.010 |
| Name | Safe System Administration |
| Scope | Administration activities shall not interfere with the on-going provisioning of functionalities to users taking advantage of the system (apart from request to start, stop, or restart the system) |
| Optional | |
| Open Issues | |
| Trace | AR |
| Architectural Level | V1 |
| Specification Level | V1 |
| Implementation Level | V1 |
| Relevance/ Importance / Priority | H |
| Comment | |
| Validation | Validation in the context of WP4. The validation is done by manual testing for the system administration. Responsible are WP4 developers. To validate requirement it is needed to provide security and safety tests and tests to guarantee non-interference. |

14.1. User management

Context

User Management, Authentication, and Authorisation are functionalities necessary to control access to the TaToo framework. In general, different users play different roles and are allowed to use the framework functionality in a way depending on the rights granted to their specific role.

On top of User Management, Authentication and Authorisation effective security mechanisms can be established to protect vulnerable resources or sensitive data. (See also chapter access control and security).

Terms and Definitions (*if applicable to explain terms used below e.g. in the description section*)

User Types: Different kind of users related to their expertise (i.e. domain experts, system administrator, researchers, etc.)

Requirements (*all, respectively the whole list of requirements*)

| | |
|----------------------------------|--|
| ID | TR.USERMGT.000 |
| Name | Management of different user types |
| Scope | <p>The TaToo system should be able to deal with and manage different types of user:</p> <p>For example:</p> <ul style="list-style-type: none"> - scientific or domain experts, System administrator - researchers - others e.g. public or decision makers <p>Note: According to the user type it shall be possible to add or remove criteria (see figure 10 in VDS3), add or remove tags, comments or descriptions.</p> |
| Optional | |
| Open Issues | |
| Trace | VDS3.UC3.4; VDS3.UC3.5; VDS3.UC3.6; |
| Architectural Level | V2: Security and User Management Concepts |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | M |
| Comment | See also section Security (TR.SECURITY.010) |
| Validation | Validation in the context of WP4. The validation is done by manual testing for the user management component. Responsible are WP4 developers. To validate this requirement it is needed to validate the functionality to create and manage different user types and the implementation of the contracts. |

| | |
|--|--|
| ID | TR.USERMGT.010 |
| Name | Management of permissions |
| Scope | The TaToo system should be able to deal with different permissions for different users or user groups. |
| Optional | |
| Open Issues | |
| Trace | AR |
| Architectural Level | V2 |
| Specification Level | V2 |
| Implementation Level | V2 |
| Relevance/ Importance / Priority | M |
| Comment | See also section Security (TR.SECURITY.010) |
| Validation | Validation in the context of WP4. The validation is done by manual testing for the user management component. Responsible are WP4 developers. To validate this requirement it is needed to test the correct implementation of permissions. |

15. Conclusion

The second version of the requirements document provides a set of new identified requirements and updated requirements from the previous version as a result of the first and the second iterations of requirements elicitation. In the third and last version new requirements may be added and current requirements updated in a controlled way, according to the spiral development model adopted in the project. Considering that no Version 3 of Needs and Gaps Analysis and Technology Survey deliverables is foreseen, updates of requirements (or new additions) will be the result of analysing feedback from the Validation Scenarios.

All requirements were discussed in several meetings within dedicated working groups. This deliverable is the basic document relevant for the developments during the architectural, specification and implementation cycles of the TaToo project, especially for Workpackage 3 and Workpackage 4.

The existing set of requirements is already a challenging set as it contains several requirements to be addressed. The second iteration of requirements elicitation has demonstrated how the first iteration was able to identify the major set. The revised document as it stands now is a consolidated view on the requirements of each functional building block as presented in Chapter 1.3. We would like to point out that the given statements in implementation levels section in the requirements tables (e.g. architectural level, specification level and implementation levels) are indications of when we plan to fulfil each requirement. As above, such plans can be revised and adapted in order to drive the process of specification and implementation.

In comparison to the first version of this document there are a couple of changes in this version. First of all information about the validation of each requirement has been introduced. The three Validation Scenarios are able to assist validation of most of the requirements. Many requirements have been updated and a lot of new requirements have been introduced. The sources for new requirements in version 2 of this Requirements Document were the three Validation Scenarios, the second round of the Needs and Gaps Analysis task, as well as the second round of the Technology Survey task, but also the evolution of the project and various inputs and improvements from the TaToo partners.

16. Acknowledgements

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17. References

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