dicode

Mastering Data-Intensive Collaboration and Decision Making

FP7 - Information and Communication Technologies

Grant Agreement no: 257184
Collaborative Project
Project start: 1 September 2010, Duration: 36 months

D4.1.2 – The Dicode Collaboration Support Services (enhanced version)

Due date of deliverable: 31 August 2012
Actual submission date: 31 August 2012
Responsible Partner: CTI
Contributing Partners: CTI, NEO

**Nature:** ☒Report ☒Prototype ☐ Demonstrator ☐Other

Dissemination Level:
☒ PU : Public
☐ PP : Restricted to other programme participants (including the Commission Services)
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☐ CO : Confidential, only for members of the consortium (including the Commission Services)

Keyword List: Data-intensive collaboration support services, rich interactive search and analysis mechanism, abstract service description, interfaces, operations, development
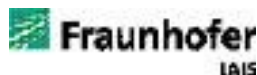
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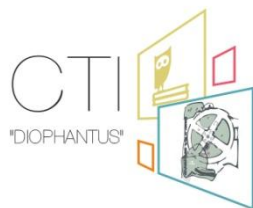
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Document history			
Version	Date	Status	Modifications made by
1	02-08-2012	First draft version	Manolis Tzagarakis (CTI)
2	07-08-2012	Second draft version	Manolis Tzagarakis (CTI) Doris Maassen (NEO)
3	14-08-2012	Third draft version (sent to the internal reviewers)	Manolis Tzagarakis (CTI) Spyros Christodoulou (CTI) Nikos Karacapilidis (CTI)
4	17-08-2012	Internal review	Max Jakob (NEO) Jörg Kindermann (FHG)
5	24-08-2012	Reviewer comments incorporated (version sent to the Dicode SC)	Manolis Tzagarakis (CTI)
6	31-08-2012	Final version (approved by SC, sent to Project Officer)	Manolis Tzagarakis (CTI)

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Summary

This deliverable is to be considered as a progress report on the enhanced version of the Dicode collaboration services, which are designed and implemented in the context of WP4. Collaboration services developed in Dicode concern the exploitation of the reasoning abilities of humans to capitalize on the outcomes of the data mining services developed in the project. In this deliverable, the technical specifications of the collaboration services being developed in the context of Tasks 4.1 and 4.4 are presented. The intended audience of this document are designers and developers of the Dicode project. The document informs them on which collaboration services are currently available (in their enhanced version), how their enhanced version differs from the initial one, and how they can be used. Future steps towards the full development of the envisioned services are also discussed. Following the conventions adopted in deliverable D4.1.1, the enhanced version of the collaboration services is presented using a formalized and project-wide adopted service description template.

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1 Introduction

1.1 Context

This deliverable presents the enhanced version of collaboration support services that have been designed and developed in the context of WP4 ("Data-Intensive Collaboration & Decision Support Services") of the Dicode project. Specifically, it reports on the progress of work being carried out in Tasks 4.1 and 4.4, by describing the current (enhanced) version of the associated services. .

This is the second in a series of three (3) deliverables reporting on the progress of work related to the implementation of collaboration support services in the context of WP4. The first deliverable D4.1.1 reported on the initial version of collaboration support services. This deliverable (D4.1.2) reports on their enhanced version. The final version of the collaboration support services will be reported in deliverable D4.1.3 (due in month 33).

1.2 Objectives

The purpose of this document is to present the enhanced version of the developed collaboration support services, as they originated from the functional specifications outlined in deliverable D2.2 ("The Dicode Approach – User requirements, conceptual integrative architecture, agile methodology and functional specifications"), and the updated Dicode approach described in deliverable D2.3 ("The Dicode Approach Revisited").

The services are presented from a technical perspective, broken down to the level of individual operations, in order to make clear their role and use, and facilitate their assessment with respect to the derived functional specifications. The operations presented are those which are available to clients to be invoked and executed without going into detail about how exactly these can be invoked or executed. In particular, the presented operations can be executed by various technologies such as REST (Fielding, 2000) or Web Services (Web Services Architecture, 2004), but such issues are not the focus of their description. The description of services takes an operation-oriented approach listing the available operations and detailing their aim and purpose.

Following the template adopted in deliverable D4.1.1, the enhanced version of the collaboration support services are presented using a service description template, called the Abstract Service Description (see also deliverable D3.1.1: "The Dicode Data Mining Framework"). The Abstract Service Description template provides a technical specification of services by providing an overview of the supported interfaces and the relevant operations. For each operation, a description along with major input and output information is presented.

2 Dicode Collaboration Support Services

The aim of the collaboration support services is to exploit the reasoning abilities of humans to facilitate sense-making of the results of the Dicode data mining services, which are the focus of WP3, thus capitalizing on their outcomes. Towards this, a number of relevant

services are being developed that can fully address the user requirements of Dicode use cases, as outlined in deliverables D2.2 and D2.3.

This document reports on the enhanced version of the services that have been developed in the context of the following tasks:
- Task 4.1: Rich interactive search and analysis mechanism, which is concerned with providing full-text and meta-data search of collaborative spaces and interaction of users with the analytical processes, and
- Task 4.4: Collaboration Support Services, which is concerned with the creation, management and use of innovative workspaces that augment synchronous and asynchronous collaboration.

In the following, we present the service description of the enhanced version of the services being developed in the abovementioned tasks of WP4. For each service, a short description related to its aim and purpose is given, followed by the abstract service description template of its initial version.

2.1   Overview of changes in the enhanced version of collaboration services

The following table provides an overview of the changes made in the enhanced version of the collaboration services, which will be presented in detail in the rest of this deliverable. The value "Updated" in the "Status" column means that the data type, interface or operation has been updated (compared to the initial version reported in D4.1.1), while the value "New" means that the data type, interface or operation has been newly introduced in the enhanced version of the collaboration support services.

Dicode Service	Interface	Status
Collaboration Search		
	Data types	Updated
	Schema of knowledge items	Updated
	Search Interface	Updated
	fullTextSearch	Updated
	rangeSearch	New
	facetedSearch	Updated
Collaboration Service		
	Workspace Interface	Updated
	showWorkspaceAnalytics	New
	Neighbourhood Interface	New
	getNeighbourhood	New
	getAllNeighbourhoods	New
	hideNeighbourhood	New
	showNeighbourhood	New
	likeItem	New
	dislikeItem	New
	showLikes	New
	showDislikes	New
	updateItem	New
	createItem	New
	KnowledgeTypes Interface	New

	createGroup	New
	createKnowledgeType	New
	addKTypeToGroup	New
	setForumTransformationRule	New
	setFormalTransformationRule	New
	assignGroupToWorkspace	New
	assignGroupToWorkbench	New

2.2   Rich Interactive Search and Analysis Mechanism

Services related to rich interactive search and analysis mechanisms are the focus of Task 4.1. A workspace in Dicode contains collaboratively generated content of various types: on the one hand, there are dedicated item types such as notes, ideas and comments. On the other hand, there is a wide array of uploaded file types such as word documents, PDF, RTF and images. Both are described using standardized meta-data. Additionally, the user can add his/her own metadata types. Workspaces serve as a "structure" for collaborative content creation. The Search Service uses workspace metadata like topic, workspace creator and creation date for result selection and ranking.

Task 4.1 is also associated with the provision of services related to supporting analysis and enabling the navigation through the various data processing layers. The description of these services will be presented in future deliverables.

2.2.1   Collaboration Search Service

A prototypical implementation of the "Collaboration Search Service" is currently being integrated into the Collaboration Service, thus making the service available to users from within individual collaboration workspaces. This service allows for indexing and searching of standard documents and helps users explore the opportunities of full-text and meta-data search. The current implementation of the "Collaboration Search Service" uses the following specification for indexing and searching of collaboration knowledge items:

Name	Description	Search Specification
type	Numerical type	Field search
creator	User ID of creator	Field search, Full text search
creationdate	Date of creation	Field search
modifiedby	Author of last modification	Field search
modificationdate	Date of last modification	Field search

contenttype	Type of content (HTML, PDF, RTF)	Field search
workspace	Workspace ID	Field search
taglist	List of tags	Field search, Full text search
content	Element text, text content of PDF or RTF	Full text search
title	Title of the element	Full text search
rating	Rating on an ascending scale from 1 to 5 indicating how important the item is	Field search
type	Type of the element such as: Note, Idea, Comment	Field search
Dynamic meta-data[1]	Arbitrary key-value pairs which can be defined by the users	Field search

The schema defines which fields are indexed and how they can be searched. In a full-text search, the results are usually ranked by relevance. This relevance is computed as the *distance* between query and document, where both are represented as a term vector. Additionally, results can be sorted or grouped by date or by natural order. Faceted search groups all search hits by a certain feature, e.g. by user, rating or type. Fields can also be used for result filtering in full-text search. Filtering search results based on particular collaboration workspaces is also possible by introducing a field "workspace id", which will return content only from workspaces to which the user has access.

The abstract service description of the enhanced version of the "Collaboration Search Service" is presented in the table below. We annotate each change with "New" or "Updated" to indicate the type of change that occurred in the enhanced version (compared to the initial one).

Name	Collaboration Search
Standards	• REST (Fielding, 2000) • XML (W3C – Extensible Markup Language, 2006)

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[1] The search technology which will be used, namely Apache Solr, supports dynamic fields, so arbitrary key-value pairs can be added to the meta-data.

Description	The Dicode Collaboration Search Service The Collaboration Search Service provides its functionality through the following interfaces: • Indexer: The Indexer indexes full-text and meta-data of documents[2]. • Searcher: The Searcher allows for full-text and field search in the index[3].
Interface	*Indexer*
insertDocument	See deliverable D4.1.1
updateDocument	See deliverable D4.1.1
deleteDocument	See deliverable D4.1.1
Interface	*Search (**Updated**)*

fullTextSearch
*(**Updated**)*
	Search for all documents matching a full text query. Depending on the server configuration, a set of additional request parameters can be used to determine the return format, to specify the preferred ranking algorithm, etc.
	
	The following examples show some of the most important queries used by the collaboration application. The parameters determine the fields returned, the result format and the ranking algorithm to be applied:
	
	• Search for the string "Columbus" in field "content":
	   o http://dic-dev02.neofonie.de:8983/solr/select/?q=content%3Acolumbus[4]
	• Search for the string "Columbus" in default field "content" (same as above):
	   o http://dic-dev02.neofonie.de:8983/solr/select/?q=columbus
	• Content search with JSON response
	   o content:columbus
	   o wt=json
	   o http://dic-dev02.neofonie.de:8983/solr/select/?q=content%3Acolumbus&indent=on&wt=json
	• Content search with highlighting in snippets
	   o content:columbus
	   o highlight columbus in content field
	• http://dic-

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[2] The service is provided by a Solr server instance. Indexing is performed via the URL http://${server}:${port}/solr/update

[3] Searching is performed by passing the query string to the following URL http://${server}:${port}/solr/select/?query=myQuery

[4] For current deployment address see Dicode-Wiki.

	dev02.neofonie.de:8983/solr/select/?q=content%3Acolumbus&indent=on&fl=content&hl=true&hl.fl=contentSorted tag search
	    o tag:egg
	    o sort rating desc
	    o http://dic-dev02.neofonie.de:8983/solr/select/?q=tag%3Aegg&sort=rating%20desc

rangeSearch (**New)**	In a range query, the user specifies an upper and lower bound of the values of a field. Range queries can be performed on textual or numeric data. The collaboration search services use range queries for creation dates and item ratings.
	
	• Date range: creationdate:[2011-09-23T15:38:20Z TO 2011-09-23T15:43:42Z]
	    o http://dic-dev02.neofonie.de:8983/solr/select/?q=creationdate%3A[2011-09-23T15%3A38%3A20Z+TO+2011-09-23T15%3A43%3A42Z]
	• Rating range: rating:[4 TO 45]
	    o http://dic-dev02.neofonie.de:8983/solr/select/?q=rating%3A[4+TO+45]

facetedSearch (**Updated**)	Provides a dynamic clustering of search results according to a set of categories like in the following example where the results are grouped by tag:
	
	http://dic-dev02:8983/solr/select/?q=*:*&facet=true&facet.field=tag
	
	`<lst name="facet_fields">`
	  `<lst name="tag">`
	    `<int name="egg">3</int>`
	    `<int name="colombus">1</int>`
	    `<int name="puzzle">1</int>`
	  `</lst>`
	  `</lst>`

Example usage	The Collaboration Search Service is accessed by Dicode's Collaboration Service. The application triggers indexing of a set of selected elements like full text and meta-data. This process is considered as the "export" of a document. As a rule of thumb, full text indexing of entire documents should be performed only if a significant change of the document occurred.
Comments	The Collaboration Search Service was implemented based on the Open Source Framework Apache Solr (Apache Solr, 2012) which

uses the quasi standard of Open Source Search, Apache Lucene (Apache Lucene, 2012). Solr offers a REST interface for indexing and searching. Alternatively, the indexer and the searcher can be accessed via the Java API or one of the libraries for other programming languages like http://code.google.com/p/solrnet/ for asp.net/.NET.

Currently, a first implementation of the service is deployed on NEO's development cluster. Before indexing, the original export format of "Knowledge items" has to be transformed into a Solr compatible representation. For convenience, NEO provides a Python Script which transforms "Knowledge items" into Solrs indexing format. The transformation task will finally be handled by the Collaboration Service.

There are a couple of things to note:

- The date format expected by Solr is different from the one in the examples. Therefore, the data in *creationdate* and *modificationdate* has to be converted as well (See also http://lucidworks.lucidimagination.com/display/lweug/Solr+Date+Format)

- All data contained in "taglist" is in "tag" fields.

- All dynamic attibute-value pairs are prefixed with "d_", e.g. "d_usecase".

At the moment, everything in the context field is treated as plain text or HTML. For different types of content, namely PDF, DOC and image files, an appropriate indexing solution is in development. Solr already provides some functionality on extracting the text and meta data for such documents.

Conformance classes	Not available
Implementation rules (*New*)	A typical indexing and retrieving process is performed as follows (examples specified using the cURL command line tool): 1a) Index a document using an XML string: • curl http://dic-dev02.neofonie.de:8983/solr/update --data-binary '<add><doc><field name="id">12345</field><field name="name">new document</field></doc></add>' -H 'Content-type:application/xml' 1b) Or index a document using an XML file: • curl http://dic-dev02.neofonie.de:8983/solr/update --

	data-binary @new-document.xml -H 'Content-type:application/xml' 2) After all new documents were sent using 1a or 1b, a "commit" has to be issued in order for the changes to be written to the search index: • curl http://dic-dev02.neofonie.de:8983/solr/update --data-binary '<commit/>' -H 'Content-type:application/xml' 3) Check if the documents are in the index, e.g: • http://dic-dev02.neofonie.de:8983/solr/select/?q=id%3A12345
Implementation status	Prototypical version implemented.
UML model	Not available

2.3   Collaboration Support Services

Dicode's Collaboration Support Services are the focus of Task 4.4; these services aim at developing innovative virtual workspaces which support collaboration towards sense-making in data intensive settings.

From a technical perspective, collaboration related functionalities are available to clients[5] through the "Collaboration Service". The enhanced version of this service, which is presented in this document, augments the initial collaboration workspaces with additional collaboration views. These views aim to further facilitate the understanding of the collaboration space. Specifically, the initial version of the "Collaboration Service" supported two views, namely the "forum view" and the "mind-map view". The technical aspects of these views were presented in deliverable D4.1.1 and their model in deliverable D2.2. In the enhanced version of the "Collaboration Service", two additional views of workspaces have been developed. These new views are:

- **Workspace analytics view,** which aims to quantify activities taking place within workspaces and display them to users in order to offer insights and facilitate their understanding, especially when collaboration workspaces grow large. In particular, the workspace analytics provide statistics related to the users and their activities in the context of a workspace and present them in a graphical way.
- **Neighbourhood view,** which allows the display of individual collaboration items and their immediate neighbours, i.e. items that are directly connected in the "mind map view". This view enables users to focus on a particular part of a collaboration session and perform additional operations.

Appendices A and B present in more detail the workspace analytics and neighbourhood views, respectively. These appendices also provide screenshots of the developed prototype to clearly explain their use and role.

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[5] By the term "client" we refer to any program (including Web browsers) able to request functionalities by executing specific operations.

Each view provides a different set of operations, which originate from the purpose of the view. The "Collaboration Service" provides its functionalities via a set of interfaces, each of which defines a set of operations that the service implements. These interfaces and related operations are presented in the next section.

2.3.1   Collaboration Service

The "Collaboration Service" offers the implemented operations via interfaces, each of which focuses on a particular aspect of collaboration-related activities. Following the categorization of service interfaces into *Core Collaboration Interfaces*, *Integration Interfaces* and *Interoperability Interfaces* (as presented in deliverable D4.1.1), the enhanced version of the "Collaboration Service" extended the Core Collaboration Interface to implement the views described above and thus augment the functionalities of the Dicode workspaces.

In the table below, we present these changes in the enhanced version of the Collaboration Service. We annotate each change with "New" or "Updated" to indicate the type of change that occurred in the enhanced version (compared to the initial one). For completeness, we have also included the interfaces and operations reported in the initial version of the service, without their description which can be found in deliverable D4.1.1.

Name	Collaboration Service
Standards	• REST (Fielding, 2000)
Description	The Collaboration Service provides all necessary operations that permit users to create, manage and configure virtual workspaces in which the collaboration takes place and to conduct collaborative activities within workspaces. In addition, this service provides operations to facilitate integration with tools developed in the context of Dicode and interoperability with third party tools (i.e. tools not developed in the context of the project). The initial version of the Collaboration Service, presented in deliverable D4.1.1, featured a number of interfaces to provide the necessary functionality. These interfaces included the *Workspace Interface*, for managing workspaces, the *Forum Interface* to allow collaboration in a manner that Web forums allow, the *MindMap Interface* to allow operating a workspace in the mind-map view, the *UserManagement Interface* which allows managing users, the *Authentication Interface* to permit authentication and connection operation to collaboration services and the *External Interface* for allowing interoperation of workspaces with third party tools. The enhanced version of the Collaboration Service, presented in this deliverable, updated some of the existing interfaces and introduced new ones to address requirements of the Dicode use cases. The changes in the enhanced version are summarized as follows:

- The existing Workspace Interface has been updated to support the "workspace analytics view" of workspaces.

- A new interface has been created, namely the *Neighbourhood Interface,* which allows users to focus on the neighbourhood of individual collaboration items.

- A new interface has been created, the *KnowledgeType Interface,* which allows users to create, manage and configure knowledge types and use them in the mind-map view of workspaces.

Below, we present all interfaces and their available operations, and describe in detail only those parts that have been introduced in the enhanced version of the Collaboration Service.

Interface	*Workspace (**Updated**)*
createWorkspace	See deliverable D4.1.1
openWorkspace	See deliverable D4.1.1
updateWorkspace	See deliverable D4.1.1
copyWorkspace	See deliverable D4.1.1
transformWorkspace	See deliverable D4.1.1
createKnowledgeType	This operation has been moved into a different interface, responsible for managing knowledge types.
*showWorkspaceAnalytics (**New**)*	Displays the "workspace analytics view" of a particular workspace. The operation takes as input the ID of the workspace for which the statistical data will be shown. Upon successful completion, a new view of the collaboration space appears, where statistical information related to a number of variables is displayed in a graphical way. For a particular workspace, the "workspace analytics view" displays the following: • The top 10 users with the most collaboration items uploaded into the workspace (displaying the percentage of their posts wrt the total posts in the workspace) • The number of items uploaded into the workspace over time • The top 20 collaboration items with the most "likes" received • The top 20 collaboration items with the most "dislikes" received • The 20 "hottest" collaboration items. Related to items appearing on a workspace, the term "hottest" refers to the number of relationships (arrows in the "mind-map view") in which an item is involved. • The top 20 collaboration items with the highest score. For each collaboration item a score is computed which is a weighted sum

	of a number of variables that include the number of likes and dislikes, the item's rating etc.
Interface	*Forum*
postItem	See deliverable D4.1.1
Interface	*Neighbourhood (**New**)*
*getNeighbourhood (**New**)*	Returns an individual item of the workspace along with only those items that are –in the "mind-map view"- directly connected to it (independently of the type of the relationship). The set of items connected to a specific item by relationships (arrows) in the mind-map view is called the "neighbourhood" of the item. The operation takes as input the ID of an item, for which the context needs to be displayed. Upon successful completion, the context of the designated item is displayed.
*getAllNeighbourhoods (**New**)*	Returns the neighbourhood of all items which are on a workspace. The operation takes as input the ID of workspace. Upon successful completion, the list of items in the workspace and their respective neighbourhoods are returned.
*hideNeighbourhood (**New**)*	Hides a neighbourhood of an item from the display. The operation takes as input the ID of the collaboration item, whose neighbourhood should be hidden. Upon successful completion, the neighbourhood of the item is hidden on the page.
*showNeighbourhood (**New**)*	Displays the neighbourhood of an item that has been previously removed from the display using the *hideNeighbourhood* operation. It takes as input the ID of an item, whose neighbourhood is to be displayed. Upon successful completion, the neighbourhood of the item is visible on the page.
*likeItem (**New**)*	Allows users to indicate that they *like* an item in the workspace. The operation stores the user and the item that he liked. The operation takes as parameter the ID of a workspace item that a user likes. The ID of the user, issuing the "like" request, which is also required to successfully complete this operation, is determined by the operation itself internally by accessing the session object that maintains the connection information. Upon successful completion, the operation increases by one the count of the variable which indicates how many users liked that item. The operation disallows the same user to "like" the same item more than once.
*dislikeItem (**New**)*	Allows users to indicate that they *dislike* an item in the workspace. The operation stores the user and the item that he disliked. The operation takes as parameter the ID of a workspace item that a user dislikes. The ID of the user, issuing the "dislike" request, which is also required to successfully complete this operation, is determined by the operation itself internally by accessing the session object that maintains the connection information. Upon successful completion, the operation increases by one the count of the variable which indicates how many users dislike that item. The operation disallows the same user to "dislike" the same item more than once.
*showLikes (**New**)*	Displays all users who like an item. The operation takes as

	parameter the ID of an item. Upon successful completion, the login names of all users that liked the particular item are displayed.
*showDislikes (**New**)*	Displays all users who dislike an item. The operation takes as parameter the ID of an item. Upon successful completion, the login names of all users that disliked the particular item are displayed.
*updateItem (**New**)*	Updates the title and content of a collaboration item in the neighbourhood view. In the neighbourhood view, only an item's title and content can be updated. The operation takes as input the ID of the collaboration item, whose content is to be updated. Upon successful completion, the item's title and content are updated.
*createItem (**New**)*	Creates a new item and adds it in the neighbourhood view. The newly uploaded item appears connected to the root item of the neighbourhood view with a "neutral" relationship. The operation takes as input the title of the item along with its content. Upon successful completion, a new item is created, which is connected to the root item with a "neutral" relationship and appears in the neighbourhood view.
Interface	*KnowledgeTypes (**New**)*
*createGroup (**New**)*	Allows the creation of a new group, which can hold knowledge types. In the context of the collaboration service's model, knowledge types are organized into groups, and these groups are then associated with workspaces to be used. The operation takes as input a name for the group. Upon successful completion, a group that can hold knowledge types is created. Newly created groups are by default empty (i.e. they do not contain knowledge types) and other operations are used to assign knowledge types to groups.
*createKnowledgeType (**New**)*	Creates a new knowledge type. The operation takes as input the name of the knowledge type and an icon file, with which its instances will appear in the "mind-map view". Upon successful completion, a new knowledge type is created.
*addKnowledgeTypeToGroup (**New**)*	Adds an existing knowledge type into a group. The operation takes as input the ID of the group and ID of the knowledge type that has been previously created. Upon successful completion, the knowledge type will appear as member of the group. Each knowledge type can be member of several groups.
*setForumTransformationRule (**New**)*	Allows configuring the knowledge type in the "mind-map view" of an item, which has been added when the workspace is operated in the "forum view". When posting a message in the "forum view", the knowledge type of that new message is not determined when the same workspace is transformed into the "mind-map view". The operation allows setting a default knowledge type of items in the "mind-map view", when these items are uploaded during the "forum view" of the workspace. The operation takes as input the ID of the group along with the ID of the knowledge type to which new forum posts should be casted in the "mind-map view". Upon successful completion, the setting is associated with the specified group.
setFormalTransformationRule	Allows configuring what argumentation types the knowledge

(New)	types in a group will be transformed into, when a workspace – containing instances of these knowledge types – is transformed into the "formal view". The operation takes as input the ID of the group as well as associative array in the form of <ID of source knowledge type in the group>:<ID of destination argumentation type> indicating the desired mappings when a transformation from "mind-map view" to the "formal view" is selected. Upon successful completion, the new transformation rules are associated with the group.
assignGroupToWorkspace (New)	Assigns a group containing knowledge types to a particular workspace. The operation takes as input the ID of the group and the ID of the workspace. Upon successful completion, the set of knowledge types in the specified group is available for use in the "mind-map view" of the specified workspace. This means that users can create instances of the knowledge types in the group and use these to advance their collaboration in the "mind-map view" of the workspace.
assignGroupToWorkbench (New)	Assigns a group containing knowledge types to a particular Dicode workbench. The operation takes as input the ID of the group as well as the ID of the workbench that corresponds to the Dicode workbench. To achieve the integration with the Dicode workbench, the Collaboration Service offers a concept similar to the "workbench" in order to allow associating collaboration workspaces with specific Dicode workbenches. Upon successful completion, the set of knowledge types is available for use in workspaces created in the context of the specified workbench. This means that whenever a new workspace is created in the context of the specified workbench, the set of knowledge types in the group are automatically added to the new workspaces, when they are operated in the "mind-map view".

Interface	*Mind-map*
createItem	See deliverable D4.1.1
uploadItem	See deliverable D4.1.1
createRelationship	See deliverable D4.1.1
updateItem	See deliverable D4.1.1
updateRelationship	See deliverable D4.1.1
deleteItem	See deliverable D4.1.1
deleteRelationship	See deliverable D4.1.1
moveItem	See deliverable D4.1.1

createGroup	See deliverable D4.1.1
updateGroup	See deliverable D4.1.1
deleteGroup	See deliverable D4.1.1
Interface	*UserManagement*
registerUser	See deliverable D4.1.1
updateProfile	See deliverable D4.1.1
Interface	*Authentication*
loginUser	See deliverable D4.1.1
logoutUser	See deliverable D4.1.1
Interface	*External*
exportWorkspace	See deliverable D4.1.1
importWorkspace	See deliverable D4.1.1
exportToCompendium	See deliverable D4.1.1
importFromCompendium	See deliverable D4.1.1
importFromForum	See deliverable D4.1.1
Example usage (***Updated***)	A web application will provide the necessary user interface through which the previously mentioned operations can be executed by end users. In general, all Dicode use cases that require support for collaboration will be able to use the above operations. In particular, users of the Dicode use cases can use the operations provided by the workspace interface to create and configure new workspaces where the collaboration will take place. Depending on their needs, they may deploy the workspace either in the "forum view" or the "mind-map view", where they are able to upload and process the available collaboration items via the respective interfaces. Whenever the collaboration reaches a critical level with respect to the number of uploaded items and becomes difficult to comprehend, they may focus on particular items via the "neighbourhood view". Whenever they need to identify patterns, get insights on the workspace's users and items, or require an overview of the workspace, they may also deploy the "workspace analytics view".

Comments	The enhanced version of the service reported provides a proof-of-concept implementation of all the presented operations, which nevertheless might still have bugs and malfunctions. Such issues will be addressed in future versions of the service, along with a more thorough evaluation of their usefulness.
Conformance classes	Not available
Implementation rules	Not available
Implementation status	Prototypical version implemented. The source code of the enhanced version of the collaboration service, implementing the above operations, can be found at the following Subversion repository https://anivas.cti.gr/websvn/listing.php?repname=ftel&path=/dicode/trunk/src/dll/
UML model	Not available

3   Development Process

The enhanced versions of the previously described services have been developed using the guidelines outlined in deliverable D5.1.1: "Standards and guidelines for development". In particular, the Java Guidelines coding convention has been used to format the authored code. In addition, design patterns have been deployed to solve common software design problems.

To manage code changes, the involved project partners have installed on their site the Subversion code repository, which hosts the code of successive versions of the services they develop.

4   Future Work

This deliverable presents the enhanced version of collaboration support services that have been designed and developed in the context of Tasks 4.1 and 4.4, continuing the implementation of the functional specifications outlined in deliverable D2.2 and revisited in deliverable D2.3. Future work will concentrate on improving and enriching the above services in order to fully address the needs of the Dicode project, taking into account the similarities and differences of the three Dicode use cases. Specifically, with respect to the implementation of the Collaboration Service, future work will focus on a number of issues that include:

- Identifying and correcting bugs and malfunctions of the enhanced version of the implemented services.
- Assessing the enhanced version of the developed services against the functional specifications. The purpose of this action is to see how the enhanced version of the services must be changed in order to properly support the Dicode use cases. This

includes identifying which operations must change their functionality, as well as which operations must be added in order to fully address the needs of the use cases. Much feedback is also expected from the project's second evaluation round.

- Appropriate tuning of the implemented services to better serve interoperability and integration issues (work towards this issue also concerns the related tasks of WP5).

5   References

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APPENDIX A: The workspace analytics view of collaboration workspaces

The "workspace analytics view" of a workspace is accessible through an icon on the "mind-map view" menu. Its main purpose is to quantify activities within workspaces and display them to users in order to facilitate their understanding and offer insights on a workspace's users and items. This view is especially useful when collaboration workspaces grow large.

Figure 1: Workspace analytics view of a workspace showing statistics of several activities in the workspace.

The "workspace analytics view" (Figure 1) features statistics related to the users and their activities. It analyses log data that are gathered during collaboration sessions and presents them in 6 charts which indicate aspects such as the evolution of the workspace in time as well as metrics used in the decision making process. In particular, the charts shown in this view include:

i) The number of collaboration items each user has contributed on the workspace as percentage of the total items posted (users with top 10 contributions appear) (Figure 2)
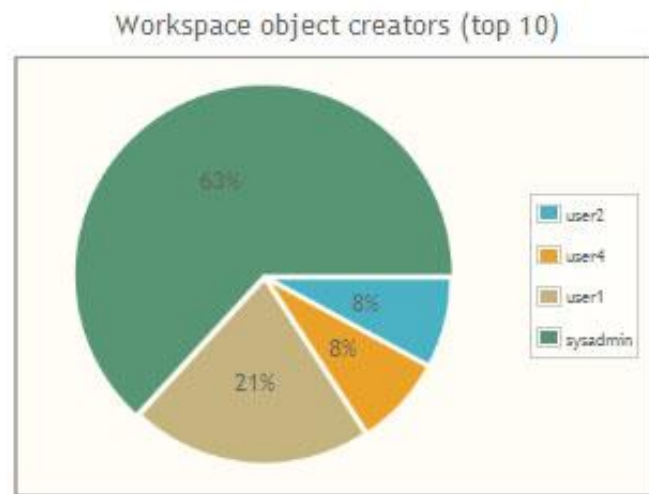
Figure 2: Pie chart of number of collaboration items contributed per user on the workspace as percentage of the total items posted

ii) The evolution of the total number of the workspace collaboration items over time (starting from the date the first object was created until the "present" day) (Figure 3)
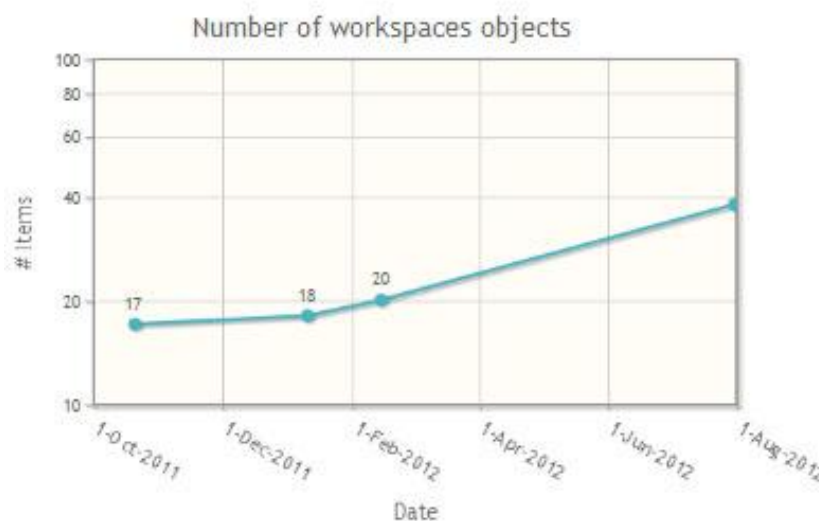
Figure 3: Evolution of the number of collaboration items over time

iii) A bar chart with the number of "Likes" received per collaboration item (collaboration items that received the top 20 numbers of "likes" are shown in this chart) (Figure 4)
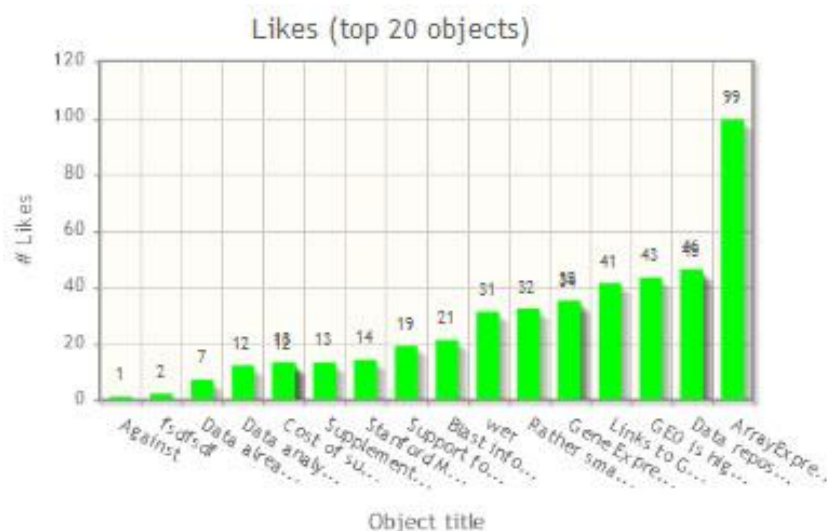
Figure 4: Number of "likes" received per collaboration item (16 items received "likes")

iv) A bar chart with the number of "dislikes" received per collaboration item (collaboration items that received the top 20 numbers of "dislikes" are shown in this chart) (Figure 5)
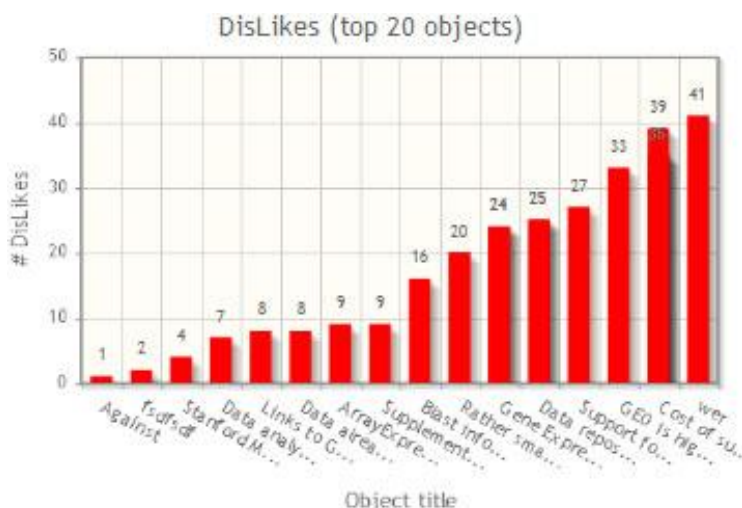
Figure 5: Number of "dislikes" per collaboration item (16 items received "dislikes")

v) A bar chart with the "hottest" collaboration objects (Figure 6). The term "hottest" refers to the number of relationships in which the collaboration item is involved in the "mind-map view". Collaboration items with the top 20 numbers of relationships appear (in the chart, different colours on each bar correspond to different types of relationships – green for relationships of type "in-favour", red for "against", grey for "neutral"). The "hotness" of an object aims to indicate which item has received the greatest focus of the discussion: the "hotter" an object is, the more focus it has received.
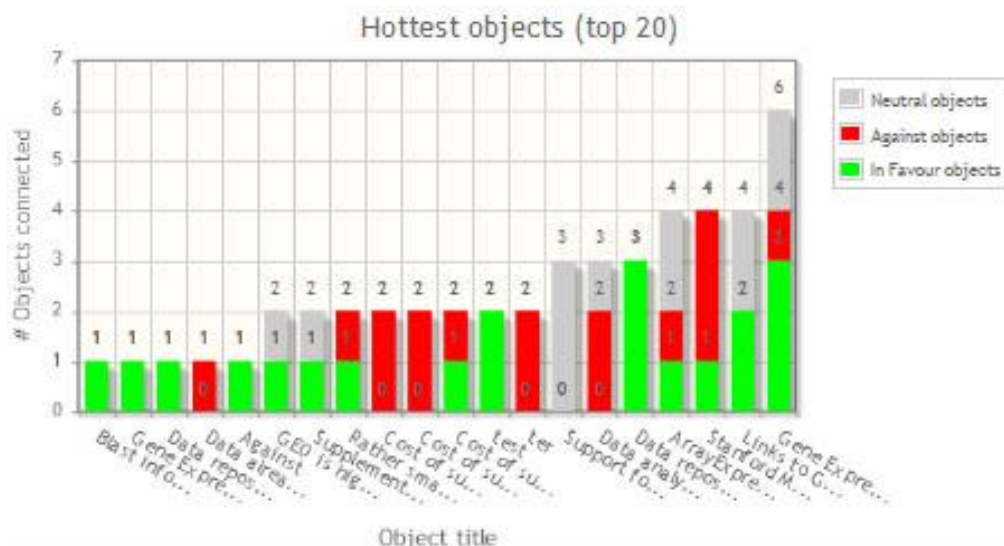
Figure 6: "Hottest" collaboration items on workspace

vi) A bar chart with the score that each collaboration item receives. The score of each collaboration item is calculated as a weighted sum of four sub-scores that include: i) the difference between the number of "likes" and "dislikes" received, ii) the item's creator score, iii) the number of relationships the item is involved, and iv) the item's rating. The default weights used to balance these sub-scores are: 0.2 for the item's "like" and "dislike" sub-score, 0.2 for the item's creator sub-score, 0.35 for the item's number of relationships and 0.25 for the item's rating. The larger score a collaboration item has, the more important is perceived for the discussion.
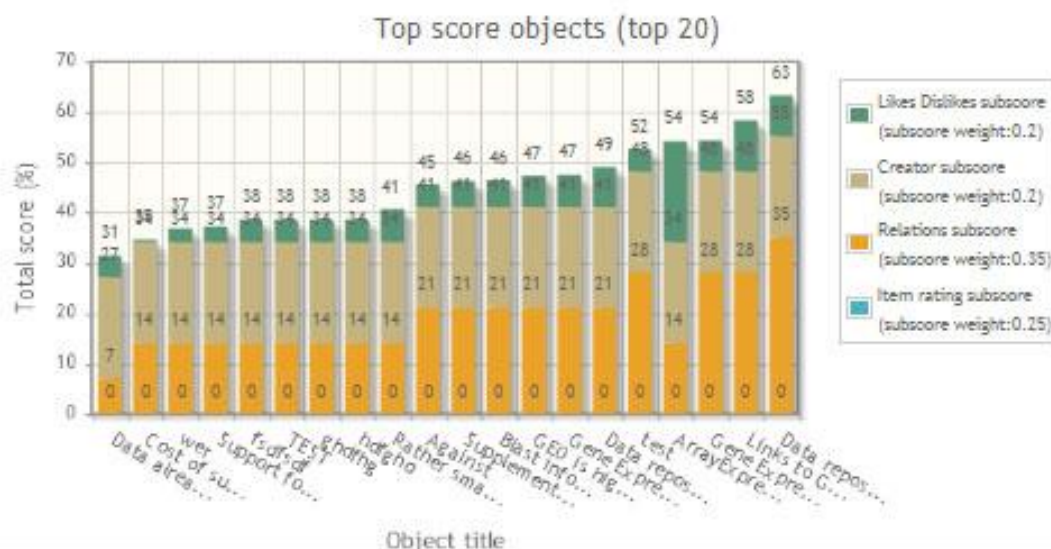
Figure 7: Score of collaboration items objects on workspace

APPENDIX B: Neighbourhood view of collaboration items

The "neighbourhood view" of collaboration items displays the specified items, along with all the items' neighbours. The "neighbourhood" of a specific collaboration item is defined as the set of items with which this item is directly connected via a relation in the "mind-map view". The aim of this view is to allow users to focus on directly connected items and not be distracted by others.

Figure 8 shows the "neighbourhood view" of a specific collaboration item with title "Gene Expression Omnibus (GEO)". The selected item is depicted on the top of the view while the item's neighbourhood is depicted beneath it with a coloured background depending on the type of relation they bear with the item (green for "in favour", red for "against", grey for "neutral"). The view also supports a number of operations. In particular, users may "like" or "dislike" all displayed items or update and even create a new one. The total number of "likes" and "dislikes" received is depicted for each collaboration item (textually and graphically through a coloured bar), while all users who "liked" or "disliked" the item are also viewable. The user may also move to another item's neighbourhood (by moving it up to the top level of the hierarchy) or choose to load all workspace items and their respective neighbourhoods.

Figure 8: Neighbourhood view of a selected collaboration item with title "Gene Expression Omnibus (GEO)", which appears on top.