

D1.6.2 Portal ontology

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Abstract.

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Executive Summary

This deliverable presents the results of the conceptualisation phase of the ontologies used by the Knowledge Web Portal (http://knowledgeweb.semanticweb.org).

The document is structured as follows:

- Section 1 briefly describes the main objectives of the workpackage 1.6.
- Section 2 presents both the main current functionalities of the Knowledge Web (KW) portal and the different kinds of portal users.
- Section 3 describes the Knowledge Web portal ontologies (Documentation, Event, Organization, Person, and Project). These ontologies reuse and extend the OntoWeb¹ and Esperonto² ontologies. This section also presents the methodological approach followed to build KW portal ontologies.
- Section 4 includes the mappings between the concepts used by the KW portal ontologies and the concepts used by the OntoWeb and Esperonto portal ontologies. The mappings between the FOAF and the KW Person ontologies are also presented.

¹ http://www.ontoweb.org/

² http://esperonto.net/

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1. Goals of WP1.6

The main goal of WP1.6 is to develop the software infrastructure underpinning the integration of the activities of the Knowledge Web partners. We call it the Knowledge Web (KW) Semantic Portal.

The main goals of the KW Semantic Portal are the following:

- To disseminate and promote the Knowledge Web Network of Excellence (NoE)
 - Outreach to Industry activities
 - To support Research (Virtual Research Center portal)
 - To support Education (Virtual Institute for Semantic Web Education (VISWE) portal)
- To monitor the Knowledge Web NoE

Firstly, the Knowledge Web Semantic Portal will be used as a portal for information access and as a dissemination point for ontology researchers, engineers, and application and content developers in both academic and industrial institutions. Secondly, it will be used for technology promotion, giving support to the outreach to industry activities. Thirdly, it will be also used as the platform support for the VISWE, whose portal will be integrated into the main Knowledge Web Portal.

That is, the semantic portal infrastructure will have two integrated instantiations: on the one hand, the industry and dissemination portal, and on the other hand, the Virtual Research Centre portal. And the semantic portal infrastructure will also integrate the VISWE portal.

One of the tasks to be carried out is the identification of the main requirements for the three uses of the Knowledge Web Portal, which are: technology promotion, dissemination of research results, and education. Another task is the development of the ontologies needed for dissemination, promotion and education, once the main requirements of the portal have been identified. After that, ontologies should be populated.

2. KW Semantic Portal Specification

The terms knowledge portal, semantic portal and community web portal can be found in the literature ([4], [5]) and they indistinctly refer to knowledge-based web sites that allow the corporate access to information and applications. A good definition of what these terms stand for can be found in [4], where they are defined as web applications that "provide the means to select, classify and access, in a semantically meaningful and ubiquitous way, various information resources (e.g., sites, documents, data) for diverse target audiences (corporate, inter-enterprise, e-marketplace, etc.)". From now on, we will use the term "semantic portal" to refer to this kind of applications. Ontologies are commonly used inside the semantic portal for structuring knowledge, since they represent shared knowledge within a community.

Figure 1 shows the different types of KW Portal users and their main functionalities.

- 1. The administrator users. These users are in charge of the KW Semantic Portal management and are responsible for managing the different users persmissions, the users themselves, and the instances, as well as the ontologies and their updates, including inclusion, removal and modification of concepts, properties, relations and axioms. We have distinguished between:
 - a. A portal administrator, in charge of which is Ángel López-Cima (alopez@fi.upm.es).
 - b. An ontology engineer, in charge of which is M. Carmen Suárez-Figueroa (mcsuarez@fi.upm.es).
- 2. The community users. These are the partners participating in KW NoE (the KW partners), and they are identified in the Technnical Annex. Their main responsibility is to populate the KW ontologies, that is, to introduce contents in the KW Semantic Portal. They can also navigate and search for information in the portal without any kind of restriction. All KW partners have the same permissions either for inserting content on the knowledge portal or for browsing the collected assets.
- 3. The external users:
 - a. The guest users. They can navigate through hyper-linked information and search for information. Ontologies are used to provide a navigational structure to browse the KW Semantic Portal.
 - b. The software agents. The KW Semantic Portal includes facilities for exporting the ontologies to OWL and RDF(S), and for generating the content in RDF. Because of this fact, the software agents will be able to use KW content for other purposes.

To sum up, the process of content provision in the KW Portal will be carried out collaboratively by KW partners. The Ontology Engineer is in charged of developing the ontologies to be used by the KW partners (as a primary piece of knowledge for describing knowledge assets) and by all of users (as indexes to browse the knowledge portal).

KW Users		
Administrator users		
Portal Administra	ator <u>Ontology Er</u>	ngineer
 Permission manag Instance managem User management 	ement • Ontology m lent • Ontology m	odification anagement
Community users: In	ntranet	
WP Leaders	Organizations	<u>Managers</u>
Instance Edition/Insertion	Instance Edition/insertion	Instance Edition/insertion
Documents Tacks	Persons Events	 Documents Events
• Events	- LYCING	- LVEIRS
External users: Extr	<u>anet</u>	
<u>Guests</u>	Software Ager	<u>its</u>
Instance visual	ization Ontologies impl	ementation (RDFS, OWL)
 Instance naviga 	RDF Instance in	приетистион

Figure 1. Type of Knowledge Web users

We have distinguished the following functionalities in the first prototype of the KW Portal:

- Knowledge Presentation. This is done by means of user-defined visualizations of ontology classes, relations and instances with different browsing permissions for portal users. The knowledge stored in the portal can be accessed with menus generated automatically from ontologies which are synchronized, and can be viewed differently according to the various types of information stored in them.
- □ *Knowledge Editing*. The KW Portal allows inserting, updating and removing class instances, their attributes and relation instances, in multiple inter-linked ontologies and with different edition permissions for the portal users.
- □ *Knowledge Search and Querying* based either on keywords or on the structured information provided by the ontologies inside the system.
- □ *Administration Services*, which allow managing the knowledge portal users, the editing and visualization permissions, and some other portal needs.

To use the semantic portal as a tool for monitoring the Knowledge Web project, the first draft of the ontologies includes information about the project (milestones, workpackages, etc.), the organizations participanting, the people involved in the project, the documents related to the project (deliverables, minutes, etc.), and the events associated with such project.

The Knowledge Web Semantic Portal (http://knowledgeweb.semanticweb.org) has been built reusing the ODESeW technology [2].

3. The KW Ontologies

In this section we present how we have built the KW ontologies, and we focus on the following issues:

- The methodological approach followed to build the ontologies and the identification of the technology used for their development.
- Brief explanation of the OntoWeb and Esperonto portal ontologies, which are being reused for building the KW portal ontologies.
- Detailed description of the KW portal ontology, which is composed of the following ones: Documentation, Event, Organization, Person and Project ontologies.

3.1. The Ontology Building Process

When dealing with ontologies, ontologists should not be anarchic in the use of modeling components in the ontology conceptualization. For building the KW portal ontologies we have reused efficiently the OntoWeb and the Esperonto portal ontologies. Once we have identified which parts of the ontologies can be reused, we have extended them following the steps proposed by the conceptualization phase of METHONTOLOGY [3], which are displayed in figure 2.

Figure 2 emphasizes the ontology components (concepts, attributes, relations, constants, formal axioms, rules, and instances) attached to each task, and illustrates the order proposed to create such components during the conceptualization activity. This modeling process is not sequential as in a waterfall life cycle model, though some order must be followed to ensure the consistency and completeness of the knowledge represented. If new vocabulary is introduced, the ontologist can return to any previous task.



Figure 2. Tasks of the conceptualization activity according to METHONTOLOGY

Our experience of building ontologies has revealed that ontologists should carry out the following tasks:

- Task 1: To build the glossary of terms that identifies the set of terms to be included in the ontology, their natural language definition, and their synonyms and acronyms.
- Task 2: To build concept taxonomies to classify concepts. The output of this task could be one or more taxonomies where concepts are classified.
- Task 3: To build ad-hoc binary relation diagrams to identify ad-hoc relationships between concepts of the ontology and with concepts of other ontologies. The ad-hoc relationships are similar to the objects properties³ in OWL vocabulary.
- Task 4: To build the concept dictionary, which mainly includes the concept instances⁴ for each concept, their instance and class attributes, and their ad-hoc relations.

Once the concept dictionary is built, the ontologist should define in detail each of the ad-hoc binary relations, instance attributes and class attributes identified in the concept dictionary, as well as the main constants of that domain.

³ http://www.w3.org/TR/owl-ref/#Properties

⁴ Although instances can be created when the ontology is used (after its construction) the ontologist can decide whether to model relevant instances or not. This field is optional.

- Task 5: To describe in detail each ad-hoc binary relation that appears on the ad-hoc binary relation diagram and in the concept dictionary. The result of this task is the ad-hoc binary relation table.
- Task 6: To describe in detail each instance attribute that appears in the concept dictionary. The result of this task is the table where instance attributes are described. The instance attributes are those attributes whose value(s) may be different for each instance of the concept. These attributes can be a kind of datatype property⁵ in OWL vocabulary.
- Task 7: To describe in detail each class attribute that appears on the concept dictionary. The result of this task is the table where class attributes are described. Unlike instance attributes, which describe concept instances and take their values in instances, class attributes describe concepts and take their values in the class where they are defined. These attributes can be a kind of datatype property⁶ in OWL vocabulary.
- Task 8: To describe in detail each constant and to produce a constant table. Constants specify information related to the domain of knowledge, and they always take the same value, and are normally used in formulas.

Once concepts, taxonomies, attributes and relations have been defined, the ontologist should describe formal axioms (task 9) and rules (task 10) that are used for checking constraints and for inferring values for attributes. And only optionally should the ontologists introduce information about instances (task 11).

3.2. Reusing OntoWeb and Esperonto Portal Ontologies

As we said before, the ontologies developed for the Knowledge Web Portal have been developed following existing ontologies in the same or similar domain. These existing ontologies have been reused and extended to be used in the Knowledge Web NoE.

To develop the KW portal ontologies, the OntoWeb portal ontology (http://www.aifb.unikarlsruhe.de/ontology) and the Esperonto portal ontologies (http://esperonto.net) have been reviewed in order to reuse them efficiently. In addition, the KW Technical Annex has been used to complement the knowledge included in the reused ontologies. The participant comments have also been added to improve the ontologies.

First, we have analyzed the ontology used in the **OntoWeb** project (http://www.ontoweb.org/). Such ontology models information about events, news, organizations, persons, products, projects, publications, etc. The OntoWeb ontology (also know as SWRC-Semantic Web Research Community Ontology⁷) includes:

- 54 concepts
- 84 attributes

⁵ http://www.w3.org/TR/owl-ref/#Properties

⁶ http://www.w3.org/TR/owl-ref/#Properties

⁷ http://ontobroker.semanticweb.org/ontos/swrc.html

• 109 ad-hoc relations

Second, we have reviewed the ontologies used in the **Esperonto** project (http://esperonto.net). The Esperonto portal ontology is composed of the following modular ontologies: *project*, *documentation*, *person*, *organization*, and *meeting*. They describe respectively projects and their structure, documents that are generated in a project, people and organizations participating in it, and meetings (administrative, technical, etc.) held during a project lifecycle.

Figure 3 presents the aforementioned five modular ontologies (each ontology is represented by a triangle) and the ad-hoc relationships between different concepts belongs to these ontologies (a project has associated meetings, a document belongs to a project, a document summarizes a meeting, people participate in a meeting and have a role in a project, etc.). The aim of this figure is to show all the relations in the Esperonto ontology without expliciting the domain and the range of such relations (which are shown in the ad-hoc relationships diagram of each modular ontology).

The Esperonto ontologies, which can be reused to describe R&D projects, include:

- 71 concepts
- 144 attributes
- 39 ad-hoc relations



Figure 3. Relations between the Esperonto portal ontologies

3.3. Building the KW Ontologies

The Knowledge Web Portal (http://knowledgeweb.semanticweb.org) is able to manage multiple ontologies. Currently, five domain-specific ontologies (*Documentation*, *Event*,

Organization, Person and *Project*) have been developed to be included in the KW Portal. These ontologies are intended to support the Knowledge Web NoE management and the results dissemination. Such ontologies describe the project and its structure, the documents generated in the project, the people and the organizations participating in it, and the events related to the project. The five ontologies have been developed with METHONTOLOGY [3] and the WebODE ontology editor (http://webode.dia.fi.upm.es/), and such ontologies have been evaluated using ODEval [1]. They are available in RDFS and OWL at http://knowledgeweb.semanticweb.org.

Figure 4 shows the relationships between the five ontologies aforementioned (each ontology is represented by a triangle). The aim of this figure is to show all the ad-hoc relations between the KW ontologies without expliciting the domain and the range of such relations (which are shown in the ad-hoc relationships diagram of each modular ontology).



Figure 4. Main ad-hoc relationships between the ontologies for the Knowledge Web NoE

In this section, we provide the conceptualization of the ontologies, which is based on the set of intermediate representations proposed in METHONTOLOGY [3]. The intermediate representations used in this document are: the *concept classification tree* (also known as *concept taxonomy*) and the *concept dictionary*. In order to illustrate the ad-hoc relationships between different concepts (in the same or in different ontology), several figures are also shown. In the future versions, the ontologies will include several axioms and will supply different inferences.

3.1.1. The Documentation Ontology

This ontology models knowledge of documentation used in the Knowledge Web NoE.

The main concept of this ontology is 'Documentation', which is organized according to the type of document (additional documentation, management documentation, publication, technical documentation, and thesis) within a taxonomy. This taxonomy is shown in figure 5. As it can be seen in the figure, the technical documentation related to a project are manuals, slides and deliverables. For example, publications can be books or articles (an article in a workshop, an article in a book, etc.).



Figure 5. The taxonomy of the Documentation ontology

In table 1 we provide the concept dictionary of the Documentation ontology, including all the domain concepts, their concept instances dated June 15, 2004, their instance attributes, and their ad-hoc relations. In this table typical instance attributes for 'Documentation' (title, abstract, on-line version, etc.) can be seen. The ad-hoc relations specified for each concept are those whose domain is the concept. For example, the concept 'Agenda' has one binary relation: 'is associated with'. This table also shows the instances for each concept. For example, the concept 'Templates' has (on June 15, 2004) three instances: 'Deliverable template - LaTeX', 'Deliverable template - Word', and 'Template for new participant applications'.

Concept name	Instances	Instance attributes	Ad-hoc relations
	Knowledge Web Detailed-Programme of Activities		
Additional	Knowledge Web Fact Sheet		
Documentation	Knowledge Web Membership Application		
	Quality Management Procedure		

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Concept name	Instances	Instance attributes	Ad-hoc relations
Agenda	KnowledgeWeb Crete Meeting Agenda		is associated with
	Annex I Annex II		
Annex	Annex III Annex IV Annex V		
	Annex VI		
Article Article		Pages Volume Edition Chapter Book Name	
Article in Conference		Name of Conference Conference Place	
Article in Journal		Volume Number Journal Name	
Article in Workshop		Workshop URL Name of Workshop Editors of Workshop	
AudioConference Minutes			
Book		Number of Pages ISBN Editorial Edition Place Edition	
Contract	KW Contract	KW Contract	
Cost Statement		Period Number	
Deliverable	 D1.1.1v1: Industry board member list, clustering and organizational and operational charter (MoU) D1.1.1v2: Board member list, clustering and organizational and operational charter (MoU) D1.1.2: Prototypical business use cases D1.1.3: Typology of ontology-based processing tasks D1.1.4: System requirements and knowledge processing requirements for prototypical applications and business cases D1.2.1: Evaluation of the utility of ontology development tools for different types of industrial application needs D1.2.2: Report on Semantic Web Framework requirements analysis D1.2.3: Methods for ontology evaluation D1.3.1: Best practices and guidelines for industry D1.3.2: Identification of standards on metadata for ontologies 	Status Nature Keywords Dissemination level Delivery date Deliverable number Contractual date of delivery Attached software Actual date of delivery	is delivered in has authoring partner has lead participant has Q.A. partner has contact person is associated with

Concept name	Instances	Instance attributes	Ad-hoc relations
	D1.3.3: Report on requirements of OOA		
	D1.4.1: Presentation of technology roadmap		
	D1.4.2: Presentation of business cases and success		
	stories in industry		
	D1.4.3: Report on first international technology show		
	D1.5.1: Project presentation and project showcase		
	D1.5.2: Report on joint education and training activities		
	with cooperating networks		
	D1.6.1: Portal requirements analysis and system design		
	D1.6.2: Portal ontology		
	D1.6.3: Portal versions		
	D1.6.4: Portal contents releases		
	D2.1.1: State of the art on the scalability of ontology-		
	based technology		
	D2.1.2: Report on methods for approximate reasoning,		
	using knowledge compilation, language weakening and		
	approximate deduction		
	D2.1.3: Report on modularization of ontologies		
	D2.1.4: Definition of a methodology, general criteria,		
	test suites for benchmarking ontology building tools		
	D2.2.1v1: Specification of a common framework for		
	characterizing alignment		
	D2.2.1v2: Specification of a common framework for		
	characterizing alignment		
	D2.2.2: Specification of a benchmarking methodology		
	for alignment techniques		
	D2.2.3: State of the art on current alignment techniques		
	D2.2.4: Description of alignment implementation and		
	benchmarking results		
	D2.3.1: Specification of a methodology for ontology		
	syntactic and semantic versioning		
	D2.5.2. Specification of knowledge acquisition and		
	D2 4 1: Semantia requirements for web services		
	description		
	D2.4.2: Definition of semantics for web service		
	discovery and composition		
	D2 4 3. State of the art on agent-based services		
	D2.4.4: Guidelines for the integration of agent-based		
	services and web-based services		
	D2.5.1: Specification of coordination of rule and		
	ontology languages		
	D2.5.2: Report on query language design and		
	standarization		
	D2.6.1: Report on budget allocation		
	D2.6.2: Report on research excahnge and collaboration		
	D2.6.3: Report on workshop and conference		
	organization		
	D2.6.4: Report on the research advance		
	D3.1.1: Specification of VISWE tasks and goals (as		

Concept name	Instances	Instance attributes	Ad-hoc relations
	result of a requirements analysis)		
	D3.1.2: Document on organizational structure and legal		
	form of VISWE to which all participating partners have		
	agreed		
	D3.1.3: Memorandum of Understanding signed by		
	participating partners, regarding commitment to		
	organizational structure and legal form of VISWE		
	D3.2.1v1: Learning unit collection available		
	D3.2.1v2: Learning unit collection available		
	D3.2.2: Report on educational events		
	D3.2.3: Report on core curricula in Ontology and		
	Semantic Web		
	D3.2.4: Document describing M.Sc. curriculum on		
	which all participating universities have agreed		
	D3.2.5: Memorandum of Understanding regarding		
	curriculum and mutual course approval signed by		
	participating universities		
	D3.2.6: Summer school on semantic web technologies		
	D3.3.1: Report on the agreed metadata standard for		
	learning units		
	D3.3.2v1: Basic infrastructure available, provides initial		
	learning unit collection from task 3.2.3		
	D3.3.2v2: Basic infrastructure available, provides initial		
	learning unit collection from task 3.2.3		
	D3.3.3: Prototype of advanced learning platform		
	D3.3.4: Report on collaboration with IMS consortium		
	and ProLEARN		
	D4.1.1: EC reporting		
	D4.1.2: Report on Audit regime		
	D4.1.3: Public report		
	D4.2.1: Financial and accounting report		
	D4.3.1: Technical report		
	D4.4.1: Consortium Agreement (including resolution of		
	conflicts)		
	D4.4.2: Setting up legal entities		
	D4.5.1: Report on Gender Action Plan		
	D4.5.2: Report on public engagement activities		
	D4.6.1: Report on self-assessment, risk analysis and		
	market watch		
	E-D2: Co-operation with Knowledge Web/VISWE on		
	graduate education.		
	T-D2: Co-operation with Knowledge Web and other		
	NoE on industrial competence centres and VISWE		
		Title	
		Abstract	is generated by
Documentation		Version Number	has author
		On-line PDF Version	is associated with
		On-line Version	
EC Templates			
Fax			

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Concept name	Instances	Instance attributes	Ad-hoc relations
Final Report			
Mail			
Management Documentation			
Manual			
Master Thesis			
Meeting Minutes			
Minutes			
Periodic Report			
PhD Thesis			
Project Proposal			
Proposal			
Publication		Keywords	
Six Month Report			is associated with
Slides	C-OWL: contextualizing ontologies Crete - O2I Meeting Report Crete - O2I Plenary Report Presentation Crete - WP1.6 - Semantic Portal Crete - WP2.1 - Benchmarking Ontology Technology Crete - WP2.6 - Towards a Virtual Research Centre Kick-off - Industry Area presentation Kick-off - Industry Area presentation Representing and Reasoning with Heterogeneous, Modular and Distributed ontologies 1st technical O2I Workshop Report, 5 March 2004, Paris		is associated with
Technical Documentation			
Templates	Deliverable template - LaTeX Deliverable template - Word Template for new participant applications		
Thesis			
Two Month Report			
Year Report			

Table 1. The concept dictionary of the Documentation ontology

The KW Documentation ontology imports concepts from the event ontology, the organization ontology, the person ontology and the project ontology, and these imported concepts are used to connect the Documentation ontology with different ontologies. Examples of these relations can be the following: 'Agenda is associated with Event', 'Documentation is generated by Organization', 'Deliverable has contact person Person', 'Deliverable is delivered in Milestone', etc. Figure 6 shows all the ad-hoc relations whose domain is one concept that belongs to the Documentation ontology.



Figure 6. The ad-hoc relationships of the Documentation ontology

Finally, table 2 shows the Documentation ontology statistics (number of concepts, attributes, ad-hoc relations and instances).

Concepts	35
Instance Attributes	35
Ad-hoc relations	12
Instances	93

 Table 2. Documentation ontology statistics

3.3.2. The Event Ontology

This ontology models knowledge of events that are related to the Knowledge Web NoE.

The main concept of this ontology is 'Event'. This concept is organized in the taxonomy presented in figure 7. As the figure shows, we distinguish five types of events: the international conference, the international workshop, the management project meeting, the KW area meeting and the KW plenary meeting.



Figure 7. The taxonomy of the Event ontology

Table 3 presents the concept dictionary of the Event ontology, including all the domain concepts, their concept instances dated June 15, 2004, their instance attributes, and their ad-hoc relations. In this table it can be seen the main instance attributes for 'Event', that is 'name', 'about', 'description', 'start date', 'end date', and 'place', and the unique ad-hoc relation for this concept ('has').

Concept name	Instances	Instance attributes	Ad-hoc relations
Education Area Meeting	Second European Summer School on Ontological Engineering and the Semantic Web		
EPMB Meeting		Type Decisions	
Event		Name About Description Start date End date Place	has
Industry Area Meeting	1st Technical O2I Workshop 5 March 2004, Paris		
International Conference	1st European Semantic Web Symposium ESWS2004		
International Workshop	P2PKM workshop SWS2004 SWWC workshop		
KW Area Meeting			has associated
KW Plenary Meeting	Knowledge Web 2nd Meeting - Crete KnowledgeWeb kick-off meeting, 3-4 February 2004, Madrid		has associated
Management Project Meeting			

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Concept name	Instances	Instance attributes	Ad-hoc relations
PMB Meeting		Type Decisions	
Research Area Meeting	Amsterdam Meeting 3-4. March, 2004		
Review			

Table 3. The concept dictionary of the Event ontology

The KW Event ontology imports concepts from the documentation ontology to represent the following binary relations: 'Event has Agenda', 'KW Area Meeting has associated Slides', and 'KW Plenary Meeting has associated Slides'. These ad-hoc relationships are shown in figure 8.



Figure 8. The ad-hoc relationships of the Event ontology

Finally, the Event ontology statistics is provided in table 4.

Concepts	12
Instance Attributes	10
Ad-hoc Relations	3
Instances	9

Table 4. Event ontology statistics

3.3.3. The Organization Ontology

This ontology models knowledge of organizations that work in the Knowledge Web NoE.

The main concept in this ontology is 'Organization', which is split into three subclasses: 'Company' (representing enterprises), 'University' and 'Research Institute'. The most important information about organizations working in KW is related to the organization itself (such as, name, acronym, logo, etc.) and to its location (i.e., country, street address, etc.).

In table 5 the concept dictionary of the Organization ontology is provided, including all the domain concepts, their concept instances dated June 15, 2004, their instance attributes, and their ad-hoc relations. In this table it can be seen the instance attributes for 'Organization', that is 'full name', 'acronym', 'logo', 'web site', 'country', 'city', 'zip code', and 'street address'. The ad-hoc relations specified for each concept are those whose domain is the concept. For example, the concept 'Organization' has 9 binary relations: 'generates', 'has contact person', 'team is formed by', 'participates in', 'leads', 'works in', 'has', 'is involved in', and 'is task leader in'. This table also shows the instances for each concept. For example, the concept 'Company' has one instance (on June 15, 2004): 'France Telecom'.

Concept name	Instances	Instance attributes	Ad-hoc relations
Company	France Telecom		
Organization		Organization full name Organization acronym Organization logo Organization Web Country City Zip code Street address	generates has contact person team is formed by participates in leads works in has is involved in is task leader in
Research Institute	Centre for Research and Technology Hellas Institut National de Recherche en Informatique et en Automatique		
University	École Polythechnique Fédérale de Lausanne Free University of Bozen-Bolzano Freie Universität Berlin Learning Lab Lower Saxony National University of Ireland Galway The Open University Universidad Politécnica de Madrid University of Innsbruck University of Innsbruck University of Karlsruhe University of Karlsruhe University of Machester University of Sheffield University of Trento Vrije Universiteit Amsterdam Vrije Universiteit Brussel		

Table 5. The concept dictionary of the Organization ontology

The KW Organization ontology imports concepts from the documentation, the person, and the project ontologies, to be connected with the other ontologies. Figure 9 shows all the ad-hoc relationships whose domain belongs to the Organization ontology. For example: 'Organization generates Documentation', 'Organization team is formed by Person', 'Organization leads Workpackage', etc.



Figure 9. The ad-hoc relationships of the Organization ontology

Finally, table 6 shows the Organization ontology statistics.

Concepts	4
Instance Attributes	8
Ad-hoc Relations	9
Instances	18

 Table 6. Organization ontology statistics

3.3.4. The Person Ontology

This ontology models knowledge of persons who work in the Knowledge Web NoE. The person ontology is focused on general purpose personal information.

The main concept of this ontology is 'Person'. This concept is organized in the taxonomy, which is shown in figure 10. As it can be seen in the figure, we have divided the concept 'Person' into four different types (university staff, company staff, project officer, and student). For example, a student can be a master student, a phd student or an undergraduate student.

We should mention that in the case of 'University Staff', 'Associate Professor' is almost synonymous with 'Senior Lecture' and 'Assistant Professor' is almost synonymous with 'Lecture'.



Figure 10. The taxonomy of the Person ontology

Table 7 presents the concept dictionary of the Person ontology, including all the domain concepts, their concept instances dated June 15, 2004, their instance attributes, and their ad-hoc relations. In the table it can be observed the main instance attributes for 'Person': 'name', 'photo', 'e-mail', 'homepage', 'date of birth', 'role', 'country', 'city', 'zip code', 'street address', 'telephone', and 'fax'. It can also be seen the 7 ad-hoc relations for this concept (i.e., 'belongs to', 'is contact person of'). This table shows the instances for each concept. For example, the concept 'Associate Professor' has two instances (on June 15, 2004): 'Asunción Gómez-Pérez' and 'Enrico Franconi'.

Concept name	Instances	Instance attributes	Ad-hoc relations
Administrative Staff	Paolo Traverso		
Assistant Professor	Jesús Barrasa Paolo Bouquet Valentina Tamma York Sure		
Associate Professor	Asunción Gómez-Pérez Enrico Franconi		
Company Staff			
Full Professor	Boi Faltings Carole Goble Dieter Fensel Enrico Motta Fausto Giunchiglia Ian Horrocks Karl Aberer Michael G. Strintzis		

Concept name	Instances	Instance attributes	Ad-hoc relations
	Michael Wooldridge Stefano Spaccapietra Stefanos Kollias		
Junior Researcher	Andrei Lopatenko Arthur Stutt Jens Hartmann Marc Ehrig Martin Dzbor Max Völkel Roberta Cuel Sven Van Acker Vasileios Papastathis		
Manager			
Master Student			
Person	Alain Leger Alice Carpentier Christian Ernst Mayer Ellen Schulten Guus Schreiber Heidrun Allert Leonarda Haid-Garcia Wolf Siberski Wolfgang Nejdl Ying Ding	Full Name Photo e-mail Homepage Date of Birth Role Country City Zip code Street Address Telephone Fax	belongs to is contact person of is WP leader in works in is involved in leads is author of
PhD Student	Andreas Harth Andrei Tamilin Angel López-Cima Anna V. Zhdanova Dasiopoulou Stamatia David Manzano-Macho Diego Ponte Giorgos Stoilos Ilya Zaihrayeu Ion Constantinescu José Ángel Ramos Gargantilla Knud Möller Mª del Carmen Suárez-Figueroa Mark Carman Miguel Esteban Gutiérrez Mikalai Yatskevich Mustafa Jarrar Nikolaos Simou Pavel Shvaiko Philippe Cudre-Mauroux Rafael González-Cabero		

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Concept name	Instances	Instance attributes	Ad-hoc relations
	Rubén Lara Hernández Stefano Zanobini Wolf Winkler		
Professor	Robert Meersman Robert Tolksdorf Rudi Studer		
Project Officer	Brian Macklin		
Researcher	Diana Maynard Elena Paslaru Jeff Pan Jerome Euzenat John Breslin Klaus Schild Lyndon JB Nixon Malgorzata Mochol Michal Zaremba Vassilis Tzouvaras		
Senior Researcher	Giorgos Stamou Hamish Cunningham Holger Wache Luciano Serafini Manfred Hauswirth Marco Ronchetti Martin Rajman Matteo Bonifacio Walter Binder Yiannis Kompatsiaris		
Student			
Technical Staff	Alexandre Delteil Benjamin Schwarz François Paulus Luigi Lancieri Marco Nanni Michel Plu Patrick Grohan		
Undergraduate			
University Staff			

 Table 7. The concept dictionary of the Person ontology

The KW Person ontology imports concepts from the documentation ontology, the organization ontology, and the project ontology, to connect the Person ontology with the others. In figure 11 we can see all the ad-hoc relationships whose domain is a concept that belongs to the Person ontology. Examples of these relationships can be: 'Person is author of Documentation', 'Person belongs to Organization', 'Person is involved in Task', etc.



Figure 11. The ad-hoc relationships of the Person ontology

Finally, table 8 shows the Person ontology statistics.

Concepts	18
Instance Attributes	12
Ad-hoc Relations	7
Instances	93

 Table 8. Person ontology statistics

3.3.5. The Project Ontology

This ontology models the Technical Annex of a NoE, including information about: milestones, workpackages, tasks, projects or networks of excellence, etc. This ontology is not organized in a taxonomy; it only includes several concepts and the relationships between them.

In table 9 we can see the concept dictionary of the Project ontology, including all the domain concepts, their concept instances dated June 15, 2004, their instance attributes, and their ad-hoc relations. For example, let us see the concept 'Workpackage'. As we can see, this concept has the following instance attributes: 'title', 'number', 'description of work', 'objectives', 'expected results', 'mailing list', 'person-months', 'start month', and 'end month'. We can also see the ad-hoc relations for this concept (i.e., 'has associated', 'has involved partner'). This concept has 21 instances ('WP1.1: Industrial Application Needs', 'WP1.6: Semantic Portal Structure', etc) which are the WPs already identified in the Technical Annex of KW NoE.

Concept name	Instances	Instance attributes	Ad-hoc relations
Activity		Activity name Activity number Activity deliverables Activity objectives	

Concept name	Instances	Instance attributes	Ad-hoc relations
		Activity tasks Activity timeline Start date	
Milestone		Month Milestone number Milestone description	has associated is associated with
Network of Excellence	Knowledge Web	Network full title Network acronym Proposal/Contract Number Network URL Network summary Network summary Network objectives Network start date Network end date	has associated has associated event is developed by
Task	 T1.1.1 Establishment of an industrial board T1.1.2 System requirements analysis T1.1.3 Knowledge processing requirements analysis T1.1.4 Self-assessment T1.2.1 Utility of ontology-based tools T1.2.2 Interoperability of tools and services T1.3.3 Ontology content evaluation and usability T1.2.4 Self-assessment T1.3.1 Best Practices and Guidelines T1.3.2 Ontology repository T1.3.3 Standards T1.3.4 Ontology Outreach Authority (OOA) T1.3.5 Self-assessment T1.4.1 Technology Roadmap T1.4.2 Business cases and success stories T1.4.3 International Technology Show T1.4.4 Self-assessment T1.5.1 Negotiation with identified potential co- operators T1.5.2 Detailed discussion about possible joint education and training activities T1.5.3 Define a program of joint activities with each network T1.5.4 Self-assessment T1.6.1 Semantic portal analysis requirements and design T1.6.2 Semantic portal ontology prototype development T1.6.3 Semantic portal prototype development T1.6.4 Semantic Portal Unit and integration testing T1.6.5 Content annotation and management T1.6.6 hosting and running http://knowledgeweb.semanticweb.org 	Task name Task number Task description Start month End month	has involved partner has participant leader has person leader team is formed by belongs to

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Concept name	Instances	Instance attributes	Ad-hoc relations
	T1.6.7 hosting and running www.iswsa.org		
	T1.6.8 Self-assessment		
	T2.1.1 State of the art on the technology		
	participating on the scalability WP		
	T2.1.2 Approximate reasoning with ontologies		
	T2.1.3 Modularization of ontologies		
	T2.1.4 Definition of a methodology and general		
	criteria for ontology-based tools benchmarking		
	T2.1.5 Construction of prototypes of tools for		
	benchmarking ontology building tools		
	T2.1.6 Benchmarking of ontology building tools		
	according to the criteria and test beds produced		
	T2.1.7 Self-assessment		
	T2.2.1 Definition of a common framework for		
	characterizing alignment		
	T2.2.2 Design of a benchmark suite for		
	alignment		
	T2.2.3 Synthesis of current alignment techniques		
	T2.2.4 Research on alignment techniques and		
	implementations		
	T2.2.5 Definition of the format for delivering		
	alignment		
	T2.2.6 Self-assessment		
	T2.3.1 Ontology versioning		
	T2.3.2 Process modeling of consensus		
	T2.3.3 Patterns of ontology versioning		
	12.3.4 Self-assessment		
	12.4.1 Survey on the state of the art of current		
	semantic web services initiatives		
	12.4.1:Survey on the state of the art of current		
	T2 4.2 A nelvois of surront initiatives to identify		
	12.4.2 Analysis of current initiatives to identify		
	research offerts		
	T2 4 3 Define requirements for web service		
	description		
	T2 4 4 Define semantics for dynamic web		
	service discovery and automatic composition		
	T2.4.5 Define semantics for automatic web		
	service invocation and interoperation		
	T2.4.6 Survey on the state of the art on agent		
	based services		
	T2.4.7 Guidelines for the integration of agent-		
	based services and web-based services		
	T2.4.8 Self-assessment		
	T2.5.1 Cooperation and coordination with rule		
	language development activities		
	T2.5.2 Participation in query language		
	development efforts		
	T2.5.3 Participation in any relevant query		

Concept name	Instances	Instance attributes	Ad-hoc relations
	language standardization efforts		
	T2.5.4 Monitoring of and participation in efforts		
	to design additional language layers or to extend		
	existing languages		
	T2.5.5 Self-assessment		
	T2.6.1 Monitoring the research advance		
	T2.6.2 Potential redistribution of budget to		
	research tasks		
	T2.6.3 Facilitating and managing the exchange		
	and research collaboration		
	T2.6.4 Organization of workshops		
	T2.6.5 Self-assessment		
	T3.1.1 Conducting a detailed requirements		
	analysis for VISWE		
	T3.1.2 Investigation of prior attempts		
	T3.1.3 Negotiations among Universities		
	T3.1.4 Investigation of the feasibility of		
	participating in other European development and		
	training programs		
	T3.1.5 Self-assessment		
	T3.2.1 Identification of core curriculum/a,		
	adaptation or creation of learning units		
	T3.2.2 Provision of training events and learning		
	units specifically targeted to professionals		
	T3.2.3 Organization of educational events		
	T3.2.4 Identification of core curriculum/a		
	T3.2.5 Development of an initial M.Sc. course		
	T3.2.6 Negotiations among Universities		
	T3.2.7 Enhancement and promotion of the		
	teaching materials provided by REWERSE,		
	MUSCLE, Aim@Shape, KB2.0 and Agentlink		
	III		
	T3.2.8 Self-assessment		
	T3.3.1: Agreement on formats, metadata		
	standards, etc.		
	T3.3.2: Setup of learning management system as		
	repository for learning units		
	T3.3.2: Setup of learning management system as		
	repository for learning units v2		
	T4.1.1 Communication with the EC and co-		
	ordination of reporting		
	T4.1.2 Resolution of Conflicts		
	T4.1.3 Auditing		
	T4.1.4 Focus on integration		
	T4.2.1 Accounting		
	T4.2.2 Monitoring income and expense plan		
	execution		
	T4.3.1 Activity report		
	T4.3.2 Joint Programme of Activity revision and		
	expansion		

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Concept name	Instances	Instance attributes	Ad-hoc relations
	 T4.4.1 Negotiations and monitoring of Consortium Agreement T4.4.2 Spinning off and relations with legal bodies T4.4.3 Intellectual property management T4.5.1 Overseeing the science and society issues related to Knowledge Web T4.6.1 Self-assessment, risk analysis and market watch 		
Workpackage	 WP1.1: Industrial Application Needs WP1.2: Evaluation for technology selection WP1.3: Technology Recommendations WP1.4: Promotion of Ontology Technology WP1.5: Cross Network cooperations WP1.6: Semantic Portal Structure WP2.1: Scalability WP2.2: Heterogenity WP2.3: Dynamics WP2.4: Semantic Web Services WP2.6: Towards a Virtual Research Centre WP3.1: VISWE WP3.2: Educational Contents and Event Provision WP3.3: Semantic delivery platform WP4.1: Operational Management WP4.2: Financial Management WP4.4: Legal and Knowledge Management WP4.5: Society and Gender Issues WP4.6: Self-Assessment, Risk Analysis and Market Watch 	Workpackage title Workpackage number Workpackage description of work Workpackage objectives Workpackage expected results Workpackage mailing list Person-months Start month End month	has associated has contractor leader has involved partner has person leader has person participant has is made up of has participant with workload
workpackage workload		Person-months	is workload of is workload on workpackage

Table 9. The concept dictionary of the Project ontology

The KW Project ontology imports concepts from the documentation ontology, the event ontology, the organization ontology, and the person ontology. These imported concepts are used to connect the Project ontology with the other ontologies. In figure 12 we can see all the ad-hoc relationships whose domain is a concept belonging to the Project ontology. Examples of these relationships can be: 'Milestone has associated Deliverable', 'Network of Excellence has associated event Event', 'Network of Excellence is developed by Organization', 'Workpackage has person participant Person', 'Workpackage is made up of Task', etc.



Figure 12. The ad-hoc relationships of the Project ontology

Finally, table 10 shows the Project ontology statistics.

Concepts	6
Instance Attributes	33
Ad-hoc Relations	20
Instances	365

Table 10. Project ontology statistics

4. Different Mappings between Ontologies

In this section we make explicit the mappings between the concepts used by the KW ontologies and the concepts used by the OntoWeb and Esperonto ontologies. In addition, this section presents the existing mappings between $FOAF^8$ and KW Person ontologies.

4.1. Mappings between OntoWeb, Esperonto and KW Ontologies

Tables 11 and 12 shows the reused concept from the OntoWeb ontology and the five Esperonto ontologies, and the mappings between them, respectively. The first column presents the concepts of the OntoWeb or Esperonto ontologies in alphabetical order, and the second column presents their corresponding concept in the five KW ontologies. Note that 48% of the OntoWeb concepts and 76% of the Esperonto concepts have been reused in the KW ontologies.

Concept name (OntoWeb Ontology)	Concept name (KW Ontologies)	
AcademicStaff		
AdministrativeStaff	Administrative Staff	
Article	Article	
AssistantProfessor	Assistant Professor	
AssociateProfessor	Associate Professor	
Association		
Book	Book	
Booklet		
Conference	International Conference	
Department		
DevelopmentProject		
Employee		
Enterprise	Company	
Event	Event	
Exhibition		
FacultyMember		
FullProfessor	Full Professor	
Graduate		
InBook	Article in Book	
InCollection		
InProceedings	Article in Conference	
Institute		
Lecture		
Lecturer		
Manager	Manager	
Manual	Manual	
MasterThesis	Master Thesis	

⁸ http://xmlns.com/foaf/0.1/

Meeting		
Misc		
Organization	Organization	
Person	Person	
PhDStudent	PhD Student	
PhDThesis	PhD Thesis	
Proceedings		
Product		
Project	Network of Excellence	
ProjectMeeting		
ProjectReport		
Publication	Publication	
Report		
ResearchGroup		
ResearchProject		
ResearchTopic		
SoftwareComponent		
SoftwareProject		
Student	Student	
TechnicalReport		
TechnicalStaff	Technical Staff	
Thesis	Thesis	
Торіс		
Undergraduate	Undergraduate	
University	University	
Unpublished		
Workshop	International Workshop	
	Additional Documentation	
	Agenda	
	Annex	
	Article in Journal	
	Article in Workshop	
	AudioConference Minutes	
	Contract	
	Cost Statement	
	Deliverable	
	Documentation	
	EC Templates	
	Fax	
	Final Report	
	Mail	
	Management Documentation	
	Meeting Minutes	

Minutes	
Periodic Report	
Project Proposal	
Proposal	
Six Month Report	
Slides	
Technical Documentation	
Templates	
Two Month Report	
Year Report	
Education Area Meeting	
EPMB Meeting	
Industry Area Meeting	
KW Area Meeting	
KW Plennary Meeting	
Management Project Meeting	
PMB Meeting	
Research Area Meeting	
Review	
Research Institute	
Company Staff	
Junior Researcher	
Master Student	
Professor	
Project Officer	
Researcher	
Senior Researcher	
University Staff	
Activity	
Milestone	
Task	
Workpackage	
workpackage workload	

 Table 11. OntoWeb and Knowledge Web concepts

Concept name (Esperonto Documentation Ontology)	Concept name (KW Documentation Ontology)	
Additional Documentation	Additional Documentation	
Agenda	Agenda	
Annex	Annex	

Annex I		
Annex II		
Annex III		
Annex IV		
Annex V		
Article	Article	
Article in Book	Article in Book	
Article in Conference	Article in Conference	
Article in Journal	Article in Journal	
Article in Workshop	Article in Workshop	
AudioConference Minutes	AudioConference Minutes	
Book	Book	
Contract	Contract	
Cost Statement	Cost Statement	
Deliverable	Deliverable	
Documentation	Documentation	
EC Templates	EC Templates	
Fax	Fax	
Final Report	Final Report	
Mail	Mail	
Management Documentation	Management Documentation	
Manual	Manual	
Master Thesis	Master Thesis	
Meeting Minutes	Meeting Minutes	
Minutes	Minutes	
Periodic Report	Periodic Report	
PhD Thesis	PhD Thesis	
Project Proposal	Project Proposal	
Proposal	Proposal	
Publication	Publication	
Six Month Report	Six Month Report	
Slides	Slides	
Technical Documentation	Technical Documentation	
Thesis	Thesis	
Year Report	Year Report	
	Templates	
	Two Month Report	
Concept name (Esperonto Meeting	Concept name (KW Event Ontology)	
Ontology)	(, , , , , , , , , , , , , , , , , , ,	
Audio Conference		
Meeting		
Project Meeting		
Review	Review	

Technical Meeting		
Video Conference		
	Education Area Meeting	
	EPMB Meeting	
	Event	
	Industry Area Meeting	
	International Conference	
	International Workshop	
	KW Area Meeting	
	KW Plenary Meeting	
	Management Project Meeting	
	PMB Meeting	
	Research Area Meeting	
Concept name (Esperonto Organization	Concept name (KW Organization	
Ontology)	Ontology)	
Coordinator		
Organization	Organization	
Partner		
Subcontractor		
	Company	
	Research Institute	
	University	
Concept name (Esperonto Person Ontology)	Concept name (KW Person Ontology)	
Concept name (Esperonto Person Ontology) Academic Staff	Concept name (KW Person Ontology)	
Concept name (Esperonto Person Ontology) Academic Staff Administrative Staff	Concept name (KW Person Ontology) Administrative Staff	
Concept name (Esperonto Person Ontology) Academic Staff Administrative Staff Assistant Professor	Concept name (KW Person Ontology) Administrative Staff Assistant Professor	
Concept name (Esperonto Person Ontology) Academic Staff Administrative Staff Assistant Professor Associate Professor	Concept name (KW Person Ontology) Administrative Staff Assistant Professor Associate Professor	
Concept name (Esperonto Person Ontology) Academic Staff Administrative Staff Assistant Professor Associate Professor Company Staff	Concept name (KW Person Ontology) Administrative Staff Assistant Professor Associate Professor Company Staff	
Concept name (Esperonto Person Ontology) Academic Staff Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor	Concept name (KW Person Ontology) Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor	
Concept name (Esperonto Person Ontology) Academic Staff Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Junior Academic Staff	Concept name (KW Person Ontology) Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor	
Concept name (Esperonto Person Ontology) Academic Staff Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Junior Academic Staff Manager	Concept name (KW Person Ontology) Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Manager	
Concept name (Esperonto Person Ontology) Academic Staff Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Junior Academic Staff Manager Master Student	Concept name (KW Person Ontology) Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Manager Master Student	
Concept name (Esperonto Person Ontology) Academic Staff Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Junior Academic Staff Manager Master Student Person	Concept name (KW Person Ontology) Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Manager Master Student Person	
Concept name (Esperonto Person Ontology) Academic Staff Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Junior Academic Staff Manager Master Student Person PhD Student	Concept name (KW Person Ontology) Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Manager Master Student Person PhD Student	
Concept name (Esperonto Person Ontology) Academic Staff Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Junior Academic Staff Manager Master Student Person PhD Student Professors	Concept name (KW Person Ontology) Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Manager Master Student Person PhD Student Professor	
Concept name (Esperonto Person Ontology) Academic Staff Administrative Staff Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Junior Academic Staff Manager Master Student Person PhD Student Professors Project Officer	Concept name (KW Person Ontology) Concept name (KW Person Ontology) Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Manager Manager Master Student Person PhD Student Professor Project Officer	
Concept name (Esperonto Person Ontology) Academic Staff Administrative Staff Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Junior Academic Staff Manager Master Student Person PhD Student Professors Project Officer Senior Academic Staff	Concept name (KW Person Ontology) Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Manager Master Student Person PhD Student Professor Project Officer	
Concept name (Esperonto Person Ontology) Academic Staff Administrative Staff Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Junior Academic Staff Manager Master Student Person PhD Student Project Officer Senior Academic Staff Student	Concept name (KW Person Ontology) Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Manager Master Student Person PhD Student Professor Project Officer Student	
Concept name (Esperonto Person Ontology) Academic Staff Administrative Staff Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Junior Academic Staff Manager Master Student Person PhD Student Professors Project Officer Senior Academic Staff Student Technical Staff	Concept name (KW Person Ontology) Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Manager Master Student Person PhD Student Professor Project Officer Student Technical Staff	
Concept name (Esperonto Person Ontology) Academic Staff Administrative Staff Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Junior Academic Staff Manager Master Student Person PhD Student Professors Project Officer Senior Academic Staff Student Technical Staff Undergraduate	Concept name (KW Person Ontology) Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Manager Master Student Person PhD Student Professor Project Officer Student Technical Staff Undergraduate	
Concept name (Esperonto Person Ontology) Academic Staff Administrative Staff Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Junior Academic Staff Manager Master Student Person PhD Student Professors Project Officer Senior Academic Staff Student Technical Staff Undergraduate	Concept name (KW Person Ontology) Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Manager Master Student Person PhD Student Professor Project Officer Student Technical Staff Undergraduate Junior Researcher	
Concept name (Esperonto Person Ontology) Academic Staff Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Junior Academic Staff Manager Master Student Person PhD Student Project Officer Senior Academic Staff Student Technical Staff Undergraduate	Concept name (KW Person Ontology) Administrative Staff Assistant Professor Associate Professor Company Staff Full Professor Manager Master Student Person PhD Student Professor Project Officer Student Technical Staff Undergraduate Junior Researcher Researcher	

	University Staff	
Concept name (Esperonto Project Ontology)	Concept name (KW Project Ontology)	
Milestone	Milestone	
Project	Network of Excellence	
Project Workplan		
Task	Task	
Workpackage	Workpackage	
workpackage workload	workpackage workload	
	Activity	

 Table 12. Esperonto and Knowledge Web concepts

The Venn Diagramm presented in figure 13 shows graphically shows how the three ontologies overlap.

201		Anonkage Mao
OntoWeb	Research Institute J Industry Area Meeting KW Plenary Research Area Meeting PMB Meetin University Company Event Workshop Conference	Yunior Researcher Templates Y Meeting Two Month Report Researcher ng KW Area Meeting Senior Researcher Activity EPMB Meeting Management Project Meeting Education Area Meeting University Staff
Booklet Report Graduate Employee Association Exhibition TechnicalReport Institute DevelopmentProject Department FacultyMember Misc ProjectReport InCollection ResearchTopic Unpublished ResearchGroup Proceedings ResearchGroup	Project Undergraduate Person PhDStudent FullProfessor Student AssociateProfessor TechnicalStaff AdministrativeStaff AssistantProfessor Organization Publication Manager Thesis PhDThesis MasterThesis Manual Article in Conference Article Book Article in Book	Additional Documentation Agenda Annex Article in Workshop Article in Journal Slides Audio Conference Minutes Contract Milestone Cost Statement Deliverable Documentation Mail EC Templates Final ReportProject Proposal Fax Professor Project Officer Master Student Task Workpackage Technical Documentation Review Year Report Company Staff Six Month Report Proposal Management Documentation Minutes Periodic Report Meeting Minutes WP workload
Lecturer SoftwareProject	ProjectMeeting Meeting AcademicStaff Senior Academic Staff Project Workp Coord	Technical Meeting Video Conference Partner AudioConference AnnexV AnnexIV AnnexIII Ian Junior Academic Staff AnnexII AnnexI inator Subcontractor
		ESPERONTO

Figure 13. The overlaps between OntoWeb, Esperonto and KW ontologies

4.2. Mappings between FOAF and Person Ontologies

This section presents the existing mappings between FOAF⁹ and KW Person ontologies, focused on the concept 'Person'. Such mappings are presented in table 13.

We should mention that most FOAF class and properties are testing and unstable terms.

KWEB/2004/D1.6.2/v1.0

⁹ http://xmlns.com/foaf/0.1/

Knowledge Web Person Concept	FOAF Person Class	
Full Name	name givenname firstName + surname firstName + family_name	
Photo	img	
e-mail	mbox	
Homepage	homepage	
Date of Birth		
Role		
Country		
City		
Zip code		
Street Address		
Telephone	phone	
Fax		
belongs to ('Organization')		
is contact person of ('Organization')		
is WP leader in ('Workpackage')		
works in ('Workpackage')		
is involved in ('Task')		
leads ('Task')		
is author of ('Documentation')	publications ('Document')	

Table 13. Mappings between KW Person concept and FOAF Person class

5. Conclusions

In this deliverable we have presented the conceptualization of the current five ontologies used by the Knowledge Web Portal (http://knowledgeweb.semanticweb.org). These five ontologies, which are the *Documentation*, *Event*, *Organization*, *Person* and *Project* ones, have been built reusing and extending the OntoWeb (http://www.aifb.uni-karlsruhe.de/ontology) ontology and the five Esperonto (http://esperonto.net) ontologies.

The KW ontologies reuse 48% of the OntoWeb concepts and 76% of the Esperonto concepts. The KW ontologies include:

- 75 concepts
- 98 instance attributes
- 51 ad-hoc relations
- 578 instances

Table 14 summarizes the statistics (number of concepts, attributes, and ad-hoc relations) of the OntoWeb, Esperonto and Knowledge Web ontologies.

	Concepts	Attributes	Ad-hoc relations
OntoWeb Ontology	54	84	109
Esperonto Ontologies	71	144	39
Knowledge Web Ontologies	75	98	51

 Table 14. OntoWeb, Esperonto and KW statistics

6. References

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