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Executive summary

The We-Go Knowledge Net community is established by identifying relevant eGovernment stakeholders in all Western Balkan Countries and organizing relevant activities with their participation. We-Go team participants actively contribute to this community, and the stakeholders can actively participate in sharing and communicating the knowledge about eGovernment services or in using the results of the We-Go Knowledge Net.

To offer the initial content for the We-Go Knowledge Net, the We-Go team participants made a deep analysis of implementation levels of existing eGovernment services and collected information about realized EU services and finally matched them. The desk research is a just one delivery which describes this relevant information and is the basis for the initial data stored in the form of electronic representation on local We-Go web sites in all WBC or published on the ePractice.eu portal. All local We-Go web sites and the common EU portal for eGovernment services along with organized activities within the We-Go Knowledge Net offer several system functionalities:

- content presentation (life or via web),
- search and comparison tools (printed and electronic versions),
- messaging and communication tools (life meetings or via electronic distribution channels).

The links and information about system modules of the We-Go Knowledge Net is distributed to all stakeholders in different forms: life presentations, distribution of leaflets or e-mail messaging. The initial stage of these activities is the creation of the We-Go Knowledge Net and its promotion to stakeholders.

The local We-Go web sites in all Western Balkan Countries become available and offer localized and customized content. They also refer to ePractice.eu as central portal in the EU where exhaustive information about realized services can be found. The advanced find, semantic search, and comparison tools offer a possibility to exploit the relations among different eGovernment services and their implementation issues in order to extract knowledge and understanding about implementation details, obstacles, and realized solutions in the integration process with embedded interoperability.

Messaging and communication tools offer a possibility to share the knowledge and enhance the expertise about eGovernment services. In addition they enable conditions to build an understanding about know-how transfer. A Portal of news and events keeps updated information about realized past activities and planned future activities, in order to motivate active participation of stakeholders.

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1. Current situation and overview of best practices

This document includes the basic architectural concepts/options and the required features of the We-Go Knowledge Net. The We-Go Knowledge Net is realization of work package 4 of the We-Go Project.

We-Go (Enhancing Western Balkan Countries eGovernment Expertise) includes the alignment with the outlined EU FP6 scientific objectives as well as the learning and growth perspective to reinforce and innovate eGovernment research activities in WBC together with EU partners.

The growth and learning perspective requires complementary measures to be established in order to enhance the expertise in a sustainable manner.

1.1   We-Go project WP4 Knowledge Net

The objective of work package 4 in the We-Go project is:

Assuring sustainability of coordination and sharing of expertise by initiating the We-Go Knowledge Net as a WBC eGovernment Resource Network

- in order to increase the value of the coordination action
- secure its impact even beyond the lifetime of the project
- aiming to become a WBC Good Practice to be applied in EU

Attracting and involving public, private, and NGO stakeholders to participate in dissemination activities and to support WBC national follow-up projects

- in order to ensure the orientation towards joint and common initiatives
- increase the impact of the project results
- attain equity in services for all.

1.1.1   Overview of the We-Go WP 4 objectives in Description of Work

This section extracts some of the objectives specified for WP4 in the Description of Work in the We-Go project document:

- The We-Go project will provide knowledge transfer and Good Practice for the selected eGovernment projects (see WP 1 + 2 + 3). Each of these projects provides a certain eGovernment service. Thereby each service *comprises a set of components building the solution, documentation, and support* infrastructure. The overall goal is an **easy access** to all these artefacts for WBC.

- The We-Go project must lead to sustainable results that survive the end of the project. Therefore, an infrastructure guaranteeing the access to the project results is mandatory. The We-Go Knowledge Net is proposed to provide such an infrastructure.

- Furthermore, the selected projects should stimulate further eGovernment projects in the WBC. These projects will produce similar kind of artefacts. Consequently, these artefacts should be easily accessible via the We-Go Knowledge Net as well.

- The goal is to reveal existing solutions - those that are already deployed and active – that are still difficult to find. Existing solutions will become more visible and easier to identify and manage.

- It must be possible to easily integrate the We-Go Knowledge Net and its contents into any future resource-sharing initiative on a European level. If such work emerges and develops during the course of the project, due attention will be paid to ensure alignment with any agreed policies.

The purpose of this specification document is to define the We-Go Knowledge Net in precise terms and explain all relevant characteristics required to build an electronic system to be used for the realization of We-Go Knowledge Net objectives.

1.1.2 Overview of the requirements document

The exact requirements for the We-Go Knowledge Net must be detailed as a first step of a requirements document. Types of artefacts that are relevant in sharing eGovernment components must be identified. A common Knowledge Net model realized by a federated approach in Western Balkan Countries will be realized for describing and managing eGovernment artefacts, together with their relationships among each other. Their respective services and agencies should be modelled through an appropriate "eGovernment ontology".

In practice, different components of eGovernment solutions are logically interlinked with each other. This means that the corresponding artefacts must be interlinked with each other as well (using an ontology). On the one side this requires a concept to interlink the information models. On the other side each artefact is stored in the registry as an encapsulated object and therefore links between these objects must be realized in the registry as well.

This document will consist of several sections identified as knowledge networking, We-Go Knowledge Net organization, user requirements, system requirements and system design specification.

Knowledge networking in We-Go is chapter with definitions about knowledge and networking, analyzed with implication to We-Go Knowledge Net. It is an analysis of known technologies and methodologies towards definition of principles of organization addressing how these issues are realized within We-Go Knowledge Net. The specification starts with explanation of what data is used in We-Go Knowledge Net, what kind of information these facts lead to, and what kind of knowledge can be obtained within We-Go Knowledge Net. The understanding of eGovernment services, benefits, and the know-how of implementation, integration and solving interoperability issues is expected ate later stage, as well as wisdom to use the knowledge to realize eGovernment services and organize their implementation in specific environments.

We-Go Knowledge Net organization addresses background and needs analysis for establishing such a network. It starts with motivation and continues with discussion about necessity and essential functionalities. A special chapter concerns added value and explains difference between find and semantic search functions. The functionalities for We-Go Knowledge Net are elaborated within We-Go objectives.

User requirements are specification of a document written by statements in natural language plus diagrams of the services the system provides and its operational constraints. It is written for customers and should describe functional and non-functional requirements in such a way that they are understandable by system users who don't have detailed technical knowledge. System requirements are specification of a document realized by a process of gathering information about the proposed and existing systems and distilling the user and system requirements from this information.

Sources of information for system requirements include documentation, system stakeholders and the specifications of used and similar systems. The requirements themselves are the

descriptions of the system services and constraints that are generated during the requirements engineering process.

This requirements specification document will address

- *Functionality* – What is the project WP4 work package supposed to do?

- *External interfaces* – How does the Knowledge Net interact with stakeholders?

- *Performance* – What are the indicators of performance?

- *Attributes* - What are other requirements that affect We-go Knowledge Net realization?

- *Design constraints imposed on implementation* – Are there any standards in effect, implementation solutions, policies, resource limits, operating environment(s) etc.?

In this document we elaborate how We-Go Knowledge Net is modelled and realized. We also give organization details required for realization and implementation of eGovernment services and realization of knowledge transfer. The activities mentioned so far lead to a community organization and coordinated action used for enhancing expertise about eGovernment services in Western Balkan Countries realized by We-Go Knowledge Net. We also address existing EU software solutions as a basis for data and information availability about eGovernment services, and give impact in realization of We-Go Knowledge Net by establishing different communication channels and media by using the federated approach of localized content and knowledge transfer, customized according to the elaborated specification. The customization is necessary to guarantee a comfortable management of the We-Go project artefacts and to enable sustainability.

The document contains recommendations how these activities can be improved by projects to realize a registry tool with embedded semantic search, such as the initial effort of the UKIM partner that realized a prototype of eGovernment Service Registry (http://we-go.ii.edu.mk/Default.aspx). Another way to improve semantic search capability is proposed by the YLVI platform, developed by UniVie and ARC partners.

1.2   Experience of realization of similar Knowledge Networks

There are several examples about Knowledge Networks to be used for description of eGovernment services or similar information. For example, the Transitions Online Knowledge Net is a unique resource page on 28 post-communist countries from the Czech Republic to Mongolia, with articles about specific country developments.

Probably the most similar network is the UK's Government Knowledge Network, which was a project realized recently. The following chapters give overview of several experiences for building Knowledge Networks for UK Government, although their main goal is to share knowledge among governmental departments, and We-Go Knowledge Net aims much broader including all stakeholders and direct beneficiaries: citizen and businesses.

1.2.1   Motivation and purpose of UK Government's Knowledge Network

According to the UK Government's E-Government Unit (formerly the Office of the e-Envoy) "the Knowledge Network (KN) is a world first - a government-wide electronic communication tool helping government departments to share knowledge with each other, and work online with colleagues across government."

The UK Government's Knowledge Network was launched in December 1999. Following 6 months of preparation and planning, in July 2000 KableNet.com reported that a consortium headed by Cable and Wireless and involving IBM and its Lotus subsidiary had been selected to support an in-house team in developing and deploying the necessary infrastructure and applications. Following 6 years of being run in-house, since 1 April 2006, it has been run on behalf of the UK Government as an out-sourced service.

According to a 2005 review of the UK Government's Knowledge Network ("Knowledge Network Review - the results" Cabinet Office e-Government Unit 2005) carried out for the e-Government Unit, the Knowledge Network provides a unique cross-government communications infrastructure, allowing officials in all government departments and associated bodies connected to the Government Secure Intranet (GSI) to communicate securely with each other and share common, secure access to up to 40 dedicated KM applications, discussion forums, web-based community sites, integrated workflow applications and 'knowledge pools'.

In February 2002, the Office of the e-Envoy announced that the Knowledge Network had won an award from the Management Consultancies' Association as the UK's best IT consultancy project of 2001. In June 2002, the Office of the e-Envoy announced: "A team working on the Government's Knowledge Network has today been named as the Information Age Innovators of the Year at the annual Government Computing Innovation Awards. The Knowledge Network is a world first – a government-wide electronic communication tool helping government departments to share knowledge with each other. The Information Age Innovators award recognizes personal achievement in a project advancing the cause of information-age government and was awarded to Joe McCrea, Director of Knowledge Enhanced Government and Chris Hancock, Director of the Knowledge Network.

In project lifetime 25 of applications realized within the Knowledge Network are described by users as being "mission critical" to the business of the UK Government. Some examples of what the Knowledge Network has pioneered include:

- A series of online departmental 'ministerial policy briefing systems', allowing policy officials to create, maintain and disseminate key aspects and explanations of government policy;

- CabCom – a community for staff to share papers and background knowledge to prepare Ministers for Cabinet Committees;

- The Electronic Library for Government – sharing key policy resources, job opportunities and professional development resources;

- Reduction of the amount of duplication needed to disseminate information

- Improve communication across government and provided links to important documents and facilities, including events, a directory of staff and vacancies.

1.2.2 Methodology used in UK Government's Knowledge Network

The UK Government's Knowledge Network Project has developed methodologies to improve the way in which departments are able to share information and knowledge internally, and more radically to introduce a new capacity for information and knowledge to be shared automatically across the government community.

The project activities have taken place over different timescales:

- each department to introduce a series of internal departmental briefing systems;

- the main tasks to be carried out at the strategic level were to carry out successful tendering, procurement and contract negotiations to enable construction to begin of the central Knowledge Network;

- attention shifted to the development and deployment of the central Knowledge Network infrastructure which would knit together these relatively young departmental systems in a common government-wide capacity;

- the first example in the world of any government deploying an integrated, government-wide knowledge sharing system;

- High correlation between maturity of departmental systems and embedded success (the longer the departmental systems have been in operation, the better their performance has been).

1.2.3 Benefits for UK Government's Knowledge Network

The UK Government's Knowledge Network has already delivered real improvements in departments' internal knowledge sharing:

- Information is instantly available to all stakeholders. Previously, much of the material was available in different places across the network or not at all.

- Regularly updated core policy briefing in the shape of key messages, supporting facts, parliamentary questions, media transcripts, quotes, lobby briefings and links to associated documents and internet sites – which were previously only accessible via fax, phone call, or e-mail are now available on line;

- Used to get a broader feel of wider departmental and government policies, rather than simply their own area or department;

- Beginning to bring efficiencies and quality improvements in the briefing and knowledge sharing process;

- Useful for general background briefing or cross-cutting briefs

2. Knowledge Networking in We-Go

In this chapter we will give overview of definitions about knowledge and networking. We address these terms with intention to describe how they are implemented by We-Go Knowledge Net.

2.1   Knowledge definitions and We-Go implications

2.1.1   Defining and communicating knowledge

Knowledge is defined variously as (i) expertise, and skills acquired by a person through experience or education; the theoretical or practical understanding of a subject, (ii) what is known in a particular field or in total; facts and information or (iii) awareness or familiarity gained by experience of a fact or situation [1]. Philosophical debates in general start with Plato's formulation of knowledge as "justified true belief". There is however no single agreed definition of knowledge presently, nor any prospect of one, and there remain numerous competing theories.

In We-Go WP4 terms *knowledge* will address eGovernment services, its characteristics and especially the know-how to define, implement, and integrate an eGovernment project with EU standards and interoperability.

Knowledge acquisition involves complex cognitive processes: perception, learning, communication, association and reasoning. The term *knowledge* is also used to mean the confident understanding of a subject with the ability to use it for a specific purpose if appropriate. The knowledge as process is usually analyzed and structured with concepts of data, information and wisdom in an information hierarchy where each layer adds certain attributes over and above the previous one. Data is the most basic level; information adds context; knowledge adds *how* to use it; and wisdom adds *when* to use it. Data, Information, Knowledge and Wisdom (DIKW) is a model that can be useful to understanding analysis and the importance and limits of conceptual works; usually applied in the fields of information science and knowledge management.

We-Go Knowledge Net will be explained with concepts within DIKW model in the following chapters.

Symbolic representations can be used to indicate meaning and can be thought of as a dynamic process. Hence the transfer of the symbolic representation can be viewed as one ascription process whereby knowledge can be transferred. Other forms of communication include imitation, narrative exchange along with a range of other methods. There is no complete theory of knowledge transfer or communication.

While many would agree that one of the most universal and significant tools for the transfer of knowledge is writing (of many kinds), argument over the usefulness of the written word exists however, with some scholars sceptical of its impact on societies. Other communication channels and media are also used in We-Go Knowledge Net, like organization of events, presentations, discussion forums etc. Web technology is new method for communicating the knowledge, and a lot of studies show that these networks based on electronic communication and exchange of information are very successful. Especially useful are these methodologies in process from interpreting the meaning of data as information, and then building up knowledge and concluding common understanding towards wisdom decision making process to do right things in right time. We-Go uses web technology as realization of Work package 4 in addition to recommendations and best practice presentations (mostly realized in WP1 & WP2),

awareness raising, education and trainings (mostly realized in WP3), and other forms of communication realized in WP4, like formation of community network, meetings, discussion forms, knowledge transfer through different channels and media, like events, workshops etc.

Data come in the form of raw observations and measurements or is accepted or recognized as stimuli by human sensors (in We-Go using web technologies and other communication channels, it means video and audio). Information is created by analyzing relationships and connections between the data. It is capable of answering simple "who/what/where/when/why" style questions. Information is a message for which there is an (implied) audience and a purpose. Knowledge is created by using the information for action. Knowledge answers the question "how". In We-Go knowledge for eGovernment services is a local practice or relationship of information that will enable their implementation. Wisdom is created through use of knowledge, through the communication of knowledge users, and through reflection. Wisdom answers the questions "why" and "when" as they relate to actions. In We-Go Knowledge Net wisdom deals with the future, as it takes implications and lagged effects into account, in order to find smart solutions for integration and realization of interoperability solutions.

Data in We-Go Knowledge Net can been seen as presentation of simple facts for eGovernment services structured to become information. Information for eGovernment services, in turn, becomes knowledge when it is interpreted, put into context, or when meaning is added to it. There are several variations of this widely adopted theme. The common idea is that data is something less than information, and information is less than knowledge. Moreover, it is assumed that we first need to have data or facts before information about for eGovernment services can be created, and only when we have information, knowledge about for eGovernment services can emerge.

Data in We-Go Knowledge Net are assumed to be simple isolated facts about eGovernment services' characteristics. When such facts are put into a context and combined within a structure, information about eGovernment services emerges. When information is given meaning by interpreting it, information becomes knowledge about eGovernment services. In this context knowledge is about what the services really present, how they are implemented, what are the benefits, and what is the procedure to realize, implement and integrate eGovernment services. At this point, facts about for eGovernment services' characteristics exist within a mental structure that consciousness can process; for example, to implement, to integrate, to face the obstacles and find solutions, to predict future consequences, or to make inferences. As the human mind uses this knowledge to choose between alternatives, behaviour becomes intelligent. Finally, when values and commitment guide intelligent behaviour, behaviour may be said to be based on wisdom. In the We-Go Knowledge Net the wisdom will be used by managers and project leaders responsible to realize implementation of eGovernment projects.

We-Go Knowledge Net offers data presented in electronic form. Data on web sites are presented as facts about eGovernment services without relation to other objects. It includes both useful and irrelevant or redundant information and must be processed to be meaningful to be interpreted. By analyzing these facts in We-Go Knowledge Net by processes of reasoning, discussion, or calculation one can obtain plentiful and easily available information about eGovernment services. Information in this context embodies the understanding of a relationship among data about eGovernment service, the cause and effect.

Analyzing the wide range of available information, one can build up knowledge how to use information about eGovernment services. Knowledge in the We-Go Knowledge Net schema represents a pattern that connects information and generally provides a high level of

understating about realization of eGovernment services to what are their attributes, what is their description and how to use presented facts as information about eGovernment service.

The process of transferring the knowledge from already realized eGovernment cases into Western Balkan environments within We-Go project is identified as enhancing expertise. This wise attitude or course of action (We-Go activities) can be treated as accumulated philosophic or scientific learning, or sharing knowledge in decision making process or simply creating wisdom. Wisdom in this context embodies more of an understanding of fundamental principles embodied within the knowledge that are essentially the basis for the knowledge being what it is. Wisdom is essentially systemic and refers to decision making procedures or helps in process what will happen next, in this case to enhance expertise about implementation of eGovernment services.

According to these definitions, data is the basic unit of information, which in turn is the basic unit of knowledge, which itself is the basic unit of wisdom. So, there are four levels in the understanding and decision-making hierarchy. The whole purpose in collecting data, information, and knowledge about eGovernment services in We-Go Knowledge Net is to be able to make wise decisions and use expertise how to establish and implement eGovernment services.

Figure 1 represents the transitions from data, to information, to knowledge, and finally to wisdom. It is understanding that supports the transition process in We-Go Knowledge Net. According to this figure understanding is not a separate level of its own.
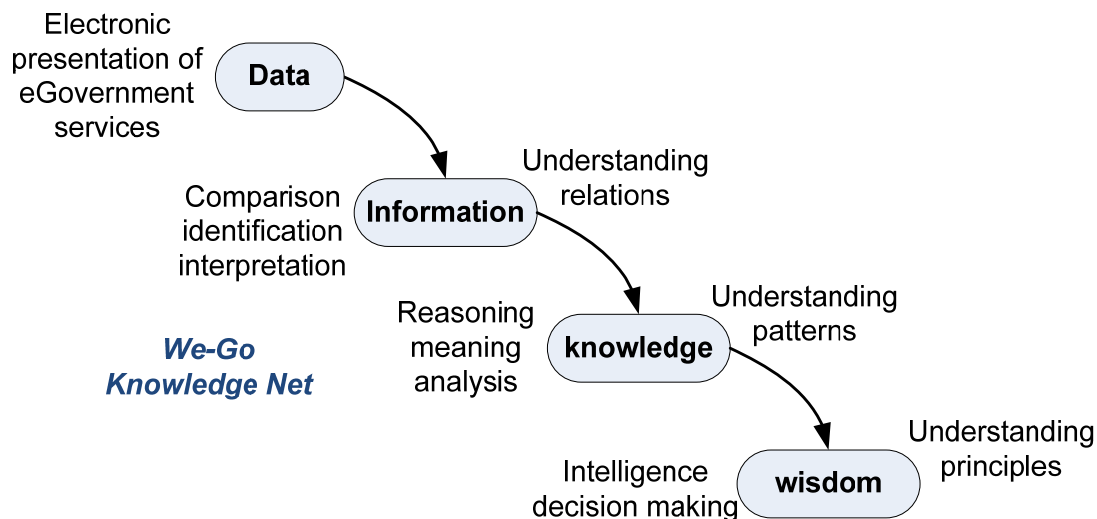

Figure 1 :   We-Go understanding in data, information, knowledge and wisdom pyramid

2.1.2   Knowledge management in We-Go Knowledge Net

Knowledge management is a management theory which emerged in the 1990s. It seeks to understand the way in which knowledge is created, used and shared. A significant part of Knowledge Management theory and practice aligns two models: (i) the DIKW model, which places data, information, knowledge and wisdom into an increasingly useful pyramid. (ii) Nonaka's reformulation of Polanyi's distinction between tacit and explicit knowledge. Both of these models are increasingly under challenge with different schools of thought emerging which are more fully described and referenced in the main article.

An objective of mainstream knowledge management is to ensure that the *right* information is delivered to the *right* person just in time, in order to take the most appropriate decision. In that sense, knowledge management is not interested in managing knowledge *per se*, but to

relate knowledge and its usage. More recent developments have focused on managing networks (the flow of knowledge rather than knowledge itself) and narrative forms of knowledge exchange.

According to Russell Ackoff [3] the content of the human mind can be classified into five categories, as presented in Figure 2. Symbols are identified as data and data that are processed to be useful and provide answers to "who", "what", "where", and "when" questions are identified as information. Application of data and information is knowledge and it answers "how" questions, while appreciation of "why" is understanding. Evaluating understanding is wisdom.

Ackoff indicates that the first four categories relate to the past; they deal with what has been or what is known. Only the fifth category, wisdom, deals with the future because it incorporates vision and design. With wisdom, people can create the future rather than just grasp the present and past. But achieving wisdom isn't easy; people must move successively through the other categories.

A further elaboration of Ackoff's definitions within the We-Go Knowledge Net follows in next paragraphs. Data presenting the characteristics of e-Government services simply exists and has no significance beyond its existence and it does not have meaning of itself. Information is data that has been given meaning by way of relational connection of eGovernment services' characteristics.
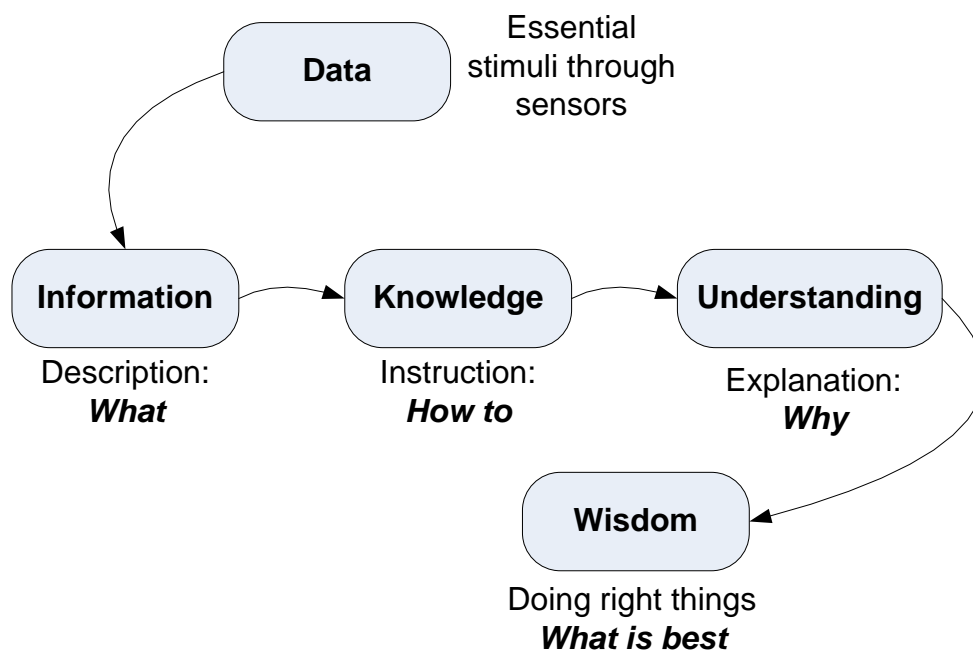

Figure 2 :   From data to knowledge and wisdom

Knowledge is the appropriate collection of information, such that it's "meaning" is useful. It is a deterministic process, but it does not provide, integration such as would infer further knowledge. In We-Go Knowledge Net, the knowledge about eGovernment services exercise stored knowledge, but directly does not provide in and of itself new knowledge about other eGovernment services (associates with modelling, simulation, etc., but not with creation). The next step requires a true cognitive and analytical ability that is only encompassed in understanding. Understanding is an interpolative and probabilistic process. It is the process by which one can use knowledge and synthesize new knowledge from the previously held knowledge.

The difference between understanding and knowledge is the difference between "learning" and "memorizing". People who have understanding can undertake useful actions because they can synthesize new knowledge, or in some cases, at least new information, from what is previously known (and understood). That is, understanding can build upon currently held information, knowledge and understanding itself. We intent that the We-Go Knowledge Net will serve in understanding process, in the sense that the users will be able to synthesize new knowledge from previously stored information and knowledge.

Wisdom is an extrapolative and non-deterministic, non-probabilistic process. It calls upon all the previous levels of consciousness, and specifically upon special types of human programming (moral, ethical codes, etc.). It beckons to give us understanding about which there has previously been no understanding, and in doing so, goes far beyond understanding itself. It is the essence of philosophical probing. Unlike the previous four levels, it asks questions to which there is no (easily-achievable) answer, and in some cases, to which there can be no humanly-known answer period. Wisdom is therefore, the process by which we also discern, or judge, between right and wrong, good and bad. We-Go Knowledge Net is basis for those decision making users to provide the ability to possess wisdom. Wisdom is a uniquely human state, for it resides as much in the heart as in the mind.

2.1.3 Knowledge engineering in We-Go Knowledge Net

Knowledge engineering is an important domain of modern science also used in We-Go Knowledge Net, by providing techniques and tools for knowledge representation and their processing. It is used when solving "creative" problems, not only to develop procedures, algorithms and define eGovernment service projects implementing various methods and strategies but also to explicitly store, update and extend knowledge bases that contain, in a generalized form, information on eGovernment services' domain necessary to solve foreseen problems. Knowledge to be used in solving a lot of practical problems and tasks appeared to be hybrid. Not only procedural knowledge (including algorithms, project initiation, procedures to implement and integrate them, and typical procedures of problem solving) is required. In fact, procedures always implicitly contain or use domain-specific knowledge, but in the form firmly tied to the software solutions. The following kinds of knowledge are also required:

- conceptual knowledge - definitions of the eGovernment service domain concepts and their relationships to each other; (We-Go uses CEN ontology)

- factual knowledge - concrete facts of the eGovernment service domain and their relations to each other; (We-Go uses ePractice.eu and We-Go federated web site content)

- heuristic knowledge - informal rules of reasoning based on practical experience of problem solving in the eGovernment service domain. (We-Go uses recommendations with implementation specifics)

The methods of knowledge representation used in We-go Knowledge Net used are classified as follows:

- Procedures – recommendations for specific organizational implementation and business re-engineering requirements: (including structures like: IF condition THEN action, or other rule-based inference). The action of the selected rule is activated when the rule is being applied. The action may typically add some assertion to the working set of hypotheses. Rules in the We-Go Knowledge Net are recommendations or experiences of similar eGovernment projects implementations representing heuristic knowledge, structured into rule sets intended to evaluate some goal.

- Frames – hierarchical knowledge structures convenient for representing knowledge on eGovernment services concepts and their relationships (like the usage of ePractice.eu web site). A frame (description about eGovernment service) is identified by its name and a set of records. Each of the records has its own name and value that can be also a reference to some other frames (eGovernment service). They can be used not only for representing knowledge but also for pattern matching to other objects being explored in the eGovernment services domain, with the purpose of further analysis and classification.

- Semantic nets – a kind of directed multi-graphs, convenient (as well as frames) for representing conceptual knowledge. Semantic nets as a form of knowledge representation in the We-Go Knowledge Net can be understood as a set of eGovernment service with description of all inherited relations among objects.

- Ontology – highly structured sets of related concepts belonging to some problem domain. We-Go Knowledge Net recommends usage of CEN ontology for definition of semantic sets about eGovernment.

Knowledge representation techniques have attracted a lot of attention starting with 1970s, due to the origin of expert systems - intelligent advisors in some relatively narrow problem domain, based on extensible knowledge base stored separately from its code. Expert systems can be used as experts or consultants in their problem domain to help human experts solve problems of diagnostics, planning, forecasting, analysis and classification, etc. Currently knowledge engineering techniques have become especially important, since they are being used to represent ontology accessible over the Web, and to help make Web surfing engines smarter. In this context We-Go Knowledge Net recommends usage of CEN eGovernment services ontology which will be described in Delivery 4.1.3.

2.2   Knowledge networking background

Knowledge networking is the creation and development of knowledge through person-to-person networking, often augmented by online communications [5]. We-Go Knowledge Net is based on the assumption the knowledge should be combined and exchanged in local web sites at all Western Balkan Countries – federated approach with localized content.

The central web site serves as comparison tool and as place to link and make easily available solutions in different EU and Western Balkan Countries. Relevant information and knowledge will be shared for eGovernment services' characteristics and the level of implementation of appropriate service.

2.2.1   Definitions and characteristics of knowledge networking

David J. Skyrme [6] describes knowledge networking as "a phenomenon in which knowledge is shared, developed and evolved", as a process of "human and computer networking where people share information, knowledge and experiences to develop new knowledge for handling new situations". He sees knowledge networking as a different way of working where "it is about openness and collaboration across departmental, organizational and national boundaries and about building multiple relationships for mutual benefit."

In context to previous definitions We-Go Knowledge Net uses information about existing eGovernment services in EU to enhance knowledge in WBC and make common understanding about benefits, necessity and efforts for their implementation. The We-Go Knowledge Net uses model where the knowledge is shared, understanding is developed and wisdom is evolved about eGovernment services. The openness and collaboration across region and national boundaries will establish multiple relations for mutual benefit.

Gilbert Probst [8] describes knowledge networks as follows: "Networks, by definition, connect everyone to everyone. Hierarchies by definition do not; rather they create formal channels of communication and authority. Networks operate informally with few rules, they depend on trust."

We-Go Knowledge Net uses bottom-up approach and although its hierarchy is top-down established, it facilitates communications among all participants to share the knowledge and develop understanding about eGovernment services.

We-Go Knowledge Net is based on the assumption the knowledge should be combined and exchanged in networks based on federated registers offering localized content in Western Balkan Countries. Two generic processes: combination and exchange are the two major processes used to generate innovations in the We-Go Knowledge Net. In this context innovation can be interpreted as implementation of eGovernment service, based on shared knowledge and understanding how to implement it in WBC environment.

2.2.2   We-Go Knowledge Networking community

Context in the We-Go Knowledge Net helps distinguish between knowledge management and document management: whereas document management can be carried out in a more or less automated manner, knowledge management cannot be accomplished without involving people as well as tangible content. In this context We-Go uses the concept of community to refer to a group of people having common identity, professional interests and that undertake to share, participate and establish communication for eGovernment services. Participation of community members is described as active role in communication with other members or

contribution to discussions and knowledge net. In theory, 90% of community members regularly do not post anything; they are not passive, since they may actively use and apply the content they have accessed online.

The key roles in We-Go Knowledge Net community are: visitors, stakeholders and We-Go participants. Visitors may visit once or twice and may or may not join. Stakeholders join the Knowledge Net as new members, who typically keep to themselves at first until they have learned enough, when they become regulars. We-Go participants are those who have taken the initial leadership or official role such as helping with the operation. They are familiar with the professional theme for eGovernment services; and they have become respected sources of both knowledge and understanding.

We-Go Knowledge Net is also organized in similar manner. We-Go partners are expected to publish relevant information by posting data and identifying relations, having a lot of participants using the information, building knowledge and have common understanding about eGovernment services and its implementation. Decision making personnel may have wisdom build upon the knowledge and understanding and use it in successful implementation of eGovernment services.

We-Go Knowledge Net is not a top-down formal organization as a task force or project team would be. There is no one person "in charge" of the community, although there may be founding members, who initiate posting of eGovernment services.

We-Go Knowledge Net will use localized and translated material to be published on a federated registers basis, enabling connections between participants, important to learning initiatives such as facilitating mentoring programs, identifying knowledge gaps, and providing both performance support and follow-up activities. The critical components of a We-Go Knowledge Net lies in the sharing of eGovernment services between participants, that see clear benefits of sharing knowledge among themselves and that has developed norms of trust reciprocity, and cooperation.

2.2.3   We-Go Knowledge Net components and channels

We-Go Knowledge Net contains several types of components:

- Content generated by participants (e.g. description of eGovernment services, presentations, recommendations, and other documents)
- Interaction among participants (e.g. meetings, e-mail communication, discussion forums, etc.)
- Management inner structure with a smaller core of active participants and different stakeholders around (e.g. We-Go management structure)
- Events (e.g. expert seminars and presentations)
- Outreach (e.g. newsletters, leaflets, etc.)

We-Go Knowledge Net is not just about providing access to data and documents: it is a form of interconnecting the social network of people who produced the knowledge. One way to facilitate knowledge sharing is by making the knowledge visible. We-Go Knowledge Net does not use just web publishing as a method for knowledge sharing; it can be made more visible by making the interactions online visible in a peer-peer way for example: "I know that you know xyz" and "I know that you know that I know abc." Visible interactions in We-Go Knowledge Net help create a common understanding about eGovernment services; mutual awareness, mutual accountability, and mutual engagement to foster their implementation.

A research in Macedonia, for a question "What is eGovernment in Macedonia?", showed answers of several persons to be "You mean We-Go".

3. We-Go Knowledge Net organization

3.1   Needs analysis and added value

3.1.1   Background and Needs Analysis

The idea of using ICT for creating efficient administration has been around for a while. *eGovernment* is a recent trend which is using ICT, in addition to organizational change and acquiring new skills, in order to provide better realization of government services and therefore citizen and business satisfaction.

The Western Balkan Countries (WBC) started to implement eGovernment services late in comparison to the other EU countries. Therefore the level of implementation is far beyond expected and the level of implementation found in the EU. We-Go project aims to support all activities towards development of eGovernment services.

The concept of Interoperability is one of the most important parts of the eGovernment movement. Interoperability is the ability of ICT systems to communicate and exchange information and knowledge. In this case the systems can belong to different regions, countries or social systems.

Sharing the knowledge of a successful project and communicating it among WBC partners and stakeholders appeared to be very important part for the future success of the eGovernment movement. This is the reason why stakeholders from Western Balkan Countries need a web-based repository of successful eGovernment projects, not just a central EU portal, like ePractice.eu, but also a Knowledge Net build as community with live communication among stakeholders and web sites and other forms of electronic and printed presentations and communications with localized (translated) and customized content.

There is a need where a stakeholder about eGovernment service can access the information of level of implementation of eGovernment services, its description, usability and requirements to fulfil appropriate government service. This is essential for developing interoperability and saves time and other efforts in realization, implementation, and integration of eGovernment service with given standards and embedded interoperability.

In addition, the Knowledge Net should serve as gathering point for all participants in eGovernment projects, where they can exchange contact information, invitations for events, opinions, and where they can communicate and share the information about implementation of eGovernment services to build up knowledge and common understanding, etc.

As a summary the necessity to build a new system identified as We-Go Knowledge Net (where knowledge about eGovernment services is shared and expertise is enhanced via know-how and technology transfer by localized and customized content and information) is to provide info about characteristics and relations of different eGovernment services, stakeholders and accompanied resources, the implementation details and expertise "know-how" to face the obstacles and problems with solutions the EU partners have experienced.

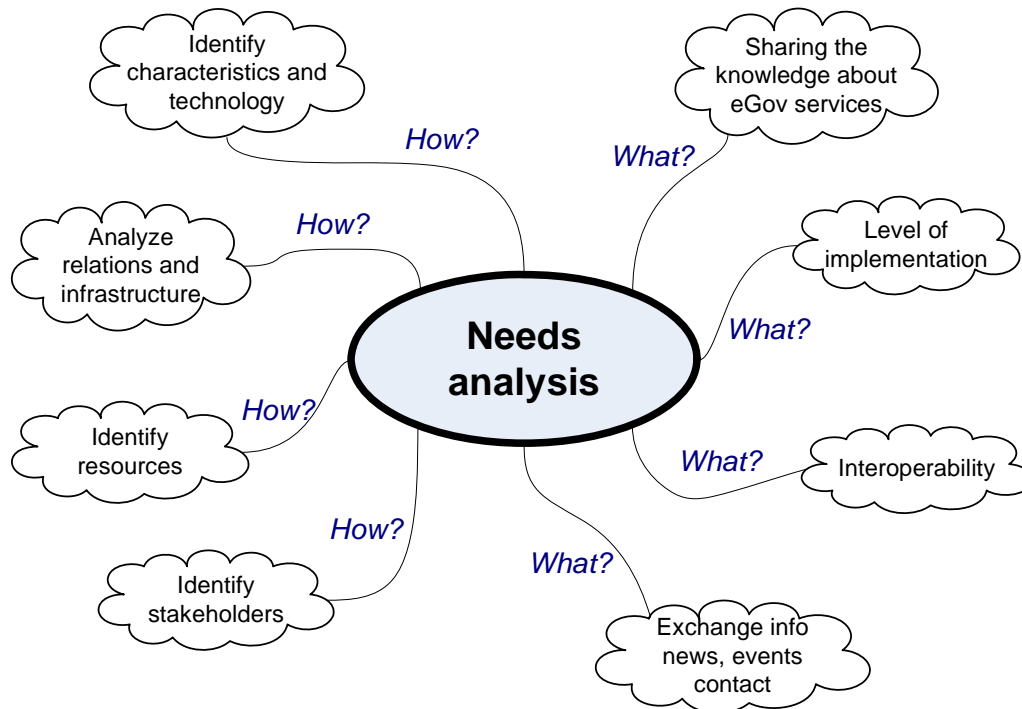The needs analysis answers the questions what to do and how to do it, and is presented in Figure 3.

Figure 3 :   What is needed for We-Go Knowledge Net and how it will be achieved?

This chapter analyzes the background and needs for building the We-Go Knowledge Net by giving answers to questions what is needed and how it will be achieved. The next chapter actually answers the question why it is needed and what tasks, resources and relations will be achieved by realization of the We-Go Knowledge Net system.

3.1.2 Motivation

The idea of creating a knowledge repository of eGovernment services as a place to exchange info about realized eGovernment services, stakeholders and accompanying resources is actually a basis of creating the We-Go Knowledge Net.

Further on, in the analysis of needs we give an idea about basic business rules, by identifying essential tasks, resources (data objects) and relations among data objects. This will further give idea about motivation for basic functionalities of the We-Go Knowledge Net system. It will definitely answer question what are our expectations.

Figure 4 shows basic task list as motivation to realize We-Go Knowledge Net. It also shows the essential data to be stored and used.
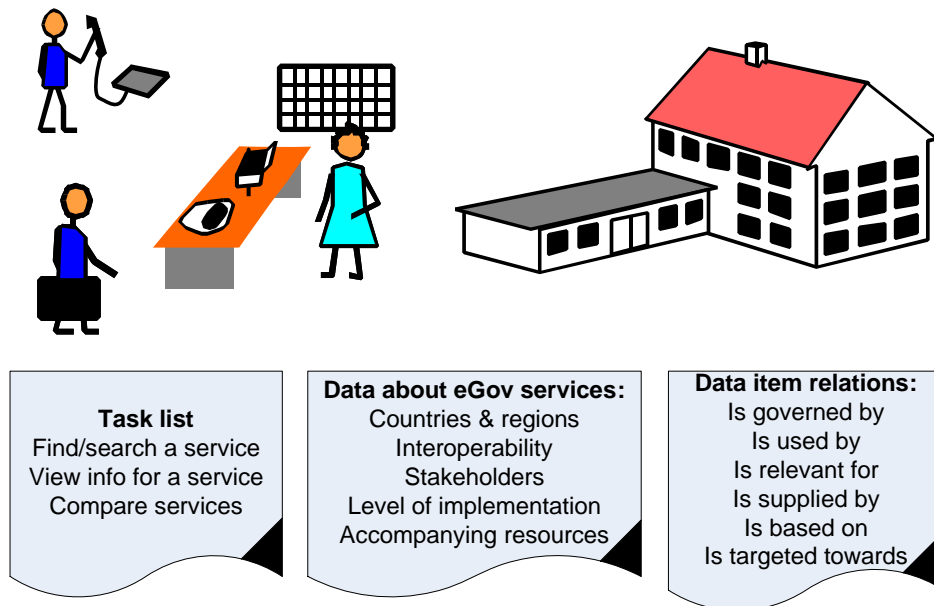
Figure 4 :   What are basic tasks, resources and relations in We-Go Knowledge Net?

The stakeholders in the We-Go Knowledge Net are: service providers like government administration, public agencies and ministries, or specialized companies or organizations, then ordinary users/ visitors who would like to find a resource or eGovernment service in particular country.

The task list to be realized is based mainly on finding appropriate service, viewing info about and comparison of services. The action finding in this case represents a complex process of semantic search based on relations between data objects.

The data objects about eGovernment services include countries and region identification, interoperability issues, stakeholders, level of implementation and accompanying resources. The relations among data objects can be identified by: "is governed by"; "is used by"; "is relevant for"; "is supplied by"; is based on" or "is targeted towards". All these relations are elaborated in details in description of CEN ontology (delivery 4.1.3).

The ePractice.eu is central EU portal for eGovernment cases and good practices. It is increasing knowledge base of good practice contains hundreds of real-life eGovernment, eInclusion and eHealth cases submitted by members of our community. The main goals of this central portal knowledge base are:

- Enable meeting – reaching different stakeholders, to share personal eGovernment case and experience

- Enable knowledge sharing – by creating a public profile and expanding professional profile of existing cases

- Enable learning process about eGovernment services – by establishing platform to browse and gain insight into real-life cases

The We-Go Knowledge Net, in addition to these goals, offers:

- Establishing a community where knowledge about eGovernment is shared and communicated and conditions are enabled to support process for understanding, enhancing expertise and "know-how" transfer with final goal to build wisdom to realize, implement and integrate eGovernment services with embedded interoperability.

- Live presentations, discussions and meetings with local stakeholders in each WBC to initiate new eGovernment services and improve the level of implementation of existing eGovernment services with interoperability and standards used at EU.

- Localised and customized data content and information about eGovernment services, their implementation details. Establishment of messaging and communication channels for a given eGovernment topic, including all relevant stakeholders.

- Initiating translation and publishing of eGovernment cases in ePractice.eu portal as a part of knowledge sharing and communication process. All localized We-Go Knowledge Net content should link to a given eGovernment case on the ePractice.eu portal, to enable easy access, find and comparison.

- Proposing improved search facilities, like semantic search and implementation of ontology based organization of knowledge base, an issue that will add value to the existing portal.

The next chapter elaborates the proposal of new functionality for semantic search, which is in actual added value to the existing organization of knowledge base.

3.1.3   Added value – semantic search

The definition of relations between data items are the added value which can be implemented in future extensions of ePractice.eu central portal for eGovernment cases knowledge sharing portal or in future realization of Registry of eGovernment services, mostly based on CEN ontology requirements.

The next analysis helps realization of semantic search and therefore comparison of different services used as Knowledge base. In this case we point out that the main objective in realization of the Knowledge sharing and communication network about eGovernment services is to create a system where eGovernment service characteristics can be identified and compared. The links to appropriate services are not primary aim – the system is not used as portal to the eGovernment services, but as a search and comparison tool that will help learning and identification process, initiate knowledge creation and usage, building up understanding and establishment of wisdom for decision making processes.

We realized that difference between advanced find functions and complex semantic search functions in the following manner. Advanced find functions (identified as "find" in Figure 5) will mean to find all records in the repository where a given data item has certain value, for example, Find all services where region="Macedonia". More complex find functions where different data item values are logically combined and identified are also treated as "find function", for example, Find all services where region="Macedonia" and provider="Ministry of Justice".

On contrary the semantic search (identified as "semantic search" in Figure 5) means find and investigate cases where relations between data items are of primary interest, for example Find all services where region="Macedonia" and relation "is governed by" is associated to a selected provider, or relation "is used by" addresses citizens. A given search criteria can be saved and used for later usage at comparison stage.

Simple distinction between "find" and "semantic search" is that "find" addresses certain values of data items or their logical combination, but "semantic search" addresses relations between different data items or their logical combination. This is presented in Figure 5.
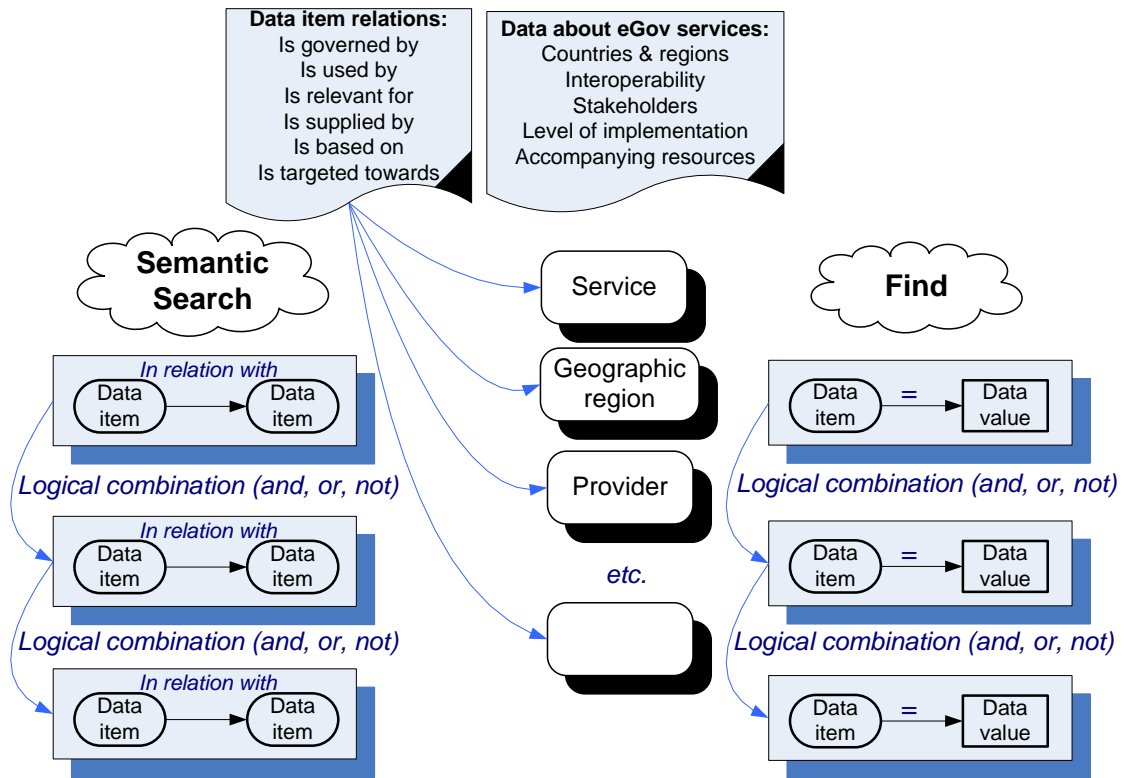
Data item relations:
Is governed by
Is used by
Is relevant for
Is supplied by
Is based on
Is targeted towards

Data about eGov services:
Countries & regions
Interoperability
Stakeholders
Level of implementation
Accompanying resources

Semantic Search

Find

Service

Geographic region

Provider

etc.

In relation with
Data item → Data item

Logical combination (and, or, not)

In relation with
Data item → Data item

Logical combination (and, or, not)

In relation with
Data item → Data item

Data item = Data value

Logical combination (and, or, not)

Data item = Data value

Logical combination (and, or, not)

Data item = Data value

Figure 5 :   What is the difference between find and semantic search?

3.2   We-Go Knowledge Net Objective

3.2.1   Overall Project Objective

The goal of system requirements document is to define why a system is being procured for a particular environment. Functional and organizational objectives are classified within this definition.

The overall objective of We-Go Knowledge Net is to create a system which will provide overview information about service and will allow easier semantic search, access and comparison of eGovernment services.

It will serve not just as repository of eGovernment services, but it will also be used as Knowledge Net of eGovernment services. With the Knowledge repository of eGovernment services we will learn about all relations to stakeholders and resources used for realization of eGovernment services. It will be a starting point for understanding and comparison between different countries and interoperability issues at all.

3.2.2   Project objectives

The realization of this system overall objective will ensure implementation of several *organizational objectives* such as:

- Enabling public administration to reach higher productivity by sharing best practices
- Enabling easier search, identification and comparison of eGovernment services
- Providing sustainable solution beyond the We-Go's lifetime
- Keeping the stakeholders informed about the implemented eGovernment services, news, current projects and action plans, upcoming events
- Specification and communication with stakeholders from other countries
- Providing clear picture for the potential visitors or investors for the available eGovernment services in the region
- Benchmarking and measurement of current status of implemented eGovernment services
- Transparent overview of status of realization of action plans and eGovernment projects
- Cross-border integration of services
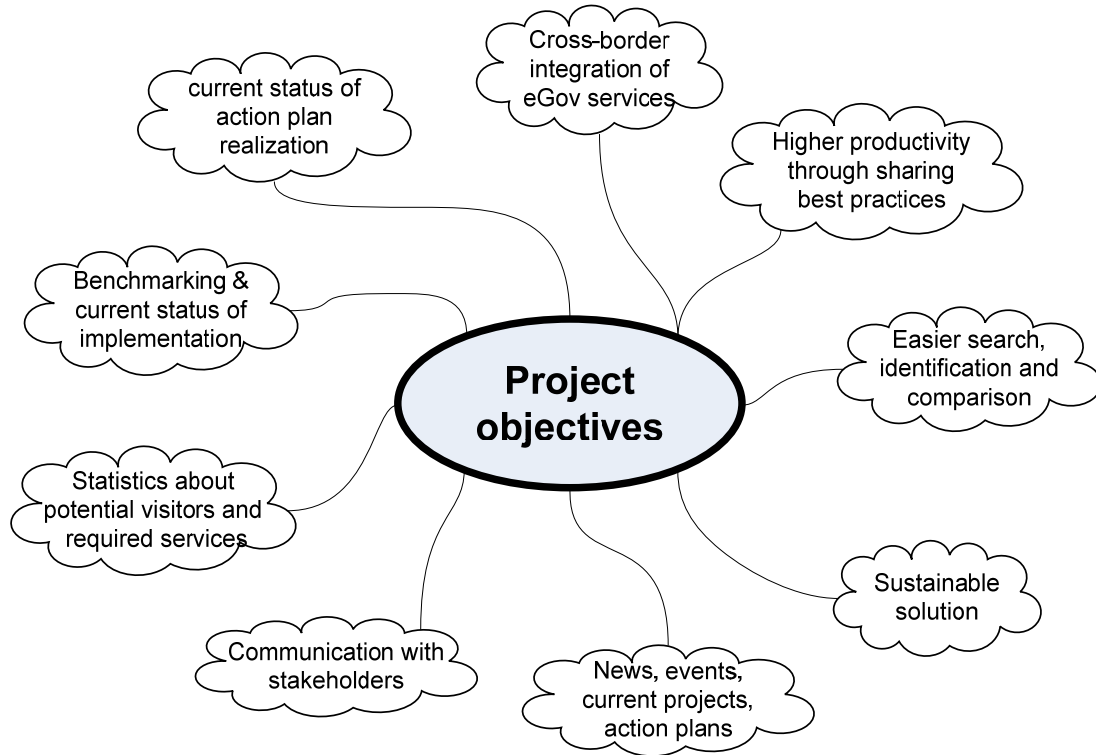
Figure 6 shows these organizational objectives.

Figure 6 :   What are We-Go Knowledge Net objectives?

4. User and system requirements

4.1   User and operating environment requirements

4.1.1   Identification of user groups

The actors identified that will be using the We-Go's Knowledge Net are described in Table 1.

Stakeholder	Major Value	Attitudes	Major Interests	Constraints
Power users	Data, Information, Knowledge and Understanding about eGov services	Upload, edit and delete content Initiate communication channel	Initializing We-Go Knowledge Net content and communication channels for a given topic	
Stakeholders	Information, Knowledge and Understanding about eGov services	Initiate and participate in communication channel	To learn about available eGovernment services and realization of action plans	Cannot upload or change content
Ordinary users	Information and knowledge about eGov services	Compare, find and semantic search of eGov services	To learn about available eGov services and realization of action plans	Cannot upload or change content Cannot use communication channels to stakeholders

Table 1:   What is the role of identified user groups in We-Go Knowledge Net?

The We-Go Knowledge Net should offer possibility for access of the following user groups:

- Power users
- Stakeholders
- Ordinary users.

Power users are those public servants authorised to add, change and update content the content about eGovernment services on local We-Go Knowledge Net register. They are responsible for the content and its direct delivery through communication channels to stakeholders. In the context of DIKW model, their major value is maintenance of Data and information about eGovernment services and building knowledge and understanding about their implementation and integration solving interoperability and cross-border cases.

Stakeholders and Ordinary users of the We-Go Knowledge Net system should have basic skills and understand principles of web and Internet; or distribution channels and media for eGovernment services. In addition stakeholders should have granted access to secured media distribution channels in order to have direct access for communication and messaging channels about certain service. For example all stakeholders in Public Revenue Office should have direct access to all news about realization of e-Taxation solution. In the context of DIKW model, their major value is building knowledge and understanding about implementation and integration of eGovernment services solving interoperability and cross-border cases.

4.1.2 Operating environment

The We-Go Knowledge Net operates via several distribution channels and media:

- Electronic presentation of content (We-Go web sites in all WBC, ePractice.eu update)
- Electronic asynchronous communication tools (e-mails, discussion forums, Q&A sessions, etc.)
- Human networking (meetings, events, etc.)
- Live presentations of content (conferences, workshops, fairs, etc.)

The presentations of content are realized in two forms: live and electronic. Live presentations are used as social events where presenters can explain details addressing the audience about raising awareness of eGovernment services or enhancing expertise in their implementation, integration and improving it with interoperability and other standards. Electronic presentations are realized as web sites, where content is presented in structured manner. A lot of tools can be used to explore the content including the advanced find and semantic search functions. A very good feature is possibility of comparison of existing services and their level of implementation with other Western Balkan Countries and also with EU. Probably the most important knowledge exploited from content data and information in the web site is the know-how, the experience of implementation, addressing all key obstacles and solutions realized in this process. The stakeholders can access the system irrelevant of the geographical position and time limits. The only constraint is access to Internet. The web browser is the tool to access the appropriate web site and its functionalities.

The communication tools concern not only messaging, but also discussion forums, meetings and Q&A sessions. E-mails represent asynchronous communication tool for messaging. Live meetings are the most usual form of human networking and electronic discussion forums are used for initiating sessions for a given topic, where the community, including experts and other stakeholders keep updated info about relevant topics. They use these forums for sharing the knowledge and having common understanding to face the problems and find solutions in different environments.

4.2   We-Go Knowledge Net system requirements

4.2.1   Identification of system modules

System modules of the We-Go Knowledge Net about eGovernment services are identified to be:

- repository of resources (including stakeholders, physical resources, legislation and governance aspects);

- repository of eGovernment services, (including description of their characteristics, and know-how of implementation and integration issues);

- search and comparison tools (including advanced find, semantic search and comparison);

- messaging and communication tools (including e-mails, discussion forums, Q&A sessions etc.);

- portal of news and events (including archive of past events with presentations, discussions, recommendations, and also announcements of future activities).

The repository of stakeholders and resources is the system module intended to organize and store information about all resources, including human resources - stakeholders, then physical resources and other resources which define governance aspects for eGovernment services. This repository functions as a database of relevant information for providers and clients (stakeholders); then for geographic regions, data and IT components (physical resources); and mandate, funding model, standards and security policy (governance aspects).

The repository of eGovernment services is the system module which organizes and stores basic data about services, administrative processes and purposes. It is the system module where all the relations between eGovernment services and data objects from repository of stakeholders and resources are defined and stored. These relations are lately used for search functions and identification, used to extract information and build knowledge about eGovernment service implementation and integration.

The search and comparison tools include advanced find, semantic search and comparison functionalities. These tools enable a typical We-Go Knowledge Net stakeholder to use relations defined in the repository of eGovernment services to find relevant info in both repositories of eGovernment services and stakeholders and resources, i.e. to exploit knowledge from mass information and data stored as content for eGovernment services.

Messaging and communication tools include different forms for asynchronous messaging like e-mails, discussion forums, Q&A sessions etc. We-Go Knowledge Net also includes synchronous forms like life meetings, and different presentation forms where on-line or life human interaction is required to enable discussion.

The portal of news and events functions is a module that offers updated info about latest news and events. All these system modules and their basic functions are presented in Figure 7.
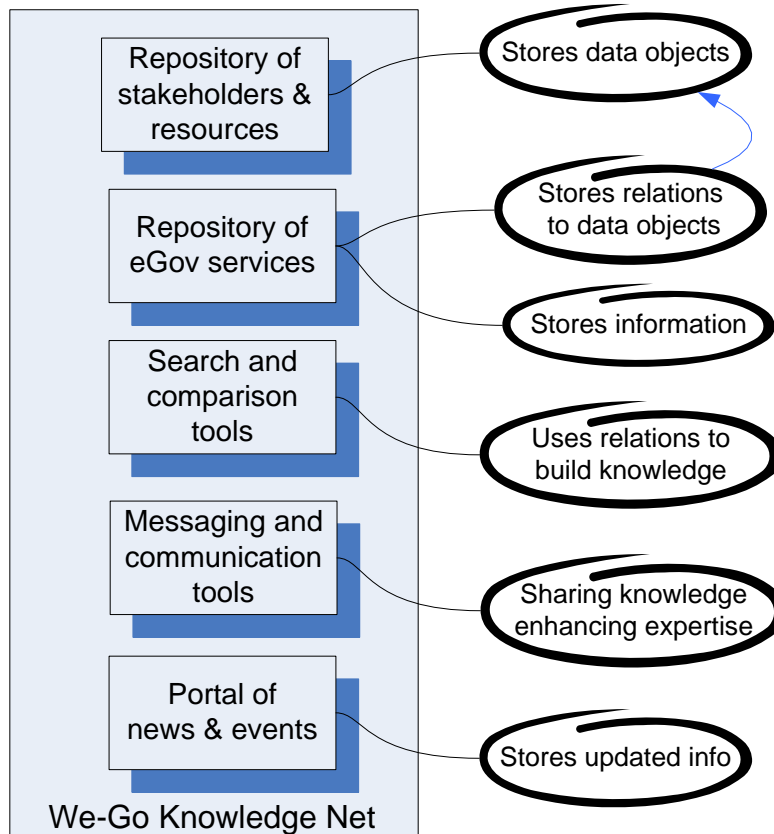
Figure 7 :   What are the We-Go Knowledge Net system modules?

4.2.2 Functionalities

The basic functionalities of the We-Go Knowledge Net are presented in Figure 8.

The We-Go Knowledge Net community is established by identifying relevant eGovernment stakeholders. Stakeholders include all government ministries and offices responsible for delivery of governmental services, including agencies and public community organizations which support or realize delivery of these services. Stakeholders are also the economic chambers, ICT industry and all those directly or indirectly involved in the process of eGovernment services, as partial service providers or as business customers. Stakeholders can be also associations and non-governmental associations which represent citizens or their interests as final citizen customers of eGovernment services.

We-Go team participants produced all other relevant conditions to establish the We-Go Knowledge Net. These activities include: deep analysis of level of implementation of eGovernment services; collection of information about existing EU services; comparison and matching among WBC and to EU. The desktop research is just one delivery which describes this relevant information as collection of content what is the current situation. We-Go project also produced recommendations that support further actions and help realization of WBC information society strategy and action plans. These essential data content and information will be given in localized and in translated form to enable easy access (in local language) and comparison to other cases (in English language, as in ePractice.eu portal). It will provide information about level of usability, interactivity and level of on-line sophistication of eGovernment service realization, and conditions to analyse interoperability issues.
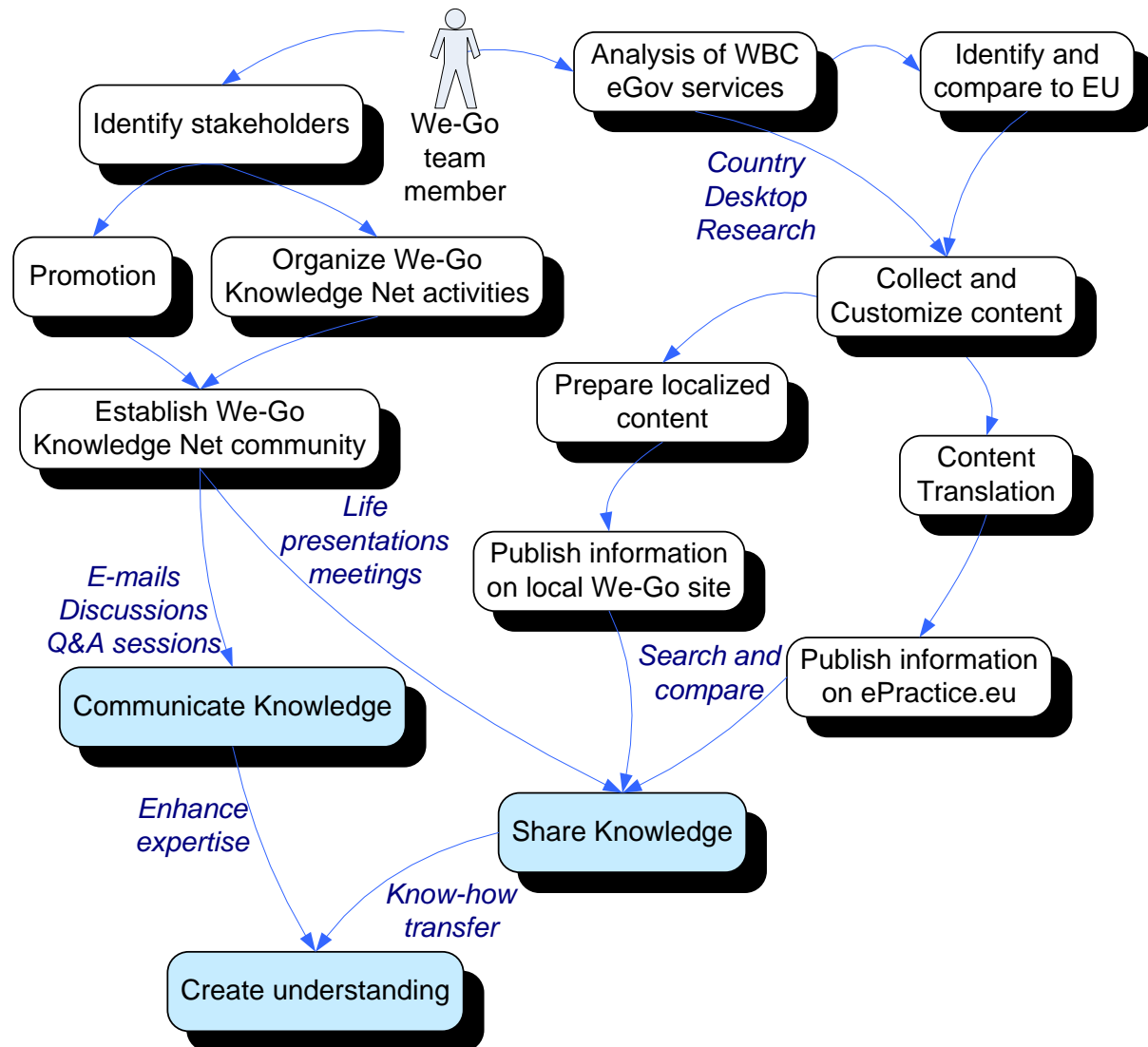
Figure 8 :   What are the We-Go Knowledge Net functionalities?

The information about system modules of the We-Go Knowledge Net is distributed to stakeholders by live presentations, distribution of leaflets or e-mail messaging. This is a part of promotion phase to establish the We-Go Knowledge Net. Initiation of local We-Go web sites in all Western Balkan Countries will make available offer of localized and customized content. The content in these web sites also refer to ePractice.eu as central portal in EU where exhaustive information about realized services can be found. The advanced find (and further development of semantic search) and comparison tools offer possibility to exploit the relations among different services and their implementation issues in order to extract knowledge and understanding about implementation details, obstacles and realized solutions in integration process with enhanced interoperability.

Messaging and communication tools realized in the We-Go Knowledge Net offer a possibility to share the knowledge and enhance the expertise about eGovernment services and further to build understanding about "know-how" transfer.

Portal of news and events keeps updated information about realized past activities and planned future activities, in order to motivate active participation of stakeholders. They also introduce the possibility to initiate implementation of new services and projects.

4.2.3 Functional (Feature) Requirements

This chapter describes the functional feature requirements of the We-Go Knowledge Net system by identifying essential functions that have to be realized by the system, specified as follows.

The We-Go Knowledge Net system must:

- provide functionalities to manage users – stakeholders by enabling access; messaging and communication tools. Managing means not just updating repository of stakeholders, but also promotion of We-Go Knowledge Net and animating bigger We-Go Knowledge Net community.

- provide functionalities to update data content and information about eGovernment services, their characteristics, implementation details and inherited relations. It also means to provide functionality to update supporting information about news and events, contact information about stakeholders or discussion forums and public Q&A sessions.

- be able to present data content about eGovernment services and display the complete information for each service by analysing relations among data objects.

- provide search and comparison tools for eGovernment services (including advanced find, semantic search and comparison tool). These tools have intention to show relations between different services, stakeholders and resources used in the service. These tools will be used to build knowledge about eGovernment services by analyzing provided information and conceptual reasoning for their implementation and integration with interoperability according to EU practice and standards.

- provide messaging and communication tools to support knowledge sharing and enhancing expertise about eGovernment services and create common understanding about know-how to implement a given eGovernment service. Selected stakeholders may join special delivery channels where a certain topic about eGovernment service is subject of discussion and deep analysis.

- provide access to eGovernment supporting information, like contact information of stakeholders, communication channels, list of upcoming events, photos and news etc.

4.2.4 Non-Functional requirements

This chapter describes the non-functional feature requirements of the We-Go Knowledge Net system by identifying other non-functional requirements necessary to enable system functioning, specified as follows.

The We-Go Knowledge Net system:

- is not intended for direct access to eGovernment services, i.e. it is not a governmental portal of eServices. The main intention is to present data content and information about eGovernment services' realization, functionalities and characteristics.

- will not provide info about customer satisfaction of eGovernment services, usability, efficiency, performance, reliability and portability, other than information entered by responsible officer.

- will not require any legislation documents for the Knowledge Net community

- will not address ethical, cultural, religious or other issues

- will not address privacy and other safety issues

4.3   Factors of realization

4.3.1   We-Go Knowledge Net assumptions and risks

The assumptions indentified in realization of We-Go Knowledge Net are the following:

- Each relevant Western Balkan Country governmental organization participating as stakeholder in the We-Go Knowledge Net is expected to appoint a power user from staff members to maintain the relevant information about eGovernment best practice projects or eGovernment service.

- Stakeholders as participants in the We-Go Knowledge Net would be interested to share and communicate their knowledge

The risks identified in realization of the We-Go Knowledge Net can be summarized as:

- Too few stakeholders may use the system

- Local barriers prohibit sharing and communication of information

- Most of entered best practice cases have incomplete information

- Stakeholders are not informed about the existence of such a system

- Unanticipated differences, like cultural, regional, etc., will make the system unusable

4.3.2   Indicators of achievement and success criteria

The indicators of achievement will show how successful is We-Go Knowledge Net. They are listed as follows:

- Increased knowledge and understanding about level of implementation and characteristics of realized governmental services by using eGovernment services

- Identification of stakeholders for various eGovernment services

- Establishing electronic communication and messaging channels for various eGovernment topics

- Inspiring and initiating new eGovernment solutions

- Identification of interested visitors and customization towards their needs

- Statistics about implemented services and status of on-going projects

- Statistics about realization of action plans and quality of realized services

- Specification of services and possibility for integration of cross-border cases

The success of the We-Go Knowledge Net, and the We-Go project overall, will be measured according the following criteria:

- The number of eGovernment projects in WBC has increased,

- The level of implementation of eGovernment services for a country has increased, and

- Interoperability issues and cross-borders cases are addressed in of eGovernment services.

5. References

[1] Oxford English Dictionary

[2] Ackoff, R. L., "From Data to Wisdom", Journal of Applies Systems Analysis, Volume 16, 1989 p 3-9.

[3] Gene Bellinger, Durval Castro, Anthony Mills, Data, Information, Knowledge, and Wisdom, http://www.systems-thinking.org/dikw/dikw.htm

[4] Nikhil Sharma, The Origin of the Data Information Knowledge Wisdom Hierarchy, 11/01/2004 http://www-personal.si.umich.edu/~nsharma/dikw_origin.htm

[5] http://en.wikipedia.org/wiki/Knowledge_networking

[6] David Skyrme, Knowledge Networking http://www.skyrme.com/insights/10knet.htm

[7] David Skyrme, Knowledge Management http://www.skyrme.com/insights/22km.htm

[8] Gilbert J. B. Probst, Practical Knowledge Management: A Model That Works; know.unige.ch/publications/Prismartikel.PDF

[9] http://en.wikipedia.org/wiki/The_UK_Government's_Knowledge_Network_Programme

SIXTH FRAMEWORK PROGRAMME

Call title: IST Call 6, Call identifier: FP6-2005-IST-6, Area: 2.6.5: International Cooperation
Instrument: Coordination Action (CA)

2.6.5.1. International cooperation for e-Government and eParticipation
Target countries: Western Balkan

Contract for: **COORDINATION ACTION**

Work Package 4- Knowledge Net
Deliverable D.4.1.2.
Evaluation of open standards for registries

Version:1.0,
Date:8.7.2008

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Document Control

Contributors

Person	Role	Organisation	Contribution
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Table of Contents

Summary

This document gives overview of technology to be used for realization of the We-Go Knowledge Net. The main characteristic of technology is to allow independence of operating systems, country specifics and other irrelevant attributes. This is the reason why the service oriented architecture is the only alternative in development of the solution. In addition we give overview on semantic search as it is the essential tool in achieving goals of the We-Go Knowledge Net.

In this document we give state of the art in Service Oriented Architectures used for e-Government services and also for on-going EU projects on e-government ontology. After analysing the current on-going projects and its results we give comparison about different models and approaches and comment what is essential to be used for We-Go Knowledge Net.

1. Introduction to technology approach

1.1   Technology

1.1.1   Service Oriented Architecture

The essence of Service Oriented Architecture (SOA) is a computational model based on remote service invocation. SOA is not a computing architecture but a style of programming that has yet to be defined. SOA provides no guidelines as to how services and service invocations are to be used, the granularity of a service, service design, service reuse, and so forth. In fact, SOA contains all of the familiar challenges of computer science in the SOA context.

SOA is considered an evolution rather than a revolution and captures many of the best practices of previous software architectures. Two core challenges of conventional computing that are not addressed by SOA are search and integration, which on its own accounts for half of the development cost of all information systems. Not only does SOA provide a basis for addressing these challenges, SOA significantly and fundamentally depends on solutions to fill the semantic gap to achieve its potential. Consider the following. SOA provides the potential of a global registry in which to search for services anywhere in the network. This is referred to as service discovery. SOA provides the potential of invoking remote services to achieve the combined results of those services. This requires that the services interoperate or integrate with respect to their respective data, protocol, and process syntax and semantics. The obvious and common challenge faced in SOA is managing services metadata.

1.1.2   Semantic search

For SOA to achieve its benefits in a reasonable scale, SOA requires discovery, orchestration / composition, and integration / adaptation to be meaningful and dynamic. Such SOA is called Semantically Enabled Service Architecture (SESA). There are already several specifications for Web Services but there are still elements missing. For instance there is no specification describing how the particular components/services of the semantic web services infrastructure would work together. The SESA vision as described by the researcher from the DERI institute [DERI, 2008] consists of:

- The problem-solving layer which consists of Ontologies, Applications, and Developer tools.
- The broker layer which consists of Discovery, Adaptation, Composition , Choreography, Mediation , Grounding, Fault, and Monitoring.
- The base layer that is providing the exchange formalism used by the architecture, i.e., Formal languages, Reasoning, and Storage and Communication.
- Finally, vertical services such as Execution management, and Security.

We expect that in near future a service-oriented world will consist of an uncountable number of services. The process of service use will involve services searching for services based on functional and non-functional requirements.

2. State of the art in Service Oriented Architecture

Considerable research has been completed and is under way to realize the potential of semantically enabled SOA. This section reviews four relevant research initiatives, OWL-S, SWSF, IRS-III, and WSDL-S, each of which has gained some momentum and addresses some pragmatic aspects. Each initiative can be characterized in terms of a conceptual model describing the underlying principles and assumptions, and a language or a set of languages that provide the means to realize the model.

2.1 OWL-S

2.1.1 Introduction

OWL-S [OWL-S, 2004] specifies a set of ontologies based on OWL which are used to describe the different aspects of a Semantic Web Service. OWL-S defines its meta-model using the Web Ontology Language, the same language that it uses for a concrete description.

OWL-S is meant to support both atomic and complex categories of services, but complex services have motivated many of the ontology's elements. There are three task types that are expected for OWL-S to enable:

- Automatic Web service discovery is an automated process for location of web services that provides a particular class of service capabilities.

- Automatic Web service invocation is the automatic invocation of a web service by a software or agent, having only a declarative description of that service, as opposed to when the agent has been previously enabled to call that particular service.

- Automatic Web service composition and interoperation involves automatic selection, composition, and interoperation of web services to perform some complex task, given a description of a user goal.

2.1.2 Description

The model is described by three sub-ontologies, known as service profile, service model, and grounding, as illustrated in Diagram 1. The service profile is used to express "what a service does" for purposes of advertising, constructing service requests, and matchmaking. It can be used to reference both non-functional descriptions and existing categorization schemes or ontologies. The most essential information presented in the profile is the specification of what functionality the service provides, the information transformation represented by inputs and outputs of the service and the state change produced by the execution of the service (which is represented by the preconditions and effects of the service).
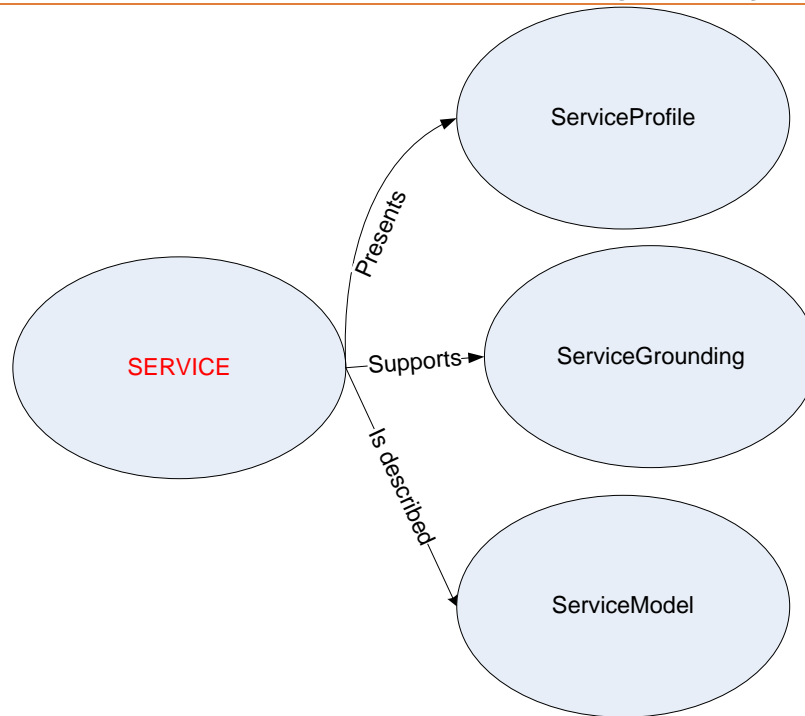
Figure 1 : What is the OWL'S Conceptual Model?

The service model is used to describe "how a service works" to enable invocation, composition, monitoring and recovery. The interaction is viewed as a process. A process is not necessarily a program to be executed, but rather a specification of ways a client may interact with a service.

The service grounding maps the constructs of the process model to detailed specifications of message formats and protocols.

The upper ontology for services specifies only two constraints: a service can be described by at most one service model, and grounding must be associated with exactly one service. OWL-S defines one particular upper ontology for profiles, one for service models, and one for groundings, nevertheless OWL-S allows for the construction of alternative approaches in each case.

In order to give a detailed perspective on how to interact with a service in OWL-S, it can be viewed as a process. It is important to understand that a process is not a program to be executed. It is a specification of the ways a client may interact with a service. An atomic process is a description of a service that expects one message and returns one message in response. A composite process is one that maintains some state; each message the client sends advances it through the process. Usually a complex service is a composite of several atomic services.

The primary language used for description of services is the web ontology language (OWL), however it soon became clear that it is not sufficiently expressive for all aspects of a service, hence other more expressive languages have been syntactically integrated: SWRL ([SWRL, 2003]), KIF ([KIF, 1998]), DRS, and PDDL ([PDDL, 1998]). By reusing OWL as a recommended standard OWL-S gained considerable momentum. However, it has the disadvantage of the need to embrace more expressive languages into the framework which then opens new research questions on interaction.

2.2 WSDL-S

2.2.1 Introduction

WSDL-S [Akkiraju et al., 2005] proposes a mechanism to supplement Web service functional descriptions with semantics, as represented by WSDL [WSDL, 2005]. This work is a refinement of a proposal developed by the Meteor-S group. WSDL-S describes a mechanism to link this semantic model with the syntactic functional description captured by WSDL.

WSDL-S is an evolutionary upgrade of the existing web services standards, and more specifically web service descriptions. In this approach, WSDL employs concepts analogous to those in OWL-S while being agnostic to the semantic representation language. The users can in compatible way describe both the semantics and operation level details in WSDL but also for the semantic domain models use languages of free choice.

The WSDL-S specification is build upon the following principles:

- Build on existing Web Services standards.

- The mechanism for annotating web services with semantics support the user's choice of the semantic representation language.

- The mechanism for annotating web services with semantics allows the association of multiple annotations written in different semantic representation languages.

- Support semantic annotation of web services whose data types are described in XML schema.

- Provide support for rich mapping mechanisms between web service schema types and ontologies.

2.2.2 Description

Using the extensibility elements of WSDL, a set of annotations can be created to semantically describe the inputs, outputs and operations of a Web service. This method keeps the semantic model outside WSDL, making the approach agnostic to any ontology representation language as illustrated in Diagram 2. The WSDL document forms the anchor point for web services description. This document provides mechanisms to annotate the service and its inputs, outputs and operations. Additionally, it provides mechanisms to specify and annotate preconditions and effects of web Services. The preconditions and effects together with the semantic annotations of inputs and outputs enable automation of the process of service discovery.
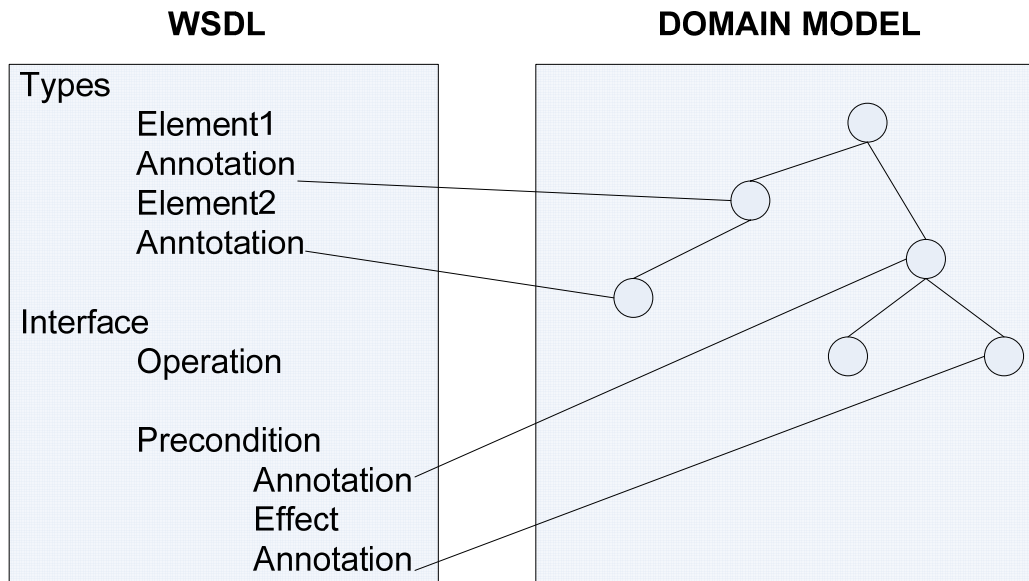
WSDL   **DOMAIN MODEL**

Figure 2 : How WSDL Mapping is realized?

WSDL-S aims to build on existing Web services' standards and promotes a compatible mechanism for adding semantics to Web services. Annotations are used for adding semantics to input and output descriptions. In addition, the creation of mappings between the XML Schema complex types and the corresponding ontological concepts is important and corresponding attributes are included in WSDL-S.

WSDL-S proposes an extension to WSDL. Following the principle of reusing the typing information given in the XML, the schemaMapping and modelReference allow the mapping to the ontology language to be used as semantic annotation. A category attribute can be used for classification and precondition and effects can be used for the annotation of operation functionality. Each of these elements can be used to create annotations, whereas WSDL-S does not imply a specific language but just includes some recommendation of usage of the extensions.

WSDL-S is focused on how to annotate services. It presents a mechanism to add categorization information to services which could be used while publishing services in registries such as UDDI. Users can choose any categorization of their choice such as NAICS, UNSPSC, and GICS. This aids in service discovery by narrowing the range of candidate services. The categorization can be used as input when the service is published in a UDDI registry or it can constitute the effective categorization when the service is made available via WSIL. Service categorization is also aimed at supporting specialized taxonomies of middleware or utility services such as mediators. The objective is to ensure that there is basic and high-level categorization information about a service and leave the details of actual categorization system and maintenance of taxonomies and classifications to the underlying service registries. This concept of associating service categorization information is borrowed from OWL-S but here it is adapted to work within the parameters of WSDL specification.

Another important aspect is the support of Quality of Service (QoS) assertions for web services. The effort is quite limited, because the intent in specification document is to stay close to the WSDL specification and yet accommodate the much needed semantics for web service descriptions as much as possible.

2.3   SWSF

2.3.1   Introduction

Semantic Web Services Framework (SWSF) [SWSF, 2005] is one of the newest approaches for Semantic Web Services. It is being proposed and promoted by Semantic Web Services Language Committee (SWSLC) of the Semantic Web Services Initiative (SWSI).

SWSL is a logic-based language used in this initiative for specifying formal characterizations of service concepts and descriptions of individual services. It includes two sublanguages: SWSL-FOL, a full first-order logic language, which is used to specify the service ontology (SWSO), and SWSL-Rules, a rule-based sublanguage, which can be used both as a specification and an implementation language. As a language, SWSL is domain-independent and does not include any constructs specific to services.

2.3.2   Description

The Semantic Web Services Ontology (SWSO) has been based on OWL-S and shares its three concepts: profile, model and grounding as described in the previous section. Thus SWSO can be seen as an extension or refinement of OWL-S. Although there are many similarities with the OWL-S ontologies, one important difference is the expressiveness of the underlying language.

In the SWSF approach there are two independent languages. In the following we briefly review the ontology as it is described in the FLOWS variant - First Order Logic Ontology for Web services. The second language, ROWS -Rule Ontology for Web services, shares the conceptual model but provides a different set of concrete semantics which relies on Logic Programming semantics.

Another fundamental aspect is a rich behavioural process model based on the Process Specification Language (PSL) [Gruninger, 2003]. The Process Model is that part of the FLOWS ontology, which offers constructs to describe the behaviour of the service based on the Process Specification Language (PSL) approach, by adding two fundamental elements:

- the structured notion of atomic process as found in OWL-S and
- the infrastructure for specifying various forms of data flow.

The core part of the PSL extended by FLOWS is called PSL Outer Core and the resulting FLOWS sub-ontology is called FLOWS-Core. The process ontology is made up of six parts that are divided according to their expressivity such as ordering constraints and occurrence constraints.

SWSL comes in two variants: SWSL-FOL and SWSL-Rules. Both languages are layered languages where every layer includes a number of new concepts that enhance the modelling power of the language. This means it is richer and more expressive than OWL-S which is based on OWL-DL, Description Logics formalism. Being based on First Order Logic, FLOWS makes use of logic predicates and terms to model the state of the world. Features from situation calculus, like the use of fluents, predicates, and terms which vary over time, were introduced to model the change of the world.

SWSL-Rules is a logic programming language, which includes features from Courteous logic programs [Grosof, 1999], HiLog [Chen and Kifer, 1993] and F-Logic [Kifer et al., 1995] and can be seen as both a specification and implementation language. SWSL-Rules language

provides support for service related tasks such as discovery, contacting, and policy specification.

SWSL includes two separate sublanguages because different tasks associated with semantic web services are better served by different knowledge representation formalisms. Because SWSL-Rules is a rule-based language with non-monotonic semantics it is better suited for tasks that include service discovery, contracting, policy specification, and others. On the contrary, the first-order logic in SWSL-FOL is found more suitable for specifying process ontologies.

2.4   IRS-III and WSMO

2.4.1   Introduction

IRS-III [Domingue et al., 2004] is a framework and an implemented platform that acts as a broker mediating between the goals of a user or client and available deployed Web services. Thus the IRS is not a framework on its own but uses WSMO as its ontology and follows the WSMO design principles.

This framework is based on the following selected design principles:

Clean ontological separation of user and web service contexts - In each case the client will exist in its own context which should be modelled within the semantic descriptions that will be quite different from that of the web service.

Capability based invocation - The IRS acts as a broker finding, composing and invoking appropriate web services in order to fulfil the request.

Ease of use - The IRS-III browser hides some of the complexity of underling ontology by bundling up related class definitions into a single tabbed dialog window.

Agnostic to service implementation platform - Within the design of the IRS there are no strong assumptions about the underlying service implementation platform.

Connected to the external environment - this environment offers reasoning tools about the user's status.

Interoperable with SWS frameworks and platforms – As far as possible SWS frameworks and platforms should be interoperable. For this reason IRS-III has an OWL-S import mechanism and is interoperable with the WSMO reference implementation WSMX.

2.4.2   Description

IRS-III is based on the idea that the content and form are easily understandable by semantic web service application builders. Many of the direct principles of IRIs are application focused, but one can say that it largely follows the problem solving approach. The IRS-III ontology is based on the WSMO conceptual model; however it has a number of differences. To achieve the goal of capability based invocation, Web services are required to have input and output roles and goals are linked to Web services via mediators. Web services are linked to goals 'inherit' to the goal's input and output roles. In WSMO, the mediation service slot of a mediator may point to a goal that declaratively describes the mapping. Goals in a mediation service context play a slightly different role in IRS-III. Rather than describing a mapping, goals are considered to have associated Web services and are therefore simply invoked. IRS clients are assumed to be able to formulate their request as a goal instance. This means that it is only required choreographies between the IRS and the deployed Web services. IRS-III choreography execution thus occurs from a client perspective [Domingue et al., 2005].

At the heart of the server is the WSMO library where the WSMO definitions are stored using the representation language OCML [Motta, 1998]. The library is structured into knowledge models for WSMO goals, Web services and mediators. The structure of each knowledge model is similar but typically the applications consist of mediator models importing from relevant goal and Web service models. Following the design principle of transparency, all information relevant to a Web service is stored explicitly within the library.

Web service within WSMO is associated with an interface that contains a separate orchestration and choreography. Orchestration specifies the control and dataflow of a Web

service, which invokes other Web services (a composite Web service). Choreography specifies how to communicate with a Web service. The choreography component communicates with an invocation module able to generate the required messages in SOAP format. A mediation handler provides functionality to interpret WSMO mediator descriptions including running data mediation rules, invoking mediation services and connecting multiple mediators together. At the lowest level the IRS-III Server uses an HTTP server written in LISP [Riva and Ramoni, 1996] extended with a SOAP [SOAP, 2003] handler.

2.5 Comparison and applicability towards We-Go Knowledge Net

2.5.1 Comparison of advantages/disadvantages

OWL-S is based on OWL that was not designed to define the semantics of processes that require rich definitions of their functionality. OWL-S inherits some of the drawbacks of OWL including lack of proper layering between RDFS, less expressive species of OWL, and lack of proper layering between OWL DL and OWL Lite, on the one side, and OWL Full on the other.

The SWSF approach can be seen as an attempt to extend on the work of OWL-S and to incorporate a variety of capabilities not included in the OWL-S goals. A difference between FLOWS, the ontology part of SWSF, and OWL-S is the expressive power of the underlying language. FLOWS is based on First Order Logic, which means that it can express considerably more than can be expressed with OWL-DL. Although the SWSF approach seems to tackle both conceptual modelling, as well as language issues, it is very unclear how the various differing paradigms interact. Moreover, the purpose of FLOWS was not to develop a Web language, but rather to develop First Order Logic ontology for Web services.

The IRS-III approach is integrated with the WSMO approach as it uses WSMO as its underlying epistemological framework. IRS-III places great emphasis on creating a capability based broker, simple publication, tightly coupled \semantic descriptions with deployed Web services.

The WSDL-S approach is a more technology centred strategy, where rather than providing a conceptual model for the description of Web services and their related aspects, it takes a bottom-up approach by annotating existing standards with metadata. WSDL-S can actually be used to represent a grounding mechanism for WSMO.

2.5.2 Applicability towards We-Go Knowledge Net

We feel that WSMO is a promising model that can be applied in the scope of the We-Go Knowledge Net. Even though, it is more a model that an implementation. The ideas presented in this model are very important for creating a real semantically enabled registry for E-Government services. We must also underline that the ideas presented in this model might take years to implement.

We identify that WSMO has a positive approach towards the semantic vision as it overcomes the drawbacks discussed above. WSMO was designed to overcome this limitation by providing different layers of expressivity, thus allowing rich definitions of Web services. We find that OWL-S does not make any explicit distinction between Web service communication and cooperation. On the contrary, WSMO makes this distinction in terms of Web service choreography and orchestration.

As WSMO is the underlying framework of IRS-III and WSDLS, we can conclude that WSDLS and IRS-III can actually be used to represent a grounding mechanism for WSMO.

2.5.3 Standardization Efforts

Standardization organizations such as OASIS, OMG, and W3C have established several technical committees to standardize SOA.

OASIS Semantic Execution Environment (SEE) TC [OASIS, 2007] aims to continue work initiated by the WSMX project and several other European Union projects from the area of

Semantic Web Services. The aim of the SEE TC is to provide guidelines, justifications and implementation directions for an execution environment for Semantic Web Services. The resulting architecture will incorporate the application of semantics to service-oriented systems and will provide intelligent mechanisms for consuming Semantic Web Services.

OASIS SOA Reference Model (RM) TC [OASIS, 2007] aims to develop a Reference Model for Service-Oriented Architecture. The Reference Model is being developed to encourage the continued growth of different and specialized SOA implementations whilst preserving a common layer of understanding about what SOA is.

OASIS also hosts several TCs whose work relates to SESA vision, for example, ebXML Registry TC, UDDI TC, FWSI TC, SOA Adoption Blueprints TC and ebXML BP TC.

While W3C [W3C, 2007] does not address issues specifically related to Service-Oriented Architectures, the results of several W3C groups are crucial to the realization of the vision like the groups: Semantics for Web Services Characterization Group, and Semantic Annotations for WSDL Working Group.

OMG [OMG, 2006] has also recognized the importance of Service-Oriented Architectures and established an SOA Working Group in 2006. Even though SOA is widely accepted as the next generation of computing to which most software vendors are committed, standards are still evolving. From 2000 to 2007 SOA standards grew enormously in number and complexity with few reference technologies.

3. Projects for E-Government Ontologies

3.1　ePractice.eu

3.1.1　Objective

According to the "About us" information on the ePractice site [EPRAC, 2008], this portal is created by the European Commission which offers a new service for the professional community of eGovernment, eInclusion and eHealth practitioners. The portal includes interactive initiative that empowers its users to discuss and influence open government, policy-making and the way in which public administrations operate and deliver services.

The project ePractice.eu involves practitioners from all 27 Member States, EU-member candidate states and EFTA countries. Practitioners from other countries outside the EU are also welcome to join.

The ePractice.eu portal includes live activities with offline content: workshops, meetings and presentations. It has a large knowledge base of case studies from members from across Europe. This portal becomes a point of reference for all users. By publishing on ePractice.eu, cases will be available to the most interesting target groups of European experts and other broad public which could comment and give advice on a particular subject.

3.1.2　Functionalities

The portal enables users to publish their real cases on the site. This portal enables peers from across Europe to meet and expand their professional networks by creating a personal profile. It eases the access to experience in order to learn from the experience of others. The areas that are main focus of the portal are:

- eParticipation
- Administrative burden
- Pan-European services
- High impact online portals
- Open Source and standardisation
- Customer centricity
- Organisational change and leadership
- Service delivery
- Laws and regulations
- eInclusion
- eHealth

The site offers several possibilities to access information. This site is EU sponsored platform where eGovernment, eInclusion and eHealth practitioners can meet, share and learn. More than 700 case studies published by ePractice.eu members are the basis of knowledge exchange. The cases are rated and can qualify for the special labels. Information about the upcoming European and worldwide can be found in the updated events calendar. The library count more than 600 items and it is the repository of reference for all related documents. More about the 32 European countries can be read in the country fact-sheets which inform in

detail about eGovernment facts of each of the countries. The ePractice community today counts over 11.500 members. The public profile allows ePractice members to get to know each other and cooperate. The most contributing members are awarded Kudos. Apart from in-house workshops, co-branded workshops with other organisations and communities complete are also in the agenda. Tore to the online text content is the ePracticeTV that offers 2 minutes learning pills on up-to-date themes related to eGovernment, eInclusion and eHealth. On the TV channel you can find interviews with main players and professionals, as well as information on upcoming events. Further there is blog that allows members to discuss related themes, announce events, post, and information. There are more than 2.600 already published news in the portal. In addition the weekly ePractice Newsletter keeps members up-to-date with the latest developments and initiatives in the area. The portal also hosts an array of communities that gather members with a common interest using the state-of-the-art exchange tools of ePractice. The service also publishes the European Journal of ePractice which is a peer reviewed on-line publication on ePractices.

The portal has advanced search capabilities. The search can be narrowed by match of any term, match of all terms, search by country, browse by domain, find only in groups, and date sequence. The search is key-based with advanced organizational structures. Even though it is not a semantic search, one can conclude that this is probably the most comprehensive portal for the practitioners in the area of eGovernment in Europe.

3.2   Knowledge Network

3.2.1   Objective

Wikipedia [WIKI, 2008] defines this project as "the Knowledge Network (KN) is a world first - a government-wide electronic communication tool helping government departments to share knowledge with each other, and work online with colleagues across government."

It was launched in December 1999 after 6 months of preparation and planning, in July 2000. Following 6 years of being run in-house, since 1 April 2006, it has been run on behalf of the UK Government as an out-sourced service.

The Knowledge Network was introduced as a communications tool and technique developed by the Labour Party in opposition in the period running up to their 1997 election victory. It is a massive computer database, which is updated 24 hours a day as news breaks to tell the ministers what to say about Government policies and to give instant rebuttal to negative stories.

3.2.2   Functionalities

The project description is not available on www.knowledgenetwork.gov.uk, known to be its official Internet site. What can be learned from Wikipedia and other reliable sources is that this project has the following features:

- A series of online departmental ministerial policy briefing systems;
- CabCom – a community for Ministerial Private Office staff to share papers and background knowledge to prepare Ministers for Cabinet Committees;
- The Electronic Library for Government – including key policy resources, job opportunities and professional development resources;
- FCO Ecpolnet– a secure global community for economic policy analysts in embassies around the world to share economic knowledge;
- EUPol - helps to provide UK embassies in the EU with up to date knowledge on the UK's engagement with the EU and Member States;
- SDNet – the officials throughout the world can share information and knowledge on environment and sustainable development issues;
- StatNet – this tool helps improve communication across government and provides a link to important GSS documents and facilities;
- Knowledge Pool - for the Cabinet Office Performance and Innovation Unit to link together policy experts and to lay the foundations for true evidence-based policy making;
- Government Legal Service, called LION (Legal Information Online Network) - to enable its members to better co-ordinate their activities and share strategic legal information with over 2,500 active members;
- WorldSearch - contains information about social security and pensions, education and training, as well as labour market policy from around the world.

Even though it is not a purely semantic project, nor it introduces ontologies, it is a revolutionary project in practice that proves that organized, consistent and accurate information is very valuable.

3.3　SmartGov

3.3.1　Objective

The overall aim of the SmartGov project [SMARTGOV, 2006] is to specify, develop, deploy and evaluate a knowledge-based platform to assist public sector employees to generate online transaction services. This is achieved by simplifying the development, maintenance and integration with already installed IT systems. The SmartGov project, through its software platform, aims to minimize the reliance on IT skills to develop E-Government services. However, E-Government also brings new styles of communicating, new behaviours, new organizational structures, new processes, new paradigms, new threats and new opportunities.

3.3.2　Functionalities

The SmartGov project defines several types of ontologies. The Enterprise Ontology was defined by the Artificial Intelligence Applications Institute at The University of Edinburgh with the goal of creating a collection of terms and definitions relevant to business enterprises. Since its publication, the ontology has become widely accepted as a useful ontology of generic business activities. Recognizing that many of these activities are common with public authorities, the E-Government service ontology can be built around it.

The Enterprise Ontology defines concepts within four broad categories: activity, organization, strategy and marketing; it also imports a standard ontology of time. Some of the concepts formally defined within the Enterprise Ontology are listed below:

- Activity (Activity, Execute, Effect…)
- Organization (Person, Machine, Legal Ownership…)
- Strategy (Purpose, Hold Purpose, Risk…)
- Marketing (Actual Customer, Sale, Competitor…)
- Time (Time Interval…)

For the purposes of the SmartGov Project the first three categories of concepts of the Enterprise Ontology are very relevant. In the fourth category, marketing and selling are not activities typically undertaken by a public authority, and there are not usually any competitors. However, there exist many similarities between e.g. a SALE and provision of a SERVICE and with a degree of consideration and slight alteration of their definitions, many of these concepts can still be used.

The Meta ontology provides the basic building blocks that are used to construct the ontology. These are primitives that are defined outside the context of the ontology and for the purposes of the ontology are assumed to have no other meaning than the ones is assigned to them. Since the ontology is based upon the Enterprise Ontology, the Enterprise Meta ontology is the most reasonable starting point for the Meta ontology that is required for the SmartGov project. The terms used in the Enterprise Meta ontology are given below:

- Entity: a fundamental thing in the domain being modelled.
- Relationship: the way that two or more Entities can be associated with each other.
- Role: the way in which an Entity participates in a Relationship.
- Attribute: a Relationship between two Entities (the "attributed entity" and the "value" entity) in which, within the scope of the model, for any particular attributed Entity, the Relationship may exist with only one value.

3.4 E-Power

3.4.1 Objective

E-POWER [EPOWER, 2005] is an IST project under the fifth Framework focusing on a methodological approach for formalizing different forms of legislation into UML models. E-POWER implements a knowledge management solution by providing a method and tools that help to improve the quality of legislation while the enforcement of law is being facilitated. Both method and tools decrease the time to market.

The E-POWER project was directed to achieve among others the following results:

- Develop a method and supporting tools with which legislation can be 'translated' into formal specifications that can be used by computers.

- Develop a pension server for the (European) citizens with which they will be able to analyse their own pension regulations.

One of the objectives was furthermore not only to make this domain more transparent for the citizens but also for insurance companies that offer pension arrangements. The Netherlands aims to open up their pension market to foreign companies but these companies will have to meet certain requirements. The analysis with the E-POWER method also strives to give insights in these requirements. This way it should provide an instrument which could decrease cross border obstacles for pension providers

3.4.2 Functionalities

MetaLex is one of the first official results of the E-POWER project. It provides a generic and easily extensible framework for the XML encoding of the structure and contents of legal and paralegal documents. It differs from other existing metadata schemes for legal documents in two respects: it is language independent and accommodates the use of XML beyond search and presentation services. The MetaLex standard has the following features:

- Multiple Languages -The same content written down in one MetaLex document using multiple languages.

- Version Management and Maintenance - MetaLex uses a comprehensive way to determine the validity and activity of a part of legal text, using four attributes (date-enacted, date-repealed, date-publication, date-effective).

- Extensibility - MetaLex supports mixing with other XML-based standards such as XHTML.

- Exchange -MetaLex is a comprehensive format for exchange between different parties.

- Presentation -MetaLex documents can be easily converted into different presentation formats, such as XHTML, PDF, and RTF.

- Search and Filtering -MetaLex facilitates search and filtering on legal documents.

- Overview -MetaLex captures the relations between different legal sources.

The MetaLex proposal was taken over and now is in procession to become CEN standard for Legal open XML ontology interchange standard.

3.5 eGov

3.5.1 Objective

Within the eGOV project [EGOV, 2005], an integrated platform for realizing online one-stop government was developed. This one-stop government platform allows the public sector to provide citizens, business partners and administrative staff with information and public services based on life events and business situations hence increasing the effectiveness, efficiency and quality of public services.

The main objective of the eGOV project was to specify, develop, deploy and demonstrate an integrated platform for realising online one-stop government. The specific objectives as stipulated on the project web site included:

- Specify and develop the next generation of governmental portals featuring advanced characteristics (e.g. personalisation, multilingualism, access from different devices, digital signatures, etc.) that would allow citizens to access public services based on life-events.

- Develop the network architecture that would provide security, authentication, authorisation etc.

- Develop a service repository where all life-events and supporting material (e.g. certificates) would be stored and a service creation environment for the administration of the repository.

- Specify, develop and use the service creation environment in order to create a number of national and local life-events and services or port existing content into the service repository.

- Specify and implement the 'Governmental Markup Language' to enable the data flow between the portal and the service repository.

- Deploy and evaluate the platform in three European countries.

3.5.2 Functionalities

Even though the eGov project does not use ontologies, it is very relevant as it defines the metadata standard that can be extended into ontology for the semantic description of the E-Government services.

At the end of the project lifecycle, the results were:

- Citizens were able to access online public services according to their needs and not the functional fragmentation of the public sector. They experienced high-quality service provision with characteristics which included: personalised content delivery, customisation, support of multilingual content, support of access from different media and support for digital signatures.

- Public authorities were able to administrate the service repository in a user-friendly, intuitive way using a Web interface. They were able to easily join the eGOV system in order for their services to be integrated and provided to citizens through the eGOV portal. The eGOV system was inherently extensible and allowed creation of innovative services

3.6 OntoGov

3.6.1 Objective

The IST OntoGov project [ONTOGOV, 2005] aims is to improve back-office processes by taking into account the whole lifecycle and to develop an ontology-enabled software platform to facilitate consistent composition, re-configuration and evolution of e-government services.

OntoGov is a semantics-based platform for the consistent composition, re-configuration and evolution of e-government services. The goal of the OntoGov project is to improve back-office processes by taking into account the whole lifecycle. The OntoGov system contributes to the bridging of decision-making with technical realisation (e.g. updating the services due to changes in national and European legislation).

3.6.2 Functionalities

In this project, the word "Services" is mostly used as an abbreviation of "Web services" so the top-level ontology is related to services provided by the system rather than to services in an organizational sense. The project concentrates on defining appropriate structures for ontologies rather than on the content of the ontology, something that needs to be filled in by domain experts.

Based on this analysis they define the requirements for an ontology language and develop several ontologies that are necessary for modelling services in the E-Government domain. Further, since modelling is not sufficient for keeping the consistency of the E-Government services, they define a change management framework based on well-known MAPE management model.

The technical contributions of the project are:

- Contribution to existing standardization efforts for web ontologies and web service languages with specific focus on appropriate extensions of these languages in order to meet the e-Government requirements .
- Open Source Tools – the project used the KAON framework in order to support dynamic aspects which are required for the Web Service Reconfiguration
- Improvement in e-government change propagation and traceability of service components

The Web Services Orchestration Registry in the project is an ontology-based repository that stores the mappings between atomic services defined in the service model and Web services that carry on with the task.

The Runtime Framework has a key component, the Process Engine that acts as an orchestration machine extracting the service ontology from the ontologies and proceeding to deliver the request to the first atomic service described in the process model.

In support of the logical architecture described above the project team has defined a set of ontologies:

- Meta ontologies;
- Domain-oriented ontologies;
- Administration ontologies.

3.7   DIP

3.7.1   Objective

DIP's [DIP, 2006] objective has been to develop and extend Semantic Web and Web Service technologies in order to produce a new technology infrastructure for Semantic Web Services (SWS) - an environment in which different web services can discover and cooperate with each other automatically. DIP's long term vision is to deliver the enormous potential benefits of Semantic Web Services to e-Work and e-Commerce.

The main achievements of the project in the scope of ontology are a case study and a comprehensive government Ontology.

3.7.2   Functionalities

The e-Government Ontology has been developed from the seamlessUK data model. This model cannot be considered Ontology at all, as it only is Taxonomy: a description and classification of terms, with some eventual synonyms. For this reason, the project attempted to improve and upgrade this taxonomy into Ontology. The new seamlessUK Ontology (also called here the 'e-Government Ontology') is a more complete model than the initial taxonomy but still lacks strong relations, good groupings of concepts and appropriate semantics.

The objectives that were fulfilled by the project are:

DIP further developed the vision of the Semantic Web based on machine-processable semantics as a new communication and co-operation infrastructure.

- Combine Semantic Web technology with Web Services for semantics-based services. Semantic Web Services provide an infrastructure that revolutionize information processing and enable access to computational resources in general.

- Application of Semantic Web Services as an infrastructure in real world scenarios within an organization and between organizations and its customers, partners and suppliers.

The applications developed in the project are of type:

- Intelligent Information Management – the Semantic Web helps organise and access the vast amount of material on the Web.

- Enterprise Application Integration – the Semantic Web Services enables access to application services that are encapsulated in both old and new applications.

- Dynamic & Smart eCommerce - Semantic Web Services in B2B applications enable virtual and smart organizations in commercial and non-commercial environments.

3.8   CEN Ontology

3.8.1   Objective

The focus group eGovernment Standards Roadmap [EGOVPT, 2007] defines ontology for E-Government services and standards initiatives in the area of eGovernment. This ontology refers to the result of the continued work from the CEN focus work group that defined draft ontology of entities related to eGovernment services as mentioned earlier [Makx, 2007].

The focus group is fulfilling the following objectives:

- Identify and map out the initiatives and services that exist within the detailed scope defined by the Focus Group, including frameworks, naming and design rules, good/best Practices, registries, repositories; and clearing houses, existing standards and specifications, project-based deliverables.

- Involve public administrations' institutions and programmes, including the European Commission's IDABC programme, and EU-funded projects under the IST and other programmes.

- Analyse in particular the standardisation requirements resulting from IDABC's guidelines and studies on the future "architecture" and "infrastructures" for pan-European services.

- Ensure as wide a dissemination of the results as possible, in order to improve awareness within the EU and beyond of these issues, including with standards organizations globally.

3.8.2   Functionalities

Under the initial project from Sun Microsystems, an initial ontology for describing government services and the use of relevant standards was developed and expressed as a topic map. The integration of the ontology into a Topic Map system was then demonstrated.
The Focus Group so far has produced the following reports:

- eGovernment standardization - a manufacturers perspective

- eGovernment standards Roadmap

- Standards and service - descriptions as a Topic Map

- Introduction to New CEN Workshop on Universal Access to eGovernment Resources

We feel that this ontology is the most appropriate for the We-Go ontology and will complexly inherit in the platform. The features will be analyzed in details in the Deliverable 4.1.3.

Here we present a small reference and more comprehensive coverage on the matter can be found in [Makx, 2007] and [CEN, 2008]. The following entities and their attributes are described in this ontology:

- Service - Service provided by or on behalf of a government agency to an audience using data in administrative processes to achieve business purposes

- Administrative process - Process within a government agency that is necessary to provide a service

- Purpose - Goal to be achieved as a result of the successful delivery of a service

- Client/Audience - The intended user or user group for a service

- Data - Distinct pieces of information

- Funding Model - Method of funding of the service and payment regimes

- Geographical Coverage - Geographic area to which the service applies

- IT Components - Elements of technical infrastructure that are or can be building blocks for eGovernment services

- Mandate - Legal context of the service, laws and regulations that govern the provision of the service

- Provider - Organisational entity that is responsible for or involved in the provision of the service

- Security Policy - Conditions and restrictions on the access to and use of the service

- Standard - Technical standards that are used to provide the service

- Subject - Classification or life-cycle event the service is related to

- Temporal Coverage - Period to which the service applies, including start and end dates of service provision

Figure 3 describes how the top level entities in the CEN ontology interrelate.
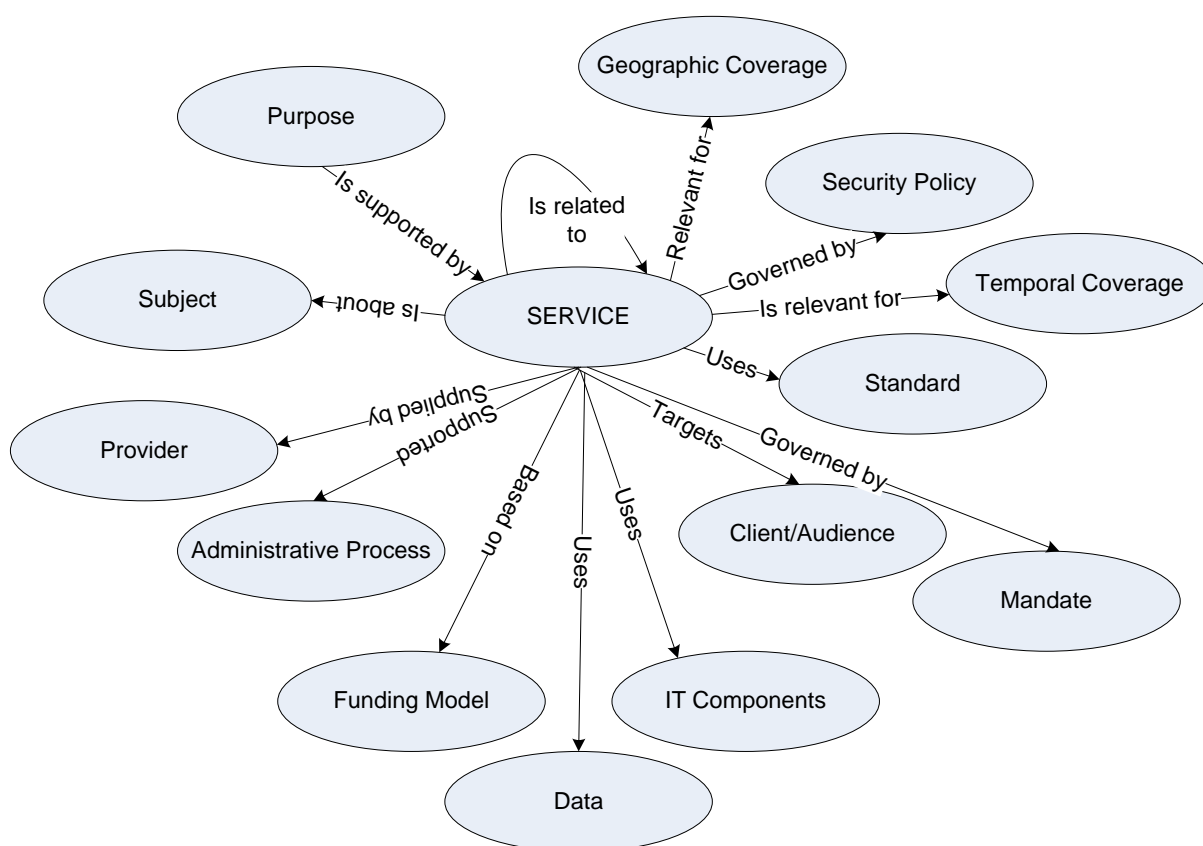
Figure 3 : How top level entities interrelate?

3.9   Comparison and applicability towards We-Go Knowledge Net

3.9.1   Comparison of advantages/disadvantages

Based on overview given above of the projects that are related to the usage of ontologies in E-Government we can conclude that:

- ePractice is a clear example how information should be available to the broader public. Even though it has an advanced search and other organizational capabilities as directory organization, we feel that it could be enhanced with introduction of semantically organized information.

- The Knowledge Networks is a case that shows how positively up-to-date information can be used in the public sector to improve the image and the service of the government in general. It does not have a known semantic component, but it contributes to the understating how the information can be organized, searched and handled.

- The mentioned projects use ontologies for representing the profile of a web service.

- SmartGov and OntoGov use ontologies to describe the lifecycle of a service.

- Ontologies for the legal documents have been developed in the E-Power and OntoGov project.

- E-Power and eGov project define E-Government metadata standards. These standards can be extended into ontologies for describing the profile of a service.

3.9.2   Applicability towards We-Go Knowledge Net

As discussed above, all of these projects provide significant inputs for the We-Go project. The overall realization of the We-Go Knowledge Net is based on existence of ePractice.eu project and experience gained within the Knowledge Network solutions, with final aim to address implementation of eGovernment in Western Balkan Countries. However, we propose how to extend the results by taking into account the whole lifecycle of the E-Government web services and enable sophisticated tools. For example, the use of the CEN eGovernment ontology will enable us to fully cover all the aspects of the web services' life cycle with semantic search capabilities, as it is presented in delivery D4.1.3.

References

[Akkiraju et al., 2005] R. Akkiraju, J. Farrell, J. Miller, M. Nagarajan, M. Schmidt, A. Sheth, and K. Verma. Web Service Semantics – WSDL-S. Technical note, April 2005.

[CEN, 2008], CEN EGovernment Focus Group, http://www.cen.eu/cenorm/businessdomains/businessdomains/isss/activity/e-government.asp, accessed 03.03.2008

[Chen and Kifer, 1993] W. Chen, M. Kifer, D.S. Warren, HiLog: A Foundation for Higher-Order Logic Programming, Journal of Logic Programming, February 1993, pp. 187-230

[DERI, 2008] The DERI Institutes, http://www.deri.at, accessed 11.11.2007

[EGOV, 2005] eGov-Power Project, http://www.egov-project.org/, accessed 10.11.2007

[EGOVPT, 2007] E-Government Project Team Project, http://www.egovpt.org/, accessed 10.11.2007

[EPOWER, 2005] E-Power Project, http://www.lri.jur.uva.nl/~epower/, accessed 10.11.2007

[EPRAC, 2008] ePractice Portal, http://www.epractice.eu/, accessed 03.03.2008

[Grosof, 1999] A Courteous Compiler from Generalized Courteous Logic Programs to Ordinary Logic Programs. B.N. Grosof. IBM Report, July 1999

[Gruninger, 2003] A Guide to the Ontology of the Process Specification Language. M. Gruninger. Handbook on Ontologies in Information Systems. R. Studer and S. Staab (eds.). Springer Verlag, 2003

[KIF, 1998] Knowledge Interchange Format: Draft proposed American National Standard, Technical Report 2/98 004, ANS, 1998

[Kifer et al., 1995] Michael Kifer, Georg Lausen, and James Wu. Logical foundations of object-oriented and frame-based languages. JACM, 42(4):741¬843, 1995

[Makx, 2007] Makx Dekkers, Top Level E-Government Ontology, E-Government Project Team Project, http://www.egovpt.org/fg/Report, accessed 10.11.2007

[OASIS, 2005] OASIS TC, http://www.oasis-open.org/, accessed 10.11.2007

[OMG, 2006] OMG, http://www.omg.org/, accessed 10.11.2007

[ONTOGOV, 2005] OntoGov Project, http://www.ontogov.com/, accessed 10.11.2007

[OWLS, 2007] The OWL Services Coalition. OWLS 1.1. http://www.daml.org/services/owls/1.1/, accessed 10.11.2007

[PDDL, 1998] PDDL The Planning Domain Definition Language V. 2. Technical Report, report CVC TR 98 003/DCS TR 1165, Yale Center for Computational Vision and Control, 1998

[Riva and Ramoni, 1996] Riva, A. and Ramoni, M., LispWeb: a Specialised HTTP Server for Distributed AI Applications. Computer Networks and ISDN Systems, 1996, pp 7-11, 953-961

[SMARTGOV, 2006] SmartGov Project, http://www.smartgov-project.org, accessed 10.11.2007

[SOAP, 2003] XML Protocol Working Group. SOAP version 1.2. Technical report, June 2003. W3C Recommendation. http://www.w3.org/TR/2003/REC-soap12- part0-20030624/, accessed 10.11.2007

[SWRL, 2003] I. Horrocks, P. F. Patel Schneider, H. Boley, S. Tabet, B. Grosof, and M. Dean. SWRL: A semantic web rule language combining OWL and RULEML, 2003, http://www.daml.org/2003/11/swrl/, accessed 10.11.2007

[SWSF, 2005] Semantic Web Services Framework. SWSF Version 1.0

[W3C, 2007] W3C, http://www.w3.org/, accessed 10.11.2007

[WIKI, 2008] Wikipedia, http://www.wikipedia.org/, accessed 03.03.2008

[WSDL, 2005] Web Services Description Language (WSDL) Version 2.0. Last Call Working Draft, W3C WS Description Working Group, August 2005

SIXTH FRAMEWORK PROGRAMME

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2.6.5.1. International cooperation for e-Government and eParticipation
Target countries: Western Balkan

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Work Package 4- Knowledge Net Deliverable D.4.1.3. Information model and ontology

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Document Control

Contributors

Person	Role	Organisation	Contribution
Marjan Gusev	WP 4 leader	UKIM	General structure, drafting and finalisation of document, We-Go Knowledge Net information model
Ljupco Antovski	Designer – researcher	UKIM	Information model of CEN ontology
Dejan Spasov	Designer – researcher	UKIM	Additions to information and data model, Register of eGovernment Services
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Robert Mosser	Designer – researcher	UniVie	YLVI implementation of We-Go Knowledge Net

Table of Contents

Summary

This document gives details about information and data model to be used in the We-Go Knowledge Net. The main intention is to provide a solution, regardless of operating systems, country specifics and other irrelevant attributes. The only alternative is a solution via web, accessed by conventional web browser.

The usage of ePractice.eu portal covers most of the features for search and comparison in a database of eGovernment Services, but as discussed in the delivery D.4.1.1 it does not cover three main aspects covered by the We-Go Knowledge Net:

- Establishing a community;
- Live presentations, discussions and meetings; and
- Localised and customized data content and information.

This document consists of descriptions of Information and Data Model for realization of:

- We-Go Knowledge Net local sites
- Register of eGovernment services based on CEN eGovernment ontology,
- YLVI platform to extend databases of eGovernment services with semantic search,

The delivery 4.2.1 is expected to show how the Information Model of We-Go Knowledge Net local sites is realized with federated approach and how the synergy with ePractice.eu portal is realized by linking appropriate content. The complete process of establishing We-Go Knowledge Net with live communications and efforts in the network initiates translation and publishing of eGovernment cases in ePractice.eu portal as a part of knowledge sharing and communication process.

The final goal of building the Information Model for We-Go Knowledge Net is to support the process for knowledge sharing and building understanding, by enhancing expertise and "know-how" transfer in order to build wisdom to realize, implement and integrate eGovernment services with embedded interoperability.

In addition, in this document, as stated in the DOW of We-Go project we propose improved functionalities by establishing semantic search capabilities based on CEN eGovernment ontology. Two approaches based on this ontology are proposed as improvement and possible future projects:

- first project builds a completely new solution – Register of eGovernment services, and
- second project extends the usage of existing databases of eGovernment services with semantic search capabilities – the YLVI platform.

1. The We-Go Knowledge Net Information Model

This document includes the basic organizational concepts for presentation of the information and data structures in the We-Go Knowledge Net. We-Go Knowledge Net is realization of Work package 4 of the We-Go Project.

The data and information will be presented according to the requirements specified in We-Go Knowledge Net delivery D.4.1.1. They include information about:

- existing eGovernment services and links to ePractice.eu,
- identified stakeholders and initiating discussion groups,
- We-Go Knowledge Net activities and workshops,
- links to ePractice.eu portal and other We-Go Knowledge Net sites.

The We-Go Knowledge Net can be improved by two approaches:

- realization of the Register of eGovernment services or
- by extending the existing database with semantic search capabilities for their relations.

Both approaches are based on the CEN eGovernment ontology, as it is described in document D.4.1.2.

The first approach to realize a register of eGovernment services is another project initiated by UKIM and Innovation, LTD [ReGS, 2007]. The prototype realized within these efforts demonstrates semantic search functionalities for eGovernment services.

The second approach to extend the existing databases/registers of eGovernment services with semantic search capabilities is based on using a special tool – the YLVI platform. YLVI is a joint development of the University of Vienna, Faculty of Computer Science, and the ARC Research Studio Digital Memory Engineering. A showcase has been set up to demonstrate the features of the platform.

1.1   General overview

The overall architecture of We-Go Knowledge Net is presented in Figure 1. We-Go
Knowledge Net objects described in Figure 1 are:

- Local We-Go Knowledge Net sites
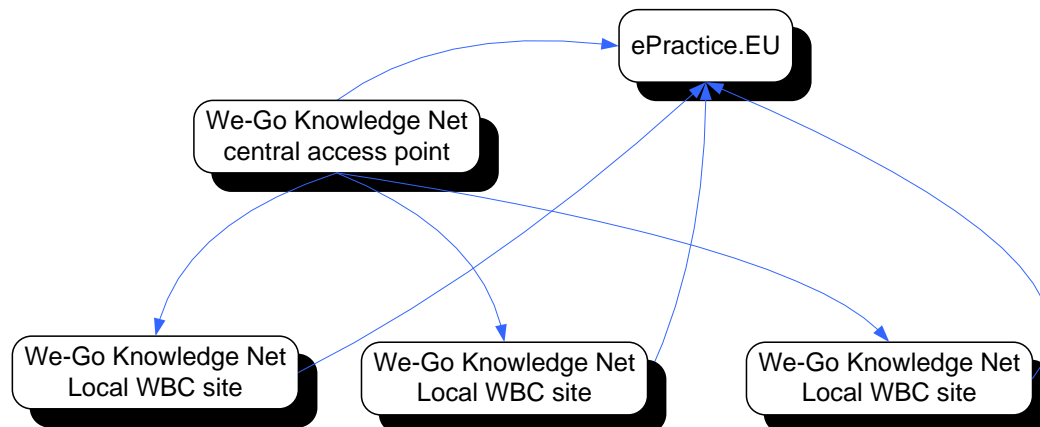- We-Go Knowledge Net Central Access Point
- Links to ePractice.eu

Figure 1 : Overall architecture of We-Go Knowledge Net.

The functionalities of these objects identified in the We-Go Knowledge Net architecture are
presented in the following chapters.

1.1.1   We-Go Knowledge Net Architecture

We-Go Knowledge Net architecture, as presented in Figure 2, consists of three levels of
organization identified as:

- top level – ePractice.eu (as a tool for data & information delivery with search &
  comparison tools);
- middle level – We-Go Knowledge Net central access point (where all links are
  updated to the top and bottom levels as tool for knowledge creation and building
  initial understanding); and
- bottom level – We-Go Knowledge Net local WBC sites (where knowledge is shared
  and communicated to stakeholders to build understanding of the "know-how" transfer
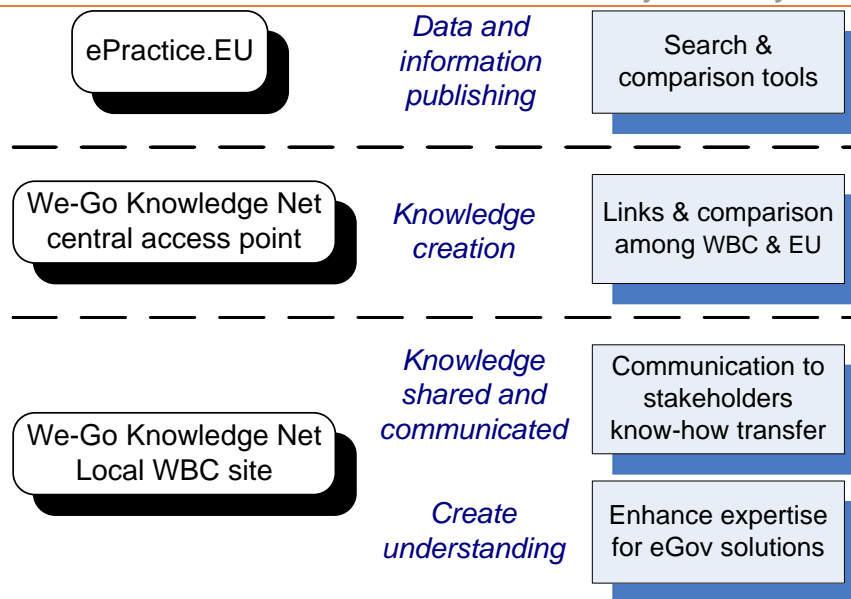 and enhance expertise.

Figure 2 : Architecture and organization of We-Go Knowledge Net.

Local We-Go Knowledge Net sites are presenting the federated approach of the registries, where eGovernment communities at Western Balkan Countries are established in order to enhance expertise about realization and implementation of eGovernment services. Each WBC site delivers data and information to identified stakeholders about eGovernment services in local language customized to their level with final goal to share and communicate knowledge and build understanding about "know-how" to implement and integrate eGovernment services with embedded interoperability. Two different communication channels are used in this process:

- live presentations and communication and
- web publishing and electronic communications.

Links to We-Go Knowledge Net central access point enable easy comparison and communication among WBC partners to share the experience about the problems faced in implementation of eGovernment services and methodologies used as their solutions. Links to the ePractice.eu are realized as enforcement to publish WBC eGovernment cases and best practices and to enable easy comparison of eGovernment services in EU with identification of their level of implementation.

We-Go Knowledge Net central access point is used as a place, where all links to WBC local sites are kept and comparison tables updated. These tables enable data and information from all We-Go Knowledge Net WBC sites to be shared and level of implementation of eGovernment services to be compared. In addition, links are given to ePractice.eu portal, so We-Go Knowledge Net stakeholders can have easy access to EU best practices.

ePractice.Eu portal will benefit from We-Go Knowledge Net since within this project all WBC partners are enforced to publish information, to participate and be active in their community and realization of mission goals. We-Go Knowledge Net will benefit from the extensive collection and structured organization of eGovernment cases, enabling easy access and comparison tools.

Both ePractice.eu and We-Go Knowledge Net will realize follow up activities in synergy and will make tremendous increase in eGovernment expertise in WBC.

1.1.2 We-Go Knowledge Net local sites

The overall objective in the We-Go Knowledge Net is to enhance expertise about implementation of eGovernment services in WBC. As specified in the requirements document (delivery D 4.1.1) it will be achieved by sharing and communicating knowledge among We-Go Knowledge Net stakeholders in the new established community.

The final goal to achieve at local We-Go Knowledge Net sites is:

- Sharing knowledge about implementation of eGovernment services
- Communicating knowledge to stakeholders
- Live "know-how" transfer on events

Figure 3 presents structure organization of each We-Go Knowledge Net site. It offers a base of realization of federated registries in local languages and customized to their level of awareness and knowledge as specified in project DOW.
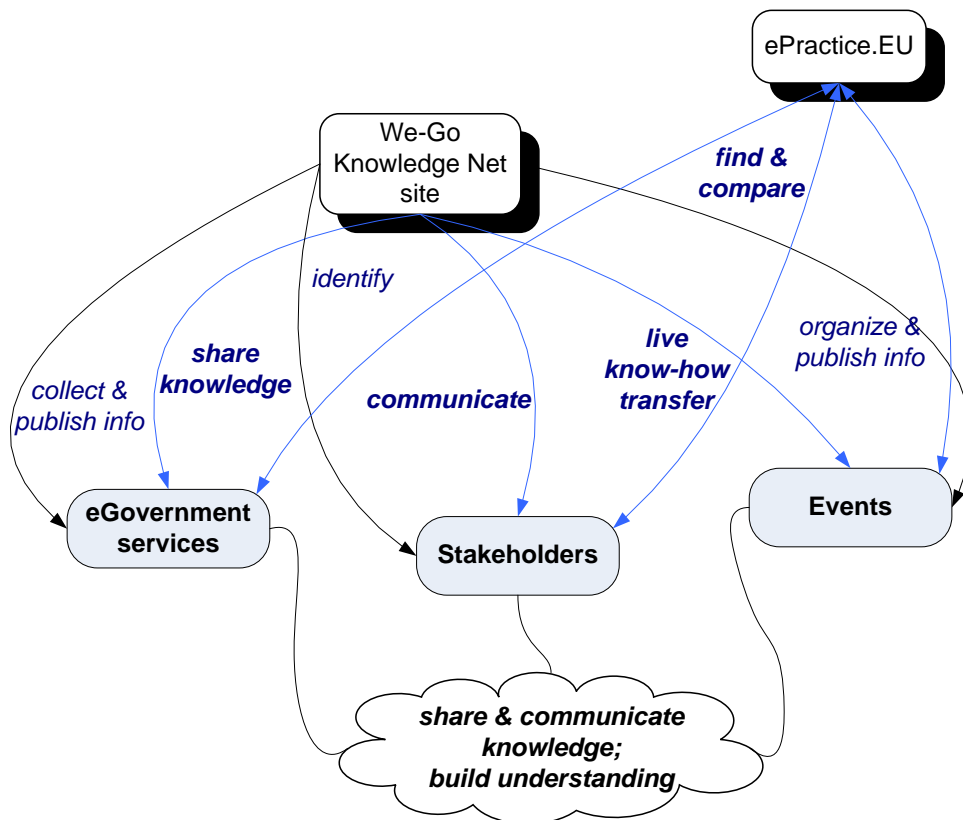

Figure 3 : Organization of We-Go Knowledge Net local site.

In order to realize the overall objective and reach the We-Go Knowledge Net goals We-Go participants in each We-Go Knowledge Net site initiate and realize at least the following main functions:

- Collection of available data and information about eGovernment services
- Publishing collected information
- Identification of stakeholders and
- Establishing communication channels for specific topics
- Organization of events

- Live presentations and "know-how" transfer
- Translation and publishing information on ePractice.eu portal.

Two main communication channels are to be realized in the We-Go Knowledge Net:

- Live presentations and meetings
- Web publishing and electronic communication

These communication channels will be used to share and communicate the knowledge about eGovernment services in local language as a part of the new established We-Go Knowledge Net community. Organized events and meetings are just part of realization of main objectives and reaching goals of the We-Go Knowledge Net.

Three topics within eGovernment solutions are to be communicated by live and electronic communication channels:

- Data and information about implementation of eGovernment services
- Stakeholders and associated communication channels
- Data and information about realized activities and upcoming events

1.1.3 Central access point for the We-Go Knowledge Net

The overall organization of the central access point in the We-Go Knowledge Net is presented in Figure 4.
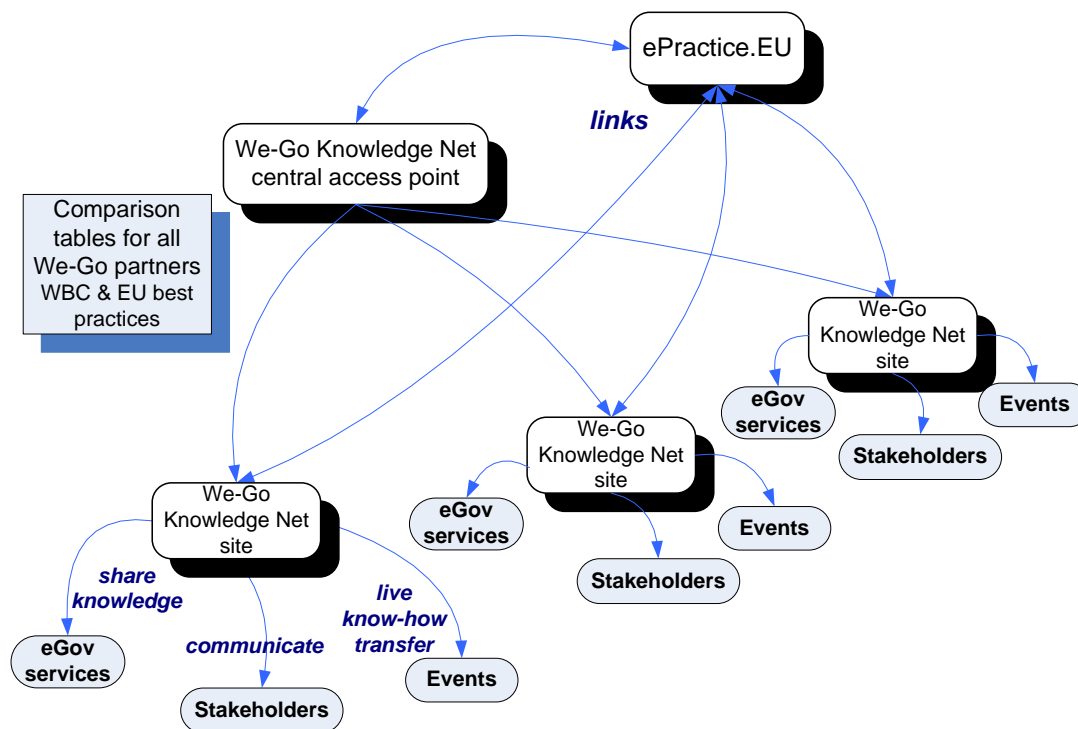

Figure 4 : Organization of We-Go Knowledge Net central access point.

The main purpose of organizing a central access point is to enable a structure where all Western Balkan Countries will have opportunity to compare levels of implementation of eGovernment services among countries. This is very stimulating approach, since all Western Balkan Countries have reach low values of development of eGovernment services in comparison to the EU countries. Some of WBC have tried applying specific services and faced problems with implementation, integration and embedding interoperability issues. The problem raises more since several donors have donated separate solutions and now the integration and lack of centralized approach for eGovernment architecture are main problems.

Comparison among these countries has competitiveness effect. In addition, the sharing of experiences for implementation problems and their integration is one of the biggest achievements in the We-Go Knowledge Net.

Keeping the structure of comparison tables and updating the links is a maintenance issue, with clarifying the semantic meaning of the eGovernment services. The links towards appropriate services in ePractice.eu portal create additional value to make comparison with all other existing EU best practices, where all WBC eGovernment stakeholders can use appropriate search and compare tools and the extensive database of eGovernment cases.

1.2   Documents describing eGovernment services

This section extracts requirements in the delivery D.4.1.1 for realization of the We-Go Knowledge Net. According to these requirements, the following data structure is proposed to all We-Go partners as basis to collect information about e-Government services in order to build knowledge and understanding about "know-how" transfer and level of implementation of eGovernment services.

1.2.1   Development

We-Go eGovernment service description format was specified within the We-Go Knowledge Net and was delivered to all partners on 17.02.2008. As a format it is extension of the format already distributed to We-Go partners within the WP1 as description of the interoperability issues within eGovernment services.

To develop this format within the We-Go Knowledge Net, the UKIM, ARC and UniVie partners have:

- specified requirements in D.4.1.1 (We-Go Knowledge Net requirements specification),
- analyzed the existing approaches in EU - D.4.1.2 (Evaluation of open standards for registries and corresponding products);
- developed general overview and description of the We-Go Knowledge Net in D.4.1.1 (We-Go Knowledge Net requirements specification),

A basis for development of a specification format was required data structure:

- in the ePractice.eu portal
- according to the CEN eGovernment ontology

The developed format will enable compatibility with ePractice.eu portal and will enforce participants to make translations in English language and include cases into ePractice.eu portal. From the other side, the content will be available in local WBC language and will enable easy access and understanding from all stakeholders overcoming the language barriers. Added value of this approach is the existence of relations among data items in the applied format, which will enable better semantic search capabilities according to the CEN ontology. At least two approaches can be used in future projects for this purposes, the first is the YLVI tool developed by the University of Vienna and the second is the UKIM Register of eGovernment services project.

1.2.2 Format

The format to be used for description of We-Go Knowledge Net eGovernment services is presented in Table 1. It possesses all fields found in the ePractice.eu and fields necessary for usage of CEN eGovernment ontology. Once the We-Go partners will have populated the customized We-Go Knowledge Net registers, it will be rather easy to translate cases and upload the ePractice.eu portal and update links in the central access point for -Go Knowledge Net.

Project – Service Name	
Abstract	
Acronym	
Web address	
Country	
Domain type	A2A, A2B, A2C
Service domain	(eGovernment, eHealth, eEducation, ...)
Topic /keywords	(Legal aspects, efficiency, benchmarking, eServices)
Governmental sector	(Ministry, agency, ...)
Application level/Scope	(National, Regional, Local, European)
IOP Layer(s)	(Semantic, Organisational, Governance)
Provider	(Ministry, Public organization, Public agency)
Provider type	(national government, local authority, NGO)
End User(s)/Target	(Administrations, Public)
Project Start Date	
Date Operational	
Status	(Operation, on-going project development, initiating)
eGov benchmarking level	**1 = info; 2 = forms; 3 = interaction; 4 = transaction; and 5 = user centric**
Language	
Type of initiative	(see epractice.eu)
Overall implem. approach	(see epractice.eu)
Funding source	(donator, or national government)
Project size	(see epractice.eu)
Implementation approach	(see epractice.eu)
Benefit/Impact	(see epractice.eu)
Key Factors	(see epractice.eu)
Lessons learnt	(see epractice.eu)
Related Services	List of services which are related
Legal framework/Mandate	Act associated for the usage
Mandate status	(under planning, in legislation, in force, withdrawn)
Policy context	(see epractice.eu)
References	
Contact person	

Administrative process	(accounting, business planning, land management, archiving, law enforcement, ...)
Process Type	(office process, remote sensing, on-location activity, ...)
Purpose/Sector	(international business development, trade, defence and security, environmental protection, disaster management, ...)
Client/Audience	(individual citizen, immigrant, tourist, SME, banking sector, blind people, ...)
Client Type	(person, business, government agency, ...)
Funding model of service	(fully subsidized, marginal cost model, commercial service)
Data collection	(personal ID, business register, vehicle register, social statistics, ...)
Data type	(documents, database, images, statistical dataset, ...)
IT components	(business intelligence, CRM, executive information system, financial system, ...)
Standard	('XML', 'SOA', 'SOAP', 'WSDL', 'Dublin Core', 'DOI', 'ebXML', 'XTM', 'PDF')
Standard type	(International standard, industry practice, workshop agreement, ...)

Table 1:   Format for description of eGovernment services in We-Go Knowledge Net.

1.2.3   We-Go Knowledge Net local WBC register of eGovernment services

The local We-Go Knowledge Net register of eGovernment services is formed upon collection of data for relevant eGovernment services. We-Go Knowledge Net supports all kinds of electronic registers in a form that allows easy access to information about a relevant eGovernment service for a given WBC country. The following entities are necessary for the existence of this electronic register:

- Project / eGovernment Service Name
- Purpose / Project goal
- Status
- Provider
- Web Address
- Sophistication level
- Link to docs describing details about eGovernment service.
- Links to ePractice.EU and other We-Go Knowledge Net sites

An example of the We-Go Knowledge Net local register is presented in Table 2.

Project/ Service	Purpose	Status	Provider	Web Address	Sophist. Level	Docs	Links

Table 2:   Entities in the local We-Go Knowledge-Net register of eGovernment services.

1.3   Content about stakeholders

The content about stakeholders in the We-Go Knowledge Net must be detailed according to the requirements document (We-Go WP4 delivery 4.1.1).

1.3.1   List of stakeholder organizations and their affinities

Stakeholders are usually identified with organization, regardless if it is a Ministry, public organization, agency, association or a company involved in the process of the eGovernment service.

The We-Go Knowledge Net uses description of stakeholder organization as presented in Table 3, with the following entities:

- reference number,
- name of the organization,
- acronym – short name of the organization,
- country identification.

No.	Organization	Short Name	Country

Table 3:   List of stakeholder organizations in the We-Go Knowledge-Net.

1.3.2   Details about stakeholders

Each stakeholder organization consists of several persons responsible for given service realization or implementation. Therefore the following entities are specified as details about stakeholders. This is very important in the We-Go Knowledge Net since it is a basis for realization of live communication or for activating appropriate communication channels such as electronic discussion groups, mailing lists etc.

A detailed page about a stakeholder should have details about persons from a given institution involved in realization of eGovernment services. The format is presented in Table 4.

Person:	Telephone	Postal address	e-mail: address	Service interest

Table 4:   Table with stakeholder details used in the We-Go Knowledge-Net.

1.4   We-Go Knowledge Net activities and workshops

The specification of We-Go Knowledge Net events including activities and workshops has to be detailed in order to give clarification about initiatives, current status of development, identification of stakeholders, statistics about involvement of stakeholders and realized events. This will give an idea about know-how transfer and We-Go Knowledge Net efforts to enhance expertise about eGovernment.

1.4.1   Description of activities

Activities in the We-Go Knowledge Net are described with the following entities:

- Date
- Location
- Name of activity
- Purpose of activity
- Target audience

A possible example of these data structures are shown in Table 5.

Date	Activity	Location	Purpose	Target audience

Table 5:   Entities describing events in the We-Go Knowledge-Net.

1.4.2   Description of workshop events

Workshop events in the We-Go Knowledge Net are described with the following entities:

- Event number
- Event acronym
- Date
- Event name
- Purpose of the event
- Target audience

The format of these data structures are shown in Table 6.

No	Acronym	Date	Name	Purpose	Target audience

Table 6:   Format of We-Go Knowledge Net workshop's entities.

Additional attributes and entities which describe statistics about events are presented in Table 7. In addition to the previous format they contain:

- Number of We-Go presentations
- Number of recommendation documents delivered
- Number of participants on events

No	Id	Date	Name	We-Go Presentations	Participants

Table 7:   Format of entities defining statistics of We-Go Knowledge Net events.

In addition the format should offer possibility to give links to appropriate documents.

1.4.3   Detailed workshop descriptions

Detailed description of each workshop should be described with the attributes given in previous chapter about workshops:

- Event number
- Event acronym
- Date
- Event name
- Purpose of the event
- Target audience

In addition it should give clear indication about the following data items:

- invitation for the event intended for general public with leaflet, poster or other promotion material,
- invitation for We-Go participants and the eGovernment stakeholders,
- agenda of the event,
- agenda of the workshop with list of the presentations, and
- report – including details of organization and overview of outcomes with links to presentations and recommendations,
- links to photos or other documented artefacts.

All docs have to be available as downloadable links in document textual or pdf format. In addition a link to photos should give idea about selected moments from the organized event.

All presentations should be available in English and localized form as PowerPoint presentations. Pdf documents with handout of slides are also recommended to be used.

In addition if there are documents which give recommendations for future activities then they are also listed and included in the list of presentations.

2. Register of eGov Services based on CEN eGovernment Ontology

2.1 Ontology

CEN ontology is analyzed within delivery D.4.1.2 "Evaluation of Open Standards". It is the most comprehensive approach of all analyzed on-going projects in EU.

The ontology for E-Government services and standards initiatives in the area of eGovernment is defined by the focus group eGovernment Standards Roadmap [EGOVPT, 2007], as result of the continued work from the CEN focus work group [Makx, 2007]. The ontology defines entities in eGovernment services and address relations among entities enabling a tool for sophisticated semantic search capabilities.

2.1.1 Ontology diagram

The features of ontology diagram are presented in Figure 5.
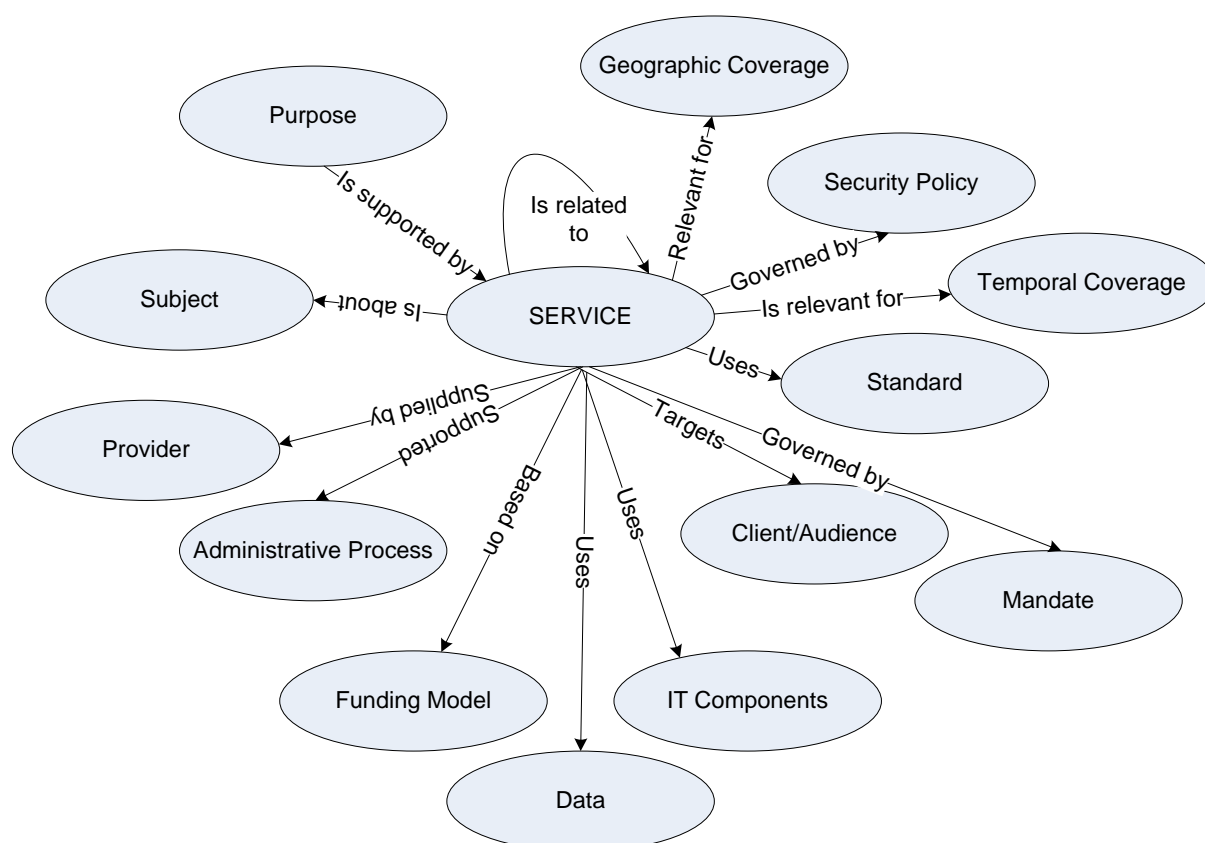
Figure 5 : How top level entities interrelate?

This is only a small reference and more comprehensive coverage on the matter can be found in [Makx, 2007]. The following entities and their attributes are described in this ontology:

- Service
- Administrative process
- Purpose

- Client/Audience
- Data
- Funding Model
- Geographical Coverage
- IT Components
- Mandate
- Provider
- Security Policy
- Standard
- Subject
- Temporal Coverage

Figure 5 describes how the top level entities in the CEN ontology interrelate with relations "uses"; "based on"; "supported by"; "is about"; "relevant for"; "targets" and "governed by".

2.1.2 Top level service description

The description of the service object is presented in Table 1.

Entity	SERVICE
Definition	Service provided by or on behalf of a government agency to an audience using data in administrative processes to achieve business purposes
Descriptive elements	Name, Identifier, Description, Type, Language, Status, Accessibility
Controlled vocabularies	List of names and/or identifiers of Services, e.g. * 'passport renewal', * 'birth registration', * 'tax return submission', * 'weather forecast', * 'information on traffic congestion', * 'on-line voting' List of types, e.g. * 'request for permit', * 'submission of information', * 'interactive questionnaire', * 'video streaming' ISO 639, RFC 3066 for languages List for status, e. g. * in planning * under development * under testing * pilot * operational * phasing out * discontinued
Relations	* is supported by ADMINISTRATIVE PROCESS * is support for BUSINESS PURPOSE * is targeted towards CLIENT/AUDIENCE * is using DATA

	* is based on FUNDING MODEL * is relevant for GEOGRAPHIC COVERAGE * is using IT ENVIRONMENT * is governed by MANDATE * is supplied by PROVIDER * is governed by SECURITY POLICY * is related to SERVICE * is using STANDARD * is about SUBJECT * is relevant for TEMPORAL COVERAGE

Table 8:   Service description of the Register of eGovernment Services based on CEN ontology.

2.2   Information model

The information model is defined with description of all items in the model presented in Figure 5. The model is defined within

- Legal and business issues
- Technical environment
- Resources (including human, spatial and temporal)

All objects will be described with appropriate tables, identified with the following entities:

- Definition – what is the main purpose of the object;
- Descriptive elements – what fields define its characteristics;
- Controlled vocabularies – what are the values of some predefined items;
- Relations – what are relations to other objects.

2.2.1   Legal and business issues

Administrative Process object description is given in Table 2.

Entity	ADMINISTRATIVE PROCESS
Definition	Process within a government agency that is necessary to provide a service
Descriptive elements	Name, Identifier, Description, Type
Controlled vocabularies	List of administrative processes, e.g. 'accounting', 'business planning', 'land management', 'archiving', 'law enforcement' List of types, e.g. 'office process', 'remote sensing', on-location activity'
Relations	* is related to ADMINISTRATIVE PROCESS * is support for BUSINESS PURPOSE * is creating DATA * is governed by MANDATE * is supplied by PROVIDER * is governed by SECURITY POLICY * is contributing to SERVICE

Table 9:   Administrative process description of the Register of eGovernment Services based on CEN ontology.

The entities of the object identified by purpose in the CEN ontology are presented in Table 3.

Entity	PURPOSE
Definition	Goal to be achieved as a result of the successful delivery of a service
Descriptive elements	Name, Identifier, Description, Type
Controlled vocabularies	List of business purposes, e.g. 'international business development', 'trade', 'defence and security', 'environmental protection', 'disaster management'

Relations	* is supported by ADMINISTRATIVE PROCESS * is related to BUSINESS PURPOSE * is governed by MANDATE * is governed by SECURITY POLICY * is supported by SERVICE

Table 10:   Purpose object description of the Register of eGovernment Services based on CEN ontology.

Funding Model object entities of the CEN ontology model are presented in Table 4.

Entity	FUNDING MODEL
Definition	Method of funding of the service and payment regimes
Descriptive elements	Name, Identifier, Description, Type
Controlled vocabularies	List of types, e.g. 'fully subsidized', 'marginal cost model', 'commercial service'
Relations	* is governed by MANDATE * is used by PROVIDER * is used for SERVICE

Table 11:   Funding model object description of the Register of eGovernment Services based on CEN ontology.

The entities of the mandate object entities from CEN ontology are shown in Table 5.

Entity	MANDATE
Definition	Legal context of the service, laws and regulations that govern the provision of the service
Descriptive elements	Name, Identifier, Description, Type, Status
Controlled vocabularies	List of laws and regulations, .e.g. 'Freedom of Information Act', 'VAT law', 'EU Directive 2003/92' Status, e. g. "under planning", "in legislation", "in force", "withdrawn"
Relations	* governs DATA * governs FUNDING MODEL * governs GEOGRAPHIC COVERAGE * governs PROVIDER * governs SECURITY POLICY * governs SERVICE * governs TEMPORAL COVERAGE

Table 12:   Mandate object description of the Register of eGovernment Services based on CEN ontology.

The security policy object entities are presented in Table 6 for the CEN ontology.

Entity	SECURITY POLICY
Definition	Conditions and restrictions on the access to and use of the service
Descriptive elements	Name, Identifier, Description, Type, Language
Controlled vocabularies	TO BE DETERMINED
Relations	* restricts CLIENT/AUDIENCE * governs DATA * governs GEOGRAPHIC COVERAGE * is related to MANDATE * governs SERVICE

Table 13:   Security Policy description of the Register of eGovernment Services based on CEN ontology.

The Register of eGovernment services uses object identified as subject with entities presented in Table 7 for the CEN ontology.

Entity	SUBJECT
Definition	Classification or life-cycle event the service is related to
Descriptive elements	Name, Identifier, Description
Controlled vocabularies	List of subjects, such as in UK IPSV (Integrated Public Sector Vocabulary), EUROVOC, AGROVOC
Relations	* is topic of SERVICE * is related to SUBJECT

Table 14:   Subject item description of the Register of eGovernment Services based on CEN ontology.

2.2.2 Technical environment

Data items are essential for description of services in the Register of eGovernment services for the CEN ontology. They are presented with the entities presented in Table 8.

Entity	DATA
Definition	Distinct pieces of information
Descriptive elements	Name, Identifier, Description, Type, Language
Controlled vocabularies	List of data collections, e.g. 'personal identification data', 'business register', 'vehicle register', 'social statistics' List of types, e.g. 'documents', 'database', 'images', 'statistical dataset'
Relations	* is created by ADMINISTRATIVE PROCESS * is related to DATA * is relevant for GEOGRAPHIC COVERAGE * is using IT ENVIRONMENT * is governed by MANDATE * is used by PROVIDER * is governed by SECURITY POLICY * is used for SERVICE * is using STANDARD * is about SUBJECT * is relevant for TEMPORAL COVERAGE

Table 15:   Data item description of the Register of eGovernment Services based on CEN ontology.

IT Components defined in the Register of eGovernment Services based on CEN ontology have entities shown in Table 9.

Entity	IT COMPONENTS
Definition	elements of technical infrastructure that are or can be building blocks for eGovernment services
Descriptive elements	Name, Identifier, Description, Type
Controlled vocabularies	List of types, e.g. 'business intelligence', 'CRM', 'Executive Information System', 'Financial System'
Relations	* is used for DATA * is governed by SECURITY POLICY * is used for SERVICE * is using STANDARD

Table 16:   IT components description of the Register of eGovernment Services based on CEN ontology.

Technical standard object entities are presented in Table 10, for the Register of eGovernment services based on the CEN ontology.

Entity	STANDARD
Definition	Technical standards that are used to provide the service
Descriptive elements	Name, Identifier, Description, Type
Controlled vocabularies	List of standards, e.g. 'XML', 'SOA', 'SOAP', 'WSDL', 'Dublin Core', 'DOI', 'ebXML', 'XTM', 'PDF' List of types, e.g. 'International Standard', 'Industry Practice', 'CEN Workshop Agreement'
Relations	* is used for DATA * is used for IT ENVIRONMENT * is related to STANDARD

Table 17:   Description of the object Standard in the Register of eGovernment Services based on CEN ontology.

2.2.3   Human, spatial and temporal resources

Client / Audience as resource object in the Register of eGovernment Services based on the CEN ontology has entities presented in Table 11.

Entity	CLIENT/AUDIENCE
Definition	The intended user or user group for a service
Descriptive elements	Name, Identifier, Description, Type
Controlled vocabularies	List of audiences, e.g. 'individual citizen', 'immigrant', 'tourist', 'SME', 'banking sector', 'blind people' List of types, e.g. 'person', 'business', 'government agency'
Relations	* is related to CLIENT/AUDIENCE * is restricted by SECURITY POLICY * is target of SERVICE

Table 18:   Client/audience object description of the Register of eGovernment Services based on CEN ontology.

Provider object entities are presented in Table 12.

Entity	PROVIDER
Definition	Organisational entity that is responsible for or involved in the provision of the service
Descriptive elements	Name, Identifier, Description, Type, Status
Controlled vocabularies	List of organisational units, e.g. 'Office of the Prime Minister', 'Ministry of Finance', 'City Council of Amsterdam', 'Social Security Agency' List of organisation types, e.g. 'national government', 'local authority', 'NGO'
Relations	* is using ADMINISTRATIVE PROCESS * is using DATA * is governed FUNDING MODEL * is relevant for GEOGRAPHIC COVERAGE * is governed by MANDATE * is related to PROVIDER * is supplying SERVICE

Table 19:   Provider object description of the Register of eGovernment Services based on CEN ontology.

Geographic Coverage object is spatial resource in the model of Register of eGovernment services based on CEN ontology. Its entities are shown in Table 13.

Entity	GEOGRAPHIC COVERAGE
Definition	Geographic area to which the service applies
Descriptive elements	Name, Identifier, Type
Controlled vocabularies	Names and/or identifiers based on national and international standards, e.g. ISO 3166 for country codes, NUTS for European regions List of types, e.g. 'local', 'regional', 'national', 'international'
Relations	* is basis for DATA * is governed by MANDATE * is serviced by PROVIDER * is used for SERVICE

Table 20:   Geographic coverage object description of the Register of eGovernment Services based on CEN ontology.

Temporal Coverage is another object in the model of the Register of eGovernment Services based on CEN ontology with entities presented in Table 14.

Entity	TEMPORAL COVERAGE
Definition	Period to which the service applies, including start and end dates of service provision
Descriptive elements	Date-and-time, Type
Controlled vocabularies	Date-and-time based on international standards, e.g. ISO 8601 and/or W3CDTF. List of types, 'Start', 'End'
Relations	* is basis for DATA * is relevant for SERVICE

Table 21:   Temporal coverage object description of the Register of eGovernment Services based on CEN ontology.

2.3   Data model and ERD

2.3.1   Entity Relationship Diagrams

Entities are physical items (including people) or aggregations of data items that are important to the business you're analyzing or to the system intended to build. Each entity is described by several attributes; individual instances of an entity will have different attribute values.

The Entity Relationship Diagram (ERD) represents *relationships*, which identify the logical and numeric linkages between pairs of entities. Relationships are named in a way that describes the nature of the connections. The *cardinality*, or multiplicity, of each relationship is shown with a number or letter on the lines that connect entities and relationships and can be identified as a) One-to-one or b) Many-to-many.

The complete entity relationship diagram for the Register of eGovernment Services based on CEN ontology is shown in Figure 6.
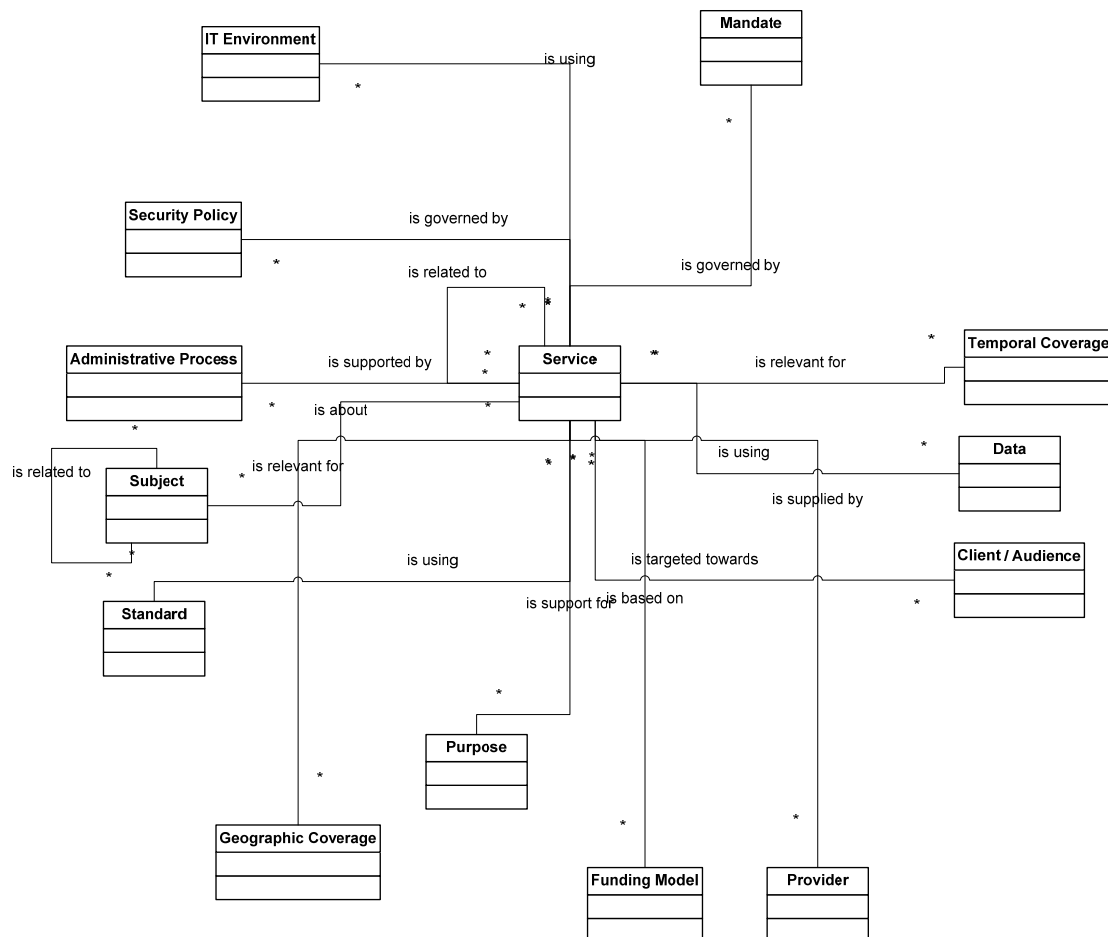
Figure 6 : Complete ERD diagram for Register of eGovernment services based on CEN ontology.

Auto referencing is given by the relation "is related to" and concerns the subject and service objects. The administrative object is in relation "is supported by" with the service object. Service is central object in this ERD. Two relations "is governed by" address the security policy object and the mandate object (representing legal aspects). Three relations "is using" concern IT environment, data items and standard objects. Two relations "is relevant for" link

the subject and temporal coverage objects. Administrative process is addressed with the "is supported by" relation. Purpose object is related with relation "is support for". The relation "is based on" addresses funding model. Another relation "is supplied by" exists to provider (representing the resources with which the funding model is realized).

### 2.3.2   ERD Diagram for administrative process, purposes and funding model

Figure 7 presents the entity relationship diagram for administrative process object of the Register of eGovernment Services based on CEN ontology. Two relations "is governed by" exist to security policy and mandate object (representing legal aspects). Another relation "is support for" concerns the purpose object. Data items are addressed by the "is creating data" relation. Provider is linked by the relation "is supplied by". Auto referencing is given by the relation "is related to".
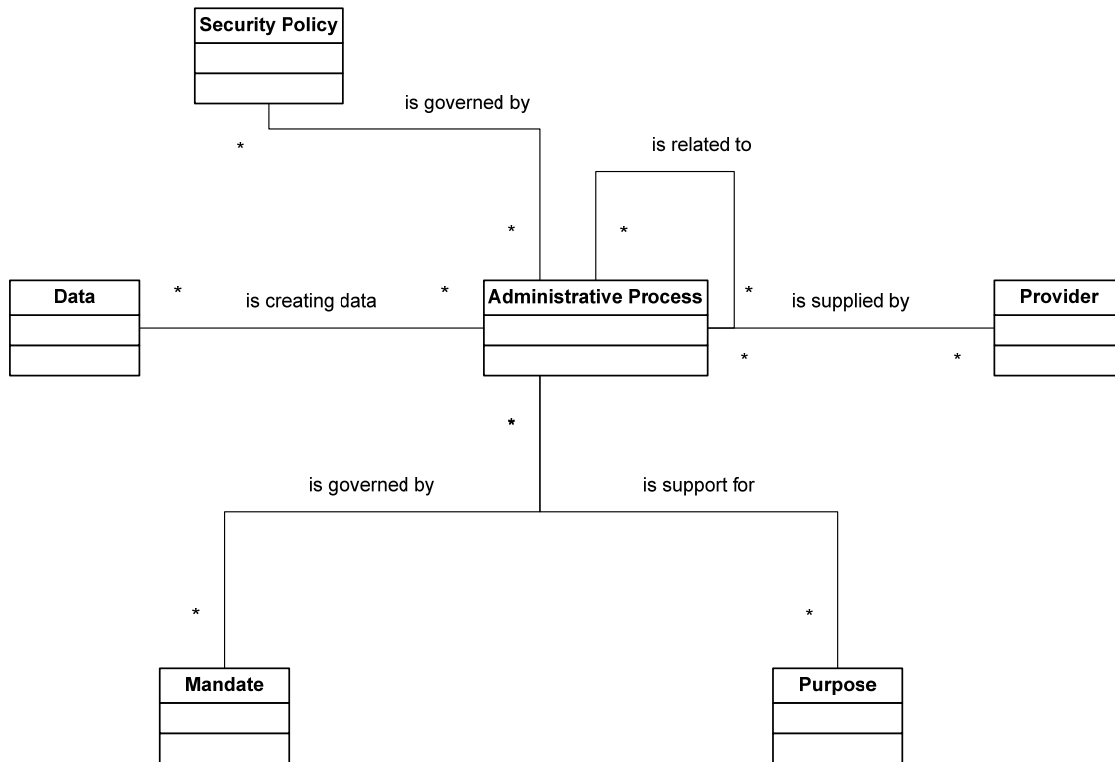
Figure 7 : ERD Diagram for administrative process in the Register of eGovernment services based on CEN ontology.

The entity relationship diagram for purposes of the Register of eGovernment Services based on CEN ontology is shown in Figure 8. Auto referencing is given by the relation "is related to" within the administrative process object and also within the purpose object. The administrative object is in relation "is support for" with the purpose object. Two relations "is governed by" address the security policy object and the mandate object (representing legal aspects). The relation "is relevant for" addresses data items. Another relation "is service by" exists to provider (representing the resources with which the funding model is realized).

is related to
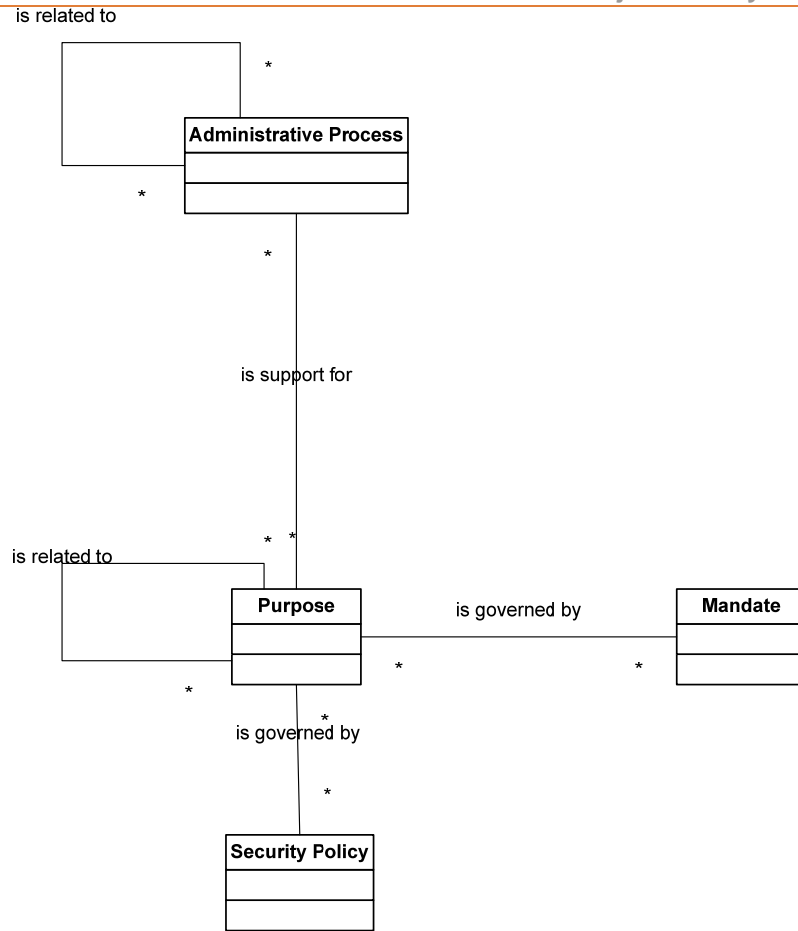
Figure 8 : ERD Diagram for purposes in the Register of eGovernment services based on CEN ontology.

Figure 9 presents the entity relationship diagram for funding model of the Register of eGovernment Services based on CEN ontology. Relation "is governed by" exists to mandate object (representing legal aspects). Another relation "is used by" exists to provider (representing the resources with which the funding model is realized).
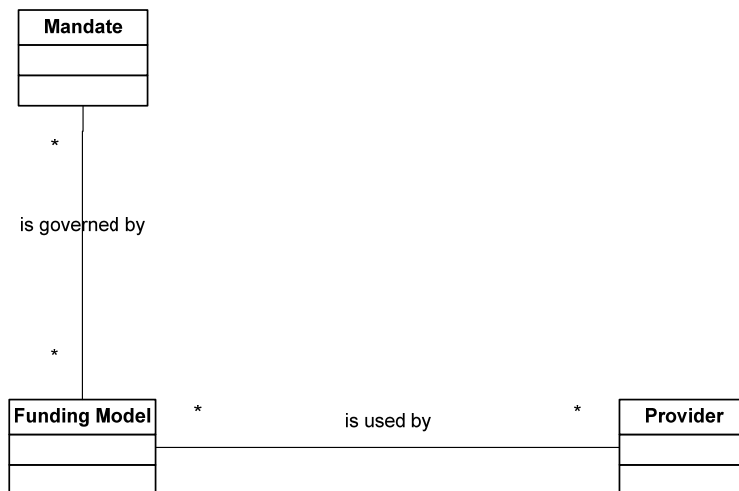
Figure 9 : ERD Diagram for funding model in the Register of eGovernment services based on CEN ontology.

2.3.3 ERD Diagram for data items and IT environment

The entity relationship diagram for data items of the Register of eGovernment Services based on CEN ontology is shown in Figure 10. Auto referencing is given by the relation "is related to". The administrative object is in relation "is creating data". Two relations "is governed by" address the security policy object and the mandate object (representing legal aspects). Two relations "is using" concern IT environment and standard objects. Subject item is related with relation "is about". The relation "is relevant for" addresses geographical coverage. Another relation "is used by" exists to provider (representing the resources with which the funding model is realized).
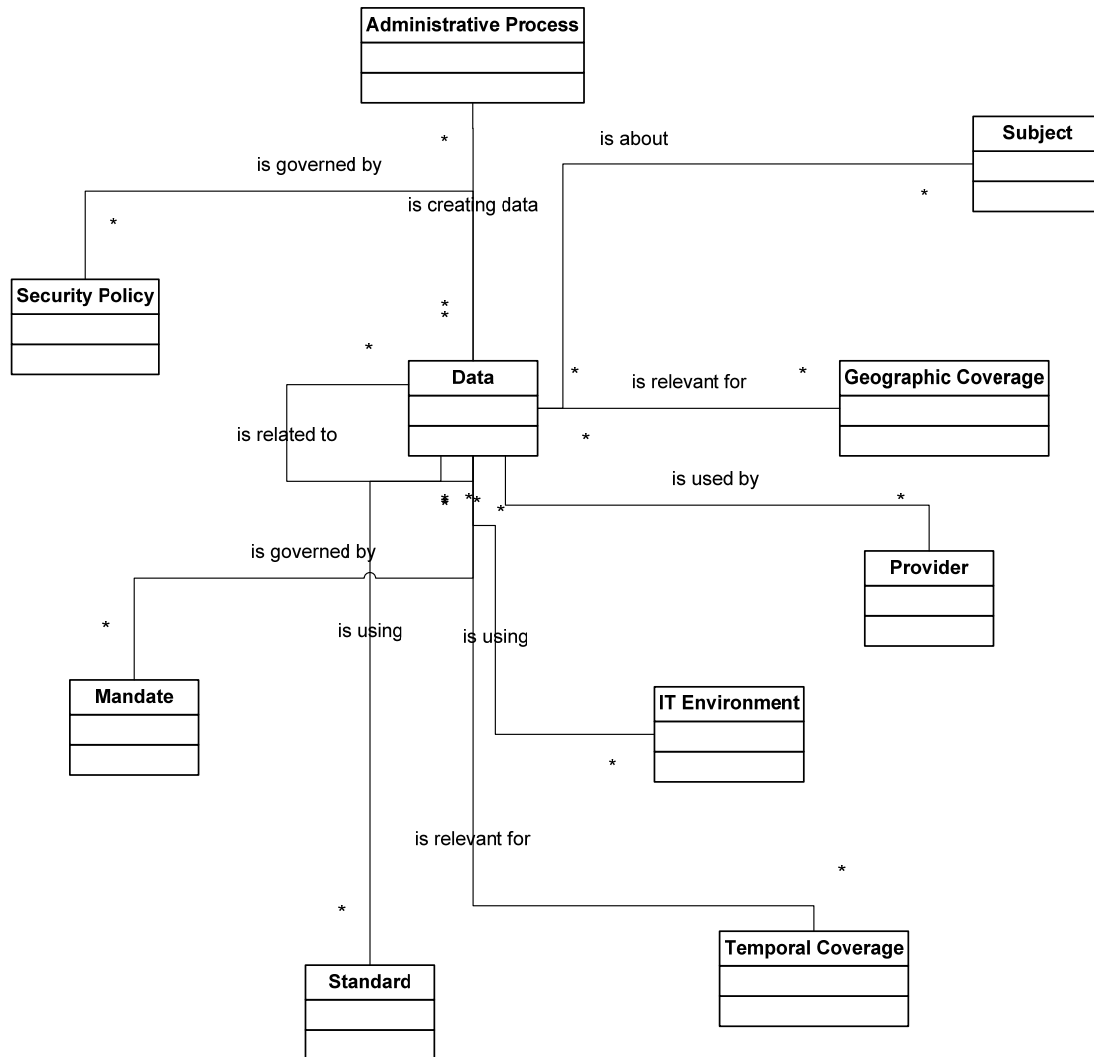
Figure 10 :   ERD Diagram for data items in Register of eGovernment services based on CEN ontology.

Figure 11 presents the entity relationship diagram for IT environment of the Register of eGovernment Services based on CEN ontology. Relation "is governed by" exists to security policy. Two relations "is using" address data items and standard objects.
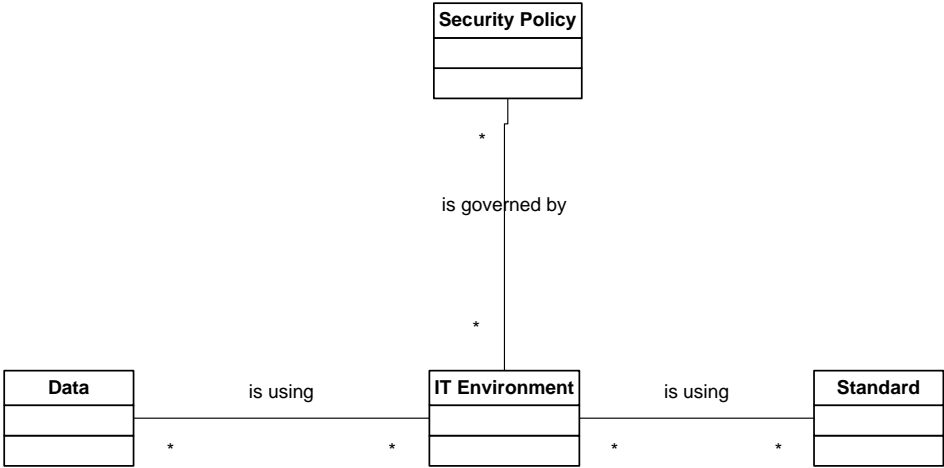
Figure 11 : ERD Diagram for IT environment in the Register of eGovernment services based on CEN ontology.

2.3.4   ERD Diagram for providers and geographical coverage

Figure 12 presents the entity relationship diagram for provider object of the Register of eGovernment Services based on CEN ontology. Relation "is governed by" exists to mandate object (representing legal aspects). Another relation "is service by" concerns the geographical coverage. Administrative process object is associated with the "is supplied relation". Two relations "is used by" address data items and funding model objects.
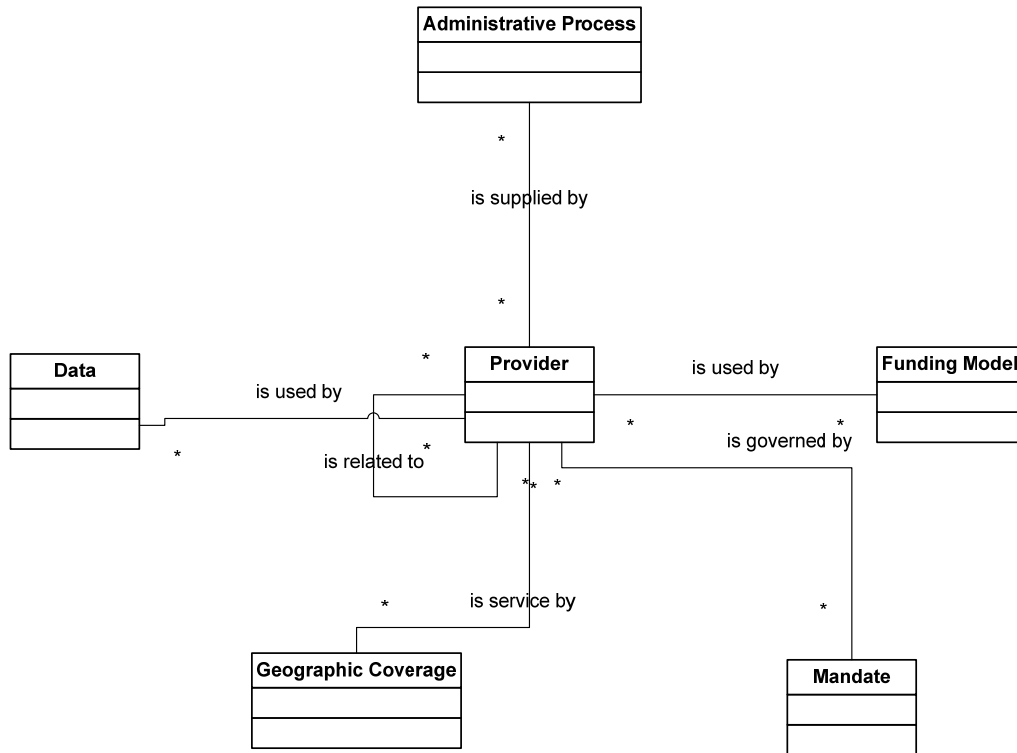
Figure 12 :   ERD Diagram for providers in the Register of eGovernment services based on CEN ontology.

The entity relationship diagram for geographical coverage of the Register of eGovernment Services based on CEN ontology is shown in Figure 13. Relation "is governed by" exists to mandate object (representing legal aspects). The relation "is relevant for" addresses data items. Another relation "is service by" exists to provider (representing the resources with which the funding model is realized).
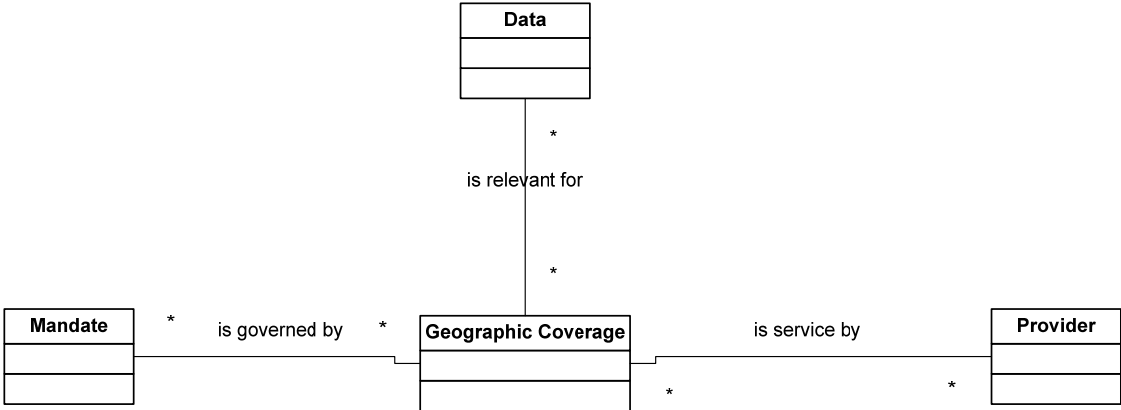
Figure 13 :   ERD Diagram for geographical coverage in the Register of eGovernment services based on CEN ontology.

3. We-Go Knowledge Net showcase with YLVI platform

3.1   Introduction

3.1.1   Background

While conducting preliminary work for the work package we discovered YLVI as a platform for the We-Go Knowledge Net that is capable to satisfy the needs and requirements. YLVI is a joint development of the University of Vienna, Faculty of Computer Science, and the ARC Research Studio Digital Memory Engineering. There are currently several YLVI implementations in use in different projects.

A showcase has been set up in autumn to demonstrate the features of the platform. Therefore the CEN eGovernment Ontology has been utilized, as it is described in document D.4.1.2.

The remainder of this document introduces the most important features of YLVI which are inherited of course by the We-Go Knowledge Net implementation.

3.1.2   YLVI features

YLVI is a so-called
- Collaborative
- Semantic
- Media
- Wiki.

Each of the name-giving aspects is described briefly in the next paragraphs.

Collaborative Wiki

As any conventional Wiki also YLVI features the distributed authoring of HTML pages, called articles. Those articles are versioned, allowing to access previous versions of the text via the history of the article. YLVI allows embedded media, e.g. figures, and simple and effective linking. Another common feature is a full text search over the article content. But unlike other Wikis Sylva's range of features goes beyond that.

Semantic

YLVI provides semantic annotation of objects, including classification, attribution and strong linking between objects. Objects are articles or media (see next paragraph). This way objects can be attributed and categorized. The underlying abstract meta-model can be dynamically replaced or adapted, for the concrete instantiation of concepts, attributes and relationships. The semantic features allow for a better search that is based on the categories, attributes and typed links. As an addition the search is also dynamically.

Media

Media objects can not only be embedded in articles. YLVI offers complete media management. This also means that unstructured media can be annotated like articles since they are at the same level. Media thus can be classified, attributed and searched the same way as articles.

Including external resources

A very useful feature for a platform like the YLVI implementation of We-Go Knowledge Net is the handling of links to external resources. They are treated like internal links and thus can as well be typed. This way resources on other platforms or on the Internet can be categorized and annotated and as a result can be queried like any other object in YLVI.

YLVI Forms

Just like basic wikis YLVI as well works with a wiki-style markup language. As some previous users indicated, not everyone is comfortable with this input method. Therefore YLVI Forms allows end users to add structured data to an article through what appear to be normal HTML forms. YLVI Forms are associated to articles of a given type.

Full Role-based Access Control (RBAC)

The full Role-Based Access Control (RBAC) allows for fine grained access control for users and/or user groups to individual content types and functions of the system.

3.2 Conventional versus faceted browsing

This chapter addresses information access in the web systems. Conventional web pages with search facilities use:

1) one or more search fields to formulate a query to identify stored information,
2) drop-down menus to narrow the search down to pre-defined but mostly static categories (e.g. ePractice.eu).

3.2.1 Query formulated by search fields

Different persons would probably describe the same piece of information with different words. To overcome this problem the search:

- runs through the attributes of the information pieces as annotated by the users;
- runs a full text search on documents.

The full text search is expected to deliver more results which are not always a benefit. However, too many search results can overload the user interface. The user could end up running through ridiculously long lists of hits manually. In these cases the pre-defined query provides solution.

YLVI as a platform supports full text search of articles as well as pdf and Microsoft Word media objects.
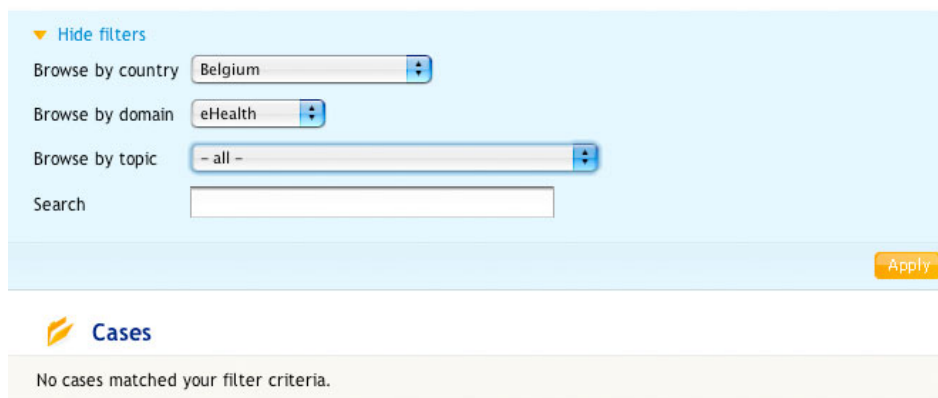
Figure 14 :   Browsing interface of epractice.eu

3.2.2 Predefined query in drop-down menu

As already mentioned the use of pre-defined, static drop-down menus allows narrowing down the results by choosing from a set of categories. They are part of the search query. But the use of static forms puts a high work load on. Each category has to be added manually. Besides, it is not ensured that there is always a hit when searching in a category or a combination of categories, as shown in Figure 14. This is due to the nature of the static drop-down menus. They could, for example, be defined before any information is being contributed to the network. For any given category the user could be confronted with a search that does not deliver any results. This can be a quite frustrating experience for users which needs to be resolved by using faceted search. To make access to a single piece of information, that is part of an extensive knowledge pool, more efficient, the system makes use of the semantics. They

are used to refine the search dynamically and are based on categories, attributes, and typed links. This technique is known under the term "faceted semantic browsing".

Faceted Browsing or Faceted Semantic Browsing is used e.g. by online stores to assist the user when browsing through a catalogue. Figure 15**Fehler! Verweisquelle konnte nicht gefunden werden.** shows the online store of Penguin Publishing where Faceted Browsing supports the user to browse the offer on books. On the left side the page gives the user a choice of categories to choose from. Different categories can be combined. The results page, located in the centre of the screen, is dynamically updated according to the user's selection. For each category only values are presented that deliver a hit. In the screen shot given in 15 the user would be offered to choose Paperback as a Format if no book would meet these criteria. In addition, each of the values of the categories is accompanied by the number of results the selection of that value will deliver.

Figure 15 :   Browsing through the catalogue of Penguin Publishing supported by faceted browsing (www.penguin.co.uk).

3.3   Finding Objects with YLVI platform

The following paragraphs show how the article "Central Register of Residence" that is of type "Service" is easily found among a few demo cases. Of course the features are even more useful when searching through a lot more cases.

3.3.1   Activation of search tool

Figure 16 shows the start screen of the YLVI implementation of We-Go Knowledge Net. The search and navigation pane can be found on the left hand side of the screen. It offers full text search and faceted semantic search. When opening the tree item "Administrative" the user can choose between "article" or "media" object. When going for "article" the search results are shown at the bottom of the pane. Notice that the results list is always generated dynamically. The selection of type "article" is reflected by the display of an according search filter, as presented at Figure 17.

Figure 16 :   The start screen in YLVI implementation of We-Go Knowledge Net.

Figure 17 :   The Semantic Search Pane in YLVI implementation of We-Go Knowledge Net.

3.3.2   Semantic search tool

To narrow down the search the tree item "CENEGOV" is opened. The options given there are the categories of the CEN ontology. But only categories that have an instantiated object are given here. Thus, this list is generated dynamically as well and is illustrated in Figure 16. Choosing "Service" there cuts down the results list. Now only articles of type "Service" can be found in the results list. Again this selection is added to the list of search filters as shown in Figure 17. Any single filter can be removed at any time.

Current Filters

Is of type "Article"
Is of type "Service"

Results (1-6 of 6)

- Central Register o...
- Commercial Registe...
- CRR
- e-Taxes
- European Business ...
- TestArticle

p. **1** of **1**

Figure 18 :   Results List with two filters applied in YLVI implementation of We-Go Knowledge Net.

Current Filters

Contains "registration act"
Is of type "Article"
Is of type "Service"

Results (1-1 of 1)

- Central Register o...

p. **1** of **1**

Figure 19 :   Filter from full text search added in YLVI implementation of We-Go Knowledge Net.

The field "Link Types" lets the user narrow down the search according to the typed links between objects. This could be a link between the "Service" Central Register of Residence and a "Mandate" e.g. Registration Act. The link is then typed as "governed by" according to the CEN eGovernment ontology. To show the combination between the semantic search feature and the full text search figure 19 shows the search filter "contains registration act" added. This is done by typing "registration act" in the full text search field and clicking the magnifier symbol. Then the string is added as search filter. The search now shows only one result, the Central Register for Residence. The representation of this demo case in the YLVI implementation of We-Go Knowledge Net is shown in figure 20.

Central Register of Residence

Ⓣ**Service**

Ⓑ*operational*

Ⓒ Registration Act 2001   Ⓒ E-Government Act 2004   Ⓒ Data Protection Act 2011

Ⓒ Immigrant

Ⓒ Austria

Austria-Central Register of Residence.pdf

Incoming links
Outgoing links
- is governed by
  - Data Protection Act 2011
  - E-Government Act 2004
  - Registration Act 2001
- links to
  - Austria-Central Register of Residence.pdf
- is targeted towards
  - Immigrant
- is relevant for
  - Austria
External links

Figure 20 :   The article "Central Register of Residence".

3.4   Architectural Options

YLVI follows a central database approach that is very different to a federated register approach. The two options and their advantages and drawbacks are briefly introduced in the next paragraphs.

Option (1) constitutes a central database where all content is stored. Option (2) presents a network of federated databases that are connected with each other. An access layer lies on top of this network structure allowing the user to search through the complete content through a single point of access.

Each of the options has its advantages as well as drawbacks. Due to the contrary approaches each option has different requirements.

3.4.1   Central database solution

This design option, as illustrated in Figure 21 is a common type for portals. One system, comprised of one or more servers, houses the central database solution. The advantages of using a central database are the reduced maintenance of the overall solution as only one system needs to be taken care of. Implementation and deployment is at ease as change or new software only need to be updated on a single system. Overall fewer resources are required to build a Knowledge Net solution following this design option. Control over the own content can be realized through Role-Based Access Control, as outlined earlier in this document.
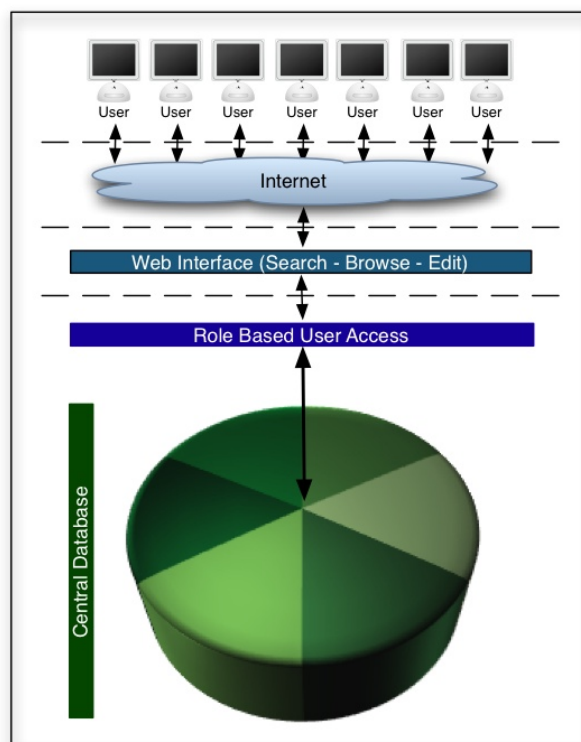

Figure 21 :   Central Architecture of YLVI implementation.

3.4.2   Network of federated databases

When using a solution based as network of federated databases then a number of standalone systems connected in a network build the Knowledge Net, as presented in Figure 22. Repositories of user groups are actually physically separated. Each of the systems becomes a node in the network. Each node runs the same software.

The Registry Information Service on European Residents (RISER) follows a similar approach, although the implementation details differ. RISER allows to search through the residence registers of several states through a central portal. The search is passed to every register connected and the results are returned to the user cumulated on a single results page. In contrast to the Knowledge Net the registers are powered different software systems. Data exchange is realized through interfaces. Like in the architecture with a single database the access to content is enforced through Role-Based Access Control. But in addition the content is not on a remote server which adds to feeling of security and control of the own content, thus decreasing privacy concerns. In case of RISER a central European residence register would violate the data privacy acts of several states.

Another advantage of a federated approach is the fact that the network is operational even if one or more nodes are offline. General availability of the system is higher.

But there are also major drawbacks. First of all maintenance effort is multiplied. Regardless of the size of a single node it requires a basic set of hardware and personal for maintenance. In addition deployment and update of the system is more complicated since necessary steps have to be performed on every node. Concepts to add and eliminate nodes must be specified. Through different connection qualities of the nodes the response times experienced by the user might differ within a session or a single node with connection problems could slow down the whole system. Those issues need to be taken care of.

The design and implementation of a federated system to enable access to the content regardless on which node it is physically stored is far more pretentious compared to a central solution resulting in additional expenditure in the design and implementation phase.
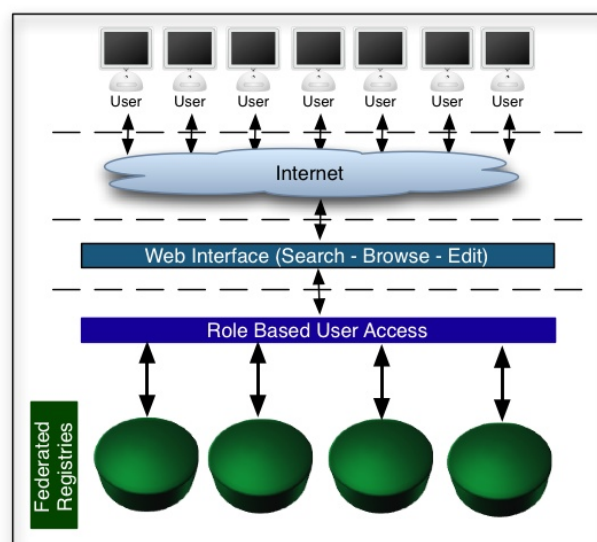

Figure 22 :   Federated Architecture for YLVI implementation of We-Go Knowledge Net.

References

[OWLS, 2007] The OWL Services Coalition. OWLS 1.1. http://www.daml.org/services/owl s/1.1/, accessed 10.11.2007

[WSDL, 2005] Web Services Description Language (WSDL) Version 2.0. Last Call Working Draft, W3C WS Description Working Group, August 2005

[SWSF, 2005] Semantic Web Services Framework. SWSF Version 1.0

[Makx, 2007] Makx Dekkers, Top Level E-Government Ontology, E-Government Project Team Project, http://www.egovpt.org/fg/Report, accessed 10.11.2007

[OASIS, 2005] OASIS TC, http://www.oasis-open.org/, accessed 10.11.2007

[W3C, 2007] W3C, http://www.w3.org/, accessed 10.11.2007

[OMG, 2006] OMG, http://www.omg.org/, accessed 10.11.2007

[YLVI, 2006] Popitsch et. al. YLVI – Multimedia zing the Semantic Wiki. In SEMWIKI ,06: Proceedings of the 1st International Workshop on Semantic Wikis, Budva, Montenegro, ESWC2006.

[ReGS, 2007] Register of eGovernment Services, UKIM PMF Informatika & Innovation LTD company, internal report 2007.