

# PROJECT FINAL REPORT

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<sup>1</sup> Usually the contact person of the coordinator as specified in Art. 8.1. of the Grant Agreement.

## 4.1 Final publishable summary report

### Executive Summary

This document summarizes the activities and achievements of the +Spaces project. Short for "**policy simulation in virtual spaces**", Positive Spaces (+Spaces) leverages social media to help policy makers tap into the thoughts and insights of their citizens. +Spaces is a research project funded by the European Union in the Governance and Policy Modeling area. It was active from 1/1/2010 till 30/9/2012, with eight organizations from across Europe participate in its consortium.

Policy makers often invite citizens to participate in discussions on eGov or openGov websites. We prefer to go to the people – in their virtual spaces. Using the tools and methods developed by the +Spaces consortium, policy makers can ask questions, foster debates, and conduct role-playing sessions across a range of social media.

+Spaces is directed at three types of end-users: Policy makers, citizens, and application developers. +Spaces helps policy makers reach their citizens and understand them better. The +Spaces tools allow policy makers to easily define polls, conduct debates, and even define role-playing simulation sessions in multiple social spaces at the same time – in Facebook, and Twitter, and even in a 3D virtual world. This allows policy makers to tap into citizens' thoughts and opinions, "meet" them in a virtual world, and gain new insight. It provides an easy way for citizens to make their voices heard and express opinions about public policy. +Spaces uses a variety of social media to let people express their opinions and influence policy makers, while maintaining their privacy. Finally, +Spaces addresses the needs of eGov application developers as well, helping them reach a wider audience and easily deploy applications in multiple virtual spaces simultaneously.

In the next sections we list the project objectives, summarize its main S&T results, and portray the potential impact it has. In the following chapters we also summarize the use and dissemination of foreground, and the societal implications of the project. We conclude with the final report on the distribution of the European Union financial contribution.

### Project Context and Objectives

ICT is able to contribute to the efficient monitoring and improved prediction of the impact of government proposals, decisions and legislation in society on a large scale, aggregating and analyzing information through information systems. We need artificial environments that will enable, or engender, mass participation under various contexts and that will simulate specific aspects of human society and behaviour. We need to use these environments as "Petri dishes" where e-Government applications can be executed by applying appropriate transformations from real life rules to ICT mechanics. By stimulating this micro-society and observing the reaction of its members, Government will be able to extrapolate conclusions for the real societies. +Spaces put forth the use of existing virtual spaces (VS) as that societal Petri dish for modelling real world behaviour and proposes to develop the required tools and methods to exploit VSs to that end.

The main objective of the +Spaces project was to deploy applications for policy makers, that would allow them to do just that – use virtual spaces as Petri dishes of society.

#### Policy making applications

The applications deployed in the context of +Spaces were to cover the necessary services facilitating the participation of end users (i.e. people / citizens) and ultimately enabling the incorporation of the input of relevant stakeholders in decision making. +Spaces set out to employ social technologies for collecting and aggregating social information from multiple VSs through structured and unstructured forums, blogs, e-polls,

e-petitions and provision of additional relevant information accompanying the aforementioned. To this end, +Spaces set out to evaluate the effectiveness of the developed technologies, by setting up experiments using actual VS content for the specific policy making applications deriving from requirements of the end-user. The behaviour of the community was to be monitored and the results extracted, validating not only the technologies developed by +Spaces, but also their output and value to governmental agencies.

In order to achieve this main objective, several additional objectives were defined:

### **+Spaces API and middleware**

An important objective of +Spaces was to create an API and the underlying infrastructure (middleware) that would allow applications for policy making to be deployed across a broad and diverse make-up of VS environments depending on the demands for sample size, relevance, demographics, theme, VS "openness", or functional capability.

A common API framework was devised in order to allow for an ideal "write once run everywhere" approach to application creation. The underlying infrastructure was developed in order to support interoperability and to provide baseline data management and baseline security services for advanced policy making functionalities by following a loosely coupled approach based on Service Oriented Architecture (SOA).

### **Common Infrastructure Services**

A second +Spaces objective was to deploy a set of common infrastructure services on top of the above middleware.

In order to bring about the envisioned utility, the infrastructure services include cross-platform data services, authorization, and security and privacy mechanisms.

### **Data Mining**

Data mining, text mining and information retrieval mechanisms were to be developed in order to collect data from VSs.

In the course of the +Spaces project we gathered structured data from polls and petitions, unstructured data from VS blogs and debate logs and relational information like social networks from user tracing. The collected data was aggregated and represented into an appropriate common format in order to be further processed.

### **Recommender and Reputation Systems**

In order to achieve a critical mass of participants, +Spaces set an objective to develop recommendation and reputation systems.

Algorithms were developed for making use of the aggregated social network information for purposes and recommendations and reputation. A recommender system based on familiar people's preferences recommends interesting people to interact with, places to visit, and objects to consume. A social network based reputation system assists support decisions on whether users' opinions can bring true value to the policy making process. This is based on the wisdom of the crowd (e.g., acceptance, popularity, or explicit ranking) and on sentiment analysis.

### **Statistical Analysis Tools**

In order to analyze, interpret, and present the aggregated data in appropriate fashion, an objective was defined to develop a set of statistical analysis tools to be deployed inside the +Spaces platform.

## **Business Modelling**

In order to generate a realistic and economically viable scenario bringing together a number of independent actors that interact to produce some desirable outcome, it was crucial to examine the motivations of each actor in the scenario – this was set as another objective.

In our analysis we considered the needs of the VS citizens as a market, modelled the incentives behind each stakeholder involved, and used these models to derive conclusions and form a series of business recommendations.

## **Legal analysis**

As +Spaces set out to utilise VSs to enable mass, it was anticipated that a number of legal questions would ensue whilst attempting to utilise data from VSs to formulate real life rules and policies, or simply to analyse behaviour in the virtual domain to aid in further governmental decisions. In order to address this question, an objective was defined, to dedicate significant effort to legal analysis. The aim of this analysis was to draw up a list of requirements for how the +Spaces would be able to legally realise its technology aim without infringing relevant EU laws on intellectual property, privacy/data protection laws and consumer protection law.

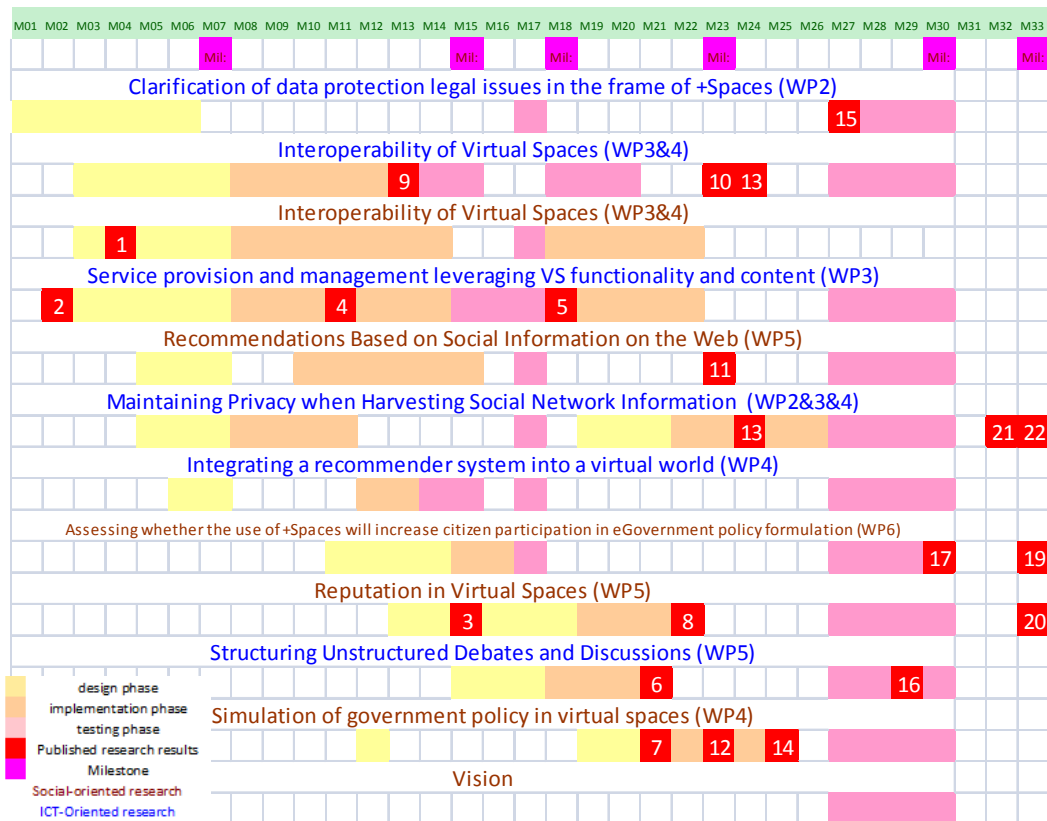
## **Main Science & Technology Results**

In this section we report the S&T results of +Spaces, as achieved by the various project WPs.

### **WP1: Research Coordination**

The purpose of WP1 was to monitor and steer the research work of +Spaces. The contribution of all the research-oriented partners was required, as each one displays expertise on a different scientific field. This was enlarged by the interdisciplinary nature of +Spaces research which is a blend of social- and ICT-oriented research. In Research and Development projects some tasks are indeed stemming from computer-based research while others come from other scientific areas closer to social sciences.

An overview of the research activity and the research lifecycle is provided in Figure 1.



**Figure 1. Research items lifecycle and progress**

**Error! Reference source not found.** illustrates the progress of each of the research items in the course of the project. It depicts their lifecycle using a different colour for design, implementation and evaluation phase as mentioned above. The research challenges remain active during their whole lifetime but they deliver outputs on certain periods based on the type of research challenge and solution maturity. There are 22 outputs that are indicated on the table:

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## **WP2: User and Legal Requirements**

The methodology followed for the extraction of the user requirements involved two major techniques: a) the creation and dissemination of questionnaires targeting to the mass participation of the various user categories; and b) the organization of meetings for specific focus groups that represented each end-user category, targeting to expert participation and a more qualitative input.

The purpose of the questionnaire was to get answers that were posed internally from the consortium. These answers were essential for the project development but couldn't be posed explicitly to the end-users because of the differences in the "language" as well as in the familiarity with the project concept. Therefore the questions and available options were "disguised" in a way that the users could understand and answer them. WP2 had adopted a certain methodology to associate questionnaire answers to the internal questions and objectives of the project.

Upon completion of the period for which the questionnaire was made available, WP2 collected From the replies to the questionnaire: 11.83% of the respondents were policy makers, 11.83% application developers, 53.76% virtual space users, and 16.13% users belonged to other categories not mentioned in the questionnaires. Another 6.45% of the respondents did not answer this particular question.

The conclusions that stand out from the questionnaire answers can be summarized in the following:

- The vast majority of the participants feel that policy simulation is a prospect that can be used to get early feedback about social reactions
- In the policy formulation process there are various instances in which we can involve citizens for undertaking a simulation experiment. Participants think the best times to do that is when the draft is ready or during the idea formulation, that is, at the very start of the process
- People are slightly more familiar with using SNS than with VWs
- The vast majority of the participants recognizes the importance and the innovation of the applications that +Spaces is going to implement
- Participants who have an experience with using e-government services, feel that it would be good if +Spaces had a similar "look and feel"
- Many participants believe that the citizens participation and knowledge is valuable and probably worth paying for it
- The majority of the participants stated that they depict their normal behaviour when acting in a virtual space as well as that they would provide real information when needed for a purpose such as the one stated from +Spaces
- Most of the participants stated that they would be interested to participate in a +Spaces application (polling, debating, simulation)
- Most of the people taking the questionnaire felt that +Spaces would be effective in allowing citizens to affect policy making

Regarding the focus groups meetings, there were three held, one for each end-user category. Experts from each related field were invited to participate in a face to face meeting (when relevant, participation in the meeting was also made available through virtual worlds).

The policy makers focus group meeting was held in the premises and under the organization of HeP (19/05/2010). The list of participants included: employees from various sectors of the Greek (Hellenic) Parliament that were not involved in the project and policy makers from members of the parliament (elected parliamentarians) to consultants of ministers and parliament services in the sector of ICT. The main conclusions from this discussion are highlighted below:

- The experts found the concept very useful and especially the concept of conducting societal experiments by simulating policies. They particularly identified that it may be useful to attract the youngster and help them better understand legislation framework

- The experts were mainly concerned about the aspect of information evaluation and of the malicious use of the platform. The experiments must take place in a contained environment
- The experts stated that in some type of applications the participation of someone from the policy maker group would make sense in order to monitor, filter and guide the discussion
- The importance of the incentives for participation was stressed out

Another focus group meeting was held in the ATC premises (16/04/2010) where the participants were mainly e-government application developers. From the discussion that followed the main conclusions were extracted:

- The need for the existence of a (technical) moderator was stressed out. This is a central requirement and a common practice in existing e-Government applications
- The clerical activities (e.g. fill in personal details) that the user must undertake must be minimal in order to avoid dissuading the participants
- The +Spaces API must be as much as possible similar to common e-government services APIs
- The cost and requirements of the infrastructure in which the platform will be hosted isn't something that should be taken lightly

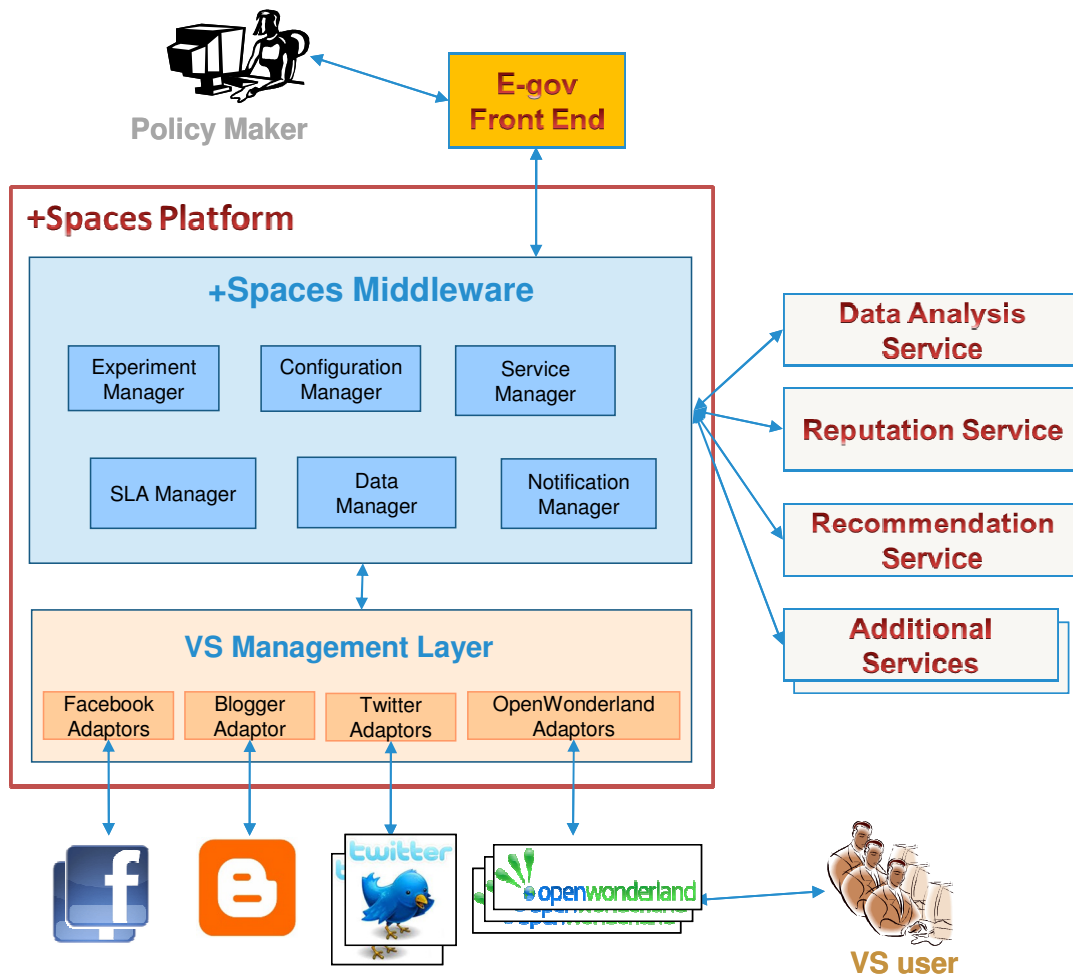
Finally, the third focus group meeting was organized by the University of Essex (25/05/2010) and the participants included people with long involvement in the use and/or development of virtual world applications. The basic outcomes of this discussion are the following:

- Privacy is one of the most important aspects that need to be taken into consideration. Virtual space users are largely dissuaded from using an application in the virtual spaces because of fear of compromising sensitive data
- Experts have raised concerns about using platforms and environments that have been implemented by companies
- People are surprisingly close to their avatars and in most of the cases they express honest opinions through them
- Recommendation and reputation systems are common and welcomed in virtual spaces but trust plays a key role in their operation
- They also highlighted that monetary compensations may be appropriate when attracting people to participate by providing their opinion or experience

### **WP3: Universal eGov Platform**

This work package was responsible for the definition of the +Spaces API and the design of the complete architecture of the +Spaces platform, in order to ensure smooth communication among all components, and easy integration. It was also responsible for carrying out the research and development of the middleware components of the +Spaces platform. This included scientific innovation to solve the challenges posed by each component's objectives, as well as the implementation work required for the delivery of a concrete, functional middleware system. The middleware provides the underlying infrastructure on top of which the software components are deployed.





**Figure 2. Overall architecture**

Figure 2 depicts the overall architecture of the platform. The front-end is developed by ATC, and serves as the entry point of the policy maker (government officer) for creating and configuring experiments, and for monitoring them.

The +Spaces middleware is composed of the following components:

- **Experiment Manager (IBM)** – the main component that interacts with the system's front end and UI. All of the user functions are concentrated and managed in the experiment manager. The experiment manager operates as an orchestrator of the various platform components.
- **Service Manager (NTUA)** – the component responsible for managing the analysis services as well as managing and coordinating all communication between them and other middleware services. The middleware connection to the data analysis and recommendations was reviewed. The communications with the reputation service was implemented and tested.
- **Notification Manager (NTUA)** – responsible for notifying the analysis services of new experiments as well as actions taking place in the Virtual Spaces.
- **Data Manager (NTUA)** – provides the analysis services with an access point to the +Spaces database, allowing them to recover older data that they have lost due to failure.

- SLA Manager (NTUA) – creates, monitors and evaluates Service Level Agreements between analysis services and government organisations.
- Configuration Manager (IBM) – All of the +Spaces middleware components are configurable, and operate differently with different configuration parameters. The configuration manager is the focal point for system configuration. It contains and exposes all of the configuration parameters for the middleware components. It is an internal component.

Platform capabilities: Polling, Debating and Role-Playing Simulation in Virtual Spaces, Virtual Spaces Interoperability, Data Aggregation and Distribution, Data Analysis, Recommendation and Reputation, Data de-identification, Data Recovery, SLA Management, Trust and Security.

Throughout the projects, discussions were conducted with KULeuven in order to ensure the implementation of the privacy requirements into the platform as well as to meet the conditions stemming from the terms and conditions (T&Cs) of the various virtual spaces utilized in +Spaces. These requirements were taken into consideration in the implementation process and further adjustments.

The front-end of the +Spaces platform was developed by ATC. For each type of experiment, different information is required from the policy maker (a poll requires a set of questions, while a debate requires background information, and a role-playing simulation is even more complex and requires role-definitions and more). For this reason, a different set of front-end dialogs was developed for each phase.

The +Spaces API is a set of methods exposed as web services that allow three types of utilization and communication with the +Spaces platform, to enable PMs and public servant to initiate, define activate and monitor experiments:

- 1) A set of methods of the Experiment Manager, allowing application developers to develop various front-ends as required by policy makers
- 2) A set of methods and API definitions of the Service Manager, Notification Manager, and Data Manager, for services to subscribe to the +Spaces platform, follow experiment, and perform various analyses
- 3) A set of methods and API definitions of the VS Management Layer, for virtual space owners or other users to connect additional virtual spaces to the platform

#### **WP4: Virtual Space Application and Integration**

The objectives of this work package are to produce an integrated solution that will comprise the +Spaces platform (technical integration, deployment of +Spaces applications in Virtual Spaces); use the solution to develop the actual testbeds, preparing the work for WP6 where evaluation and testing during the pilots operation will take place; and Virtual Spaces Management and connection to the +Spaces platform.

Work in this WP includes the technical integration but also the actual development of adaptors for the deployment of e-Government applications in virtual spaces, and the mechanism that manages these adaptors.

The components developed in this WP take a generic action from the API (WP3) and translate it into a set of actions specific to each VS, and then translate the results back from each VS into a common uniform format. We established a single environment where application creators "write once, run everywhere". By using the +Spaces API, the application interfaces transparently with a variety of disparate social network APIs. In lieu

of a cross-world protocol or standard, such a method is implemented to interface with various VS environments, provided their APIs are open.

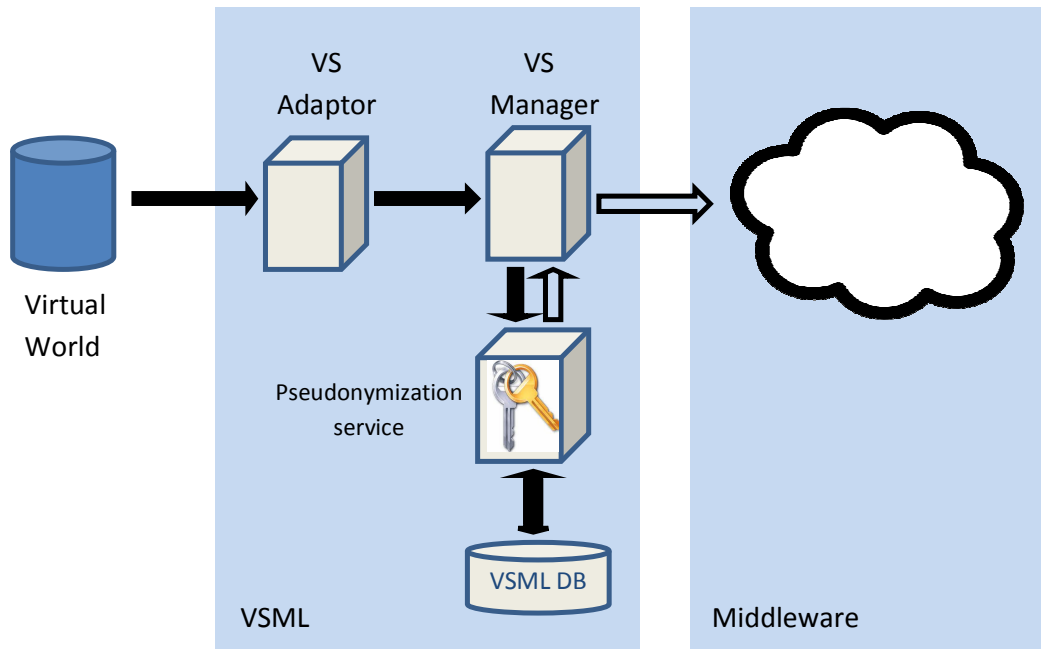
The Virtual Space Management Layer (VSML) is the core component that stands between the middleware and the virtual spaces and its role is to aggregate and orchestrate data from the underlying virtual spaces. This process enables the timely deployment of the experiments and the monitoring of relevant actions that take place in the virtual spaces. The VSML is primarily constituted by a number of adaptors that serve into homogenizing the data acquired from the virtual spaces and as wrappers of the single API calls that +Spaces built and uses.

These are the adaptors that were implemented:

- Polls
  - OpenWonderland
  - Facebook
  - Twitter
- Debates
  - OpenWonderland
  - Facebook
  - Blogger
- Role-Playing Simulation
  - OpenWonderland
  - Twitter

In order to support maximal user privacy, we have added a pseudonymization mechanism, which creates a pseudonym for each user in each virtual space. VS Manager incorporates this functionality, and pseudonymizes the real IDs of users before sending them to the middleware and vice-versa. The real user IDs and their pseudonyms are stored in VSManager database (separated from the middleware) and reused each time specific user's pseudonymization is required.

This case is depicted in Figure 3 below:



**Figure 3. Pseudonymization Service**

Transaction pseudonym system, in which a user is assigned a new pseudonym for each transaction is a stronger privacy and de-identification mechanism. However we have chosen not to implement it here, since this would reduce the usability of the data from the external services point of view. For example, for social network analysis purposes, used by the recommendation and the reputation services, the history of a user's behaviour is important, and thus the same pseudonym should represent that user on all transactions.

### **WP5: Analysis Services**

The objective of this work package was to provide analysis services required for the process of policy simulation. External services may be used as well, but the following three services are provided by the +Spaces platform:

- 1) Data Analysis Service, for providing policy makers with easy access to results of experiments, and to enable exploratory data analysis
- 2) Recommendation Service – for recommending potential participants for an experiment, and for recommending interesting experiments to users
- 3) Reputation Service – for identifying misuse

All three +Spaces services are fed with information on activities by the NotificationManager. Each service, upon activation, subscribes to the notification manager in order to receive the relevant activity information that originates from the experiment manager (e.g., creation of an experiment) or the virtual spaces adaptors. The data analysis service monitors the activities related to +Spaces experiments, while the recommendation service and the reputation service monitor, in addition, various social activities in the virtual spaces (such as direct communication between users, etc.), for the purpose of social network analysis that is required for producing recommendations and reputation scores.

The Data Analysis Service, developed by Fraunhofer, is a software tool for the statistical analysis of the data gathered from virtual spaces during +Spaces experiments. It supports analysis and interpretation, by presenting it in an appropriate fashion to enable policy makers to draw conclusions. Specifically, it gathers structured data from the policy making applications (polling, debating, and simulation) and unstructured data from text (blogs, debates). Innovations in this service in comparison to existing solutions include filtering for specific time spans (to allow the analysis before and after specific events during an experiment). Additionally, research on the automated clustering of free text answers is performed.

Recommendations of the Recommendation Service are based on two of the core elements of social media – people and tags. The +Spaces Recommendation Service is implemented on top SaND – IBM’s Social Network and Discovery engine, which is described in detail in **Error! Reference source not found.** Relationship information among people, experiments, and their tags, is gathered from event notifications coming from all virtual space adaptors, and fed into SaND where they are aggregated and indexed. Based on these aggregated relationships SaND recommends experiments that are potentially of interest to people, and people that may potentially be interested in experiments.

For the Reputation Service, research was conducted in order to devise algorithms that make use of social network information for inferring how a person is perceived. Intensive work was done in order to identify the types of useful information that comes from the +Spaces platform, and to model them in order to calculate a reputation score. During our research we learned that trust is much more difficult to predict through social media indicators. Number of followers seems to be its strongest predictors, though the strength of this predictor is not high. Influence seems to be predicted best by the number of blog commenters. It turns out that the number of followers – which seems to be a basic indicator of the ability to reach out to more people – is not a good predictor of this reputation flavor.

## **WP6: Pilots Operation and Evaluation**

The objectives of this work package were to plan and set up the scenarios that the governmental agency wished to test; and to allow all the involved end-users to thoroughly evaluate the applications developed in WP4. The latter constituted a first class opportunity to also test the +Spaces platform from a technological point of view. This feedback along with the designated evaluation report was then used by the technical WPs so as to refine their work.

### Pilot Planning

The planning of all pilots was led by ATC, with involvement of all partners, in brainstorming and discussions, and with extensive involvement of HeP in identifying interesting policies, defining the questions to be asked, and gathering relevant background. The pilot actors were involved, trial use cases were associated with research objectives and together with the outcome of WP2 (use cases and functional specifications) defined the pilot objectives and the +Spaces components that were evaluated. In addition, a time plan was created for expected results.

In order to ensure a smooth running of the pilots while covering all the scenarios the governmental agency wishes to test, meticulous plans for the entire pilots operation was drafted. The participating parties were defined along with their roles and obligations during the execution of the pilots. Specifically for the policy maker’s engagement, HeP partner presented in details its operative structure in order for the consortium to decide which would be the most appropriate people to be mobilized.

In parallel, +Spaces evaluation framework was defined, prescribing the testing and evaluation indicators. It was the result of a thorough study of evaluation frameworks that have been utilized from other past EU-

funded projects similar to +Spaces (e-Government projects). It adopts a certain attitude towards evaluation that stems from considering the following aspects:

- +Spaces pilot objectives
- Existing evaluation methods and frameworks
- Technology acceptance methodologies
- +Spaces advantages over competitions

It consists of the following elements:

- +Spaces evaluation perspectives and criteria
- Stakeholder's involvement – raising awareness mechanisms
- Tools for aggregating data

The governmental agency (HeP) provided the consortium with a set of current policies that are of interest to its parliamentarians and seem to be of interest to citizens, based on existing web conversations about them.

The policies that were picked are:

- Smoking banning in public places
- EU financial crisis - Roadmap to EU growth
- Education
- EU Corporate Political Governance
- Turkey accession in EU
- EU Energy Efficiency Plan
- Co-habitation contract
- Water is a human right (European initiative)
- Let me vote in my residence (European initiative)
- #Hellas version 2020

The use of these policies was planned in three phases:

- **First pilot: Validating the tools for supporting polls by running a closed group testing pilot**  
A poll was prepared around the first policy, for capturing citizens' opinions about the policy. The pilot plan illustrated the full details of the planned experiment, as they need to be input into the front-end of the +Spaces platform.
- **Second pilot: Validating the tools for supporting debates by running an open testing pilot**  
Background information about all policies was prepared, to be provided to debates participants before they actually state their thoughts. Clear debate questions were phrased.
- **Third pilot: Validating the tools for role-playing simulation by running an open testing pilot, as well as validating the platform as a whole by running multiple experiments of various types on multiple policies**  
In order to run a thorough pilot of all platform capabilities, polls were defined on all policies to serve as an ice-breaking poll in the role-playing sessions. This way, the platform capabilities are interchanged with each other. The goal is to run such polls for a whole week, allowing citizens to dedicate a minimal amount of time for their policies of interest. Following this first week, debates are to be launched about the most interesting five policies (based on poll participation). Finally, once

debates run their course, role-playing sessions will take place on the three most interesting policies (based on debate participation).

Before actual execution of the pilot, participating actors (policy makers) were trained to use the system. This entails both the use of the +Spaces front-end and its required details, as well as maintaining the experiments – especially as moderators to debates and to role-playing sessions.

#### Pilot Execution

The first pilot (poll experiment on the “smoking banning” policy) was run during May 2011.

A focus group of HeP people was initiated, in which they used the +Spaces front-end in order to create the experiment. The poll prepared in advance was inserted into the system by one of the participants. Upon clicking “create”, the poll was deployed in three spaces simultaneously: in OpenWonderland, in Facebook, and in Twitter. Email invitations were sent by the platform to a list of citizen emails provided by the users and by the consortium. A Twitter announcement invited Twitter followers to take part, and viral dissemination was used to attract more users.

The second pilot was run during June 2012. Debates were launched on different policies in both 3D (OpenWonderland) and social media (Facebook and Blogger). The consortium devoted a lot of thought, effort, and time in order to increase participation over the various debates. For each policy, dedicated searches were performed in order to identify the relevant communities who will find interest in the policy. Invitations were placed in the spaces of these communities – either as wall messages on Facebook or as a comment in a Blogger blog. Each policy had at least one dedicated moderator from the consortium (in addition to the HeP appointed moderators), and this moderator made efforts to increase the volume of participation.

All in all it was very difficult to reach a critical mass over the three weeks of the pilot. We learned that various communities (Facebook pages and Blogger blogs) that discuss the same or similar questions, receive hundreds responses. Politician Facebook pages often even receive thousands of responses. But we did not manage to convince those people to join the same debate on our +Spaces page.

We identified several reasons for our lack of success, and believe the value of +Spaces is intact:

- **It takes time to build a critical mass.** Other Facebook pages or Blogger blogs exist for a long time and already have a critical mass of followers with an interest on the focused topic, so it’s easier for them to attract additional response to a new question.
- **Provocation is a good stimulator.** This was even a suggestion of the reviewers during the review, to ask provocative questions in order to get more answers. However, +Spaces as a consortium is composed of partner organizations, each of which is concerned about its reputation and can not risk being provocative.  
When +Spaces is installed by customers, they may opt to be provocative in their own field, and thus will gain more responses than +Spaces can gain as a consortium.
- **Participants wish to know they are heard.** Even when an interesting question is asked, people will give it the attention and answer it only if they are convinced that someone will receive their answer – be that specific politicians who turn to their constituents over the Facebook pages, or the rest of the community.  
When +Spaces poses a question as a project (rather than on behalf of a known politician), potential

responders do not find it relevant to answer.

We are convinced that once real policy maker use +Spaces to post questions on their behalf on their own existing spaces in which they already have a critical mass, participation levels will be high, and the policy maker will be able to gain from all the benefits of +Spaces (multiple deployment, interoperability, data analysis, etc.).

The third pilot ran during August and September. In this pilot was started with launching up to eleven preceding polls – to be later used as ice-breakers during role-playing sessions. We then launched five debates on the policies that received more poll responses. We finally ran role-playing sessions on three most interesting policies. The role-playing sessions took place during the project plenary meeting in Madrid on September 12-14.

#### Pilot Evaluation

The evaluation methodology of +Spaces makes use of both qualitative and quantitative criteria and indicators in order to end up to the final assessment of the platform and of the overall project implementation as well. Interrelations between these indicators are created, so as to provide an in-depth picture and analysis of the project outcomes. It takes advantage of a set of tools for gathering the appropriate and necessary data and approaching the various stakeholders which are external to the project team.

For evaluating the pilots execution, specific tools were utilized,

- Focus groups organized at the HeP premise, documenting policy makers suggestions and comments
- Interviews with senior developers and executives were organized
- Logs were analysis and usability tests over the platform were performed
- Questionnaires were distributed to participants

Minutes drafted from the focus group and interviews together with the analysis of platform's performance during the pilot execution, led to the evaluation of +Spaces prototype in three levels: a) policy making effectiveness, b) social acceptance, and c) impact assessment. In addition, the evaluation was accompanied with the technical assessment which is an internal procedure among the project's partners and focused on important conclusions concerning the success of the project in terms of results vs. initial objectives.

### **WP7: Dissemination & Exploitation**

The objectives of this work package were the following:

- To disseminate the results of the +Spaces concept and project using tools that are in alignment with the nature of the technology we are developing and the behaviour of the audience we are targeting.
- To analyse the virtual world and social networking sites market and involved communities from diverse angles (technology, sociology, e-Governance) in order to involve them in the most effective way.
- To ensure that we reach out to the virtual space users (the citizens) and government bodies, involving them in our work and communicating the results of this work to them in the most appropriate ways.
- To develop a sound exploitation plan that builds on the exploitable products and defines the future use of the technologies generated during the project.



- To lay concrete foundations for the commercial exploitation of its results, by exploiting the software to major advantage in the main lines of business of the industrial project partners.
- To provide a continuous analysis from a business, legal and social viewpoint, so as to ensure to confirm that the platform architecture and design achievements, as well as the prototypes developments of the project are accurate and consistent with the planned objectives set out by the project.

The dissemination and exploitation activities are summarized in the next section.

### Legal Evaluation

+Spaces has been a very successful project with regard to addressing privacy and ethical issues. In order to disseminate the research on these issues, +Spaces even organised and led a workshop for the education of other FP7 Research Projects in Objective 7.3, ICT for Governance and Policy Modelling on privacy and ethical issues in December 2010.

The +Spaces consortium -and specially KU Leuven and IBM- has dedicated significant amount of time and effort in carrying out a thorough analysis of the Terms and Conditions of the various spaces that are used by the project for the running of the +Spaces platform. In this way we carefully studied the potential implications for +Spaces and ensured full compliance of our system to the relevant European and national legal framework.

The compliance requirements in the terms and conditions of the spaces can be classified under four different categories:

#### **1. Posting content**

- The +Spaces platform posts content onto the spaces on behalf of the policy maker – it deploys experiments, posts questions and background information for debates, and solicits participation through the use of its Twitter and Facebook accounts.
- Posting content requires attention to issues such as intellectual property rights, , third party indemnification, the issuing of one sided press releases from various spaces on the +Spaces platform, and more.

#### **2. Deploying a UI**

- The adaptors of +Spaces deploy user interfaces on the various spaces, in the form of applications that engage citizens in +Spaces experiments
- Deploying applications requires attention to issues such as opting out buttons, “log out”, customer support, export regulations, redirecting users to competitor sites, and more.

#### **3. Storing content**

- The +Spaces platform stores information from the various spaces. Information has two forms: information posted by citizens as a response to a +Spaces invitation (poll response, debate participation); and additional information about citizens, such as demographics, social network, etc.
- Storing data requires attention to issues such as privacy, personal data, the need to ask for consent, maintaining up-to-dateness of data, and more.

#### 4. Extracting content

- As stated above, the +Spaces platform extracts information from the various spaces. It then transfers the data to its various components (middleware, services) that may reside on servers of different partners, in different countries. The information is analyzed, and some of the results (like recommendations) are sent back and presented on the spaces.
- Data extraction and analysis requires attention to issues such as transferring content to other contexts, taking into account copyright issues, and more.

The consortium spent efforts in understanding the different requirements of the different spaces, and in implementing these requirements in a legally compliant way into the +Spaces platform. Moreover, in order to ensure compliance with the relevant data protection legislation, KU Leuven made a thorough analysis of the data processing operations and the role of the various actors in +Spaces. The consortium partner ATC was specified as the “data controller” of the project and the relevant notification has been made to the Greek Data Protection Authority. In addition Controller-Processor agreements were drafted between ATC and the data processors: NTUA and Fraunhofer (the agreement is in final phrasing). A full report of these activities will be provided in D7.4 (M30).

### Potential Impact, Dissemination & Exploitation

#### Potential Impact

+Spaces leverages social media to help policy makers tap into the thoughts and insights of their citizens. E-government has the potential to go way beyond web sites with public services or online ballots. The emergence of social networks and 3D virtual worlds calls for the development of tools that involve people in the policy-making. Although virtual spaces are usually thought of as places to meet friends, +Spaces allows policy-makers to use them to test how people will react to new proposals and legislation, by developing technologies that engage citizens from different online communities—including Facebook, Twitter, and Blogger, alongside virtual worlds like Open Wonderland.

The idea is to have policy-makers go to where the public is. We can more easily run policies by people and get their opinions by going to them in their online communities than by using government websites. Policy-makers can now ask questions, create debates, and conduct structure role-playing sessions across the range of social media.

Following its evaluation from perspectives of end-users (policy makers, citizens, and application developers), as well as from the technical and legal perspectives; we conclude that the +Spaces platform has the potential to strongly impact on the domains of eGovernment and eParticipation by assisting policy makers in understanding the citizens and involving them in the policy making process. +Spaces is unique in its scope – supporting several types of engagements as well as (an extensible) range of virtual spaces. Its interoperability principles have the potential of impacting a broad spectrum of domains of user engagements, in the public, private, and business sectors.

- Most of the people expressed their satisfaction about the UI and from +Spaces capabilities and functionalities (see sub-section **Error! Reference source not found.**)
- High ranked officials in the Hellenic Parliament were very impressed with the use of social networks. Similar reactions came from a high ranked official in the Austrian Parliament (see sub-section **Error! Reference source not found.**)

- Overall the participants felt that the process worked very well. They thought that it was clear what they were meant to be doing at each stage, and they were able to participate fully in the session (see sub-section **Error! Reference source not found.**).

These encouraging results indicate high potential with regard to a future commercial position of +Spaces.

It should be noted, that legal constraints will have to be taken into account by any potential use. They are unlikely to act as a barrier for the commercial rollout of +Spaces, yet they may imply more efforts in the adaptation of the platform for each use, especially if additional social networks are added or more complex analysis is performed. These efforts have to do with the evolution in Developer API terms and the overall EU and national legal frameworks related to data protection issues.

In order to increase the market impact of +Spaces, it is important to address key recommendations for improvement.

#### Discussions of Success

Following the evaluation in the pilots, the characteristics of the +Spaces prototype and related evaluation results were matched against these criteria with a view to draw conclusions related to success and market impact of +Spaces.

#### 1) Effective and transparent contribution to the eParticipation/eGovernment domain:

- The innovative features of +Spaces, if accepted, have the potential to make an impact on how policy makers make decisions and how citizens are involved in, influence, and even accept new legislations.

These innovative features are:

- The simultaneous deployment on multiple spaces – allowing citizens to pick the space of their choice
- The interoperability that allows thoughts and ideas to flow among spaces and thus support the evolution of conversation in all spaces.
- The introduction of role-playing sessions – structured debates that engage participants in a thought provoking experience and assists their participation due to the moderated structure.
- Important features:

- The complete cycle of +Spaces experiments is an added value to the policy making process.

#### 2) Sufficient engagement of the targeted group:

- +Spaces is designed to support sufficient engagement through viral dissemination over the social networks, as well as through the recommendation service that aims to suggest additional

experiments to citizens bases on their past engagement with the platform and in the social networks.

- The recommendation service encountered several limitations due to the legal and ethical issues and its functionality had to be reduced, thus its performance wasn't the envisioned one. Even though this drawback narrowed down project's capabilities during the pilot executions, the participants highlighted its need to assure the quality of the people engaged and content provided.

### 3) Scalability in policy making process:

- Scalability is required in several levels – in the number of policies that may be handled at the same time, in the number of citizens that participate simultaneously, and in the amount of data that may be processed.
  - +Spaces is designed to support multiple policies and process large amounts of data, limited only by the capacity of its servers. Simultaneous participation is dependent on the virtual spaces – handled by Facebook, Twitter, and Blogger. Open Wonderland is limited to about 20 simultaneous participants.
- Although we deployed, moderated and analyzed more than 7 policies, raised by different departments of the Hellenic Parliament and other EU parliaments; and although we approached more than 100 existing communities; we didn't manage to engage enough citizen in our experiments in order to prove the system's scalability.

### 4) Data analysis of contributions:

- The pilot evaluation taught us that the data analysis service visualized results in a sufficient way for both debates and role-playing sessions. A drawback was the lack of multilingualism.
- Policy makers expressed a wish to receive a concrete report with the main aspects triggered like highlights and sentiments.

### 5) Overall acceptance of the new approach for the policy making process:

- The pilots and the interviews that followed it taught us that the +Spaces platform meets PMs needs for the policy making process and subsequently it is accepted (user friendly and explanatory interface).
- It is foreseen that the integrated tool utilizing the debates and role-playing simulation can bring to the surface the core advantages of +Spaces against the common approaches used

6) Ease of use and user friendliness:

- The comments received from the people voted via Virtual Spaces and the evaluation of the PMs concerning the eGov Front-End showed that +Spaces platform utilizes easy to use and friendly interfaces. In some cases, more explanatory description requested, though in principle, the interface is very easy to use and friendly.
- Most of the people expressed their satisfaction about the UI. Some refinements in the Facebook and Front-End screens were proposed.
- Role-playing seemed to be time-consuming and knowledge needed, though these comments were not ranked with high importance.

7) Usefulness:

- The technical aspects connected to the usefulness proved that +Spaces platform was accepted by the stakeholders.
- Due to the use of social networks, and the game-flavor of role-playing, +Spaces can attract young people to participate in the legislation process
- +Spaces synchronous experiments offers a communication that resembles a lot a face to face discussion
- Both 2D and 3D role-playing simulations are innovative and very impressive
- Members of the Hellenic Parliament appreciated the project as a whole

8) Factors that help or hinder realistic contribution:

- SNs utilization showed that realistic contributions can be harvested. Some people may be reluctant to express political views on social networks for their friends to see; however politician's pages on Facebook world-wide prove that hundreds and sometime thousands of responses are made on every status update, showing that if deployed on the right Facebook page, the +Spaces debates may gain the proper amount of participation.
- The 3D environment is something new with a lot of innovations, like a brainstorming game or a place where fresh ideas are born. On the other hand, it has a learning curve that may hinder most users from participation.

9) Sustainability in terms of re-using the platform:

- Several parliamentarian bodies expressed an interest in using the platform

#### 10) Impact on legislation formulation:

+Spaces has the potential to impact the legislation formulation at various stages. Its single front-end for deploying various types of engagements on several spaces allows it to be used for different granularity of questions: policy makers may define complex polls and raise serious debates, while also using the same platform for asking minor questions and poking the brains of their followers for any contemplation. Having an active +Spaces space, after the initial stage of building a followers list, the policy maker can have direct communication with their constituents.

#### Dissemination

The dissemination and exploitation plan was categorized by two sets of activities: a) pre-pilot activities and b) post-pilot activities. The concept was to exploit the pilots as the tipping edge of the dissemination effort and use common dissemination activities to support and maintain the critical mass that is needed for efficient dissemination. Furthermore, the work in WP7 was focused on planning the basic dissemination activities such as to categorize the dissemination activities into traditional (which include the use of newsletters, brochures, presentations, etc) and social-based activities such as dissemination through the use of social media. The latter is proved to be much more efficient, especially in projects such as +Spaces and it builds upon the visibility that the project has already gained, but mostly on the social graph of the consortium members.

As part of the project's dissemination the following activities were carried out:

#### **Preparation of new dissemination material**

The project partners have prepared new dissemination material which followed a commercial approach. This has been achieved by using a clear and simple language and by pointing out the benefits of using +Spaces for three different target groups. To this end, the partners created two types of dissemination material which are in line with the dissemination approach to support clearly the exploitation efforts:

- A new commercial leaflet which presents in one page the benefits for the three identified target groups "Citizens", "Application developers" and "Policy makers"
- Three different types of bookmarks, including short, simple, precise messages pointing out the +Spaces benefits for each target group.
- Preparation of a +Spaces poster carrying the main slogan "Engage citizens in the policy making process" and which was used in the HeP conference in June 2012

#### **Successful organization of two +Spaces events to be pointed out as dissemination highlights**

The +Spaces partners have organized, either by themselves or in collaboration with other projects or initiatives, three successful events which should be mentioned at this point:

- December 2010, Brussels, 1<sup>st</sup> workshop on Privacy and Legal issues related to modern public services. A workshop in which all the project funded by the EC unit for ICT for Governance and Policy Modelling participated

- 7<sup>th</sup> June 2012, Athens, +Spaces Final Conference in the Hellenic Parliament. Presentation of the project, demo session of the platform for +Spaces stakeholders.
- 4<sup>th</sup> July 2012, Samos summit\_ Legal challenges for FP7 projects. A +Spaces and WeGov workshop.

**Maintaining and update of the project's website ([www.positivespaces.eu](http://www.positivespaces.eu))** – This topic is summarized in the next section.

Furthermore, several new publications either scientific or for the popular press were prepared by the project partners and uploaded to the project's website.

Besides, additional efforts have been placed on intensifying the contact to other projects especially from the "ICT for Governance and Policy Modelling" (ICT-2009.7.3) unit. Pursuing this ambition, +Spaces has enriched its collaboration activities with three European projects during the reporting period. +Spaces has intensified its collaboration with the projects **Socios, WeGov and Rural Inclusion by organizing and celebrating several successful events, workshops in collaboration with these projects during 2012**. These activities are considered to increase common awareness about all participating projects and to attract potential customers for the +Spaces platform.

In terms of raising awareness via the Social Networks, it can be stated that the +Spaces partners have put increased efforts in disseminating the piloting activities via our +Spaces social network accounts. The project is active in Facebook, Twitter and Linked In.

#### Exploitation

The exploitation activities started on PM08 and continue after the project's end. The partners have made enormous progress in preparing feasible exploitation strategy for the project results and they have committed to establish solid **sustainability strategy**.

+Spaces has clearly identified the project results and classify them accordingly to their potential demand in order to define the future use of the knowledge, products and other results generated during the project. Consortium has proved the concept of +Spaces in different application environments (**Public Sector, Educational Sector and Business Sector**) to guarantee the sustainability of the project results. The offer of +Spaces is mainly addressed to policy makers, however the **educational sector** and **business sector** can also take advantage of the tools benefits. Therefore **three Business Models with real market validation have been developed** in +Spaces in order to maximise the market reach. +Spaces has evaluated several business scenarios to perfectly identify which are their needs and what are the benefits they can gain from this solution. The business validation, as part of the project evaluation carried out along with WP6, guarantees the acceptance of this products and the sustainability of the platform in the current market.

+Spaces partners have studied all possible alternatives to exploit project results. For this purpose, every partner has developed an **individual exploitation plan** to exploit its assess individually or in partnership with other organisations. However the aim of the project is to exploit +Spaces platform as integrative service in which all partners take part of this agreement. Concrete commercial strategies have been defined (**1. Selling of the entire platform; 2. Selling standalone components of the platform and 3. Foster an OpenSource Community over the +Spaces Platform and Build on It**) to exploit the +Spaces results. Each partner has explained its business intention and has describe which commercial strategies fit better with its interests. This exploitation analysis was concluded with a financial study needed to get realistic pricing scheme.

+Spaces has tried to transform existing users into customers on the one hand, as well as recruiting new ones on the other. +Spaces has been aggressive in marketing as they were taking advantage of all dissemination activities. Therefore +Spaces has developed an extensive **promotional campaign** with the objective of **creating awareness, educating the target group and promoting the active participation of stakeholders** in the project. The marketing material has been created accordingly.

One of the main objectives of +Spaces consortium has been to identify key contacts and approach them with **the intention of selling, offering +Spaces platform** and getting useful functionalities feedback. The consortium developed a common approaching plan to reach its potential customers based on its networking contacts. After several interactions with them, **Austrian, Serbian and French parliamentarians, The Polish Ministry of Administration and Digitalization among others** have shown significant interest in +Spaces. Consortium partners will keep in contact with these organisations to continue the relationship in order to mature the acquisition of +Spaces and guarantee the long term sustainability of the project outcomes.

## Project Website

The +Spaces website resides in [www.positivespaces.eu](http://www.positivespaces.eu). The website includes:

- Announcing project relevant events on the +Spaces homepage: the “HeP conference” in Athens organized by +Spaces in the “Legal Challenges for FP7 projects workshop” organized by +Spaces in collaboration with the project WeGov. In order to increase the publicity about these events they were announced on the homepage of the +Spaces website.
- Uploading of diverse dissemination material, such as:
  - Videos explaining the +Spaces platform functionalities under the section Public Material.
  - New publications issued by members of the consortium
  - New dissemination booklets and commercial leaflet tailored to the different target groups of CITIZENS, POLICY MAKERS and SOFTWARE DEVELOPERS
  - Upload of +Spaces poster
  - Upload of new newsletter issue
  - Updating of the sections “Liaisons” with other projects and “Projects of common Interests”

## Project Logo and Promoting Materials



Figure 5. +Spaces Logo



Figure 6. +Spaces Presentation Header





Figure 7. +Spaces Poster<sup>2</sup>

<sup>2</sup> original may be found at  
[http://www.positivespaces.eu/index.php?option=com\\_content&view=article&id=30&Itemid=32](http://www.positivespaces.eu/index.php?option=com_content&view=article&id=30&Itemid=32)



Figure 8. +Spaces Promotional Bookmarks<sup>3</sup>

## Project Beneficiaries

| Beneficiary name  | Short name | Country | Contact Person  |
|---|------------|---------|---|
| IBM Israel – Science and Technology LTD / IBM Haifa Research Lab                          | IBM        | Israel  | Michal Jacovi ( <a href="mailto:jacovi@il.ibm.com">jacovi@il.ibm.com</a> )                                  |
| Institute of Communication and Computer Systems / National Technical University of Athens | ICCS/NTUA  | Greece  | Kostas Tserpes ( <a href="mailto:tserpes@mail.ntua.gr">tserpes@mail.ntua.gr</a> )                           |
| Fraunhofer-Gesellschaft zur Foerderung der angewandten Forschung e.V.                     | Fraunhofer | Germany | Philipp Senger ( <a href="mailto:philipp.senger@scai.fraunhofer.de">philipp.senger@scai.fraunhofer.de</a> ) |
| University of Essex   | UEssex     | UK      | Michael Gardner ( <a href="mailto:mgardner@essex.ac.uk">mgardner@essex.ac.uk</a> )                          |
| ATOS Origin Sociedad Anonima Espanola   | ATOS       | Spain   | Ana Piñuela Marcos ( <a href="mailto:ana.pinuela@atosresearch.eu">ana.pinuela@atosresearch.eu</a> )         |
| Katholieke Universiteit Leuven (K.U.Leuven) – Interdisciplinary Centre for Law and ICT    | KULeuven   | Belgium | David Stevens ( <a href="mailto:David.Stevens@law.kuleuven.be">David.Stevens@law.kuleuven.be</a> )          |

<sup>3</sup> Original bookmarks may be found here:

[http://www.positivespaces.eu/index.php?option=com\\_content&view=article&id=31&Itemid=33](http://www.positivespaces.eu/index.php?option=com_content&view=article&id=31&Itemid=33)

|                             |     |        |  |
|-----------------------------|-----|--------|--|
| Athens Technology Center SA | ATC | Greece | Ilias Spais ( <a href="mailto:I.Spais@atc.gr">I.Spais@atc.gr</a> )                         |
| Hellenic Parliament         | HeP | Greece | Dimitris Koryzis<br>( <a href="mailto:dkoryzis@parliament.gr">dkoryzis@parliament.gr</a> ) |

## 4.2 Use and dissemination of foreground

A plan for use and dissemination of foreground (including socio-economic impact and target groups for the results of the research) shall be established at the end of the project. It should, where appropriate, be an update of the initial plan in Annex I for use and dissemination of foreground and be consistent with the report on societal implications on the use and dissemination of foreground (section 4.3 – H).

The plan should consist of:

- Section A

This section should describe the dissemination measures, including any scientific publications relating to foreground. **Its content will be made available in the public domain** thus demonstrating the added-value and positive impact of the project on the European Union.

- Section B

This section should specify the exploitable foreground and provide the plans for exploitation. All these data can be public or confidential; the report must clearly mark non-publishable (confidential) parts that will be treated as such by the Commission. Information under Section B that is not marked as confidential **will be made available in the public domain** thus demonstrating the added-value and positive impact of the project on the European Union.

## Section A (public)

This section includes two templates

- Template A1: List of all scientific (peer reviewed) publications relating to the foreground of the project.
- Template A2: List of all dissemination activities (publications, conferences, workshops, web sites/applications, press releases, flyers, articles published in the popular press, videos, media briefings, presentations, exhibitions, thesis, interviews, films, TV clips, posters).

These tables are cumulative, which means that they should always show all publications and activities from the beginning until after the end of the project. Updates are possible at any time.

| TEMPLATE A1: LIST OF SCIENTIFIC (PEER REVIEWED) PUBLICATIONS, STARTING WITH THE MOST IMPORTANT ONES |   |                               |   |                           |            |                      |                     |                |   |  |
|---|---|-------------------------------|---|---------------------------|------------|----------------------|---------------------|----------------|---|--|
| NO.   | Title   | Main author                   | Title of the periodical or the series   | Number, date or frequency | Publisher  | Place of publication | Year of publication | Relevant pages | Permanent identifiers <sup>4</sup> (if available) | Is/Will open access <sup>5</sup> provided to this publication? |
| 1   | <i>The Perception of Others: Inferring Reputation from Social Media</i>         | <i>Michal Jacovi (IBM)</i>    | <i>Proceedings of CSCW'2014</i>   | <i>February 2014</i>      | <i>ACM</i> | <i>Baltimore, US</i> | <i>2014</i>         |                |   | no   |
| 2   | <i>Do Not Track initiatives: myths and reality around the lost user consent</i> | <i>Eleni Kosta (KULeuven)</i> | <i>BILETA 2012: 'Too many laws, too few examples' Regulation, technology, law &amp; legal education</i> | <i>March 2012</i>         |            | <i>Newcastle</i>     | <i>2012</i>         |                |   |  |

<sup>4</sup> A permanent identifier should be a persistent link to the published version full text if open access or abstract if article is pay per view) or to the final manuscript accepted for publication (link to article in repository).

<sup>5</sup> Open Access is defined as free of charge access for anyone via Internet. Please answer "yes" if the open access to the publication is already established and also if the embargo period for open access is not yet over but you intend to establish open access afterwards.

|    |  |                                   |  |                       |             |                          |             |  |  |  |
|----|--|-----------------------------------|--|-----------------------|-------------|--------------------------|-------------|--|--|--|
| 3  | <i>Online Communities support Policy-making: The Need for Data Analysis</i>              | <i>Roman Klinger (Fraunhofer)</i> | <i>Third International Conference on eParticipation (ePart 2012)</i>   | <i>September 2012</i> |             | <i>Norway</i>            | <i>2012</i> |  |  |  |
| 4  | <i>e-Government and Policy Simulation in Intelligent Virtual Environments</i>            | <i>Fotis Aisopos (NTUA)</i>       | <i>International Conference on Web Information Systems and Technologies, WEBIST 2012</i>                     | <i>April 2012</i>     |             | <i>Porto, Portugal</i>   | <i>2012</i> |  |  |  |
| 5  | <i>Policy testing in virtual environments: addressing technical and legal challenges</i> | <i>Mania Kardara (NTUA)</i>       | <i>International Journal of Electronic Government Research (IJEGR), Volume 8, Issue 3</i>                    |                       |             |                          |             |  |  |  |
| 6  | <i>Serious Games for Role-Playing Government Policies</i>                                | <i>Michael Gardner (UEssex)</i>   | <i>ReLive'2011</i>   | <i>September 2011</i> |             | <i>Milton Keynes, UK</i> | <i>2011</i> |  |  |  |
| 7  | <i>Using virtual worlds for online role-play</i>   | <i>Michael Gardner (UEssex)</i>   | <i>IED Europe</i>  | <i>November 2011</i>  |             | <i>Madrid, Spain</i>     |             |  |  |  |
| 8  | <i>+SPACES: serious games for simulating government policy</i>                           | <i>Michael Gardner (UEssex)</i>   | <i>iED Boston Summit</i>   |                       |             | <i>Boston, USA</i>       |             |  |  |  |
| 9  | <i>A Service Oriented Architecture Enabling Policy Simulation in Virtual Spaces</i>      | <i>Mania Kardara (NTUA)</i>       | <i>3rd IEEE International Conference in Games and Virtual Worlds for Serious Applications- VS Games 2011</i> | <i>May 2011</i>       | <i>IEEE</i> | <i>Athens, Greece</i>    | <i>2011</i> |  |  |  |
| 10 | <i>Do you want to know?: recommending strangers in the enterprise</i>                    | <i>Ido Guy (IBM)</i>              | <i>CSCW'2011</i>   | <i>March 2011</i>     |             | <i>Hangzhou, China</i>   | <i>2011</i> |  |  |  |

|    |   |                                 |  |                |                 |                 |      |  |  |  |
|----|---|---------------------------------|--|----------------|-----------------|-----------------|------|--|--|--|
| 11 | <i>Digital Traces of Interest: Deriving Interest Relationships from Social Media Interactions</i> | Michal Jacovi (IBM)             | ECSCW'2011   | October 2011   |                 | Aarhus, Denmark | 2011 |  |  |  |
| 12 | <i>Mining Expertise and Interests from Social Media</i>   | Ido Guy (IBM)                   | WWW'2012   | April 2012     |                 | Lyon, France    | 2012 |  |  |  |
| 13 | <i>+SPACES: Serious Games for Role-Playing Government Policies</i>                                | Michael Gardner (UEssex)        | Technology Mediated Learning Research seminar, Kings College London                      | January 2012   |                 | London, UK      | 2012 |  |  |  |
| 14 | <i>Data Analysis for Real-World-Policymaking using Online Communities</i>                         | Roman Klinger (Fraunhofer)      | ESWC'2012  | October 2012   |                 | Aarhus, Denmark | 2012 |  |  |  |
| 15 | <i>Dependencies support Event Extraction from Biomedical Literature</i>                           | Roman Klinger (Fraunhofer)      | European Conference on Machine Learning and Principles and Practice                      | September 2011 |                 | Athens, Greece  | 2011 |  |  |  |
| 16 | <i>Virtual Worlds for Policy Making</i>   | Kostas Tserpes (NTUA)           | CROSSROAD  |                |                 |                 |      |  |  |  |
| 17 | <i>+Spaces: Intelligent Virtual Spaces for eGovernment</i>  | Kostas Tserpes (NTUA)           | IE'2010  | July 2010      |                 | Kuala Lumpur    | 2010 |  |  |  |
| 18 | <i>Service Selection Decision Support in the Internet of Services</i>                             | Kostas Tserpes (NTUA)           | EuroPar'2010   |                |                 |                 | 2010 |  |  |  |
| 19 | <i>Same places, same things, same people?: mining user similarity on social media</i>             | Ido Guy (IBM)                   | CSCW'2010  |                |                 |                 | 2010 |  |  |  |
| 20 | <i>Privacy Settings in Social Networking Sites: is it fair?</i>                                   | Aleksandra Kuczerawy (KULeuven) | Duquenoy P., Fischer-Hübner S., Hansen M. (eds.), PrimeLife Summer School on Privacy and |                | Springer-Verlag |                 | 2011 |  |  |  |

|    |  |                               |   |  |  |  |  |  |  |  |
|----|--|-------------------------------|---|--|--|--|--|--|--|--|
|    |  |                               | <i>Identity Management for Life, Springer-Verlag (2011)</i> |  |  |  |  |  |  |  |
| 21 | <i>Treading the Thin Line between ePrivacy and Electronic Communications: An Assessment of Legal Definitions in the EU 2009 Telecoms Package</i> | <i>Eleni Kosta (KULeuven)</i> | <i>BILETA'2011</i>  |  |  |  |  |  |  |  |

**TEMPLATE A2: LIST OF DISSEMINATION ACTIVITIES**

| NO. | Type of activities <sup>6</sup> | Main leader     | Title  | Date/Period          | Place                 | Type of audience <sup>7</sup>                  | Size of audience | Countries addressed |
|-----|---------------------------------|-----------------|--|----------------------|-----------------------|--|------------------|---------------------|
| 1   | <i>SIG Meeting</i>              | <i>HeP</i>      | <i>+Spaces SIG Meeting</i>   | <i>October 2010</i>  | <i>HeP Premises</i>   | <i>Policy Makers and Members of Parliament</i> | 15               | <b>Greece</b>       |
| 2   | <i>Workshop</i>                 | <i>KULeuven</i> | <i>+Spaces Workshop on the Privacy and Data Protection Framework</i> | <i>December 2010</i> | <i>Brussels, BE</i>   | <i>EU Project members</i>                      | 15               | <b>EU</b>           |
| 3   | <i>Workshop</i>                 | <i>NTUA</i>     | <i>Workshop on Leveraging the Potential of Virtual Worlds</i>        | <i>May 2011</i>      | <i>Athens, Greece</i> | <i>Attendees of VSGames'2011</i>               | 20               | <i>Global</i>       |

<sup>6</sup> A drop down list allows choosing the dissemination activity: publications, conferences, workshops, web, press releases, flyers, articles published in the popular press, videos, media briefings, presentations, exhibitions, thesis, interviews, films, TV clips, posters, Other.

<sup>7</sup> A drop down list allows choosing the type of public: Scientific Community (higher education, Research), Industry, Civil Society, Policy makers, Medias, Other ('multiple choices' is possible).



|   |            |          |   |           |                |  |    |        |
|---|------------|----------|---|-----------|----------------|--|----|--------|
| 4 | Conference | HeP      | +Spaces Final Conference  | June 2012 | Athens, Greece | Policy Makers, Members of Parliament, Greek TV | 50 | Greece |
| 5 | Workshop   | KULeuven | Legal Challenges for FP7 projects, a +Spaces and Wegov Workshop | July 2012 | Samos, Greece  | Attendees of the Samos Summit'2012             | 15 | EU     |

**Section B (Confidential<sup>8</sup> or public: confidential information to be marked clearly)  
Part B1**

The applications for patents, trademarks, registered designs, etc. shall be listed according to the template B1 provided hereafter.

The list should, specify at least one unique identifier e.g. European Patent application reference. For patent applications, only if applicable, contributions to standards should be specified. This table is cumulative, which means that it should always show all applications from the beginning until after the end of the project.

| <b>TEMPLATE B1: LIST OF APPLICATIONS FOR PATENTS, TRADEMARKS, REGISTERED DESIGNS, ETC.</b> |                                    |  |  |                                 |                                       |
|--|------------------------------------|--|--|---------------------------------|---------------------------------------|
| Type of IP Rights <sup>9</sup> :   | Confidential<br>Click on<br>YES/NO | Foreseen<br>embargo date<br>dd/mm/yyyy | Application<br>reference(s)<br>(e.g. EP123456) | Subject or title of application | Applicant (s) (as on the application) |
| N/A  |                                    |  |  |                                 |                                       |
|  |                                    |  |  |                                 |                                       |
|  |                                    |  |  |                                 |                                       |
|  |                                    |  |  |                                 |                                       |

<sup>8</sup> Note to be confused with the "EU CONFIDENTIAL" classification for some security research projects.

<sup>9</sup> A drop down list allows choosing the type of IP rights: Patents, Trademarks, Registered designs, Utility models, Others.

## Part B2

Please complete the table hereafter:

| Type of Exploitable Foreground <sup>10</sup>      | Description of exploitable foreground   | Confidential Click on YES/NO | Foreseen embargo date dd/mm/yyyy | Exploitable product(s) or measure(s) | Sector(s) of application <sup>11</sup>   | Timetable, commercial or any other use | Patents or other IPR exploitation (licences) | Owner & Other Beneficiary(s) involved |
|---|---|------------------------------|----------------------------------|--------------------------------------|--|--|--|---------------------------------------|
| <i>Commercial exploitation of R&amp;D results</i> | <i>+Spaces<br/>Middleware including:<br/>Experiment Manager (IBM),<br/>Notification Manager (NTUA),<br/>SLA Manager (NTUA),<br/>Notification Sender (NTUA),<br/>Services Manager (NTUA),<br/>Data Schemata (NTUA)</i> | <i>No</i>                    | <i>N/A</i>                       | <i>Source code</i>                   | <i>O84.1 - Administration of the State and the economic and social policy of the community</i> |  |  | <i>NTUA, IBM</i>                      |
| <i>Commercial exploitation of R&amp;D results</i> | <i>Front End</i>  | <i>No</i>                    |                                  | <i>Source code</i>                   | <i>O84.1 - Administration of the State and the economic and social policy of the community</i> |  |  | <i>ATC</i>                            |
| <i>Commercial</i>                                 | <i>Data</i>   | <i>No</i>                    |                                  | <i>Source code</i>                   | <i>O84.1 -</i>   |  |  | <i>Fraunhofer</i>                     |

<sup>10</sup> A drop down list allows choosing the type of foreground: General advancement of knowledge, Commercial exploitation of R&D results, Exploitation of R&D results via standards, exploitation of results through EU policies, exploitation of results through (social) innovation.

<sup>11</sup> A drop down list allows choosing the type sector (NACE nomenclature) : [http://ec.europa.eu/competition/mergers/cases/index/nace\\_all.html](http://ec.europa.eu/competition/mergers/cases/index/nace_all.html)

| Type of Exploitable Foreground <sup>10</sup>      | Description of exploitable foreground   | Confidential Click on YES/NO | Foreseen embargo date dd/mm/yyyy | Exploitable product(s) or measure(s) | Sector(s) of application <sup>11</sup>   | Timetable, commercial or any other use | Patents or other IPR exploitation (licences) | Owner & Other Beneficiary(s) involved |
|---|---|------------------------------|----------------------------------|--------------------------------------|--|--|--|---------------------------------------|
| <i>exploitation of R&amp;D results</i>            | <i>Analysis Service</i>   |                              |                                  |                                      | <i>Administration of the State and the economic and social policy of the community</i>         |  |  |                                       |
| <i>Commercial exploitation of R&amp;D results</i> | <i>Virtual Space Management Layer including adapters for OpenWord erland (Uessex)</i> | <i>No</i>                    |                                  | <i>Source code</i>                   | <i>O84.1 - Administration of the State and the economic and social policy of the community</i> |  |  | <i>IBM, UEssex</i>                    |

## Middleware Layer

### Overview

The +Spaces Middleware contains the main functionality of the platform. It handles the communication and data flow between the government end users, the VS Management Layer and the built-in and external analysis services. It offers data persistence, storing all information about experiments, actions and services and supports a recovery mechanism that allows analysis services to retrieve their data in case of failure.

### Technical requirements

The following requirements are necessary for the installation:

### Hardware Requirements

Minimum memory requirements for RAM : 2GB or more

Operating system (Ubuntu Linux or Windows. Tested on Ubuntu Linux 10.04 and Windows 7)

### Software Requirements

Java version 1.6 or later

Glassfish version 3.1.1 or later

Apache Ant (tested on version 1.8)

MySQL version 5.5 or later

### Installation instructions

The ear can be downloaded from this URL

### Usage Guidelines

The functionality of the service is exposed through a SOAP interface. In order to gain access to the functionality of the core services, the users must invoke these methods through a SOAP call. A list of the methods available through the interface is given in the following Section.

## **Layer's components**

### **Experiment Manager**

The experiment manager is responsible for all of the experiments in the system, their definition, initiation, monitoring and termination.

This includes persisting experiment definition data, assigning services, request the VSML to deploy the experiment, persist and distribute virtual spaces action monitor and expose experiment statuses, and provide the front end with necessary data.

The main functionalities of the component are the following:

#### **Create experiment**

The experiment manager provides the front end with current platform information such as available services and virtual spaces resources. Then an experiment definition document is sent to the experiment manager. This document is parsed and persisted. Notification about services assignments are sent to the services manager. The details of the experiment definitions are sent to the VSML for deployment.

In time, messages from the VSML arrive with information about the event deployment. This information is saved as experiment status, and made available for the front end to present to the user.

#### **Monitor experiment**

The information from the virtual spaces is being sent by the VSML to the experiment manager. This information includes a variety of details regarding experiment participants, their information and actions they perform. The experiment manager saves that information as a part of the platform recovery support for analysis services.

In addition to storing the data, the experiment manager passes the information onto the services manager to be sent to the appropriate services for analysis. During this process the experiment manager uses the database to assign a sequence number for each action. This number can be used to retrieve actions from the database starting from the last received action+1, in case of service recovery.

### **Expose platform information**

The experiment manager exposes a number of important data elements regarding the platform to the front end, this includes statuses of experiments, statuses of adaptors, availability of virtual space resources and the external services

### **Technical specs and interfaces**

The Experiment manager exposes a set of APIs for use by the various components. The APIs are implemented in a variety of technologies depending on the intended consumer within the overall architecture.

#### **Web API**

The Web API is intended for use by the front end component.

#### **Methods:**

**public Collection <Resource>getAvailableResources( int vsId)**

**public Collection<VirtualSpace> getVirtualSpaces()**

#### Pre conditions:

Experiment manager is running

VSManager is running

#### Post conditions:

Experiment Manager invoked the appropriate method in VSManager.

VSManger has returned a list of virtual spaces.

Experiment Manager returned the list to the method invoker.

**public void createExperiment(Experiment experiment)**

Preconditions:

Experiment manager is running

VSManger is running

An experiment definition object was created correctly

Postconditions:

Experiment definition was saved in database.

A generated Id was assigned to the experiment.

Services were assigned to the experiment.

A createExperiment method was invoked in VSmanager.

A Timer was created to end the experiment.

**public void terminateExperiment(long experimentId)**

Pre conditions:

Experiment manager is running

VSManger is running

A valid experiment id was provided.

Post conditions:

The experiment status was updated in the database.

The VSManager was informed that the experiment has terminated.

The services manager was informed that the experiment has terminated

Experiment timer was reset.

**public ExperimentStatus getExperimentStatus(long experimentId)**

Pre conditions:

Experiment manager is running.

Post conditions:

Experiment status information was read from the database and returned.

**public List<URL> getExperimentResults(long experimentId )**

Pre conditions:

Experiment manager is running.

Services manager is running.

A valid experiment id is used.

Post conditions:

Experiment manager has invoked the getServiceURLForExperiment in the services manager and received a list of urls.

Experiment manager returned the list of URLs.

**public Collection <Long> getActiveExperiments()**

Pre conditions:

Experiment manager is running.

Post conditions:



List of active experiments was retrieved from the database and returned.

**public IExperimentImpl getExperimentDefinition (long experimentId)**

Pre conditions:

Experiment manager is running.

Post conditions:

Experiment definition was read from the database and returned.

### **Java and Web Services API**

**public Collection <Long> getActiveExperiments()**

Pre conditions:

Experiment manager is running.

Post conditions:

List of active experiments was retrieved from the database and returned.

**public Map<String, Object> getExperimentData (long experimentId, Collection<String> attributes)**

Pre conditions:

Experiment manager is running.

A valid experiment id was used

Post conditions:

Requested attributes were read from the database and returned.

### **JMS API**

The experiment manager listens to JMS messages coming from the VSML.

#### **Queues:**

**VSEvents** – Used to report events taking place in a virtual space.

On arrival of a virtual space event, the event is processed and saved in the database.

**VSExperimentAction** – Used to report user actions in virtual spaces within the context of a specific experiment.

On arrival of an experiment action, the action is saved, experiments counters are updated and an action notification is sent to the services manager.

**VSRequest** – Used to send requests coming from a virtual space adaptor to the middleware (requests for user recommendations).

On arrival of a request message, the context of the request is kept, a synchronous request is performed on behalf of the VSmanager to the appropriate component (via services manager). Once a result is received it is attached to the request context and the appropriate VSManager method is invoked with the results data.

The experiment manager listens to configuration messages coming from the configuration manager. – see configuration manager.

#### **Technical requirements**

See general section for middleware components.

#### **Installation instructions**

See general section for middleware components.

#### **Usage Guidelines**

See general section for middleware components.

#### **Services Manager**

The ServicesManager is the component responsible for managing the analysis services as well as managing and coordinating all communication between them and other middleware services.

The ServicesManager accepts registration requests from analysis services, registers them in the +Spaces platform and maintains their details. When a new experiment is created, based on the government user's selection, the ServicesManager assigns the experiment to the analysis services. Throughout the experiment, when an action occurs, it will initiate notifications to the services assigned to this experiment. Notifications for actions can be sent individually or in a bulk. The time interval for sending the notifications in case they are sent in bulk is defined by the administrator through the configuration manager by defining the respective parameter. The ServicesManager implements a Message Driven Bean in order to listen to messages from the Configuration Manager

## **Technical specs and interfaces**

### **Web API**

#### **RegistrationOutputType register(RegistrationInputType serviceRegistration)**

Register new service to platform. Invoked by analysis services

#### **ReputationRate getReputationForUser (String userID)**

Polls reputation service and returns reputation rate for users. Invoked by Data Analysis Service

#### **List<String> getUsersWithReputation(ReputationRate rate)**

Polls reputation service and returns users with reputation rate higher than the given rate. Invoked by Data Analysis Service

### **EJB Local API**

#### **public List<RegisteredService> getAvailableServices()**

Returns a list of all the available service currently registered

#### **public List<RegisteredService> getAvailableServices(AnalysisServiceType serviceType)**

Returns a list of all the available service of the specified type currently registered

#### **public void assignServicesToExperiment(Experiment experiment, List<String> services)**

Invoked by the experiment manager at the creation of a new experiment. Passes the list of the analysis services selected by the end user. The services manager stores the assignment and notifies the services.

**public List<URL> getServicesForExperiment(long experimentID, ServiceType type)**

Returns all services of the given type assigned to the experiment

**public List<URL> getServicesForExperiment(long experimentID)**

Returns all services assigned to the experiment

**public List<URL> getAnalysisURLForExperiment(long experimentID)**

Returns the URL with the experiment results that the Data Analysis Service will provide

**public List<Long> getExperimentRecommendationsForUser(String UserID)**

Polls recommendation service and returns a list of all recommended experiments for this user

**public List<String> getRecommendedUsersforExperiment(long experimentID)**

Polls recommendation service and returns a list of recommended users for a new experiment

**public void terminateExperiment(long experimentId)**

Invokes NotificationManager in order to notify assigned services of the termination of an experiment

### **Technical requirements**

See general section for middleware components.

### **Installation instructions**

See general section for middleware components.

### **Usage Guidelines**

See general section for middleware components.

## **Notification Manager**

The NotificationManager will be responsible for notifying the analysis services of important events that take place in the Virtual Spaces. The component has been designed following the WS-Notification specifications, the main notions and entities involved in which are described in detail in D3.1.

The Notification Manager exposes two web APIs:

- The Notification Producer API, responsible for receiving subscriptions and dispatching notifications to subscribed services based on the topics of their subscription and
- The Subscription Manager API, implementing message exchanges associated with querying and manipulating Subscription resources.

When an action or bulk of actions must be dispatched to a list of services, the Notification Service is triggered by the Services Manager. Notifications will be sent in the cases of experiment creation, experiment termination, as well as user actions in the Virtual Space. In the latter case, some services may wish to receive only specific types of actions strictly connected to the experiment while others may be interested in a broader spectrum of actions. For example, social interactions between users may be useless for the Data Analysis Service but are of great value for the Recommendation Service. The mapping between services and action types is done via subscriptions.

While in the case of polls and debates one can expect a small and easy to predefine set of action types (e.g. vote), in the case of simulation, depending on the specific scenario, the types of actions that can be associated with an experiment may vary greatly. Therefore, while in the generic case subscriptions refer to all the experiments that the service has been assigned, it is also possible for services to subscribe to specific types of actions related only to a single experiment. In that case, a list of available action types will be sent to the service upon experiment creation and the experiment id should also be included in the subscription topic.

## **Technical specs and interfaces**

### **NotificationProducer Web API**

#### **SubscribeResponse subscribe(Subscribe subscribeRequest)**

Create a subscription for a registered service on a new topic. The method produces a Fault Message if the service has not been registered

### **NotificationProducer EJB Local API**

**public void notifyOfAction( String experimentID, IAction action)**

Sends notification of a new action to subscribed services

**public void notifyOfNewExperiment**

Sends notification of a new experiment to subscribed services

**public void notifyOfTerminatedExperiment**

Sends notification of the termination of an experiment to subscribed services

### **SubscriptionManager Web API**

**UnsubscribeResponse unsubscribe(Unsubscribe unsubscribeRequest)**

Unsubscribe from a topic

**PauseSubscriptionResponse pauseSubscription(PauseSubscription pauseSubscriptionRequest)**

Pause an active subscription

**ResumeSubscriptionResponse resumeSubscription(ResumeSubscription resumeSubscriptionRequest)**

Resume a paused subscription

### **SubscriptionManager EJB Local API**

**public EndpointReferenceType getConsumerReference()**

Gets the value of the consumerReference property

**public void setConsumerReference(EndpointReferenceType value) {**

Sets the value of the consumerReference property

**public FilterType getFilter()**

Gets the value of the filter property

**public void setFilter(FilterType value)**

Sets the value of the filter property

**public SubscriptionPolicyType getSubscriptionPolicy()**

Gets the value of the subscriptionPolicy property

**public void setSubscriptionPolicy(SubscriptionPolicyType value)**

Sets the value of the subscriptionPolicy property

**public XMLGregorianCalendar getCreationTime()**

Gets the value of the creationTime property

**public void setCreationTime(XMLGregorianCalendar value)**

Sets the value of the creationTime property

**public CurrentTime getCurrentTime()**

Gets the value of the currentTime property

**public void setCurrentTime(CurrentTime value) {**

Sets the value of the currentTime property

**public TerminationTime getTerminationTime()**

Gets the value of the terminationTime property

**public void setTerminationTime(TerminationTime value**

Sets the value of the terminationTime property

### **Technical requirements**

See general section for middleware components.

### **Installation instructions**

See general section for middleware components.

### **Usage Guidelines**

See general section for middleware components.

### **Data Manager**

The DataManager component aims to provide analysis services with an access point to the +Spaces database, allowing them to recover older data that they have lost due to failure.

The +Spaces middleware, besides distributing actions to the services, will also store all data regarding the experiments and the actions taking place in the virtual spaces and associated with them. In case of failure, services will poll the DataManager for the actions and experiments that they have missed based on the id of the latest action that they received.

Depending on the number of events (actions or new experiments) that have occurred since the last message received (so, essentially depending on how long the service was down), the DataManager will either return a list of all events or, in case the number of events exceeds a threshold, a message stating that the list of actions will follow. In the latter case the recovery mechanism will be activated in order to create an xml file containing all the events and send them to the service. The threshold will have a default value but will also be able to be defined by the platform administrator via the ConfigurationManager.

## **Technical specs and interfaces**

### **RecoveredExperimentsReturnType getExperiments(String experimentId)**

Returns all experiments that have been assigned to the service and are newer than the experiment with the specified ID

### **RecoveredActionsReturnType getActions(String actionId)**

Returns all actions that are associated with an experiment assigned to the service, their action type matches the service's subscription and are newer than the actions with the specified ID.

### **RecoveredActionsReturnType getActionsPerExperimentId(String actionId, String experimentId)**

Returns all actions that are associated with the given experiment, their action type matches the service's subscription and are newer than the actions with the specified ID.

### **public RecoveredActionsReturnType getActionsPerExperimentIdAndActionType(String actionId, String experimentId, ActionType actionType)**

Returns all actions that are associated with the given experiment, are of the given action type and are newer than the actions with the specified ID.

## **Technical requirements**

See general section for middleware components.



## Installation instructions

See general section for middleware components.

## Usage Guidelines

See general section for middleware components.

## Configuration Manager

The configuration manager component is the main configuration data and properties repository for the platform. It is a single point of configuration and administration that allows changing the behavior of the platform and different components removing the need to configure each component separately, also removing the need for a configuration ui for each component.

## Technical specs and interfaces

### EJB Local API

**Collection<Attribute> getAttributesByPrefix(String prefix);**

Pre conditions:

Some attributes with the specified prefix are in the database.

Post conditions:

Attributes with the given prefix were read from the database, and returned.

**Collection<Attribute> getAttributesByNames(Collection<String> keys);**

Pre conditions:

Attributes with the specified names are in the database.

Post conditions:

Attributes with the given names were read from the database, and returned.

**boolean setAttribute(Attribute attribute);**

Pre conditions:

An attribute with the specified name does not exist.

Post conditions:

An attribute with the specified name and value have been saved in the database. A JMS message was sent on the configuration topic with the new attribute name and value.

**boolean updateAttribute(Attribute attribute);**

Pre conditions:

An attribute with the specified name exists.

Post conditions:

The new value of the attribute has been saved in the database. A JMS message was sent on the configuration topic with the attribute name and value.

**Collection<Attribute> getAllAttributes();**

Pre conditions:

Attributes exists in the database.

Post conditions:

All attributes have been read from the database and returned.

**boolean deleteAttribute(String name);**

Pre conditions:

An attribute with the given name exists in the database.

Post conditions:

The attribute record was deleted from the databse.

**Technical requirements**

See general section for middleware components

**Installation instructions**

See general section for middleware components

## Usage Guidelines

See general section for middleware components

## SLA Manager

The SLAManager creates, monitors and evaluates Service Level Agreements between analysis services and government organisations. The SLAs allows service providers to give QoS guarantees as well as set pricing terms for the usage of their services. The SLAs between the two parties are based on the agreement offer that the service provider gives when registering and is agreed upon by the government user when selecting the service. The monitoring results describing the service usage that are used in order to evaluate the SLA and decide whether there has been a violation of the terms or estimate the charges are retrieved from the ExperimentManager.

## Technical specs and interfaces

### Web API

#### **CreateAgreementOutputType createAgreement (CreateAgreementInputType agreementOffer)**

Creates a Service Level Agreement and stores it in an XML file.

#### **void createAgreementTemplate (EndpointReferenceType serviceURL, AgreementTemplateType agreementOffer)**

Create a new agreement template for the registered service

#### **AgreementType getAgreementOffer (EndpointReferenceType serviceURL)**

Returns the provider's service agreement offer, so that the end user consents.

## Technical requirements

See general section for middleware components

## Installation instructions

See general section for middleware components

## Usage Guidelines

See general section for middleware components

## Front-End

### *Overview*

Front-End component provides the User Interface for the system administrators and common users to interact with the +Spaces system functionality. It is implemented as a Web Application around the popular DotNetNuke CMS system.

The Front-End Web Application supports two different types of users:

- Policy designers: The Front-End allows policy designers to create policies and experiments. The user can define the parameters of the experiment and schedule its execution to a later point at time.
- Citizen: A citizen can browse through all available experiments and contact search queries. The Front-End provides links to the results of the experiments.

The following figure depicts the architecture of the Front-End Web Application.

### **Figure 3: Front-End, Architecture**

The Front-End Web Application is actually split into two components: A DotNetNuke portal and the Core Front-End Web Application. The DotNetNuke portal provides the advanced User Management System, which allows the assigning of different roles to users and providing different access rights to them. It also allows a system administrator to easily edit the content of the application's HTML pages (Home page, Terms and Conditions and so on). DotNetNuke provides a WYSIYYG editor for content editing and doesn't require extensive technical knowledge.

The Front-End Core Web Application is implemented as a separate ASP.NET application. It provides the main functionality of the platform (creation of policies and experiments, searching through available components).

Both these components share the same Look and Feel and are provided to the user through a Single-Sign-On umbrella. Therefore, if a user log-ins into the DotNetNuke platform, then she is automatically logged-in into the Front-End Core Web Application as well. The Front-End Core

Web Application has access to the user's permissions, as these are set up in DotNetNuke's User Management System, and can differentiate the content it presents based on these. Thanks to the Common Look and Feel and the Single-Sign-On functionality the users experience these two applications as a single one.

The only interface of the Front-End with the other +Spaces components is a SOAP Web Service that is used for the communication with the +Spaces Middleware. This Web Service is used for the creation of policies and experiments and for retrieving the existing ones. All the information of the policies and experiments is stored in the Middleware. However the Front-End Core Web Application duplicates some experiment information in a local database for the following reasons:

- Information for experiments that are scheduled to begin in a later time is stored in the local database.
- Experiment information is cached in the local database in order to avoid the time consuming SOAP Web Request every time an experiment query is issued.

The scheduling of the creation and termination of experiments is achieved with the aid of the Quartz.NET Scheduler.

The following table summarizes the components implemented.

| <b>Component</b>                       | <b>Distribution File</b> |
|--|--------------------------|
| +Spaces Front End Core Web Application | MiddlewareClient.zip     |
| +Spaces Front End Database Scheme      | positivespaces.sql       |
| +Spaces DotNetNuke Skin                | positivespacesskin.zip   |

## ***Technical specs and interfaces***

### **Technical requirements**

The Front-End Web Application is based on Microsoft technologies. The following are the minimum software requirements:

- Operation System: **Windows Server 2003 R2**
- Application Server: **IIS Server 6.0**
- Database Server: **MSSQL Server 2005**
- **DotNetNuke Framework 5.02**<sup>12</sup>
- **Quartz.NET Scheduler 1.0.3.3**<sup>13</sup>

### **Installation instructions**

The Front-End Web Application components need to be installed in a Microsoft Web Services Machines. The installation requires that a MSSQL server and IIS application server are already up and running.

1. The first step is the DotNetNuke installation. DotNetNuke Community Edition is provided as a ZIP file that can be extracted in the host machine. Following the instructions provided in the DotNetNuke installation a Virtual Directory is created in the ISS. Then the user can visit the home page of the created Virtual Directory and finish the application.
2. The next step is the installation of the +Spaces Skin. This is performed through Extensions DotNetNuke page, which is available in the Host menu.
3. In order to create the Front-End Core Web Application Database the user can make use of the provided positivespaces.sql file. This file contains the schema of the database.
4. The Front-End Web Application is installed as a common ASP.NET application. The following section in the Web.Config file assures the proper operation of the single-sign-on functionality:

---

<sup>12</sup> <http://www.dotnetnuke.com/>

<sup>13</sup> <http://quartznet.sourceforge.net/>

```
<machineKey validationKey="5D47CD6D18BA31A710097EF4E62A664DF399D5E5"  
    decryptionKey="B931DDF9100FFE91D29668AF3FDAA935D6C8E15BE9CF5BE5"  
    decryption="3DES" validation="SHA1" />  
<authorization>  
    <allow users="*" />  
</authorization>  
<authentication mode="Forms">  
    <forms name=".DOTNETNUKE"  
        protection="All"  
        timeout="60"  
        cookieless="UseCookies"  
        enableCrossAppRedirects="true"  
        loginUrl=" ../positivespaces/Login.aspx"  
    />  
</authentication>  
<roleManager enabled="true" />
```

5. The last step of the installation is the installation of the Quartz.NET scheduler. The Quartz.NET scheduler is installed as Windows Service. In order to install the service one must have administrative rights and run the Quartz.Server.exe. In order for the scheduler to be able to schedule experiments creation and termination, the MiddlewareLibrary.dll from the Front-End Core Web Application must be copied into the folder that the Quartz.Server.exe resides.

## Usage Guidelines

The Front-End Web Application is available at the address: <http://paris.atc.gr/positivespaces/>

The following figure depicts the Home Page of the application.



## The +Spaces Project

+Spaces (dubbed Positive Spaces) is an FP7 project (call 4, Objective 7.3) aiming at policy making simulation in virtual spaces. It proposes to make use of existing virtual worlds (VWs) as the societal sandbox for modelling real world behaviour and plans to develop the required tools and methods for exploiting VWs to that end.

## +Spaces Concept



Traditional Government models that measure public opinion with the purpose to enact and understand societal reactions and trends lag behind in dynamicity. Proper societal modelling for identifying the target groups that will effectively represent the society is usually a fault-prone procedure, while the compilation of the feedback acquisition process is itself slow and monolithic ? usually through polls.

ICT is able to contribute to the efficient monitoring and improved prediction of the impact of government proposals, decisions and legislation in society on a large scale, aggregating and analyzing information through information systems. Artificial environments are needed, for enabling, or engendering mass participation under various contexts and for simulating specific aspects of human society and behaviour.

Virtual worlds can comprise the societal sandbox for modeling real world behavior. +Spaces plans to develop the required tools and methods for exploiting virtual worlds to that end. By simulating specific aspects of human behavior in virtual worlds, governments may be able to extrapolate conclusions for the real society

## Experiment Creation

The objective of this application is to demonstrate the capabilities of the system to create experiments in a Virtual World. Please register in order to be able to create an experiment and test all available features.

Figure 4: Front-End, Home Page



A non-authenticated user has only access to the Experiments page. The Experiments page presents a table with all active experiments. The user can limit the results by entering a search expression at the appropriate field at the top right of the table. By clicking at the “Click to visit” link, one or more URLs related to the experiment will appear.

**+Spaces** comes to help policy makers reach their citizens and understand them better. On its very basic use, it allows to easily define a poll and automatically deploy it in multiple spaces at the same time – in Facebook, in Twitter, and even in a 3D virtual world. This way many citizens are reached, on their preferred social media. **+Spaces** also supports debates, in which policy makers can tap into citizens’ thoughts, ideas, and opinions; and express their own opinions at the same time. There are textual debates –in Facebook or in a blog – and there are “meetings” in a virtual world where policy makers and citizens may talk to each other and share charts and other information. Finally, to really engage citizens, **+Spaces** supports role-playing simulation sessions, where polls, debates and structured sessions are used for gaining new insights. For any session **+Spaces** provides rich and innovative visualizations that for understanding the points of view of the citizens. Below is the list of currently active experiments. Click the small icon on the right of an experiment to get the links to it in the various spaces.

| Show 10 entries  |   | Search: <input type="text"/> |
|--|---|------------------------------|
| Name   | Description   | Links                        |
| EU will overcome the financial crisis without having to be dissolved | The economic & financial crisis and the reactions of the EU to it, like the EU monetary policy, the austerity measures and the new agreements among EU leaders, is the showcase of how EU responds to global economic crisis for mobilizing new sources of growth.<br><a href="http://positivespaces2.grid.ece.ntua.gr:8080/Sim-war/Simulation?eid=47">http://positivespaces2.grid.ece.ntua.gr:8080/Sim-war/Simulation?eid=47</a> | Click to visit               |
| test2d(10/09/12@14:11)   | test2d(10/09/12@14:11)  | Click to visit               |
| test2d(07/07/2012@15:45)   | test2d(07/07/2012@15:45)  | Click to visit               |
| test3d(07/09/2012@15:20)   | 07/09/2012@15:20  | Click to visit               |
| Higher Education Privatization Sim                                   | Higher education privatization refers to a process of universities taking on characteristics of an enterprise and not a publicly owned body   | Click to visit               |
| test2dsim  | 06/09/2012@13:05  | Click to visit               |

Figure 5: Front-End, Experiments Page

To acquire access to the administrative pages of the application (manage policies and experiments) a two-step procedure must be followed:

- The user must register to the site. A register button is available at the application's menu. By registering the user will create a username and password. Registration is open to everyone. A registered user however, doesn't have any elevated privileges compared to an anonymous user.
- A system administrator must add the appropriate role to the created user. This is achieved through DotNetNuke's management system and is a manual procedure. Usually the interested user will send an email to the system administrator requesting access to the administrative pages.

An authorised user will gain access to the following pages:

- **Policies:** List of available policies and a form for creating a new one
- **New Experiment:** Form for creating a new experiment
- **Search:** Search experiments by policy. Provides access to Experiment page.

The screenshot displays the front-end of the Spaces website. At the top, there is a header with the "Spaces" logo, which includes a blue plus sign and a globe icon, set against a background of a blue grid pattern. Below the logo is a navigation bar with three items: "Home", "Experiments", and "Policies".

Under the navigation bar, the section "Available policies" is highlighted in blue. It contains a list of 13 policies, each preceded by a small circle:

- o Fotis Test Policy
- o Philipps Text Policy
- o Smoking banning
- o Turkey accession in EU
- o EU Financial Crisis
- o Education
- o EU Corporate Political Governance
- o EU Energy Efficiency Plan
- o Co-habitation contract
- o #Hellas version 2020
- o Water is a Human Right
- o Let me vote in my residence

Below the list, the "Create Policy" section is also highlighted in blue. It features a "Name:" label followed by an empty text input field. Underneath the input field is a blue button with a checkmark icon and the text "Create".

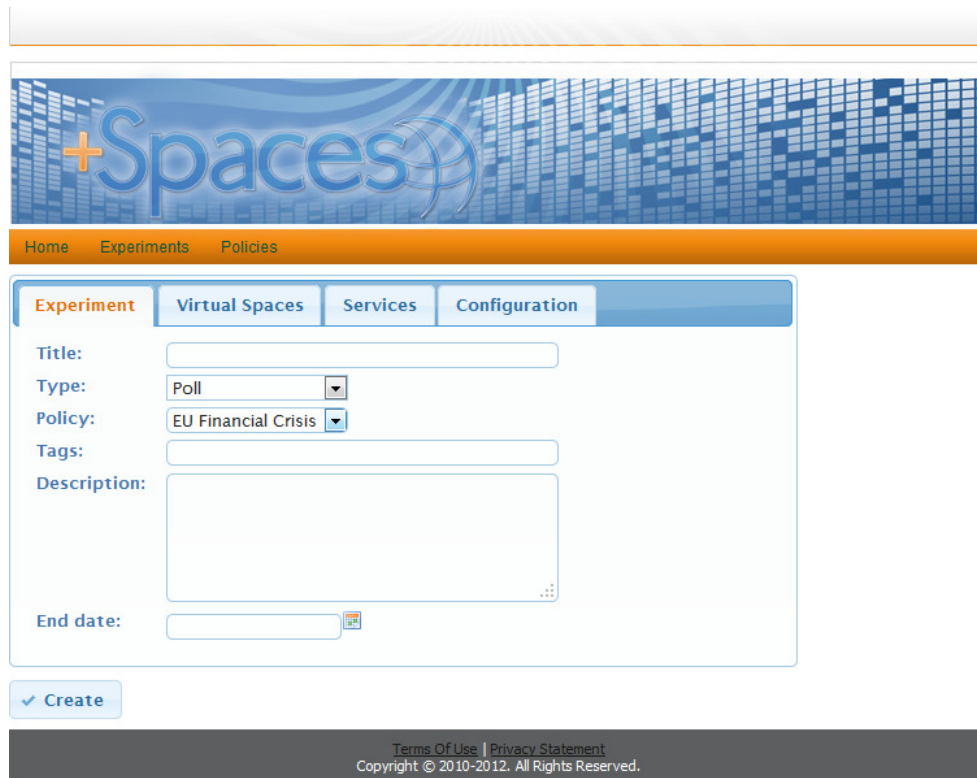
At the bottom of the page, there is a dark grey footer containing the text: "Terms Of Use | Privacy Statement" and "Copyright © 2010-2012. All Rights Reserved."

**Figure 6: Front-End, Policy Creation**

The New Experiment page contains 4 tabs with forms that the user must fill in. The page will inform the user about mandatory fields and won't allow the creation of an experiment with incomplete data.

1. **Experiment:** Title, type, policy, description, start and end date of experiment
2. **Virtual Spaces:** Selection of virtual spaces
3. **Services:** Selection of services
4. **Configuration:** Detailed configuration of the experiment

The content of the Configuration tab will be different, depending on the type of the experiment (poll, debate or simulation).



The screenshot displays the 'Create Experiment' form in the Spaces application. At the top, there is a navigation bar with 'Home', 'Experiments', and 'Policies'. Below this is a header banner with the 'Spaces' logo. The main form area has four tabs: 'Experiment', 'Virtual Spaces', 'Services', and 'Configuration'. The 'Experiment' tab is selected and contains the following fields:

- Title:** A text input field.
- Type:** A dropdown menu with 'Poll' selected.
- Policy:** A dropdown menu with 'EU Financial Crisis' selected.
- Tags:** A text input field.
- Description:** A large text area with a 'Go' button in the bottom right corner.
- End date:** A date picker field.

At the bottom left of the form is a blue 'Create' button with a checkmark icon. The footer of the page contains the text: 'Terms Of Use | Privacy Statement' and 'Copyright © 2010-2012. All Rights Reserved.'

**Figure 7: Front-End, Create Experiment**

In order to finish the creation of the experiment the user must click the “Create” button. The Front-End will then forward the request to the Middleware and will inform the user regarding the outcome.

The Search page allows the user to search experiments by policy. It also allows the user to also display the terminated experiments. The page provides access to the individual experiment page. This page is reached through the open folder icon at the left of each table row.

The screenshot shows the 'Spaces' application interface. At the top, there is a navigation bar with 'Home', 'Experiments', and 'Policies' links. Below this, a search filter is set to 'Policy: EU Financial Crisis'. There is a checkbox for 'Include Terminated' which is currently unchecked, and a 'Search' button. The search results are displayed in a table with a 'Name' column. The table contains three entries, each with a small icon and a description.

| Name |  |
|------|--|
|      | <b>(2)EU will overcome the financial crisis without having to be dissolved</b><br>The economic & financial crisis and the reactions of the EU to it, like the EU monetary policy, the austerity measures and the new agreements among EU leaders, is the showcase of how EU responds to global economic crisis for mobilizing new sources of growth. |
|      | <b>EU will overcome the financial crisis without having to be dissolved</b><br>The economic & financial crisis and the reactions of the EU to it, like the EU monetary policy, the austerity measures and the new agreements among EU leaders, is the showcase of how EU responds to global economic crisis for mobilizing new sources of growth.    |
|      | <b>EU will overcome the financial crisis without having to be dissolved</b><br>The economic & financial crisis and the reactions of the EU to it, like the EU monetary policy, the austerity measures and the new agreements among EU leaders, is the showcase of how EU responds to global economic crisis for mobilizing new sources of growth.    |

Figure 8: Front-End, Search Experiments

The experiment page presents detailed information about the experiment. This page is read-only and can't be edited. The page presents the same tabs as the "New Experiment" page. The Services tab however is replaced with the Results tab. The Results tab hosts an iFrame with a remote page that presents the results of the experiment.

From the experiment page the user can perform the following two actions:

- Terminate an experiment. This action can't be undone.
- Send email invitations to friends. The user needs only to enter the email addresses of his/her friends and click the "Send" button. The system will generate an email with information and links about the experiment and send it to the provided email addresses.

The screenshot displays the front-end of a web application named 'Spaces'. At the top, there is a blue header with the 'Spaces' logo, which includes a plus sign and a globe icon. Below the header is a navigation bar with links for 'Home', 'Experiments', and 'Policies'. The main content area features a tabbed interface with four tabs: 'Experiment' (selected), 'Virtual Spaces', 'Results', and 'Configuration'. The 'Experiment' tab is active and shows the following details:

- Title:** Turkey accession in EU
- Type:** Poll
- Policy:** Turkey accession in E
- Tags:** Turkey AccessionProcess Cyprus
- Description:** Turkey is willing to be part of the EU but has not conformed to all the chapters of the accession partnership. The accession process is still in progress without a lot of success
- End date:** 29/9/2012

Below the experiment details, there is a 'Terminate' button with a power icon. Underneath, there is an 'Invitations' section with a '+ Add' button and an empty input field. At the bottom of this section is a 'Send' button with an envelope icon. The footer of the page contains the text: 'Terms Of Use | Privacy Statement Copyright © 2010-2012. All Rights Reserved.'

Figure 9: Front-End, Experiment page

## Data Analysis Service

The Data Analysis Service is a stand-alone application which acts as a terminal analysing and visualizing the results of a certain type of experiment. Additionally there is a small set of functionalities which calculates statistical measures for the presentation of intermediate result in the different virtual spaces.

## Technical specs and interfaces

The Data Analysis Service mainly communicates with the +Spaces through the **notificationHandler** implemented as a web service. This handler receives and interprets the different type of notifications (actions) arriving at the web service running on the server. The backend of the Data Analysis Service is a SQLite database storing all notifications and the (intermediate) results of the further analysis acting as a caching mechanism for quick response times. The frontend of the Data Analysis Service is implemented in JavaServer Pages (JSP) technology with a Java library in the background managing all the communication, analysis and interpretation of the data.

Another interface is a simple library of web functions provided to the other services in the +Spaces project. The main functionality is to provide the mean results of the preceding poll experiments **getMeanOfPoll** during the ice breaker in a role-play simulation.

During the implementation and testing phases the consortium implemented some routines and web services to recover existing experiments using the middleware recovery service. The Data Analysis Service has one interface to this recovery service where it is possible to recovery experiments in a local version of the Data Analysis Service and/or the live system running on the server.

## Technical requirements

The technical requirements of the Data Analysis Service are a Tomcat 7 environment and an integrated and SQLite database.

## Installation instructions

After the standard installation of the Tomcat environment, the SQLite database has to be installed and has to be accessible from the Tomcat environment. Afterwards the whole service (frontend and backend) can be installed by using a simple war-file based deployment strategy.



## Usage Guidelines

The main functionality in the Data Analysis Service backend is the **notificationHandler**. The input of this function is a so called action which is a java object sent by the middleware. The handler processes this action, interprets the data, contacts the IBM reputation server (if the arriving action was a user profile), and stores the results in the database. So the usage of the Data Analysis Service backend is just limited to the call of this web function with the correct input parameter.

The frontend is a combination of JAVA code and the JSP technology for visualization of the results. It is implemented using the model view controller (MVC) architecture for every certain type of experiment (poll, debate, role-play simulation). The usage and the task of the frontend is mainly the visualization and the interpretation of the calculated results of the respective experiment. According to that the usability of the frontend is a key factor in the development of the Data Analysis Service frontend and this is the reason why a close cooperation with the end-users and the other technical partners was necessary and useful. During this collaboration three different types of views were created (poll, debate, role-play simulation), tested and evaluated.

## VS Manager

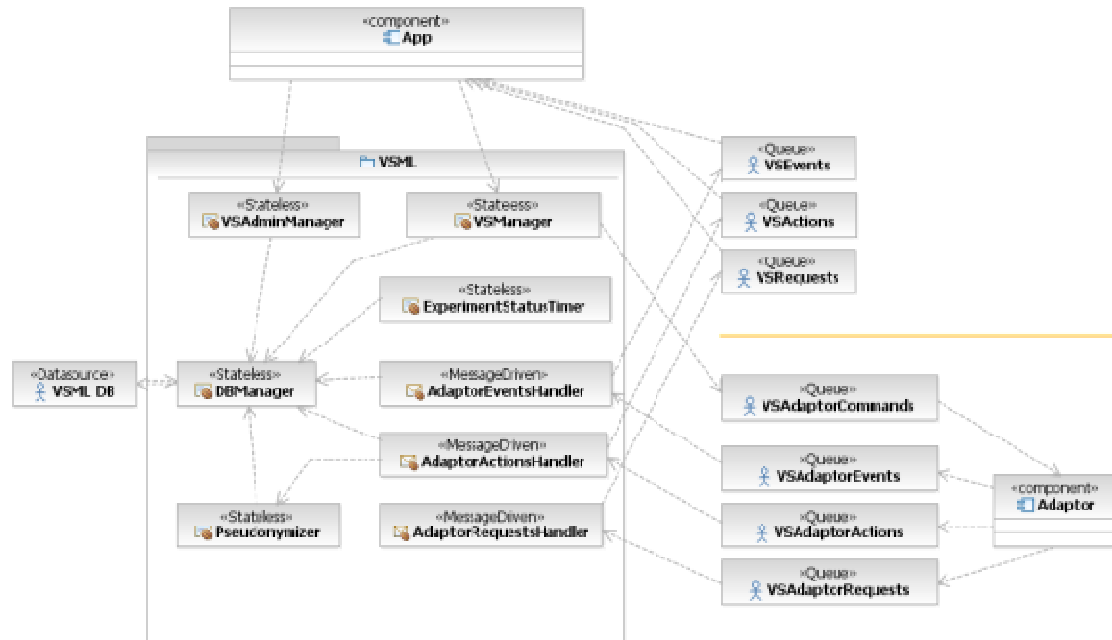
Virtual Spaces Manager is a core component of the layer, and is responsible for centralization of the adaptors work and for implementation of a convenient interface to the Middleware Layer.

Main functionality (see detailed description later):

- Adaptors management: adaptors registration, configuration, and the retrieval of status, enable/disable adaptors.
- Virtual spaces and resources management: declaration of new space/resource, storage of details, on-demand provision of these details to adaptors and to application layer
- Experiments handling: deployment of experiments, reporting of experiment statuses, control of resources utilization, forwarding of reported events and actions.
- Pseudonymization: replacement of users' real IDs by generated pseudonyms and vice-versa.
- Recommendations support: forwarding of recommendation requests from the adaptors to the application layer and forwarding recommendation commands from the application layer to the adaptors.
- Failover: handling of adaptors failure and later recovery.

## Technical specs and interfaces

The component includes several internal modules, each responsible for handling part of the work, such as pseudonymization component, messages handlers, etc.



The layer exposes two interfaces to application layer:

- EJB remote interface: for layer controlling, passing commands and getting information on-demand
- JMS interface: for getting asynchronous events, actions and requests by the application

The layer exposes one interface to adaptors:

- JMS interface: both for sending commands and configuration to adaptors and for getting information back from adaptors (events, actions, requests)

### Application EJB remote interface

- The interface used to pass requests and to retrieve data from Virtual Space Management Layer.

The interface has:

- Main functionality interface (VSMangerRemote), which allows normal flow operations and experiments management.
- Administration interface (VSAdminManagerRemote), which allows basic administration, such as definition of virtual spaces, resources and adaptors.

It EJB remote interfaces, called directly from the application beans. The EJB interface to application can be easily transformed to web services, allowing deployment on separate independent server.

All the DTO (data transfer objects) implemented as simple Java classes.

### **Application JMS interface**

The interface is used to get asynchronous data back from VSML to the application:

- Events – experiment related events (deployment, handling, failure)
- Actions – virtual space actions reported by the adaptors, both experiment related and global ones
- Requests – requests sent by adaptors to the application

It is asynchronous JMS interface. Main reasons for selecting JMS technology was to keep the VSML layer generic, effective throughput of messaging flow and native integration into J2EE technology, supporting transactions management.

### **Adaptors Interface (VSManger -> adaptors)**

The interface is used for sending commands to adaptors:

- ExperimentCommand – command to start/end deployment/handling of an experiment. The adaptor gets full information required for the deployment, including experiment details and list of relevant resources.
- ConfigCommand – command that passes configuration details to adaptor.
- RecommendationCommand – command to recommend experiment(s) to users(s)
- ActivationCommand – command to enable/disable adaptor. Used to handle failure situations.

It is asynchronous JMS interface. The main reason for selection of JMS interface to adaptors was to decouple between the layer and adaptors, in order to keep the layer generic.

All commands are sent to the same JMS queue (VSAdaptorCommands), while each command holds a message selector, to distinguish between target adaptors. Adaptors are identified by virtual space ID.

## Technical requirements

The following requirements are necessary for the installation:

### Hardware Requirements

Minimum memory requirements for RAM : 2GB or more

Operating system (Ubuntu Linux or Windows. Tested on Ubuntu Linux 10.04 and Windows 7)

### Software Requirements

Java version 1.6 or later

Glassfish version 3.1.1 or later

Apache Ant (tested on version 1.8)

MySQL version 5.5 or later

## Installation instructions

The war can be downloaded from this URL:

<http://gforge.grid.ece.ntua.gr/svn/positivespaces/trunk/VSML/VSML/VSML-war>

## Usage Guidelines

The functionality of the service is exposed through a SOAP interface. In order to gain access to the functionality of the core services, the users must invoke these methods through a SOAP call. A list of the methods available through the interface is given in the Section above.

## VS Adaptors (OWL)

### Generic

*The following is common to all adaptors:*

The +spaces adaptors are all implemented as J2EE applications, some of them includes an additional agent running within the context of the virtual space. The adaptors are optimized for a GlassFish, and use a MySQL database for persistency.

### Installation

Database: deploy SQL schema.

Server configuration:

- Configure database connection
- Configure JMS transport resources.

There are several steps to be done before starting the adaptor:

- Define the virtual space in the VSML web console
- Define the supported experiment type in the VSML web console
- Define virtual spaces resources in the VSML web console
- Define the adaptor and credentials in the VSML web console

After performing these tasks the adaptor may be started. Once the adaptor starts it begins to communicate with the VSML. At this point it should appear as 'started' in the VSML console. The VSML will then send a configuration command including the details inserted by the administrator; after this process ends successfully the adaptor should appear in status 'ready'.

### **Technical specs and interfaces (full interfaces in D3.1)**

The bi-interfaces between the VSML and the adaptor are asynchronous and implemented over JMS.

The commands in the interface are:

#### **Experiment Command**

Command to start/end deployment/handling of an experiment. The adaptor gets full information required for the deployment, including experiment details and list of relevant resources.

Each command has several attributes that must be included in it:

Operation type which is one of the following: DEPLOYMENT,

UNDEPLOYMENT, HANDLING\_START, OTHER.

Virtual space Id – identify the correct VS

Experiment -experiment definition, including experiment xml document as delivered to the experiment manager

Resources – list of resources to apply

AdaptorData – backup data for failover

### **Config Command**

Command that passes configuration details to adaptor.

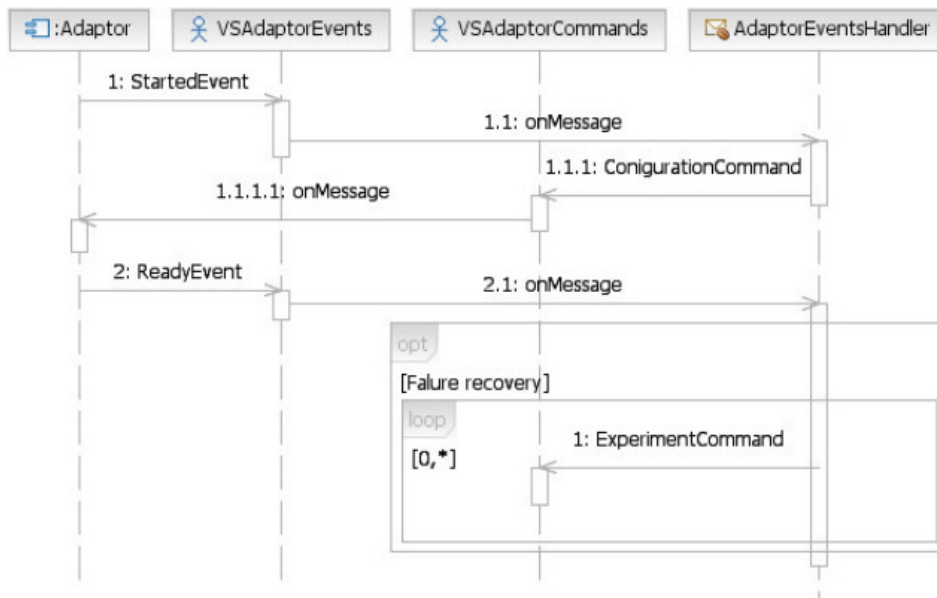
### **Recommendation Command**

Command to recommend experiment(s) to users(s)

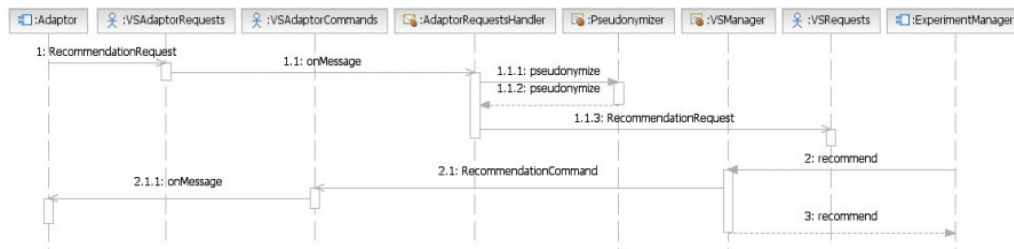
### **Activation Command**

Command to enable/disable adaptor. Used for handling failure situations.

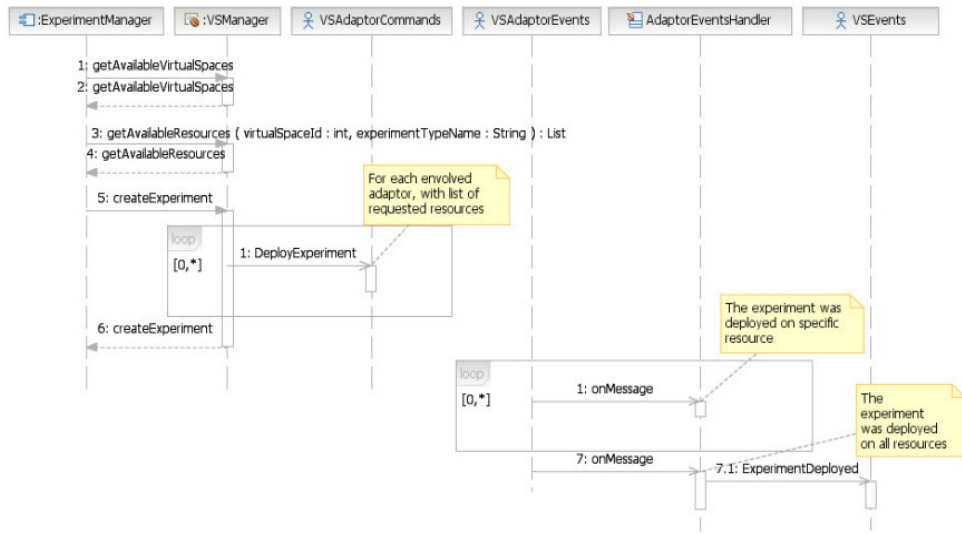
This diagram depicts the communications between the adaptor and VSML on adaptor startup



This diagram depicts the communication between the adaptor and VSML on recommendation requests.



This diagram depicts the communication flow when experiment is



deployed.

### Open Wonderland adaptor(s)

The +Spaces project prototyped three applications in Open Wonderland (OWL) by which citizens can be engaged in policy discussion: [polls](#), [debates](#) and [role-play simulations](#). Here is a brief description of these OWL applications and the way in which, from an architectural standpoint, the applications are implemented in Open Wonderland.

The additional *invisible* responsibilities of each application are:

- to receive updates from the +Spaces middleware
- to communicate user actions to the +Spaces middleware

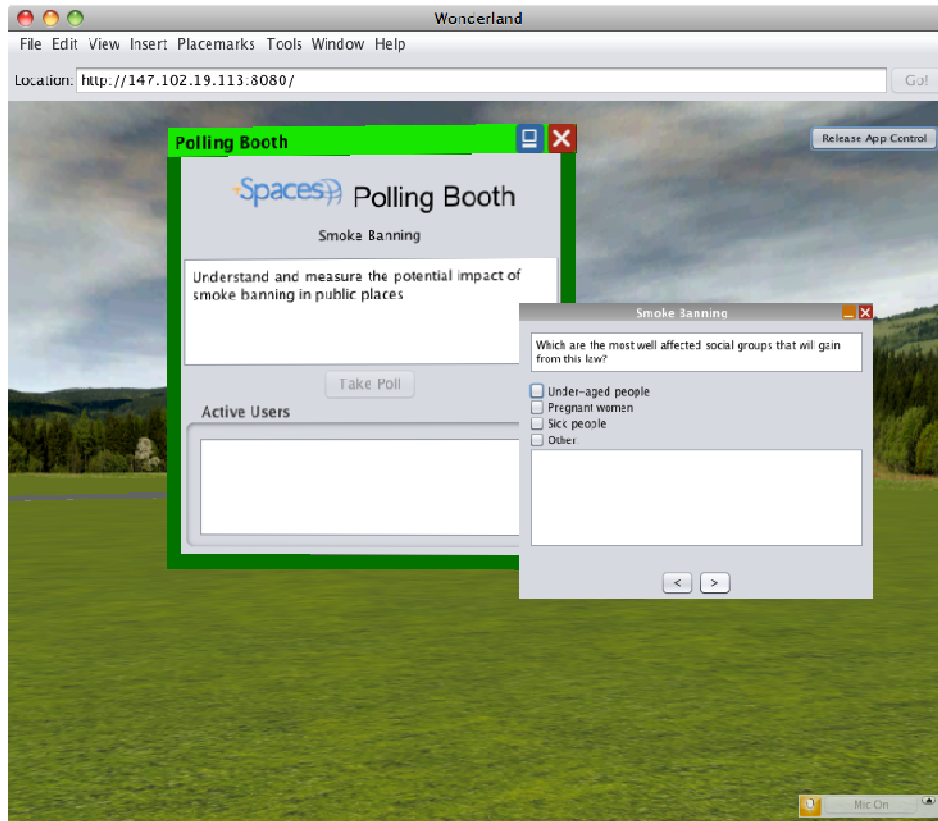
Each application is implemented as an OWL ‘cell’, packaged in an OWL module. However, there are some additional supporting modules that provide cells and other functionality used by the three applications. This section will review each application, beginning with the Polling Booth, and then briefly describe the other functionality before summarizing the work.

### Technical specs and interfaces



## **Polling Booth**

The Polling Booth is the simplest of the applications and is implemented as a 2D cell. The client implementation is a 2D Swing application that displays the current users of the Polling Booth, along with metadata describing the poll, and a button by which the user may take the poll. The user interaction of voting in a poll is implemented as a heads-up-display (HUD) component—this is because the activity is private to the user (see Figure 1, below). The description of the poll, such as its title and sequence of questions, is represented as an instance of a Java class that takes the role of a data model, with no behaviour. The Java Poll class is dependent on some other data-model-like classes such as BinaryPollQuestion, and FreeTextAnswer.



**Figure 10 - +Spaces OWL Polling**

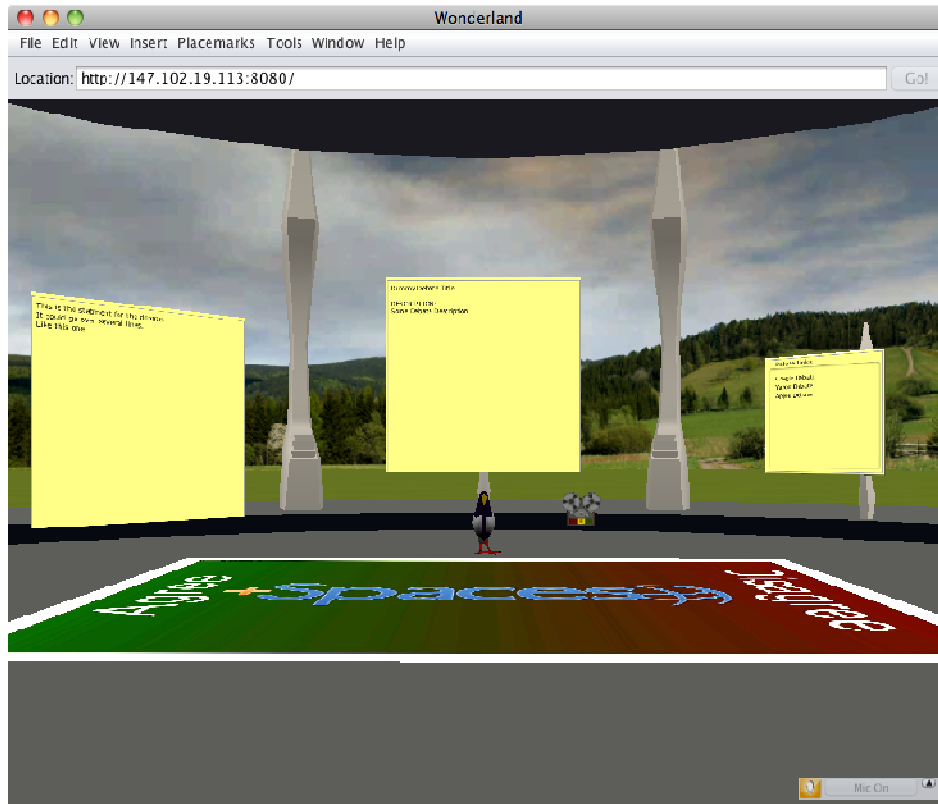
The server implementation of the Polling Booth cell acts as a gateway between the client implementation and the +Spaces middleware; thus it has two responsibilities: communication with the client and communication with the +Spaces middleware. The server communication with the client follows the regular OWL architecture, relying on subclasses of `App2DCellClientState`, `App2DCellServerState` and [CellMessage](#). However, server communication with the +Spaces middleware follows the example of the [connectionsample](#) module that relies on the use of a subclasses of [BaseConnection](#), [Message](#) and [ResponseMessage](#) and implementations of [ServerPlugin](#) and [ClientConnectionHandler](#).

The communication flow is as follows (and is common to all three +Spaces OWL applications):

- The +Spaces middleware creates a connection to the OWL server, and calls a method on the connection to set the data model of a cell (identified by its cell id) to be an instance of class Poll. The connection sends a message (an instance of a subclass of Message) to the OWL server and waits for a response.
- On the OWL server, the instance of (an implementation of ClientConnectionHandler) receives the message. It then looks up the instance of CellMO according to the cell id (via the method CellManagerMO.getCell()), casts it to be of the correct class and calls a method to set its poll data model. The CellMO instance, in turn, sends an instance of (a subclass of) CellMessage to its clients, causing the clients to update. Finally, the ClientConnectionHandler returns an instance of (a subclass of) ResponseMessage to indicate if the operation to set the poll was a success.
- From the client, when the user interacts with the Polling Booth, the answers (and other actions) are sent from the Cell to the CellMO on the server via an instance of (a subclass of) CellMessage. The Polling Booth CellMO then calls a method on the instance of (an implementation of) ClientConnectionHandler to send the user's actions to the instance of (a subclass of) BaseConnection, where it is received and passed on to the +Spaces middleware via a listener pattern.

### **Debating Chamber**

The Debating Chamber application is also implemented as a cell, taking on two roles: it acts as a container for other elements of the chamber; and it presents a 'carpet' to the user on which he or she may express a vote.



**Figure 11. +Spaces OWL Debating Chamber**

When the CellIMO that represents the Debating Chamber is inserted into the world, instances of other subclasses of CellIMO are added as its children, as shown above in Figure 2. These are:

- Two instances of StickyNoteCellIMO—these post-its are used to display the ‘statement’ and ‘description’ of the debate.
- An instance of ModelCellIMO—this is used to hold the 3D model of the chamber (the OWL auditorium model).

- An instance of `AudioRecorderCellMO`—this is used to produce an audio recording of the debate (it adds the instance of the `Debating Chamber CellMO` as a listener to be informed when a user terminates a recording).
- An instance of `SharedActionCellMO`—this is used to render messages received from other virtual spaces such as Twitter and Facebook (this is based on the twitter viewer module that is in the OWL modules source code repository and rendered as a pigeon on the client).
- An instance of `LinkListCellMO`—this is used to render the list of URLs that users may double-click on to open a browser. This cell is part of a new module that is based on the `Sticky Note` cell: it is rendered similarly, with a list replacing the text area.

The `CellMO` that represents the `Debating Chamber` maintains managed references to each of these children (except for the instances of `ModelCellMO` and `AudioRecorderCellMO`). For example the `Debating Chamber CellMO` has a field labelled 'debateDescriptionCellRef' which is an instance of `ManagedReference<StickyNoteCellMO>`. The references are used as follows:

- When the `setDebate()` method is called on the `Debating Chamber CellMO`, it calls the method `setText()` on each instance of `StickyNoteCellMO`, with the parameter representing the description or statement, appropriately. It also calls the method `setLinks()` on the the instance of `LinkListCellMO`, with a list of links (URL-displayname pairs). The result of these method calls is to update the display of the contents of the cells on the clients.
- From the client, when the user interacts with the `Debating Chamber`, the user votes are sent from the `Cell` to the `CellMO` on the server via an instance of (a subclass of) `CellMessage`. From then on, the mechanism follows the same pattern as the `Polling Booth`.
- When the `+Spaces` middleware reports a comment from Twitter or Facebook, it is received as a `Message` by the implementation of `ClientConnectionHandler` associated with the `Debating Chamber CellMO`. This, in turn, calls the method `notifySharedMessage()` on the `Debating Chamber CellMO`, which then calls the method `addRecord()` on the instance of `SharedActionCellMO`, eventually causing the clients to display the contents of the comment.

In terms of its communication with the `+Spaces` middleware, the implementation of the `Debating Chamber` application follows the pattern set by the `Polling Booth`. That is, it reports user actions and receives comments from other virtual spaces via the OWL server.

### **Simulation Agora**

The 'Simulation [Agora](#)' is the name we give to the virtual space that hosts the role-playing simulation. It is the most complex of the applications and is also implemented as a cell, somewhat similar to the Debating Chamber. However, unlike the Debating Chamber it does not provide any direct user interaction features for 3D objects, and instead represents the floor of the agora (rendered as an EU flag) and provides a HUD control panel to a privileged user role by which the stages of the simulation can be managed.



Figure 12. +Spaces OWL Simulation Agora

Figure 3 illustrates some of the elements of the Simulation Agora and the HUD control panel that is accessible to the moderator (or any member of the admin user group).

The HUD control panel is implemented as a Swing [tabbed pane](#). One of the tabs provides the moderator with the means to step forwards and backwards through the stages of a 'template' that describes activities of a role-play simulation (more information about the use of [role-play templates](#) is provided in an earlier blog posting). Each of the two templates is implemented in Java in the form of a (pseudo) state machine: as the moderator progresses the template from one stage to the next, the state machine calls methods on the CellMO that represents the

Simulation Agora to insert and remove child cells and to update the state of those child cells. Without going into too much detail, the sequence of stages of the state machine are as follows:

1. Meet Participants—this is the starting stage of the simulation
2. Ice Breaker Vote—this is an optional stage, specified by the policy maker, in which participants may vote on a question related to the policy
3. Ice Breaker Results—the results of the ice breaker vote are presented
4. Assign Roles—the moderator assigns the participants to the roles described in the template
5. Prepare Statements—the participants create a number of statements according to the description of their role (the number of statements is specified by the template)
6. Read Statements—the participants read out their statements
7. Mark & Group Statements—the participants and the moderator collaborate to group their statements and to assign votes to statements
8. Present Results—the participants discuss the results of marking and grouping the statements
9. Final Vote—if there was an ice-breaker vote, then the participants are given the opportunity to vote again to determine if their views on the policy have changed
10. End Simulation—the results of the final vote are presented

The children of the cell that represents the Simulation Agora are:

- An instance of PosterCellMO—this shows the current stage of the simulation by rendering an appropriate image. This cell remains visible at all times.
- An instance of a simulation carpet cell—this in turn has a child Poster cell that displays the question that the carpet is to be used to answer. The simulation carpet is used to capture the participants' vote on the ice breaker vote and the final vote. It is added and removed as necessary by the state machine, in response to the moderator's interaction with the HUD control panel.
- Two instances of PosterCellMO—to present the results of the ice-breaker vote and final vote. The state machine adds these cells when appropriate and sets their contents to present the results of the preceding votes.

- A cell that is used by participants to add 'statements'—this is a cell developed specifically for the project. It is a 2D cell, in which the client implementation is provided by a 2D Swing application that uses an instance of [JDesktopPane](#). The cell is added as a child when the state machine is at the 'Prepare Statements' stage.
- Pairs of cells to represent each user role. Each role is associated with a poster cell describing the role, and next to it a 'podium' cell that acts as a place mark. The placemarks are used to enable the participants to jump to a description of their roles. These pairs are added at the 'Assign Roles' stage by the state machine.
- A cell to represent a countdown timer. This is added and removed when necessary by the state machine.
- A shared action cell, as described in the Debating Chamber application.

The CellMO that represents the Simulation Agora maintains references to the [CellIDs](#) of each of these children. For example the Simulation Agora CellMO has a field labelled 'simulationDescriptionCellID' which is a reference to the CellID of the instance of PosterCellMO that displays the description of the simulation. The fields are used as follows:

- When the `setSimulation()` method is called on the Simulation Agora CellMO, it follows more or less the same pattern as the Debating Chamber, except that it also retrieves the template identifier from the simulation and creates a new instance of the state machine that represents that template.
- When the moderator steps through the stages of the template, the CellIDs are used to identify the appropriate cells to delete or update, as described in the stages above.
- From the client, when the user interacts with the Simulation Agora, the user votes and statements are sent from the Cell to the CellMO on the server via an instance of (a subclass of) `CellMessage`. From then on, the mechanism follows the same pattern as the Polling Booth and Debating Chamber.
- When the +Spaces middleware reports a comment from Twitter or Facebook, it follows the same pattern as the Debating Chamber.

The other two tabs on the HUD control panel enable the moderator to inform the server when 'something interesting happens.' That is, something worth noting by the data analysis service; for example, when a video recording of the session is replayed, viewers are able to jump to appropriate timestamps to view the users' activities (and listen to their comments). This is implemented using the regular OWL architecture—a message from the Simulation Agora cell to the OWL server which is then forwarded to the +Spaces middleware. All other communication between the +Spaces middleware, the OWL server and the OWL clients is as described in the two applications above.



## **Other +Spaces Functionality**

In addition to the cells that provide the functionality for the Polling Booth, Debating Chamber and Simulation Agora, we also implemented a module with some extra features:

- A means of reporting user activity to the +Spaces middleware:
  - two users come in range of each other (implemented using a client plugin)
  - a user 'chats' (using the text chat)
  - a user is forcibly disconnected
  - a user is forcibly muted
  - a user logs in or logs out
  - a user begins speaking
  
- a servlet which provides a means of capturing profile information about a user (which is then forwarded to the +Spaces middleware)

## **Summary**

In summary, we have developed 19 OWL modules for the +Spaces project, the following of which have been (or will be) donated to the OWL source code repository:

- countdown timer
  
- office-converter
  
- postercontrol

- tightvnccontrol
- twitter
- webcamcontrol
- webcaster

### **Technical requirements**

#### *The minimum system requirements needed to run Open Wonderland:*

For the Wonderland client, users will need a modern PC (1.5Ghz+, 1GB RAM) with hardware-accelerated OpenGL drivers installed. For Solaris and Linux Nvidia cards/drivers are recommended (Nvidia drivers are more stable and feature complete than others). Users will also need an accelerated graphics card, typically geared towards running 3D games. The project recommends a graphics card with 256MB of video memory for the best performance, but 128MB should also work.

The minimum requirements for a Wonderland server suitable for software development are the same as the requirements for running the client. A Wonderland server plus one or two clients can comfortably run on a high-end desktop or laptop. For an installation that supports multiple users, a server-class computer will be needed. For optimum performance, different Wonderland services can be run on separate servers.

#### *Operating systems required to run Open Wonderland:*

Since Open Wonderland is based upon Java, the client will run on Windows, Mac OS X, Linux, and Solaris. For the X11 application sharing feature to be enabled (this enables you to run applications such as Firefox, Open Office, and NetBeans), the Wonderland server must be running on either Linux or Solaris. Note that 2D Java applications such as the shared whiteboard, multi-user PDF Viewer, sticky notes, web cam viewer, or video player will work when the server is run on any platform.

#### *Minimum network speed required to run Open Wonderland:*

We have found that it is best to be connected to wired ethernet (not wireless) over at least a DSL-speed link.

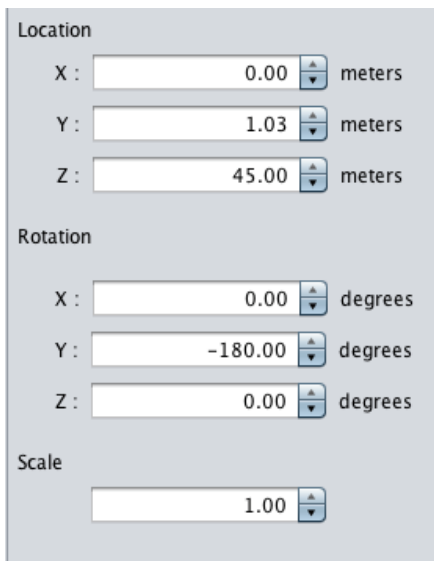
#### *Software that needs to be installed to run Open Wonderland:*

To run the client browser, the Java Runtime Environment (JRE) version 6 is required.

## **Installation Instructions**

The following are the instructions for deploying +Spaces applications into Open Wonderland:

- 1) Start the OWL client and login as admin/admin.
- 2) Remove the existing 'Polling Booth'/'Debate Carpet'/'Simulation Agora', using the 'Object Editor' (from the menu bar-- Tools>Object Editor).
- 3a) To insert a poll--move your avatar to the desired position, then use the 'Insert Object...' dialogue box to insert a Polling Booth cell.
- 3b) To insert a Debating Chamber--ensure that your avatar is at the landing position (check this by teleporting to the starting location placemark), then use the 'Insert Object...' dialogue box to insert a Debate Carpet. Note that the object name is 'Debate Carpet' not 'Debating Chamber'.
- 3c) To insert a Simulation Agora—move your avatar directly forwards, so that it is beyond the boundary of the Debating Chamber, then use the 'Insert Object...' dialogue box to insert a Simulation Agora. Open the 'Object Editor' and select the 'Simulation Agora' from the object hierarchy. Change the position of the 'Simulation Agora' so that it is as below:



The image shows a dialog box with three sections: Location, Rotation, and Scale. Each section contains three input fields with up/down arrows and a unit label.

| Section  | Property | Value   | Unit    |
|----------|----------|---------|---------|
| Location | X        | 0.00    | meters  |
|          | Y        | 1.03    | meters  |
|          | Z        | 45.00   | meters  |
| Rotation | X        | 0.00    | degrees |
|          | Y        | -180.00 | degrees |
|          | Z        | 0.00    | degrees |
| Scale    |          | 1.00    |         |

4) Change the security settings on the object you have inserted. Open the 'Object Editor' and select the 'Polling Booth'/'Debate Carpet'/'Simulation Agora' from the object hierarchy. Add the Security Capability. Edit the permissions for 'everyone else' so that they may view the object, but not change it. The result should appear as:

| Type      | Name          | Owner?                              | Permissions |
|-----------|---------------|-------------------------------------|-------------|
| User      | admin         | <input checked="" type="checkbox"/> | 0           |
| Everybody | Everyone else | <input type="checkbox"/>            | 5           |

- 5) Make a note of the object ID of the selected object ('Polling Booth'/'Debate Carpet'/'Simulation Agora' ).
- 6) Go to the VSML Admin Console--<http://positivespaces2.grid.ece.ntua.gr:8080/VSML/>. Select the 'Resources' page.
- 7) There should already be resources (rows) in the table describing the OWL resources. Check that they are correct. If they are not correct, then first add a new resource, then delete the incorrect resource. For OWL, the URL is the object id (from step 5 above), prefaced by the URL of the NTUA OWL server (<http://147.102.19.113:8080/>). The credentials for an OWL resource are "moderator,moderator".

### 4.3 Report on societal implications

Replies to the following questions will assist the Commission to obtain statistics and indicators on societal and socio-economic issues addressed by projects. The questions are arranged in a number of key themes. As well as producing certain statistics, the replies will also help identify those projects that have shown a real engagement with wider societal issues, and thereby identify interesting approaches to these issues and best practices. The replies for individual projects will not be made public.

|   |
|---|
| <b>A General Information</b> <i>(completed automatically when Grant Agreement number is entered).</i> |
|---|

|                                |        |
|--------------------------------|--------|
| <b>Grant Agreement Number:</b> | 248726 |
|--------------------------------|--------|

|                          |   |
|--------------------------|---|
| <b>Title of Project:</b> | +Spaces – Policy Simulation in Virtual Spaces |
|--------------------------|---|

|                                       |                                 |
|---------------------------------------|---------------------------------|
| <b>Name and Title of Coordinator:</b> | Ms. Michal Jacovi, IBM Research |
|---------------------------------------|---------------------------------|

|                 |
|-----------------|
| <b>B Ethics</b> |
|-----------------|

|   |                                       |
|---|---------------------------------------|
| <b>1. Did your project undergo an Ethics Review (and/or Screening)?</b> <ul style="list-style-type: none"> <li>• If Yes: have you described the progress of compliance with the relevant Ethics Review/Screening Requirements in the frame of the periodic/final project reports?</li> </ul> <p>Special Reminder: the progress of compliance with the Ethics Review/Screening Requirements should be described in the Period/Final Project Reports under the Section 3.2.2 'Work Progress and Achievements'</p> | <i>Yes<br/>(reported<br/>in D7.4)</i> |
|---|---------------------------------------|

|  |            |
|--|------------|
| <b>2. Please indicate whether your project involved any of the following issues (tick box) :</b> | <b>YES</b> |
|--|------------|

|   |   |
|---|---|
| <b>RESEARCH ON HUMANS</b>   |   |
| • Did the project involve children?   |   |
| • Did the project involve patients?   |   |
| • Did the project involve persons not able to give consent?   |   |
| • Did the project involve adult healthy volunteers?   |   |
| • Did the project involve Human genetic material?   |   |
| • Did the project involve Human biological samples?   |   |
| • Did the project involve Human data collection?  |   |
| <b>RESEARCH ON HUMAN EMBRYO/FOETUS</b>  |   |
| • Did the project involve Human Embryos?  |   |
| • Did the project involve Human Foetal Tissue / Cells?  |   |
| • Did the project involve Human Embryonic Stem Cells (hESCs)?   |   |
| • Did the project on human Embryonic Stem Cells involve cells in culture?   |   |
| • Did the project on human Embryonic Stem Cells involve the derivation of cells from Embryos?   |   |
| <b>PRIVACY</b>  |   |
| • Did the project involve processing of genetic information or personal data (eg. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)? | X |
| • Did the project involve tracking the location or observation of people?   |   |
| <b>RESEARCH ON ANIMALS</b>  |   |
| • Did the project involve research on animals?  |   |
| • Were those animals transgenic small laboratory animals?   |   |
| • Were those animals transgenic farm animals?   |   |

|   |                        |                      |
|---|------------------------|----------------------|
| • Were those animals cloned farm animals?   |                        |                      |
| • Were those animals non-human primates?  |                        |                      |
| <b>RESEARCH INVOLVING DEVELOPING COUNTRIES</b>  |                        |                      |
| • Did the project involve the use of local resources (genetic, animal, plant etc)?  |                        |                      |
| • Was the project of benefit to local community (capacity building, access to healthcare, education etc)?   |                        |                      |
| <b>DUAL USE</b>   |                        |                      |
| • Research having direct military use   | No                     |                      |
| • Research having the potential for terrorist abuse   |                        |                      |
| <b>C Workforce Statistics</b>   |                        |                      |
| <b>3. Workforce statistics for the project: Please indicate in the table below the number of people who worked on the project (on a headcount basis).</b> |                        |                      |
| <b>Type of Position</b>   | <b>Number of Women</b> | <b>Number of Men</b> |
| Scientific Coordinator  | 1                      | 1                    |
| Work package leaders  | 3                      | 5                    |
| Experienced researchers (i.e. PhD holders)  | 5                      | 15                   |
| PhD Students  | 3                      | 2                    |
| Other   | 6                      | 15                   |
| <b>4. How many additional researchers (in companies and universities) were recruited specifically for this project?</b>                                   |                        | <b>0</b>             |
| Of which, indicate the number of men:   |                        |                      |

| <b>D Gender Aspects</b>   |                             |   |
|---|-----------------------------|---|
| <b>5. Did you carry out specific Gender Equality Actions under the project?</b>   | X                           | Yes   |
| <b>6. Which of the following actions did you carry out and how effective were they?</b>   |                             |   |
|   | <b>Not at all effective</b> | <b>Very effective</b>                                   |
| <input checked="" type="checkbox"/> Design and implement an equal opportunity policy  | ○ ○ ○ ○                     | ○ ○ ○ ○ X   |
| <input type="checkbox"/> Set targets to achieve a gender balance in the workforce   | ○ ○ ○ ○ ○                   | ○ ○ ○ ○ ○   |
| <input type="checkbox"/> Organise conferences and workshops on gender   | ○ ○ ○ ○ ○                   | ○ ○ ○ ○ ○   |
| <input checked="" type="checkbox"/> Actions to improve work-life balance  | ○ ○ X ○ ○                   | ○ ○ ○ ○ ○   |
| <input type="checkbox"/> Other: <input style="width: 150px;" type="text"/>  |                             |   |
| <b>7. Was there a gender dimension associated with the research content – i.e. wherever people were the focus of the research as, for example, consumers, users, patients or in trials, was the issue of gender considered and addressed?</b> |                             |   |
| <input type="checkbox"/> Yes- please specify <input style="width: 150px;" type="text"/>   |                             |   |
| <input checked="" type="checkbox"/> No  |                             |   |
| <b>E Synergies with Science Education</b>   |                             |   |
| <b>8. Did your project involve working with students and/or school pupils (e.g. open days, participation in science festivals and events, prizes/competitions or joint projects)?</b>   |                             |   |
| <input checked="" type="checkbox"/> Yes- please specify: university students participated in focus groups, and pilots.  |                             |   |
| <input type="checkbox"/> No   |                             |   |
| <b>9. Did the project generate any science education material (e.g. kits, websites, explanatory booklets, DVDs)?</b>  |                             |   |
| <input checked="" type="checkbox"/> Yes- please specify: OpenWonderland blog posts and YouTube videos and book chapter  |                             |   |
| <input type="checkbox"/> No   |                             |   |
| <b>F Interdisciplinarity</b>  |                             |   |
| <b>10. Which disciplines (see list below) are involved in your project?</b>   |                             |   |
| <input type="checkbox"/> Main discipline <sup>14</sup> : 1.1 Computer Science   |                             |   |
| <input type="checkbox"/> Associated discipline <sup>14</sup> : 2.2 Electric Engineering   | <input type="checkbox"/>    | Associated discipline <sup>14</sup> : 5. Social Science |
| <b>G Engaging with Civil society and policy makers</b>  |                             |   |
| <b>11a Did your project engage with societal actors beyond the research community? (if 'No', go to Question 14)</b>   | X                           | Yes   |
| <b>11b If yes, did you engage with citizens (citizens' panels / juries) or organised civil society (NGOs, patients' groups etc.)?</b>   |                             |   |
| <input type="checkbox"/> No   |                             |   |
| <input checked="" type="checkbox"/> Yes- in determining what research should be performed   |                             |   |
| <input type="checkbox"/> Yes - in implementing the research   |                             |   |
| <input checked="" type="checkbox"/> Yes, in communicating /disseminating / using the results of the project   |                             |   |

<sup>14</sup> Insert number from list below (Frascati Manual).

|   |   |  |
|---|---|--|
| <b>11c In doing so, did your project involve actors whose role is mainly to organise the dialogue with citizens and organised civil society (e.g. professional mediator; communication company, science museums)?</b>   | X   | Yes  |
| <b>12. Did you engage with government / public bodies or policy makers (including international organisations)</b>  |   |  |
| <input type="radio"/> No<br><input checked="" type="radio"/> Yes- in framing the research agenda<br><input checked="" type="radio"/> Yes - in implementing the research agenda<br><input checked="" type="radio"/> Yes, in communicating /disseminating / using the results of the project  |   |  |
| <b>13a Will the project generate outputs (expertise or scientific advice) which could be used by policy makers?</b><br><input checked="" type="radio"/> Yes – as a <b>primary</b> objective (please indicate areas below- multiple answers possible)<br><input checked="" type="radio"/> Yes – as a <b>secondary</b> objective (please indicate areas below - multiple answer possible)<br><input type="radio"/> No |   |  |
| <b>13b If Yes, in which fields?</b>   |   |  |
| Agriculture<br>Audiovisual and Media<br>Budget<br>Competition<br>Consumers<br>Culture<br>Customs<br><b>Development Economic and Monetary Affairs</b><br>Education, Training, Youth<br><b>Employment and Social Affairs</b>  | Energy<br>Enlargement<br>Enterprise<br>Environment<br>External Relations<br>External Trade<br>Fisheries and Maritime Affairs<br>Food Safety<br>Foreign and Security Policy<br>Fraud<br>Humanitarian aid | Human rights<br><b>Information Society</b><br>Institutional affairs<br>Internal Market<br>Justice, freedom and security<br><b>Public Health</b><br>Regional Policy<br><b>Research and Innovation</b><br>Space<br>Taxation<br>Transport |



|  |  |          |
|--|--|----------|
| <b>13c If Yes, at which level?</b>   |  |          |
| <input checked="" type="checkbox"/> Local / regional levels  |  |          |
| <input checked="" type="checkbox"/> National level   |  |          |
| <input checked="" type="checkbox"/> European level   |  |          |
| <input checked="" type="checkbox"/> International level  |  |          |
| <b>H Use and dissemination</b>   |  |          |
| <b>14. How many Articles were published/accepted for publication in peer-reviewed journals?</b>  | <b>28</b>  |          |
| <b>To how many of these is open access<sup>15</sup> provided?</b>  | <b>14</b>  |          |
| How many of these are published in open access journals?   |  |          |
| How many of these are published in open repositories?  |  |          |
| <b>To how many of these is open access not provided?</b>   | <b>14</b>  |          |
| <b>Please check all applicable reasons for not providing open access:</b>  |  |          |
| <input type="checkbox"/> publisher's licensing agreement would not permit publishing in a repository   |  |          |
| <b>15. How many new patent applications ('priority filings') have been made?</b><br><i>("Technologically unique": multiple applications for the same invention in different jurisdictions should be counted as just one application of grant).</i> | <b>0</b>   |          |
| <b>16. Indicate how many of the following Intellectual Property Rights were applied for (give number in each box).</b>   | Trademark  | <b>1</b> |
|  | Registered design  | <b>0</b> |
|  | Other  | <b>0</b> |
| <b>17. How many spin-off companies were created / are planned as a direct result of the project?</b>   | <b>0</b>   |          |
| <i>Indicate the approximate number of additional jobs in these companies:</i>  |  |          |
| <b>18. Please indicate whether your project has a potential impact on employment, in comparison with the situation before your project:</b>  |  |          |
| <input checked="" type="checkbox"/> Increase in employment, or   | <input type="checkbox"/> In small & medium-sized enterprises             |          |
| <input type="checkbox"/> Safeguard employment, or  | <input type="checkbox"/> In large companies                              |          |
| <input type="checkbox"/> Decrease in employment,   | <input type="checkbox"/> None of the above / not relevant to the project |          |
| <input checked="" type="checkbox"/> Difficult to estimate / not possible to quantify   |  |          |
| <b>19. For your project partnership please estimate the employment effect resulting directly from your participation in Full Time Equivalent (FTE = one person working fulltime for a year) jobs:</b>  | <i>Indicate figure:</i>  |          |
|  | 3.5  |          |
| Difficult to estimate / not possible to quantify   | <input type="checkbox"/>   |          |

<sup>15</sup> Open Access is defined as free of charge access for anyone via Internet.

| <b>I Media and Communication to the general public</b>  |   |
|---|---|
| <b>20. As part of the project, were any of the beneficiaries professionals in communication or media relations?</b>   | <input type="radio"/> Yes <input checked="" type="radio"/> No   |
| <b>21. As part of the project, have any beneficiaries received professional media / communication training / advice to improve communication with the general public?</b> | <input type="radio"/> Yes <input checked="" type="radio"/> No   |
| <b>22 Which of the following have been used to communicate information about your project to the general public, or have resulted from your project?</b>                  |   |
| <input checked="" type="checkbox"/> Press Release   | <input checked="" type="checkbox"/> Coverage in specialist press  |
| <input checked="" type="checkbox"/> Media briefing  | <input checked="" type="checkbox"/> Coverage in general (non-specialist) press                                      |
| <input checked="" type="checkbox"/> TV coverage / report  | <input checked="" type="checkbox"/> Coverage in national press  |
| <input type="checkbox"/> Radio coverage / report  | <input type="checkbox"/> Coverage in international press  |
| <input type="checkbox"/> Brochures /posters / flyers  | <input checked="" type="checkbox"/> Website for the general public / internet                                       |
| <input checked="" type="checkbox"/> DVD /Film /Multimedia   | <input checked="" type="checkbox"/> Event targeting general public (festival, conference, exhibition, science café) |
| <b>23 In which languages are the information products for the general public produced?</b>  |   |
| <input type="checkbox"/> Language of the coordinator  | <input checked="" type="checkbox"/> English   |
| <input type="checkbox"/> Other language(s)  | <input checked="" type="checkbox"/> Greek   |

**Question F-10:** Classification of Scientific Disciplines according to the Frascati Manual 2002 (Proposed Standard Practice for Surveys on Research and Experimental Development, OECD 2002):

#### **FIELDS OF SCIENCE AND TECHNOLOGY**

##### 1. NATURAL SCIENCES

- 1.1 Mathematics and computer sciences [mathematics and other allied fields: computer sciences and other allied subjects (software development only; hardware development should be classified in the engineering fields)]
- 1.2 Physical sciences (astronomy and space sciences, physics and other allied subjects)
- 1.3 Chemical sciences (chemistry, other allied subjects)
- 1.4 Earth and related environmental sciences (geology, geophysics, mineralogy, physical geography and other geosciences, meteorology and other atmospheric sciences including climatic research, oceanography, vulcanology, palaeoecology, other allied sciences)
- 1.5 Biological sciences (biology, botany, bacteriology, microbiology, zoology, entomology, genetics, biochemistry, biophysics, other allied sciences, excluding clinical and veterinary sciences)

##### 2. ENGINEERING AND TECHNOLOGY

- 2.1 Civil engineering (architecture engineering, building science and engineering, construction engineering, municipal and structural engineering and other allied subjects)
- 2.2 Electrical engineering, electronics [electrical engineering, electronics, communication engineering and systems, computer engineering (hardware only) and other allied subjects]
- 2.3. Other engineering sciences (such as chemical, aeronautical and space, mechanical, metallurgical and materials engineering, and their specialised subdivisions; forest products; applied sciences such as geodesy, industrial chemistry, etc.; the science and technology of food production; specialised technologies of interdisciplinary fields, e.g. systems analysis, metallurgy, mining, textile technology and other applied subjects)

##### 3. MEDICAL SCIENCES

- 3.1 Basic medicine (anatomy, cytology, physiology, genetics, pharmacy, pharmacology, toxicology, immunology and immunohaematology, clinical chemistry, clinical microbiology, pathology)
- 3.2 Clinical medicine (anaesthesiology, paediatrics, obstetrics and gynaecology, internal medicine, surgery, dentistry, neurology, psychiatry, radiology, therapeutics, otorhinolaryngology, ophthalmology)
- 3.3 Health sciences (public health services, social medicine, hygiene, nursing, epidemiology)

4. AGRICULTURAL SCIENCES

- 4.1 Agriculture, forestry, fisheries and allied sciences (agronomy, animal husbandry, fisheries, forestry, horticulture, other allied subjects)
- 4.2 Veterinary medicine

5. SOCIAL SCIENCES

- 5.1 Psychology
- 5.2 Economics
- 5.3 Educational sciences (education and training and other allied subjects)
- 5.4 Other social sciences [anthropology (social and cultural) and ethnology, demography, geography (human, economic and social), town and country planning, management, law, linguistics, political sciences, sociology, organisation and methods, miscellaneous social sciences and interdisciplinary , methodological and historical SIT activities relating to subjects in this group. Physical anthropology, physical geography and psychophysiology should normally be classified with the natural sciences].

6. HUMANITIES

- 6.1 History (history, prehistory and history, together with auxiliary historical disciplines such as archaeology, numismatics, palaeography, genealogy, etc.)
- 6.2 Languages and literature (ancient and modern)
- 6.3 Other humanities [philosophy (including the history of science and technology) arts, history of art, art criticism, painting, sculpture, musicology, dramatic art excluding artistic "research" of any kind, religion, theology, other fields and subjects pertaining to the humanities, methodological, historical and other SIT activities relating to the subjects in this group]

## 2. FINAL REPORT ON THE DISTRIBUTION OF THE EUROPEAN UNION FINANCIAL CONTRIBUTION

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This report shall be submitted to the Commission within 30 days after receipt of the final payment of the European Union financial contribution.

### Report on the distribution of the European Union financial contribution between beneficiaries

| Name of beneficiary   | Final amount of EU contribution per beneficiary in Euros (Final payment) |
|---|--|
| 1. IBM Israel - science and technology Ltd                              | 77,032.00  |
| 2. INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS                      | 55,437.00  |
| 3. FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V | 20,418.00  |
| 5. UNIVERSITY OF ESSEX  | 25,740.00  |
| 6. ATOS SPAIN SA.   | 15,608.00  |
| 7. KATHOLIEKE UNIVERSITEIT LEUVEN                                       | 9,581.00   |
| 8. ATHENS TECHNOLOGY CENTER SA  | 7,628.00   |
| 9. HELLENIC PARLIAMENT  | 18,556.00  |
|   |  |
| <b>Total</b>  | <b>230,000.00</b>  |

| Name of beneficiary   | Final amount of EU contribution per beneficiary in Euros (Total payments) |
|---|---|
| 1. IBM Israel - science and technology Ltd                              | 662,907   |
| 2. INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS                      | 512,437   |
| 3. FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V | 198,614   |
| 4. UNIVERSITY OF ESSEX  | 276,521   |
| 5. ATOS SPAIN SA.   | 128,914   |
| 6. KATHOLIEKE UNIVERSITEIT LEUVEN                                       | 177,457   |
| 7. ATHENS TECHNOLOGY CENTER SA  | 219,090   |
| 8. HELLENIC PARLIAMENT  | 124,058   |
|   |   |

|       |           |
|-------|-----------|
| Total | 2,299,998 |
|-------|-----------|