Network of Excellence

Deliverable D1.3

NESSoS Joint Virtual Research Lab
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Abstract

The Joint Virtual Research Lab (JVRL) is the technical infrastructure under development for the NESSoS project. It features a collection of tools and services, provided by the partners and based on the partners’ needs, which aim at being combined into a single, global architecture. The aim of the JVRL is to provide a set of facilities to streamline the cooperation between the partners, interaction among softwares, communication, and all sorts of information exchange that may be required by the project. This document describes the tools and services composing the JVRL, the current status of their integration, and what is needed in the short- and long-term future to achieve these goals. The document does not describe in detail each component of the JVRL (some, such as the mobility portal or the Common Body of Knowledge, have specific Work Packages dedicated to them), but only those not covered by other deliverables; for the others, the focus is on their role within the JVRL and how it relates to other components. A description of the ongoing and planned integration completes the deliverable.

Keyword List

Technological infrastructure, tools, services, integration.
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List of Acronyms

BSCW Basic Support for Cooperative Work
CBK Common Body of Knowledge
CEE Cloud Execution Environment
DoW Description of Work
IDE Integrated Development Environment
JVRL Joint Virtual Research Lab
KO Knowledge Object
LDAP Lightweight Directory Access Protocol
LMS Learning Management System
NESSoS Network of Excellence on Engineering Secure Future Internet Software Services and Systems
NoE Network of Excellence
OSGi Open Service Gateway initiative
PAN Personal Learning Environment
PLE Personal Learning Environment
SCO Shareable Content Object
SCORM Shareable Content Object Reference Model
SDE Service Development Environment
SDLC Software Development Life Cycle
SMW Semantic MediaWiki
UI User Interface
VEC Virtual Education Centre
VM Virtual Machine
WP Work Package
1 Introduction

NESSoS is a NoE, with the purpose of establishing connections between researchers in the field of secure service engineering. Partners of the NoE cooperate in their research, through scientific publications and information exchange.

The Joint Virtual Research Lab (JVRL) offers the technical infrastructure for the NoE’s members. Made up of an ample collection of tools and softwares, the JVRL aims at being the shared technical platform underlying all of NESSoS’s collaborative work. The JVRL addresses several needs of the cooperative research in secure software engineering, from tools for the organisation of meetings and workshops to publication-sharing areas, from cooperative development to e-learning facilities, from means of communication to development environments.

Many tools for different purposes, provided and developed by the partners, always keeping in mind their own needs and those of other members of the consortium of the NoE. But these tools are not supposed to live in separate universes, each tool beginning and ending on its individual purpose. The JVRL aims at being more than just a collection of tools. NESSoS is about cooperation and integration, and these must be achieved not only in the research, but also in the technical infrastructure. The JVRL is supposed to be an integrated set of tools, where the various components interact among themselves, and the content or data provided within one of them is readily (and possibly automatically) available elsewhere.

This is the focus of the current work in progress on the JVRL. Most of the tools have been put into place, more are currently under development, yet others might emerge in the future. As the tools are made available, they need to be connected together. Ultimately, the JVRL is supposed to become a coordinated entity, a “virtual laboratory” where the user, after being granted access (where access is required), can use all the facilities made available to his or her privilege level.

Up to three different access levels can be found in any JVRL component: an external level for public visitors, an internal level for registered members, and an administrative level. The external level is made up primarily of web sites, and provides all public information to outsiders. Information about the partners, the status of the NoE, published papers, tools developed, related events, public training courses and so on are all available on the various web sites composing the NESSoS “outer” layer. Internal visibility grants access to all resources, such as development code, deliverables’ work in progress, publishing facilities, inter-partner communication and the like. The administrative level is accessible only to the developers and maintainers of each individual JVRL component, and provides a superuser access for invasive operations such as changing, fixing, rewriting, moving. Within these macro-levels, of course, each individual component will have its own access policies for different users.

This deliverable is structured in such a way as to describe all the components, their current integration status, and future integration plans. Specifically, after a brief overview of the main building blocks of the JVRL, each chapter shall focus attention on individual components, describing them at a high level (leaving a more detailed description to deliverables for their specific work packages), and how they fit into the global view of the JVRL.
2 General overview

The JVRL is made up of several components. Some are services offering external visibility through a public web site, while others are tools accessible only by NESSoS partners and used only for internal collaboration.

The following components are currently making up the JVRL:

• the NESSoS web portal, located at http://www.nessos-project.eu/, is the main component for external visibility, and the central hub of the JVRL. The web portal contains all the information about the project; some are excerpts from the DoW, such as the project objectives or WP description, but most are updates on the project's advancement. Important news, accepted deliverables, and naturally links to the other JVRL components all have their natural home in the web portal. It is also used to collect and store NESSoS-related publications; it contains a calendar of related events (conferences, meetings, schools, workshops) where every member of the consortium can publish an event; and recently it has been extended with a plugin to create and manage surveys. Details on the advancement of the NESSoS web portal are in Chapter 3.

• the mobility portal, located at http://www.nessos-project.eu/mbp, provides information about NESSoS’s mobility program, for a tighter collaboration among the partners involved. The mobility portal is part of the mobility program, described in detail in the deliverables for WP3. An update on the status of the mobility portal is in Chapter 5;

• the Common Body of Knowledge (CBK) is another web-based service located at http://www.nessos-project.eu/cbk. This is a shared knowledge base for all the tools, technologies and methodologies created under the NESSoS flag. While a detailed description of the CBK is in the WP5 deliverables, its status within the JVRL is given in brief in Chapter 4;

• the Virtual Education Centre http://www.nessos-project.eu/vec is the last and most recent of the currently-existing public web sites for the NESSoS project. It is a front-end for the tool for interactive learning based on the Moodle platform. The Virtual Education Centre is part of WP13, and a detailed report will be published in the deliverables for that WP. Its current status in the JVRL is described in Chapter 6;

• the SDLC tools workbench, also called Service Development Environment (SDE), has a website at http://www.nessos-project.eu/sde, although it is not a web-based service like those mentioned above, rather it is an implementation of the CBK tools. It is a modified version of the Eclipse Integrated Development Environment (IDE) where the tools developed by the partners (and described in the CBK) can be integrated. Towards the end of the project, the degree of integration among the tools might allow the output of a tool to be fed as an input to another, thus allowing a full chain for software development, from the initial design to the deployment and test phase. The SDE is described in detail in the deliverables for WP2, whereas its integration in the JVRL is in Chapter 7 of this document;

• a web-based tool is also the BSCW, located at http://www.nessos-project.eu/bscw, but it is visible only to NESSoS partners. Although it has several functionalities, including a personal and customisable web portal, within NESSoS it is used only for storage of shared documents. Meeting information, slides of talks, completed deliverables, instructions for using the various JVRL tools are all stored within the BSCW;

• with a functionality in part similar to that of BSCW, the Subversion repository (Chapter 10) is used to store temporary versions of work-in-progress content. It is used to store the ongoing project deliverables, and for collaborative development of software among several partners. The repository also provides a web interface which can be accessed in read-only mode, but only with access credentials (through HTTP authentication), at the URL http://www.nessos-project.eu/svn. 10 gives some report on the status of the activity within the NESSoS SVN repository;

• the NESSoS Cloud Execution Environment (CEE) (Chapter 8) is a work-in-progress addition to the NESSoS JVRL. It consists of a cloud system which allows NESSoS users to execute virtual
machines. A preliminary version of the system has been released and is undergoing internal testing, but it still needs some improvements. It will be released to the NESSoS community as soon as the final issues have been solved;

- the NESSoS mailing lists provide a quick and efficient means of mass communication among the partners. NESSoS uses several mailing lists, depending on the purpose and domain of interest of each communication. http://www.nessos-project.eu/mls points to the mailing list preferences page, where a user can select the mailing lists to subscribe to. Some reports on the mailing lists are provided in Chapter 9;

- the LDAP directory represents a potential infrastructure for the integration of all the above tools. Since most of them can be bound to the LDAP directory, this can be used as the core of the network integration, becoming the central hub for storing user information such as access credentials to the various services. During the first year, the LDAP was mainly an authentication back-end for the NESSoS web portal, but during the second year several tools have been extended to support it as well, as described in Chapter 11. The LDAP directory has a web interface for its management, but this is accessible only to the administrators and no public URL for it has been provided.

At a first glance, some of these components may appear quite similar, and it is true that some might be used to perform tasks done by another. However, different components are used for different purposes. Specifically:

- both the BSCW and the Subversion repository can be used for versioning and collaborative documents. However, uploading documents into the BSCW requires the use of a user-interface, while the SVN does not provide an immediate overview of its content. For this reason, documents which are subject to frequent changes (such as work-in-progress deliverables, software under development, joint papers, and so on) are more fit for the SVN, especially if they are text-based (e.g., programming code or LaTeX documents). On the other hand, the BSCW is used for documents which don’t need a lot of changes (completed deliverables, meeting agendas, reviewer comments) and can be conveniently stored for historical purposes;

- some overlapping also exists between the BSCW and the web portal. However, the main difference is that the full content of the web portal is public, whereas the BSCW contains documents which pertain the consortium only. For example, completed deliverables are stored both in the BSCW and in the web portal, but the former contains all deliverables, including internal and confidential ones, while the latter only contains those deliverables which are open to the public community.

Table 13.1 summarises the various components, the partners and people in charge of them, and a link to the resource (if applicable). Figure 2.1 shows a schematic diagram of the components and the connections among them (both existing and under development); dotted lines represent parts of the JVRL which are currently work in progress.

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Table 2.1: JVRL components overview.

There are others components which have been suggested and might be included in the near future. Among these are:
• a service for creating and managing remote virtual machines is currently under development at CNR. It is currently a work in progress, so it is not part of the JVRL yet, but will soon be integrated;

• a wiki to integrate or replace the currently-existing BSCW. Whereas the BSCW has the advantage of being easy to use by non-technical people too, it is an old and quite inefficient software; a wiki could be more practical for collaborative documents or anything that’s subject to frequent changes.

Future components providing a web access will also be bound to the domain. The URLs are only redirection, because every component resides on a separate server, with different administrators. The option of transferring all components to the same server has been discussed and rejected, to enhance a cooperative integration.
3 Web portal

The web portal is the central hub of the JVRL. Every component of the JVRL which must have an external visibility (web sites, public tools, and so on) is linked, or will be linked, by the web portal. Additionally, the web portal contains public information not pertaining to the JVRL, such as the planning of events or the NESSoS-related publications. Ideally, the web portal is the starting point for the NoE’s dissemination, in terms of information about the project and its partners, results achieved, or publicly available improvements in the research fields.

The web portal is located at the URL http://www.nessos-project.eu/. At first sight (Figure 3.1 depicts an overview of the front page), the portal describes the project at large, illustrating the objectives of the NoE, the partners of the consortium, and the project structure in Work Packages. It also features some links to the FP7 homepage, and a login to a reserved area.

The web portal is enhanced with usage statistics. This is a feature that is currently implemented only on the main web portal, but in the future will be extended to other web components of the JVRL. Statistics are collected using an attached Google Analytics\(^1\) account. The data show that the web portal is frequently used: in the time window between July 2011 (when statistics were implemented) and August 2012, the web portal has received a total of 6408 visits, 3734 by unique users, with spikes occurring around meetings and NESSoS-related conferences. Most of the traffic comes from searches, and little from referrals. Further details on the traffic data is part of the dissemination deliverables.

With respect to deliverable D1.2, there have been several updates to the web portal. The following list summarises the changes from the previous deliverable (the last two are visible only to certain members of the consortium):

- highlighted the JVRL in the main menu;
- deliverables page;
- related projects page;
- survey tool;
- query for reporting publications;
- query for survey results.

3.1 New sections

The content structure has not undergone any major revision. Some minor sections have been added or highlighted. Specifically, the JVRL is now not only in the Integration area of the web portal, but it can also be accessed from a link in the main menu. This has been done to facilitate the access to other components of the JVRL, making the web portal more efficient as a central hub for the project.

Additionally, a new section called “Deliverables” has been added. This page contains the deliverables which have been approved by the Commission and are not marked as reserved documents. It has been discussed whether this page should be based on the publication management plugin (J!Research, described in detail in deliverable D1.2), adding the deliverables as an ad-hoc publication type. However, since this could make the deliverables appear in the publications list unless some major changes were made on the plugin, and considering the very low rate of changes required for the deliverables’ page, a static page maintained by the web portal administrators was preferred.

The documents linked in the page are the final version of the approved deliverables, and are stored locally in the web portal with a uniform file-naming policy. The deliverables’ page will be updated at the end of each 1-year period, after the project review, adding the deliverables for the past year.

A page also has been added for projects on topics related to NESSoS in which consortium members are involved. The page lists a large set of project, with the acronym, full name, project number, web site (if available), and a contact person for the project.

\(^1\)http://www.google.com/analytics/.
3.2 Survey tool

To carry out the self-assessment of the JVRL (described in Chapter 12), a tool for managing surveys was added to the web portal. The tool is a Joomla! plugin called JQuarks4S², version 1.1.2 (free). Figure 3.2 shows the main page for JQuarks4S administration.

JQuarks4S has an administrator front-end that allows the creation of surveys, which are divided into sections which in turn contain questions. A survey can be made public or available only to all or some registered users. There are several options for creating the questions, including choice selection, text input, multiple answers, mandatory or optional questions.

The administrator is allowed to view the answers to the questions, and the free version of the plugin includes some basic reporting options.

So far, the survey tool has only been used once, for the self-assessment of the JVRL. The experience received highlighted both positive and negative issues in the tool.

On the positive side, the plugin is rather easy to use. Creation of surveys, sections and questions, management of user and temporal authorisation is very intuitive. The reporting facility is also clear and can help create some statistics.

However, the plugin is lacking some major features, such as page splitting, or selective reporting. Moreover, the code is quite bugged, and if an error occurs while creating questions and assigning them to sections, it may be necessary to delete and rebuild the question. Also, the tool includes a means of ordering the questions, but it is a bit scrambled and does not work very well. Last, a problem reported by several users was related to the fact that if a mandatory question is not answered when completing the survey, the error messages that are issued do not help the user in finding the unanswered question.

JQuarks4S is an excellent tool for small surveys with few questions and a wide range of users, but if the number of questions increases the tool shows its limitations. In the future, if more surveys are needed, it is possible that this tool be abandoned in favour of a more efficient one.

3.3 Queries

The Joomla! plugins used in the NESSoS web portal provide basic facilities for retrieving information from the internal database, but in some cases the reports were not exhaustive or selective enough. For this reason, some scripts have been created containing queries responding to specific partners’ needs. These queries are built over the basic structure of the Joomla! database, but currently they are not fully integrated into the web portal because they address individual needs.

The J!Research plugin used for managing publications, for one, is a very rich and useful tool. However, there is not specific field for the partners involved in a publication, and in particular there is no means of reporting the per-partner publications. Instead of undergoing a major revision of the plugin code, a preferred solution was to create a specific query, visible only to the partners responsible for the dissemination work package, displaying the publications for each partner.

Additionally, the report from the self-assessment of the JVRL (described in Chapter 12) was to be made available to several partners, within the limit of the JVRL components they are responsible for. Individual queries that retrieve the per-component results from the database have been provided to the partners, to help them visualise the consortium’s suggestions and improve their component.

In both cases, if a need arises to make said results available to all partners, the queries could be integrated into the registered area of the NESSoS web portal, with visible links for reaching them.

²http://www.jquarks.org/
NESSOS FP7 PROJECT

Submissions open for ESSoS 2012 conference

Call For Papers
International Symposium on Engineering Secure Software and Systems (ESSoS)

February 18 - 17, 2012
Eindhoven, The Netherlands

In cooperation with ACM SIGSAC and SIGSOFT and (pending) IEEE CS (TCSE).

CONTEXT AND MOTIVATION

Trustworthy, secure software is a core ingredient of the modern world. Unfortunately, the Internet is too. Hostile, networked environments, like the Internet, can allow vulnerabilities in software to be explored from anywhere. To address this, high-quality, security building blocks (e.g., cryptographic components) are necessary, but insufficient. Indeed, the construction of secure software is challenging because of the complexity of modern applications, the increasing sophistication of security requirements, the multitude of available software technologies and the progress of attack vectors. Clearly, a strong need exists for engineering techniques that scale well and that demonstrably improve the software’s security properties.

GOAL AND SETUP

The goal of this symposium, which will be the fourth in the series, is to bring together researchers and practitioners to advance the status of the art and practice in secure software engineering. Being one of the few conference-level events dedicated to this topic, it explicitly aims to bridge the software engineering and security engineering communities, and promote cross-fertilization. The symposium will feature two days of technical program, and is also open to proposals for both tutorials and workshops. In addition to academic papers, the symposium encourages submission of high-quality, informative experience papers about successes and failures in security software engineering and the lessons learned. Furthermore, the symposium also

Figure 3.1: The main page of the NESSoS web portal.
4 Common body of knowledge

The Common Body of Knowledge, or CBK for short (http://www.nessos-project.eu/cbk), aims at providing a guide to the different existing bodies of knowledge that comprise NESSoS’s field of interest “engineering secure software and services”. Second, the CBK provides mechanisms to establish a common terminology to which each author can relate his/her own terms to.

A brief overview is given on the Common Body of Knowledge platform as part of the JVRL. A more detailed description can be found in deliverables D5.1 and D5.2. In the following we differentiate between technical and content updates.

4.1 Technical changes

On the technical side, many new updates of the existing 3rd party software components have been made, which included bug fixes and some features, that contribute to the overall CBK experience.

We executed several software version updates on the CBK platform. We migrated the platform from SMW+ 1.5.1 to SMW+ 1.7.0 manually. This resulted in an improved layout, the faceted search works on the basis of Apache Solr, the formerly so-called Ontology browser turns into the Improved Data Explorer. In addition, the new version of the SMW+ can execute automatic platform updates without server restarts or manual migration steps. We also moved from MediaWiki 1.16 to MediaWiki 1.17 and we moved from Semantic MediaWiki 1.5.6 to Semantic MediaWiki 1.7.1.

We improved our backup strategy to ensure business continuity in case of an attack. The reason for establishing business continuity instead of finding and fixing all vulnerabilities of the system, e.g., via penetration testing is that we lack the resource to conduct intensive penetration testing to ensure resilience against all kinds of attacks. Hence, we implemented daily incremental VM-Image backups and we store these for five days. We also conduct a full backup once a month to ensure the availability of the system. Furthermore, we create a daily dump of the CBK database and the SMW+ installation. This data is stored on an external ftp server and versioned using the subversion tool.

The CBK is now fully integrated with the NESSoS LDAP system. It is still possible to log in with the formerly registered user but a second option allows to authenticate against the NESSoS LDAP.

A CBK blog has been established, on which CBK updates are announced, changes are documented and CBK stats such as the KO count are given. The underlying system is the open source blog software WordPress, which has been installed in the newest version (3.4.1) and is linked from the CBK’s main menu. The CBK blog follows a minimalist design paradigm serving the sole purpose of keeping stakeholders and interested people up-to-date on the current CBK’s development activities.

We added an overview of the kind and amount of knowledge objects in the CBK to the main page (see Figure 4.1).

![Browse the CBK!](edit)

- Browse all "tools" (30)
- Browse all "methods" (14)
- Browse all "notations" (10)
- Browse all "techniques" (49)

**Sum of all "knowledge objects" = 104**

Figure 4.1: An overview of knowledge objects in the CBK
4.2 Changes to contents

We conducted the following contextual updates. We added a long and a brief description of the CBK's background and goals on the main page of the CBK. In addition, we added an image on the main page to give a quick overview of the main goals. We also added a detailed description on how to add knowledge objects to the CBK including many screenshots for a better understanding. Furthermore, we added help texts to each attribute of all forms.

We also updated the set of knowledge objects. Many new knowledge objects have been contributed by the partners. In addition, the partners also revised numerous knowledge objects. We added the mature knowledge objects Microsoft's Secure Development Life-cycle (SDL), McGraw’s Touchpoints, and the OWASP Comprehensive, Lightweight Application Security Process (CLASP).

We also updated the ontology with a new KO type for security standards.
5 Mobility portal

The mobility of network fellows within NESSoS is a mechanism that supports the integration of activities across various sites. It brings together researchers working on related topics; it drives knowledge exchange and knowledge generation through union and diversity. It increases the capability of joint cooperation among researchers.

The Mobility Portal is integrated with the NESSoS LDAP system.

The Mobility Portal (http://www.nessos-project.eu/mbp) supports the NESSoS Mobility Programme in different ways. Basically, for non-registered visitors,

- it provides up-to-date information about mobility actions already performed within the Mobility Programme: namely, for each of them, the starting date, the participant, the institutions which are involved, the duration, the source for the funding, and the summary of the action;

- it graphically depicts, inside an annual calendar, the mobility actions already performed;

- it provides up-to-date information about other mobility programmes: namely, for each of them, the institution which runs the programme, the eligible candidates, the main goals of the programme, the duration, the funding that it provides, the deadlines for applications, and the link to the programme’s site.

In addition, for those registrants in the Mobility Portal,

- it provides an on-line application form to submit a request for a mobility grant, by filling the following fields: the destination partner, the estimated duration, the objectives of the mobility action, and the requested grant (for travel and lodging);

- it provides on-line access to their requests for grants, while they have not been yet accepted: in particular, requests can be reviewed, modify, and even withdraw by their own creators;

- it provides an on-line form to report about a mobility actions already performed, including the starting date, the duration, the budget (only travel and lodging), the funding source, and a summary. This report is automatically published, and available for visitors, in the Mobility Portal.

Last but not least, for the coordinators of the Mobility Programme,

- it provides on-line access to the pending requests for mobility grants, from which they can accept or reject the applications;

- it provides on-line access to the Mobility Portal’ activity logs.

Tables 5.1 and 5.2 show statistics about the Mobility Portal’s visitors during the period from September 1st, 2011 to August 31st, 2012. They were automatically generated with Visitors Web Log Analyzer version 0.7. (Note: multiple hits with the same IP, user agent and access day, are considered a single visit).

As expected, the current functionality of the Mobility Portal will be extended based on the needs that may arise from the partners over time.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of unique visitors</td>
<td>3,046</td>
<td>427</td>
</tr>
<tr>
<td>Number of unique visitors from Google</td>
<td>20</td>
<td>34</td>
</tr>
<tr>
<td>Number of unique visitors from NESSoS Web Portal</td>
<td>68</td>
<td>75</td>
</tr>
<tr>
<td>Different pages requested</td>
<td>186,851</td>
<td>34,883</td>
</tr>
</tbody>
</table>

Table 5.1: Mobility Portal: General statistics.
Table 5.2: Mobility Portal: Unique visitors in each month.

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>136</td>
<td>–</td>
</tr>
<tr>
<td>Feb</td>
<td>70</td>
<td>80</td>
</tr>
<tr>
<td>Mar</td>
<td>71</td>
<td>45</td>
</tr>
<tr>
<td>Apr</td>
<td>103</td>
<td>45</td>
</tr>
<tr>
<td>May</td>
<td>130</td>
<td>38</td>
</tr>
<tr>
<td>Jun</td>
<td>166</td>
<td>62</td>
</tr>
<tr>
<td>Jul</td>
<td>238</td>
<td>80</td>
</tr>
<tr>
<td>Aug</td>
<td>200</td>
<td>77</td>
</tr>
<tr>
<td>Sept</td>
<td>–</td>
<td>787</td>
</tr>
<tr>
<td>Oct</td>
<td>–</td>
<td>536</td>
</tr>
<tr>
<td>Nov</td>
<td>–</td>
<td>341</td>
</tr>
<tr>
<td>Dec</td>
<td>–</td>
<td>269</td>
</tr>
</tbody>
</table>
6 Virtual Education Centre

The Virtual Education Centre (VEC) is a tool that establishes a technical infrastructure solution used to spread the knowledge acquired, as well as for education and training purposes. It has been deployed as a standalone service due to the plan to persist beyond the life of NESSoS, but it uses common authentication base of the JVRL platform.

As we described in [11] the VEC is composed of a Learning Management System, which is Moodle in our case, and an e-portfolio, Mahara.

The basic functionality that the VEC offers is the creation of online courses. It also offers the possibility of creating course categories and add new courses to these categories. There many resources available such as adding files, folders, URLs to one course. Also, we can add some activities to the course such as chat, lessons, forums, quiz, surveys, assignments, wikis or workshops. The way these resources or activities can be added is shown in Figure 6.1.

![Figure 6.1: Adding Resources and Activities to a Course.](image)

The VEC platform also allows us to create real time virtual conferences. In these conferences we can share audio, video, slides, chat and even the desktop. The conference moderator (Teacher) can choose who speaks each time. The slides can be uploaded to the server. Every attendant can see the slides and the red pointer of the moderator. Slides can also be marked with notifications. Conference recording is possible using the BigBlueButton platform. The architecture of this new adding to the VEC can be seen in Figure 6.2.

One of the interesting add-ons that can be incorporated to the VEC platform is the Mahara e-portfolio. This way we can export some of the VEC resources such as forums or posts to our Mahara e-portfolio.
Figure 6.2: BibBlueButton Architecture.
7 SDLC tools workbench

The development of secure software and systems implies dealing with multiple programming languages, platforms and tools. The tasks carried out during the development process are ranged from requirements specification to testing comprising modelling, and implementation as well as validation and verification. To enable developers to find, use, and combine security-related tools, a SDLC\(^1\) tools workbench is used, namely the Service Development Environment (SDE) [14].

The SDE provides an overview of available tools and their area of application and allows developers to use these tools in a homogeneous way, re-arranging tool functionality as required, and last but not least enables users to stay on a chosen level of abstraction, hiding details of underlying tools and formal details as much as possible.

In this chapter, we give an overview on the core of the SDE platform, the tools integrated so far in the SDE and present the connections between the SDE and the CBK (for detailed information about the CBK see Chapter 4 and D5.2).

7.1 SDE – Service Development Environment

The SDE is based on the Eclipse platform [5] and its underlying, service-oriented OSGi [13] framework. OSGi is based on so-called bundles, which are components grouping a set of Java classes and metadata providing among other things name, description and version. An OSGi bundle may provide arbitrary services to the platform and therefore all tools are integrated as bundles which offer certain functions for invocation by the SDE platform.

![Figure 7.1: Architecture of the SDE (adapted from [8]).](image)

Figure 7.1 shows that the User Interface (UI) provided by SDE within Eclipse environment offers a graphical access not only to the SDE workbench functionalities, but also to all tools. Tools can be seamlessly integrated in the SDE by writing a wrapper, which defines how functions of each tool can be used.

Furthermore, the SDE provides the ability to compose new tools out of existing ones, a process known as orchestration in the world of services. Creating a new service as orchestrations of other existing services is possible using either a textual, JavaScript-based approach, or a graphical work-flow approach. With the latter the user can build tool chains by connecting boxes that represent the integrated tools. Figure 7.2 illustrates these features of the SDE tool workbench:

- the tool browser lists available tools by category;
- the function browser lists the functionalities of a tool;
- the blackboard stores data in-between tool function calls;
- the graphical orchestration defines tool chains and the data flow between tools;

\(^{1}\)Software Development Life Cycle
the shell allows for direct access to tool functions.

The SDE is available for downloading at [14]. The website also contains a tutorial for tool integration and videos demonstrating the SDE in action.

Each NESSoS partner is responsible for the integration of their own tools into the SDE and for investigating reasonable ways of orchestration using several tools. During the second year of the project, further tools were integrated into the SDE, such as Absint, PPRS, Shell-Tool and X-CREATE. They complement the set of tools already integrated during the first year, such as Avantssar-atse (CL-ATSE), CORAS Tool, UML4PF and VeriFast among others.

Due to the fact that the SDE is a generic framework, it is able to cope with all kinds of tools. Nevertheless, if required, SDE will be further developed addressing security specific requirements. More information about the SDE and the integrated tools can be found in D2.3.

7.2 Connections between CBK and SDE

For the NESSoS project, the team play of the CBK and the SDE (Figure 7.3) is an advantage, because the CBK contains information about all the tools—not only those that are already integrated in the SDE. In the SDE, the information about tools and their functions can be reused for the integration of a tool. Furthermore, the CBK allows to compare several of them in order to find those that might be used in a tool chain. Naturally, not all tools fit together immediately and it might be necessary to write some converters for the input/output of the tools in order to be able to connect them. In order to ease this task, possible applications for each tool are described in the CBK’s example section. Consequently, the researchers can become acquainted with a new tool by straightforwardly working with it and some example data using the SDE workbench.

A typical work-flow is outlined in the following (researchers should have Eclipse & SDE installed):

- Tool owners describe their tools in the CBK and integrate some of them in the SDE.
Based on the tools’ descriptions in the CBK and once a researcher has installed a SDE platform (using the update site link from within the CBK) he is able to try out an example that is described in detail in the CBK.

Using the contact data of the CBK tool page, the researcher can contact the tool owner, in order to discuss if the output of that tool can be connected with his tool.

If they realise that they need a converter between the output of the first and the input of the second tool, a new software that performs the conversion can be written and included in the SDE as tool.

Finally, the three resulting tools are orchestrated and executed in a tool chain.

Afterwards, this tool chain will be described in the CBK and everyone can use the tool chain being only aware of the input to be provided and the final results it provides (there is no need to become familiar with the details of the orchestrated tools).

These collaborations are thought to foster fruitful research ideas to come up in such a way that researchers are encouraged to further develop their methodologies and tools.
8 NESSoS Cloud Execution Environment (CEE)

Cloud systems are becoming very common in the last years because they allow users to exploit the resources or services they need for their computation exactly when they need them and for the time they need them. The user is then relieved from the burden of managing those resources (e.g., configuring and managing the physical machines that provide services to the users), because this is a task of the Cloud service provider, so he can focus on his specific business.

A Cloud Execution Environment is provided as a part of the JVRL to ease the cooperation among the NESSoS users, because they can exploit this environment to easily share their tools and software.

In the following, we give a brief description of the main features of the Cloud, of a very common Open Source software to deploy Cloud IaaS services (OpenNebula), and of the Cloud Execution Environment that has been deployed in the Pisa data centre of CNR.

8.1 Introduction to Cloud

A definition of Cloud systems has been given in [9]. The most notable advantages of Cloud systems is the big computational power available on demand, and the possibility to get further resources or to release unused ones while the computation is running. As a matter of fact, the Cloud environment allows the user to exploit the resources he needs for his computation only when he actually needs them. Distinct Cloud service models are available, depending on the kind of resources or services provided to users. Here, we focus on the Infrastructure as a Service (IaaS) model, the one supported by the NESSoS CEE, where the resources that are provided to users are virtual machines connected by a virtual network. When requesting virtual machines, users can choose the features of these machines, such as the computational power and the storage capacity, the most proper network configuration and operating system and can run on these virtual machines the applications they need. Once requested, the machines are available in few time and the number and/or the features of these machines can be updated by the users (increased or decreased) on demand during the computation according to their needs.

Cloud computing facilities are currently provided by several big companies (Public Clouds); among them Amazon [3, 4], Google [6], IBM [1], Microsoft [2] and others. As an example, users exploiting Amazon Elastic Compute Clouds (EC2) [3], request to the Cloud provider a number of virtual machines with some features, such as the operating system (e.g., see Amazon Machine Image, AMI [3]) and the network configuration (e.g., see Amazon Virtual Private Clouds, VPC).

Instead of using a Public Cloud, users can create their own Cloud systems by deploying a Cloud framework in their data centre, such as Eucalyptus, OpenNebula, OpenStack and others, thus exploiting their physical machines to host virtual ones (Private Clouds).

8.2 OpenNebula

OpenNebula.org [12] is a project that aims at defining a reference and open source tool for the management of IaaS Cloud Computing platforms [7, 10]. OpenNebula is the result of many years of research and development in the field of efficient and scalable management of virtual machines deployed on a large scale infrastructure, and partnerships with the community of users and with the major players in the field of Cloud Computing. Many of its innovative features have been developed to solve the problems arising from the use cases of companies and industries proposed in the context of international projects.

Currently, OpenNebula is an industry standard for IaaS Cloud Computing, offering a complete solution for managing virtualised data centres to create both private, public and hybrid Clouds. The interoperability of OpenNebula allows to create cloud services using existing resources in the data centre. OpenNebula code can be freely downloaded from its website, which offers a good documentation, covering both the installation and the use, consisting of web pages, manuals, white papers, wikis, and forums. In addition, there is also a commercial version of the software, called OpenNebulaPro, provided by C12G Labs3 that has a support of commercial type.

OpenNebula supports the most common virtualisation tools to manage virtual machines such as Xen, KVM and VMware. In this way, in addition to avoiding vendor lock-in, it is very easy to integrate OpenNeb-
OpenNebula in existing data centres. For the interaction with the user, or to enable the user to create and manage your virtual machines, OpenNebula is very flexible in that it provides not only a proprietary graphical interface, the GUI called Sunstone, but also compatible interface with the services of Amazon EC2 and OCCI interface. In addition, OpenNebula provides powerful integration APIs that facilitate the development of new components, such as new drivers to support virtualisation hypervisor. To simplify the creation of virtual machines, OpenNebula provides a repository for images, which allows you to create and share virtual machine images (which may be operating systems or data), and a repository for templates, which allows you to record definitions machines virtual, which can be later used to create new virtual machines. Once a template has been instantiated in a virtual machine, a number of operations can be done to control the life cycle, how to stop, suspend, reactivate, or migrate from a data centre to another. A network system easily adaptable and customisable in OpenNebula is well integrated with the specific requirements of the network of existing data centres. It also provided support for VLAN and Open vSwitch. From the security point of view, OpenNebula supports user and group accounts, as well as different mechanisms of authentication and authorisation. In addition, OpenNebula provides access control list, which supports the management of roles and fine-grained permissions. Finally, OpenNebula, beside the command line interface, also offers a graphical interface, SunStone, that allows administrators and users to easily manage their virtual and physical resources. A simplified version for users of that GUI, called SelfService, is also available.

8.3 NESSoS CEE

The NESSoS CEE is an OpenNebula-based Cloud IaaS system deployed in the Pisa data centre of CNR, that is shared with the NESSoS user as a JVRL component. As a matter of fact, the CEE provides to NESSoS’s users the execution environment where their tools and software can be deployed and executed. The Cloud paradigm eases the task of tool and software sharing. As a matter of fact, each partner can act as a software provider, by preparing a Virtual Machine image properly configured for running his software, or can act as software user, and in this case he can run instances of the images prepared by the provider partners to exploit the software he need avoiding any installation and configuration effort.

The CEE runs over a cluster is composed by five machines. One master node and four slave nodes. The master node is based on two Intel Xeon CPU E5630 processors, each one is a quad-core CPU running at 2.53GHz. The master node has 64 GBytes of DDR3 RAM. The slaves have a different hardware configuration: each slave is based on a single Intel Xeon CPU E31230 quad-core processor running at 3.20 Ghz. Each slave node hosts 16 GBytes of DDR3 RAM.

All the nodes run as operating system Linux Ubuntu 12.04 server, 64-bit. For performing virtualisation the machines exploit Kernel-based Virtual Machine (KVM), a virtualisation infrastructure for the Linux kernel. KVM can be used only on processors with hardware virtualisation extensions, like the ones installed in the cluster machines.

The OpenNebula version currently deployed on the CEE is v3.4.

The authentication system of OpenNebula has been configured to exploit the NESSoS LDAP service, thus allowing NESSoS’s users to exploit the Cloud services provided by Conero exploiting the usual NESSoS login and password.

NESSoS’s user can easily access and use the CEE for their computation through the OpenNebula graphical interface called SelfService.
9 Mailing lists

As illustrated in Deliverable 1.2, specific mailing lists support e-mail communication. The Project Management Team maintains such mailing lists. Here, for the sake of completeness, we remind the reader the description and functionalities of all the mailing lists, and we give some statistic data about the traffic and the number of subscribers of the main mailing lists, covering the period September 1, 2011 – August 31, 2012.

Purely project related mailing lists are denoted with the suffix @iit.cnr.it. The NESSoS community at large has its own mailing lists with the suffix nessos-project.eu. The same suffix is for the list devoted to communication with the webmaster (webmaster@nessos-project.eu) as well as for the list for asking generic information (info@nessos-project.eu).

Table 9.1 presents the lists.

Lists with suffix @iit.cnr.it are closed. Only CNR people can add registrants, and then only members that are subscribed to a list can send/receive e-mails. To prevent an avalanche of unsolicited messages, senders shall carefully target their messages to the narrowest audience, as reasonably possible. For changes, deletions, or additions of mailing lists, the interested reader should contact the PMT.

The mailing list nessos@iit.cnr.it has 6 subtopics: WP6, WP7, WP8, WP9, WP10, WP11. Senders may subscribe to a subtopic as follows:

- going to the http://www.nessos-project.eu/mls Login Web Page. A user without a listserv password may just ask for a new password following the appropriate link;
- in the subscriber corner, the mailing lists may be chosen (generally users will be already subscribed to many for NESSoS) in the settings page, by ticking the checkboxes for the appropriate topics. The Other tick means all the other WPs;
- when sending an email to the whole list, a user should just send it to nessos@iit.cnr.it;
- when sending an email to a specific Work Package (i.e., to a specific subtopic), users should send it to nessos@iit.cnr.it and put in the subject WPx: (where $x = 6 \ldots 11$) and the usual subject.

In addition, community@nessos-project.eu is the mailing list for the open research community. Registration to the list is open, and it is available from the project public web site (http://www.nessos-project.eu/).

Finally, webmaster@nessos-project.eu is the mailing list to ask for modifications to the project public web site (apart from publications, news, and events that can be inserted by the users themselves).

During the period under investigation, 119 emails have been sent over the main working mailing list nessos@iit.cnr.it. At August 30, 2012, the subscribers to this list were 88. During the same period, 12 emails have been sent over the Community list community@nessos-project.eu. At August 30, 2012, the subscribers to Community were 268.

### Table 9.1: NESSoS Mailing Lists

<table>
<thead>
<tr>
<th>Mailing List</th>
<th>Description</th>
<th>Addressees</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="mailto:nessos@iit.cnr.it">nessos@iit.cnr.it</a></td>
<td>The main working mailing list for WP leaders and their proxy for the General Assembly.</td>
<td>All project members, All WP leaders and their proxy, All GA members, Persons in charge of management and financial aspects, All associated partners, All the Industry Advisory board members, All the project management team members</td>
</tr>
<tr>
<td><a href="mailto:nessos-wpl@iit.cnr.it">nessos-wpl@iit.cnr.it</a></td>
<td>For WP leaders and their proxy for the General Assembly.</td>
<td>All project members, All WP leaders and their proxy, All GA members, Persons in charge of management and financial aspects, All associated partners, All the Industry Advisory board members, All the project management team members</td>
</tr>
<tr>
<td><a href="mailto:nessos-ga@iit.cnr.it">nessos-ga@iit.cnr.it</a></td>
<td>For administration and financial issues.</td>
<td>All project members, All WP leaders and their proxy, All GA members, Persons in charge of management and financial aspects, All associated partners, All the Industry Advisory board members, All the project management team members</td>
</tr>
<tr>
<td><a href="mailto:nessos-afm@iit.cnr.it">nessos-afm@iit.cnr.it</a></td>
<td>For the NESSoS associated partners.</td>
<td>All project members, All WP leaders and their proxy, All GA members, Persons in charge of management and financial aspects, All associated partners, All the Industry Advisory board members, All the project management team members</td>
</tr>
<tr>
<td><a href="mailto:nessos-associated@iit.cnr.it">nessos-associated@iit.cnr.it</a></td>
<td>For the NESSoS Industry Advisory board.</td>
<td>All project members, All WP leaders and their proxy, All GA members, Persons in charge of management and financial aspects, All associated partners, All the Industry Advisory board members, All the project management team members</td>
</tr>
<tr>
<td><a href="mailto:nessos-pmt@iit.cnr.it">nessos-pmt@iit.cnr.it</a></td>
<td>For the project management team at CNR.</td>
<td>All project members, All WP leaders and their proxy, All GA members, Persons in charge of management and financial aspects, All associated partners, All the Industry Advisory board members, All the project management team members</td>
</tr>
<tr>
<td><a href="mailto:community@nessos-project.eu">community@nessos-project.eu</a></td>
<td>General list for events of interest.</td>
<td>All the subscribers, All project Members</td>
</tr>
<tr>
<td><a href="mailto:webmaster@nessos-project.eu">webmaster@nessos-project.eu</a></td>
<td>For communication with the webmaster.</td>
<td>All the subscribers, All project Members</td>
</tr>
<tr>
<td><a href="mailto:info@nessos-project.eu">info@nessos-project.eu</a></td>
<td>For requesting generic information.</td>
<td>All the subscribers, All project Members</td>
</tr>
</tbody>
</table>
10 Subversion repository

The Subversion repository (SVN) manages the shared documentation and the project resources which require cooperative work. The SVN consists of a folders tree and a list of commands.

The tree root contains all the project files and folders and is accessible from http://www.nessos-project.eu/svn. In particular, the root folder contains general project files, e.g., the description of work\(^1\) and a sub-folder for each work package (WP). The WP folders are meant to contain the files and folders used by the WP contributors for the cooperating activities, e.g., WP deliverables.

The Subversion repository is likely the most used among the JVRL components. Tools, papers and deliverables are constantly written or developed using the cooperation and versioning facilities of Subversion. As of 2012, August 2\(^{nd}\), the repository is at version 1713, with commits being thus split among the partners:

- **CNR** 123
- **ATOS** 55
- **ETH** 122
- **IMDEA** 64
- **INRIA** 147
- **KUL** 61
- **LMU** 394
- **Siemens** 182
- **SINTEF** 231
- **UDE** 201
- **UMA** 99
- **UNITN** 44

\(^1\)http://www.nessos-project.eu/svn/DoW.pdf
The adoption of LDAP in NESSoS came as an anticipation of a single sign-on (SSO) facility. This is because most of the main cooperation tools are bundled with a binding for LDAP, which generally is used for authentication. This is true for Joomla which supports the NESSoS web portal (Chapter 3); it is true for MediaWiki, the technology underlying the CBK (Chapter 4); for Subversion (Chapter 10); and for Moodle, on which the Virtual Education Centre is based (Chapter 6). By enabling LDAP support, these softwares can connect to LDAP for authentication, instead of using their own databases. Users stored in an LDAP directory have a “password” attribute, hidden and encrypted, which serves the purpose. Currently, the only component of the JVRL which is LDAP-enabled is the web portal. The web portal used native Joomla authentication only in its early stages of development, after which LDAP authentication has totally replaced the previous one.

Some of the JVRL components have already been configured to support LDAP authentication. The Virtual Education Centre supports LDAP as its primary authentication method since its initial release, and the structure of the LDAP directory has been tweaked to comply with the requirements of that component. Also, the CBK, after an initial deployment with an autonomous authentication system and individual credentials for each partner, has now switched to full LDAP support and can be accessed with the same credentials used for the web portal.

The structure of the LDAP directory in itself is quite simple. Figure 11.1 is an excerpt of an administrative UI used for managing the NESSoS LDAP. The root DN is dc=nessos-project,dc=eu, and the bulk of the content are the members’ data, contained in uid=username,ou=members,dc=nessos-project,dc=eu. Additionally, the moodle organisational unit has been created, with two POSIX groups, cn=creators and cn=students, used by the VEC to identify different roles for users. An organisational unit called guests has also been created for future use by the CBK, but its functionality has not been used as of yet.

The bulk of the current structure for the LDAP directory is final. Based on the partners’ needs, additional groups or attributes may be added in the future.
12 JVRL self-assessment

Since the beginning of the project, the various components of the JVRL have been thoroughly used by the partners. Their individual experiences with the various components are of utter importance in improving the JVRL as a whole. For this reason, a self-assessment survey was planned to collect feedback from all users about all components of the JVRL. The results were then passed on to each individual component's developers or maintainers.

As mentioned in Chapter 3, the survey was carried out within the web portal, using a Joomla! plugin called JQuarks4S. The survey consisted in 77 questions, divided into 11 sections. 9 sections were for the individual JVRL components:

- web portal
- common body of knowledge
- mobility portal
- Virtual Education Centre
- SDLC tools workbench
- BSCW
- mailing lists
- Subversion repository
- LDAP directory

These sections consisted of 8 questions each, regarding usefulness, efficiency of maintenance, strength and weaknesses, suggestion for improvements, and so on. Additionally, 3 questions made up an overall assessment of the JVRL, and a last section had 2 questions for the name of the person filling the survey and for additional components needed in the JVRL.

The survey was open for about one month, fillable by all registered users of the NESSoS web portal. Although not all users answered the call, the results were very interesting and show a wide set of suggestions for improvements. First and foremost, it is quite clear that most members of the network are frequently using many of the JVRL components. Exceptions are the Virtual Education Centre, probably because it has been under development for the entire first year of the project and has reached a usable state only in more recent times, and the LDAP directory, which anyway is not meant to be visible to users but only to component developers.

In general, there is a good appreciation of the components, with some discordant opinions which however contain useful suggestions for improvements. The results of the self-assessment have been made selectively available to the partners responsible for the various components.

Additionally, some general suggestions for new components have been expressed, and could be addressed in the future is the need becomes consistent. The main requests are an audio/video conference tool to integrated in the JVRL instead of a separate software (but this was before the VEC was released, which supported such a tool) and a wiki to extend or replace the BSCW.
13 Integration

Although consisting of a set of tools which can be very useful per se, there is more to the JVRL than just individual tools. The main point of the JVRL is to collect these tools within a unique, integrated infrastructure whose components can communicate and interact among themselves. This is the main focus of WP1, and the final target of the Work Package over the course of the NESSoS project.

The collaborative development of the JVRL results in an allocation of components which is summarised in Table 13.1.

<table>
<thead>
<tr>
<th>JVRL component</th>
<th>Providing partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web portal</td>
<td>CNR</td>
</tr>
<tr>
<td>Common Body of Knowledge</td>
<td>UDE</td>
</tr>
<tr>
<td>Mobility portal</td>
<td>IMDEA</td>
</tr>
<tr>
<td>Virtual Education Centre</td>
<td>UMA</td>
</tr>
<tr>
<td>SDLC tools workbench (SDE)</td>
<td>LMU</td>
</tr>
<tr>
<td>BSCW</td>
<td>UNITN</td>
</tr>
<tr>
<td>Cloud Computing Environment (CEE)</td>
<td>CNR</td>
</tr>
<tr>
<td>Mailing lists</td>
<td>CNR</td>
</tr>
<tr>
<td>Subversion repository</td>
<td>CNR</td>
</tr>
<tr>
<td>LDAP directory</td>
<td>CNR</td>
</tr>
</tbody>
</table>

Table 13.1: JVRL components by partner.

13.1 Current status

Integration-wise, there have been several steps forward with respect to the previous year. Although made up of different tools, with different purposes, and maintained by different people, the JVRL is supposed to give its user a feeling of something bigger than the individual component.

Progress has been made toward a single sign-on procedure. As already mentioned in Chapter 11, the LDAP directory is being used as a database for login credentials. Several of the components of the JVRL have been designed or extended to support authentication via the LDAP directory:

- the web portal (Chapter 3) was designed with LDAP support as its only means of authentication from the beginning, except in its early stages of development;
- the Virtual Education Centre (Chapter 6) underwent a long development and internal testing phase during which it had its own individual authentication; however, the deployed service supported LDAP authentication from the beginning. The LDAP structure was modified to accommodate the needs of the VEC’s developers;
- the Common Body of Knowledge (Chapter 4) was developed using its own authentication method. For the first year of deployment, the CBK used an autonomous authentication procedure. However, it has recently been extended to support LDAP authentication, and now it is possible to use the CBK with both authentication methods;
- the mobility portal (Chapter 5) has recently completed its stage of integration to support the LDAP authentication.

Not all services are hooked to LDAP yet, but for some of them this is not supposed to be done. Most notably:

- the BSCW is not going to be integrated with LDAP, because that service also has a number of users not related to NESSoS, and for this reason it was chosen to have a separate authentication method;
• additionally, the mailing lists do not have any form of authentication; although it would theoretically be possible to have the mailing lists retrieve the e-mail addresses from the LDAP directory and use Sendmail1 to assign mailing list users based on LDAP attributes, this approach, albeit interesting from a technological point of view, is probably excessive and too complicated for a simple purpose like managing a few mailing lists with a limited number of users.

The SDE is also strictly connected to the CBK. The tools provided by the partners are described in detail in the CBK, with examples, guides, requirements and so on. The tools implemented in the SDE are a part of those described in the CBK, and the objective is to have all of them implemented by the end of the project. More details are given in the deliverables for WP2 and WP5.

13.2 Ongoing progress

The NESSoS project is mostly about integration. Representing a community of researchers combining different fields of expertise to improve research in the secure systems engineering field, integration is the key focus in the whole project, and will be a process lasting for the full duration of the project. Being the technical infrastructure of the network, the JVRL makes no exception to this rule.

The previous section highlighted the main aspects of the JVRL integration, but of course there is much to be done yet. The integration process between the various web sites making up the JVRL. Some of the components yet have to be bound to the LDAP directory for the single sign-on authentication. Namely:

• some testing to integrate the Subversion repository (Chapter 10) and the Cloud Computing Environment (Chapter 8) with the LDAP directory is going on. However, since the repository contains very relevant documents and is frequently accessed by all partners, this process is being carried on cautiously, whereas no such problems exist for the CEE for which integration work is currently in progress;

• although the project currently lacks a wiki (which has been requested by some partners, as mentioned in Chapter 12), common tools for wiki management such as MediaWiki2 or Dokuwiki3, that might be used for this purpose in case the consortium decides to set one up, all plainly support LDAP authentication, and that would be used from the initial deployment of the tool.

As for the SDE, all the tools described in the CBK are undergoing the process of integration into the platform. Additional details on the status of the SDE integration, and the tools which are still in the process of integration, is available in the deliverables for WP2.

1http://www.sendmail.com/sm/open_source/
2http://www.mediawiki.org/wiki/MediaWiki
3https://www.dokuwiki.org/dokuwiki
14 Conclusions

The JVRL represents the technological core of the NESSoS project. The partners do and will continue to rely on the JVRL components for advancing the project, and several of them also have a usefulness outside of the project itself. A key to an efficient progress of the NESSoS project is having an efficient technological infrastructure, with reliable and updated tool that comply with the partners' evolving needs. Most partners have contributed to the JVRL by providing something of their own, and work on the provided components is steady and reactive. Some partners have provided a licensed technology (such as BSCW), a previously-developed tool which is being maintained (as the SDE), or the effort needed to develop a service (Subversion, CBK and others). The second year of the project has also seen an increased effort in cooperation between partners providing different services and tools, to achieve a good degree of integration between them.

To summarise the current results, whereas the first year of the project had seen the creation or collection of the individual pieces of the puzzle, during the second year those pieces have been partly connected, forming some batches. The puzzle is not complete yet, but the big picture can be discerned, and the final structure of the JVRL is closer to completion. The partners keep cooperating to achieve these results, both within and outside the scope of their individual Work Packages.

Future work on the JVRL will be focused on putting into place those components whose need had not been foreseen at the beginning of the project and has emerged during the first two years, merging them into the already-existing infrastructure. Also, coordinated efforts on integration will continue towards the goal of a large-scale, wide-scope technological infrastructure which will provide the basis for researchers in secure Future Internet services engineering.
Bibliography


