Network of Excellence

Deliverable D1.2

NESSoS Joint Virtual Research Lab
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<td><strong>Author(s)</strong></td>
<td>Cesare Bartolini (CNR), Antonia Bertolino (CNR), Gabriele Costa (CNR), Marinella Petrocchi (CNR), Manuel Clavel (IMDEA), Marianne Busch (LMU), Nora Koch (LMU), Holger Schmidt (UDE), Widura Schwittek (UDE), Gerardo Navarrete (UMA), Sebastiano Perisi (UNITN)</td>
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<td><strong>Reviewer(s)</strong></td>
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Abstract

The Joint Virtual Research Lab (JVRL) is the technical infrastructure under development for the NES-SoS 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
DoW   Description of Work
IDE   Integrated Development Environment
JVRL  Joint Virtual Research Lab
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
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.

First off, the NoE needs some facilities to share important communications, advertise events, and provide visibility to related publications. Second, interaction and fast communication is needed to organize meetings, prepare deliverables and such. Third, research-wise there is a need of teamwork in software development, documentations and the like. And members of the NoE will need an efficient approach in managing all these requirements, so that the availability of collaboration tools does not become an impairment instead of a benefit.

To better achieve these goals, the envisioned solution was to create a shared, distributed platform integrating all needed tools in a cooperative environment. This way, partners in the NoE can benefit from an infrastructure of technical instruments to facilitate communication, meeting organization, software development, documentation exchange, and so on.

The Joint Virtual Research Lab (JVRL) is such an infrastructure. More than a simple collection of tools and softwares, the JVRL aims at being the shared technical platform underlying all of NESSoS’s collaborative work.

The JVRL is composed of a set of separate tools. These are provided by the partners, and based on the needs of the NoE and of the partners themselves. Every partner is entitled to provide or develop some tools, depending upon their specific expertise and the long-term requirements of the project. This is a first, and very basic, degree of collaboration, which has begun at the start of the project, when every partner outlined which kind of tools they believed would be useful, and what they could provide. After this stage, the tools, web sites, shared documentations, and so on have been made available.

But 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: after the tools have been 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, can use all the facilities made available to his or her privilege level.

The JVRL mainly has two separate access levels: an external and an internal one. The external level is made up primarily of web sites, and provides all public information to outsiders. Informations 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. On the other hand, internal visibility grants access to all resources, such as development code, deliverables work in progress, publishing facilities, inter-partner communication and the like. 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 of these are designed to provide external visibility (through an associated web site), while others are limited to be used only among the partners.

The core of the external visibility is the main web portal, located at the address http://www.nessos-project.eu/. The portal, described in chapter 3, contains information on the project, the Description of Work (DoW), the partners, and so on. It also contains references to other services or components of the JVRL.

The domain is relevant. Apart from being the URL of the NESSoS web portal, it is also structured so as to refer other components. So far, the redirections which have been created are:

- http://www.nessos-project.eu/mbp links to the Mobility Portal (chapter 5);
- http://www.nessos-project.eu/cbk links to the Common Body of Knowledge (CBK, chapter 4);
- http://www.nessos-project.eu/sde references the web page of the Service Development Environment (chapter 7);
- http://www.nessos-project.eu/vec links to the Virtual Education Center (chapter 6);
- http://www.nessos-project.eu/bscw is a connection to the BSCW collaborative environment. HTTP authentication is required to access;
- http://www.nessos-project.eu/svn accesses the (read-only) web interface of the Subversion repository (chapter 10). HTTP authentication is required to access;
- http://www.nessos-project.eu/mls points to the mailing list preferences page, where a user can select the mailing lists to subscribe to.

In the future, the other components which provide a web access will also be bound to the domain. However, this is only a redirect, 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.

Other web sites related to the NESSoS project are the CBK (chapter 4), which is a shared knowledgebase for all the tools, technologies and methodologies created under the NESSoS flag; the mobility portal (chapter 5), which provides information about NESSoS’s mobility program, for a tighter collaboration among the partners involved; and the Virtual Education Center (chapter 6), a frontend for the tool for interactive learning which is currently being developed. The three web sites mentioned herein have a full deliverable dedicated to each. D5.1 covers the CBK. The mobility portal is part of the mobility program, described in detail in D3.2. The Virtual Education Centre is part of WP13, whose report will be published in D13.1.

The SDLC tools workbench SDE (chapter 7) is much like 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. At some point during the lifetime 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 deliverable D2.2.

A web-based tool is also the BSCW (chapter 8), but it is visible only to NESSoS partners. Although it has several functionalities, including a personal and customizable web portal, within NESSoS it is used only for storage of shared documents. Meeting informations, slides of talks, instructions for using the various JVRL tools are all stored within the BSCW.

Mailing lists (chapter 9) 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.

With a purpose similar to that of BSCW, the Subversion repository (chapter 10) is used to store temporary versions of work-in-progress content. So far, it is used only to store the project deliverables, however it may be used also 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.
Finally, the LDAP directory (chapter 11) represents a potential infrastructure for the integration of all the above tools. Since most of them can be bound to the LDAP directory, it 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.

Table 12.1 summarizes 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).

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Table 2.1: JVRL components overview.

![Figure 2.1: Schematic view of the JVRL.](image-url)
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 structure of the web portal reflects that of the project. The portal is divided into several sections (shown on the left or top menu), and three of these sections (namely Integration, Research and Spreading of excellence) are further split into smaller categories, each representing a single Work Package. Within each of these categories, visitors may find the description of the Work Package (from the DoW), in addition to any content which will be provided by members of that WP, especially other components of the JVRL. For example, the contents of WP3 and WP5 contain links to the Mobility Portal (described in chapter 5) and the Common Body of Knowledge (chapter 4), respectively.

The portal also contains two important sections that are Publications and Events, respectively. The former (of which an excerpt is shown in Figure 3.2) is an area of the web site where users can publish all of their scientific papers related to the project. The publication list is for dissemination purposes, and is not divided into Work Packages. Users can upload their publications via a web form, or, more efficiently, using the provided BibTeX importer: a text area where the author can paste a citation to his or her publication in BibTeX format, and this will be automatically processed and entered into the database. The publications list also has a handy bibTeX exporter (regardless of whether the publication was added manually or from BibTeX), which can be used for creating a NESSoS-related bibliography. The publications list is a very active part of the NESSoS web portal, and most users have uploaded several of their recent publications to the database.

The events section contains events related to the project. These can be project meetings, conferences with research topics of interest to the NoE, or schools organized under the NESSoS flag. Any registered user of the website can post an event in this section.

The whole content of the site is public. The reserved area is only for posting content, which will be visible to visitors as well. Accounts have been created for each partner, at least one per partner. Reserved users can add content to the sections on publications, events, or any Work Package they belong to. The WPs a user belongs to are specified in the user’s account, which is in an LDAP directory, as explained in chapter 11, through the use of LDAP’s businessCategory attribute. One or more entries of the attribute allow a user to post an article, news, link etc. to the section and category specified by the attribute.

From a technical point of view, the web portal is built using the following hardware and software:

- Joomla! CMS, version 1.5.21 Stable;
- Apache 2.2.11 web server;
- a MySQL 5.0.75 database;
- a server running Ubuntu Linux 10.5.

The Joomla! CMS has been integrated with several extensions, to provide additional functionalities to the web portal. The main extensions which have been applied are:

- J!Research, an extension for publication management;
- JEvents, to publish and view events;
- extensions for LDAP integration, including the retrieval of user information other than basic authentication credentials (e.g., the Work Packages a user can post his or her content to).
Usage statistics are being monitored on the web portal, though they are not publicly reported as of yet. The engine used for collecting data is Google Analytics, which is a very consolidated tool capable of collecting a lot of interesting information. Apart from the raw number of visitors, the data collected contain details about the number of pages visited, the time spent on the web site, the geographical location, language, and server of the visitors, the technology used (browser, operating system...); and, most interestingly, the traffic source, which shows that over 50% of the traffic comes from search engines.

Figure 3.3 shows an example of the analytics report. Detailed statistics are not in the scope of this deliverable and will be reported in the dissemination deliverable (whose authors have full access to the analytics profile). So far, the reports are available only to administrators. Some means of publishing the reports are currently being investigated and could be shown on the web sites in the future.

Currently, only the web portal is being monitored, although the other web sites related to the NESSoS project will be monitored in the future.

The web portal is a work in progress based on the needs which arise from the partners over time. Beyond the basic functionality described above, current work on the web portal includes an investigation to associate the web portal to some social network such as Twitter, to allow easy and fast notification of relevant news to interested visitors.
NESSOS FP7 PROJECT

Submissions open for ESSoS 2012 conference

Call For Papers

International Symposium on Engineering Secure Software and Systems (ESSoS)

February 15 - 17, 2012
Eindhoven, The Netherlands

In cooperation with ACM SIGSAC and SIGSOFT and (sponsoring) 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 exploited 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 growing 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 state 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 ESSoS web portal.
Figure 3.2: Screenshot of the list of publications.
Figure 3.3: Sample page of the statistics for the web portal.
4 Common body of knowledge

The aim of NESSoS is to establish a new research community through integrating existing ones such as the communities around software engineering, service engineering, security engineering and formal methods. Bringing together different disciplines harbors a number of problems, such as bringing together differing perspectives, processes, methods, tools, vocabularies, and standards. Moreover, these problems have to be considered with respect to multiple dimensions such as research and practice, which further complicates the situation.

The Common Body of Knowledge CBK tries to address especially these challenges. First, the CBK aims at providing a guide to the different existing bodies of knowledges that that comprise the 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. How this is realized in detail is described in deliverable D5.1. In the following, the CBK’s relationship to the JVRL is described.

Similar to the CBK, the JVRL aims at the integration of the software engineering, services engineering, and security engineering communities. The JVRL provides a unified user interface through a portal-like website to all tools that support coordination, collaboration, and communication of NESSoS partners. On the one hand, the CBK, currently residing on a dedicated server at the University of Duisburg-Essen and accessible through the URL http://www.nessos-project.eu/cbk, is linked from the main NESSoS website within the section “Integration”, and then the sub-section “Knowledge Portal”. On the other hand, the CBK provides links back to the NESSoS website. The design of the CBK is based on the main site’s design, so that users can recognize that the websites are related. Currently, the CBK is hosted by UDE.

Further technical integration of the CBK in the JVRL is planned and already discussed by both CNR and UDE. It comprises the use of a single-sign-on (SSO) infrastructure. This enables the use of the same user credentials for the JVRL and the CBK. That is, SSO improves the JVRL’s and the CBK’s usability, since the users only need to keep one username and password combination in mind.

Technically, the CBK is based on the Semantic MediaWiki running on a Windows 2008 R2 Enterprise system. The Semantic MediaWiki itself is an extension of the MediaWiki platform, which is quite renowned for empowering the popular Wikipedia encyclopedia. The Semantic MediaWiki has been funded in parts by the SEKT [9], ACTIVE [1], and Halo [5] projects of the EU Framework Programmes FP6 and FP7. The Halo core extension in turn is an extension to the Semantic MediaWiki featuring better usability options. The whole conglomerate of the MediaWiki, the SMW extension, and the Halo core extension is called SMW+.

In summary, the CBK is already well integrated with the JVRL infrastructure, and further integration improvements are already planned.
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 (http://www.nessos-project.eu/mbp) supports the NESSoS Mobility Programme in different ways. Basically, for non-registered visitors (see Figures 5.1 and 5.2),

• 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 (see Figure 5.3),

• 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.

Notice that everybody can register into the Mobility Portal by providing his or her name, Institution (which so far need to be part of the consortium), and a registrant's password.

Last but not least, for the coordinators of the Mobility Programme (see Figure 5.4),

- 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.

Although currently hosted by IMDEA Software, the Mobility Portal is accessible from the NESSoS JVRL Web Portal. From a technical point of view, the Mobility Portal is built using the following hardware and software:

- PHP 5;
- XHTML 1.1;
• CSS 2;
• JavaScript;
• Apache 2.2.16 web server;
• a PostgreSQL 8.4.7 database;
• a server running Debian GNU/Linux 6.0.1.

Future work on the Mobility Portal will be focused on integrating the portal within the JVRL, at least from a user point of view: the user should have the same access credentials for all the JVRL web sites, or even a single sign-on solution. This seems to require to enable a binding with the already existing LDAP directory. Finally, as expected, the current functionality of the Mobility Portal will be extended based on the needs that may arise from the partners over time.
Figure 5.4: The coordinator's page of the NESSoS mobility portal.
6 Virtual Education Centre

The Virtual Education Centre (VEC) is devoted to the establishment of a technical infrastructure solution that will be used to spread the knowledge acquired, as well as for education and training purposes. Its role inside the JVRL can be seen as a service for the interaction between producers and consumers of knowledge. It will be deployed as a standalone service due to the plan to persist beyond the life of NESSoS, but it will use the common authentication base that will be used for the JVRL platform.

The Virtual Education Environment can be split into a set of components specialized in different tasks:

- a Learning Management System (LMS), consisting on a software platform for the administration, documentation, tracking, and reporting of training programs, classroom and online events, eLearning programs, and training content;
- content producer software that creates different types of documents in a common and standardized format;
- and optionally:
  - e-portfolio application that allows students to reflect on their learning, communicate with instructors, document credentials, and provide potential employers with examples of their work;
  - digital repository software that will store the information to be shared between the different applications that are part of the VEC. An eLearning repository is a database that contains useful teaching and learning information where users are allowed to query the database in an attempt to locate information that can help explain and clarify a plethora of topics.

A general overview of these components is presented in Figure 6.1, showing different layers of abstraction.

![Figure 6.1: The Virtual Education Centre Architecture.](image)

We have selected Moodle\(^1\) as a LMS solution because it fulfills all the desired characteristics needed for the VEC. Moodle is an open source Course Management System (CMS) that runs on PHP, and can

\(^1\)http://moodle.org/.
support a SQL database. It consists on a box of tools on a single, robust, easy-to-use and customizable platform for teachers and learners in virtually any educational setting. Moodle can be used to conduct courses fully online or, in most cases, to support face-to-face teaching and learning.

On the other hand, we have selected Mahara\(^2\) as an electronic portfolio solution. Mahara is learner-centered — a form of Personal Learning Environment (PLE), with social networking and the capability to form groups and group portfolios. It can be connected to Moodle for improving interoperation in a seamless way.

We are still testing solutions to be used for web conference. This kind of tools will enhance real-time collaboration and will be useful for virtual seminars, meetings, and research discussions.

As “the content” is the main objective in an eLearning environment, it should be independent of the LMS selected in order to enhance reusability and adaptation by employing a standard format. A common standard format for eLearning content is SCORM (Shareable Content Object Reference Model). SCORM defines how to create “shareable content objects” (SCOs) that can be reused in different systems and contexts. There are many freeware and commercial SCORM tools that can be used for adding content to the LMS. Moreover, Moodle fully supports SCORM.

We are still elaborating a list of tools that can be used for storing learning material into the VEC, beyond the basic tools that Moodle offers. Below is a short list of tools we have identified that can be used for providing content to the current version of the Virtual Education Centre.

- podcast producer: a podcast by any other name like video-cast, screen-cast, audio-cast, doc-cast, etc.;
- audio-cast: audacity is a free application for recording live audio, editing Ogg Vorbis, MP3, WAV or AIFF sound files;
- screen-cast: Wink, to be used for tutorial and presentation creation software;
- video-cast: opencast project Matterhorn is a free, open-source platform that supports the management of educational audio and video content.

Finally, the Virtual Education Centre will share the same authentication platform that is planned for the JVRL: LDAP. Moreover, the VEC will implement single sign-on for all the services on it: Moodle, Mahara, web conference, repository, etc..

\(^2\)http://mahara.org/.
7 SDLC tools workbench

Developing service-oriented secure software and systems implies dealing with multiple programming languages, platforms and tools. The tasks carried out during development are ranging from modeling to implementation and from analysis to testing. To enable developers to find, use, and combine security-related tools, a SDLC\(^1\) tools workbench is used, namely the Service Development Environment (SDE) [8]. 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 introduction to the SDE and present the connections between the SDE and the CBK (for detailed information about the CBK see chapter 4 and D5.1).

7.1 SDE – The Service Development Environment

The SDE had been developed within the SENSORIA project [10] – FET project funded by the EU from 2005 to 2010 – and is now maintained and extended by LMU within the NESSoS and the ASCENS [2] projects. It is based on the Eclipse platform [4] and its underlying, service-oriented OSGi [7] 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.

This means the User Interface (UI) that the SDE provides within Eclipse comprises the (graphical) access not only to the SDE workbench, but also to all tools, as depicted in Figure 7.1. Existing Java tools and even native 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 workflow approach. With the latter the user can build tool chains by connecting boxes that represent the integrated tools.

The SDE is available for download at [8]. The website also contains a tutorial for tool integration and videos demonstrating the SDE in action. Tools that were used in the SENSORIA project can be found on this website as well; integration of tools related or developed within the scope of the NESSoS project are under construction and can only be accessed through the CBK tool descriptions (the necessary URL can be found in the section "Eclipse Update Site for SDE" [3]).

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. In the first year of the NESSoS project,

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\(^{1}\)Software Development Life Cycle
Avantssar-atse (CL-ATSE), Avantssar Orchestrator, CORAS Tool, EOS (Eye OCL Software), Jalapa, MagicUWE, UML4PF and VeriFast were integrated into the SDE. 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 D2.2.

7.2 Connections between CBK and SDE

For the NESSoS project the team play of the CBK and the SDE (Figure 7.2) is an advantage, because the CBK contains information about all 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 tools in order to find tools 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 this tool and some example data using the SDE workbench.

![Figure 7.2: Interplay of CBK and SDE.](image)

A typical workflow 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 realize 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 BSCW

The Basic Support for Cooperative Work (BSCW) shared workspace system is the tool of choice for efficient group collaboration. BSCW permits the creation of documents, appointments, contacts, tasks and notes within shared workspaces. Without having to install additional software, team members can access this data around-the-clock, from anywhere in the world. Mission-critical information is constantly available to all authorised personnel regardless of location, ensuring that complex workflows can be coordinated with minimal effort.

![BSCW overview](source: BSCW website).

We are currently running version 4.5.3 on a Debian 5 (Lenny) x64. The server is a Dell PowerEdge 1950, 1xXeon Quad Core E5320 1.86GHZ/2x4M, RAM 4GB 667MHZ FBD, 2x500GB SATA2 RAID1. At the moment there are 92 people subscribed to the NESSoS community. Figures 8.2 and 8.3 show some examples of BSCW usage. Further information regarding the tool is available in a set of multimedia files available at [http://www.nessos-project.ru/bscwtutorial](http://www.nessos-project.ru/bscwtutorial).
Figure 8.2: Home screen of the user.
Figure 8.3: Access version control for a file (right click on a file name).
9 Mailing lists

Specific mailing lists support e-mail communication. The Project Management Team maintains such mailing lists. 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 that have been created so far.

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:

- go to the http://www.nessos-project.eu/mls Login Web Page. If you do not have yet a listserv password just ask for a new password following the appropriate link;
- in the subscriber corner, choose the mailing lists (you are likely subscribed to many for NESSoS) and your settings page and then tick the appropriate topics. Always tick Other (that means all the other WPs);
- when sending an email to the whole list just send it to nessos@iit.cnr.it;
- when sending an email to a specific Work Package (i.e., to a specific subtopic) then send 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).

<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</td>
<td>All project 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</td>
<td>All WP leaders and their proxy</td>
</tr>
<tr>
<td><a href="mailto:nessos-ga@iit.cnr.it">nessos-ga@iit.cnr.it</a></td>
<td>For the General Assembly</td>
<td>All GA members</td>
</tr>
<tr>
<td><a href="mailto:nessos-afm@iit.cnr.it">nessos-afm@iit.cnr.it</a></td>
<td>For administration and financial issues</td>
<td>Persons in charge of management</td>
</tr>
<tr>
<td><a href="mailto:nessos-associated@iit.cnr.it">nessos-associated@iit.cnr.it</a></td>
<td>For the NESSoS associated partners</td>
<td>and financial aspects</td>
</tr>
<tr>
<td><a href="mailto:nessos-ibd@iit.cnr.it">nessos-ibd@iit.cnr.it</a></td>
<td>For the NESSoS Industry Advisory board</td>
<td>All associated partners</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 the Industry Advisory</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>board 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 project management</td>
</tr>
<tr>
<td><a href="mailto:info@nessos-project.eu">info@nessos-project.eu</a></td>
<td>For requesting generic information</td>
<td>team members</td>
</tr>
</tbody>
</table>

Table 9.1: NESSoS Mailing Lists
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 (http://www.nessos-project.eu/svn/DoW.pdf) 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 basic commands for accessing and modifying the SVN structure are listed in Table 10.1. The SVN commands are invoked by authenticated users. Currently, each NESSoS partner has a customized pair of access credentials, i.e., user name and password.

The SVN functionalities can be simply invoked via command line. Textual commands follow the syntax:

\[ \text{svn <command> [options] [arguments]} \]

where command is one of the commands described in Table 10.1. Some of the commands also require the specification of options and arguments. For example, the following command line states that file.txt must be stored in the repository and maintained under SVN’s versioning system:

\[ \text{svn add file.txt} \]

Another way to access the SVN commands is through a software based on a graphic user interface (GUI). GUI-based clients associate the standard SVN commands to a group of graphic controls. Some of these software are also integrated in the window managers of the most common operating systems (OS). This way, the commands are fully integrated in the OS, e.g., they can be listed in the contextual menus. Figure 10.1 shows an example of a client for Linux systems viewing the NESSoS repository.

The SVN content can be also accessed (read-only) through a web interface. Using a standard web browser, users can access, read and download the repository contents.

<table>
<thead>
<tr>
<th>Command (alternative)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>add</td>
<td>Prepare a local file or folder to be included in the SVN.</td>
</tr>
<tr>
<td>checkout (co)</td>
<td>Check out a working copy from (part of) the repository.</td>
</tr>
<tr>
<td>commit (ci)</td>
<td>Apply the local modifications to the SVN content.</td>
</tr>
<tr>
<td>delete (del, remove, rm)</td>
<td>Remove a file or folder from the SVN.</td>
</tr>
<tr>
<td>diff (di)</td>
<td>Show the differences between SVN version or directories.</td>
</tr>
<tr>
<td>lock</td>
<td>Gain exclusive access of a file or folder in the repository.</td>
</tr>
<tr>
<td>merge</td>
<td>Apply the differences between two sources to a working copy path.</td>
</tr>
<tr>
<td>resolve</td>
<td>Resolve conflicts on working copy files or directories.</td>
</tr>
<tr>
<td>unlock</td>
<td>Release a locked item allowing the other users to modify it.</td>
</tr>
<tr>
<td>update (up)</td>
<td>Bring changes from the repository into the working copy.</td>
</tr>
</tbody>
</table>

Table 10.1: SVN commands
Figure 10.1: Screenshot of kdesvn, a GUI-based SVN client.
11 LDAP directory

The Lightweight Directory Access Protocol (RFC 1777) was defined in 1995 to address specific efficiency requirements of the X.500 standard. However, it received a diffusion well beyond its original scope, being often used in enterprise environments as a user/organizational database.

Basically, LDAP is a tree database. Data are stored in a hierarchical structure, with node types and attributes, and rules specifying which node types can be children of a given node and the possible attributes associated with a node type.

LDAP comes with predefined node types and attributes. This means that it is quite different from e.g. a relational database, where the fields are always defined when the database is created. An LDAP directory is based on a predefined schema. Although it is possible to modify the LDAP schema, there are a number of reasons that advise against it:

- the schema structure is very complex and interconnected, and it is very easy to break the database;
- some of the softwares made for working with LDAP are based on the canon schema, and will not work on a different schema definition;
- there are enough types and attributes in the canon schema to address most requirements, so there is no strong drive to change them.

For these reasons, the LDAP schema is seldom modified, and normally the system administrators setting up LDAP use the predefined schema, using the standard attributes for their needs.

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 (as described in chapter 3); it is true for MediaWiki, the technology underlying the CBK (chapter 4); for Subversion (chapter 10); and for the BSCW (chapter 8). 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.

The structure of the NESSoS LDAP directory is pretty simple. The tree root consists of the suffix "dc=nessos-project,dc=eu". Below, there are a number of Organizational Units (ou), one for each partner of the network. Every ou contains one or more users belonging to that partner. Figure 11.1 shows the current tree structure.

The LDAP database has been populated with basic information for the portal's access rights. For example, the attributes are used by Joomla to determine whether the user is a regular user or an administrator, and what sections or categories he or she can post articles to. For example, the businessCategory attribute determines where a user can post articles. A user with a value of "Integration/Knowledge Portal" in that attribute is entitled to post an article to the "Knowledge Portal" category of the "Integration" section.

This is a temporary setup, however, because policies for the LDAP structure have not been discussed among the partners yet. So the current choice might be changed, or they might as well be used by other partners. As soon as the developers of the individual components of the JVRL start binding their services to LDAP, LDAP management policies will be agreed upon.

Although this has not been implemented yet, the LDAP can also serve much as a whitepages directory, for example listing at least a user for each partner and his or her relevant information such as the email address. Potentially, the LDAP directory has several other integration uses, which will be investigated in the future development of the NoE.
Figure 11.1: The NESSoS LDAP tree.
12 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.

During the first year of the project, WP1 has been centered around the following issues:

- identifying the requirements of the JVRL, based on the needs of all partners;
- selecting the components which would make up the JVRL;
- identifying the partners who would provide each component, based on their available technologies, expertise, and interests within the project (depending on their relationships with other WPs);
- setting up the individual JVRL components, making them available to all NESSoS partners.

The results of this initial process has resulted in an allocation of JVRL components which is summarized in Table 12.1.

<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>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 12.1: JVRL components by partner.**

Although these steps have been addressed for the most part, additional requirements could spring up during the course of the project, therefore additional components could be added in the future.

However, the final objective of WP1 is to integrate these tools together, forming a Joint Virtual Research Lab which is not just a collective name but can be rightfully viewed as a single entity, greater than the sum of its added parts. To achieve this, the future steps for the JVRL can be summarized as:

- identify the components which can cooperate, and how this cooperation should be achieved;
- enable the components for mutual cooperation, by integrating them depending on their structure (e.g., by making one's output compatible with the other's input, by sharing the same user database, by combining two executions into a single batch run);
- combine all integrated tools into a complex infrastructure (this will be a long-term objective).

Work on these aspects has already started and is currently at an early stage. The following sections describe the degree of integration which has already been reached, and what is supposed to be done in the future.

12.1 Current status

The integration of the JVRL components is at its initial stage of progression, and for the most part the components are standalone. However, some results are already reached or in progress.
First and foremost, the various websites belonging to different Work Packages are connected. This is either a link to or from the main NESSoS web portal, or via the domain. Every site has a domain redirection as shown in Table 12.1, and the various web sites have a link back to the web portal.

In addition to this, the web sites are designed to share a common layout. Collectively, the NESSoS web sites represent a web network with different locations devoted to different purposes (dissemination, knowledge base, e-learning, ...).

The LDAP directory represents another possible side of the integration among the web sites. The technologies underlying the various web sites (and SVN, too) are capable of supporting LDAP as a form of authentication. Currently, only the main NESSoS web portal is enabled for authentication through LDAP, but the integration of other services with the LDAP directory is currently under discussion.

The SDE (chapter 7) is an integrated tool on itself, since it collects the various tools developed by the NESSoS partners, but this is outside the scope of the JVRL and belongs to the deliverables for WP2 (specifically D2.2). However, from the point of view of the JVRL, there is a strict tie between the SDE and the CBK, since the former is supposed to contain the implementation of all the methods whose description can be found in the latter. In other words, the CBK is going to contain (among other things) the documentation for the SDE.

As for the documentation for other components of the JVRL, everything is stored in the BSCW. A new user joining the NESSoS project can connect to the BSCW (however, this requires obtaining a separate account for that tool, until a shared authentication is established), and find documentations or howtos for joining to the mailing lists, finding the Subversion repository, adding tools to the SDE.

12.2 Future steps

A lot of work needs to be done yet from an integration perspective. Currently, the JVRL has more the shape of a collection of individual tools than that of a unitary collaborative environment. Integration among the components will be the target of the work on WP1 during the second year of the project, while the third year will be focused around the creation of a distributed shared infrastructure containing all of the JVRL.

The web sites have a wide degree of possible improvement. A lot of connections are still missing or are not particularly clear, while future perspectives expect NESSoS's web sites to collectively represent a large web network with the main portal as its central hub. Plus, a user should have the same access credentials for all the web sites, or even a single sign-on solution, so that the various web sites do not appear as independent, but the user has the feeling of being on a unique distributed web platform. This will require to enable a binding with the already-existing LDAP directory.

The SDE will probably rely on a distributed shared test bed, a shared platform the various integrated tools can be tested against, and which will also serve as a testing platform for future tools or research advances by the partners. This is a component of the JVRL which has not been started yet, and is supposed to be discussed in the short term.

Also the LDAP directory needs improvements. Policies for its management have not been discussed yet, but it is quite likely that, as integration develops, the service developers raise some requirements in terms of the LDAP structure, such as some attribute for managing specific policies. These issues will be addressed as they emerge.
13 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, such as the SDLC tools workbench (SDE) or the Virtual Education Centre, also have a usefulness outside of the project itself. Building the JVRL as an efficient technological infrastructure is key to an efficient progress of the NESSoS project.

For this reason, work on the JVRL proceeds at a steady pace. Most partners have contributed to the JVRL by providing something of their own, be it a licensed technology or the effort needed to develop a service. Towards the end of the first year of the project, additionally, the partners have begun to collaborate to achieve interaction between their tools.

To summarize the results of the work on the Joint Virtual Research Lab during the first year of the project, one could say that the pieces of the puzzle have been collected (*rectius*, created), and now need to be combined together into a global perspective. The partners are actively 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 coordinating such efforts on integration 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


