DEHEMS
An EU funded climate change initiative

SEVENTH FRAMEWORK PROGRAMME

Project no. **224609**

Project acronym: **DEHEMS**

Project title: **Digital Environment Home Energy Management Systems**

Instrument: *Please tick*	CA	STREP ✓	IP	NOE

ICT - Information and Communication Technologies Theme

D3.16 Open source release and project site for this subsystem

Due date of deliverable (as in Annex 1): 30th September 2009

Actual submission date: 17th December 2009

Start date of project: 1st June 2008 Duration: 30 months

Organisation name of lead contractor for this deliverable: Manchester City Council

Revision [V1.0]

Project co-funded by the European Commission within the Seventh Framework Programme (2007-2013)		
Dissemination Level		
PU	Public	✓
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

European Commission
Information Society and Media

Document Control

Work Package Leader: University of Coventry

Document Owner: Manchester City Council

File Reference: Dehems_Deliverable_D3.16.pdf

Date: 16 December 2009

Version: 1.0

Version Control Record

Version	Date	Author	Comments
0.1 (Draft 1)	29.09.2009	Ovidiu Aritoni	Initial version of document
0.2	28.10.2009	Teodor-Florin Fortis	Document structure changed
0.3	31.10.2009	Teodor-Florin Fortis Ciprian Crăciun Ciprian Pungilă	Document content updated with contributions from C.Craciun and C.Pungila
0.4	02.11.2009	Teodor-Florin Fortis Ciprian Crăciun Ciprian Pungilă	Document content updated with contributions from C.Craciun and C.Pungila
0.5	05.11.2009	Teodor-Florin Fortis Ciprian Crăciun Ciprian Pungilă	Document content updated with contributions from C.Craciun and C.Pungila
0.6	08.11.2009	Teodor-Florin Fortis Ciprian Pungilă	Document content updated with contributions from C.Pungila
0.7	10.11.2009	Teodor-Florin Fortis	Added information for Section 1.2, Executive Summary & Conclusions
0.8	13.11.2009	Teodor-Florin Fortis	Final version. Added information about recommended system
1.0	16.11.2009	Richard Bush	Formatting and layout

Table of Contents

List of Tables

Executive Summary

This document is concerned with the review and analysis of most important solutions for open-source software hosting. This analysis is required for choosing appropriate solutions for hosting the different subsystems of the Dehems project that can be release as open-source.

The main objective of this deliverable is to provide a review of the most important solutions for open-source software hosting, as well as interesting alternative solutions. The review of these solutions is started in Section 1.1, and completed with information from Section 2. For those solutions identified in Section 1.1, a comparative analysis is performed in Section 1.2. By using the comparative tables from this section, decisions can be made for best solution to be adopted, based on specific requirements of the project.

Background and Motivations

Given the potential application of semantic techniques to other areas of human interface design, an independent open source community site will be formed for the continuation and evolution of this work. The review on open-source repositories is interesting for achieving this target, and taking relevant decisions related with appropriate hosting solutions for supporting the open-source development of different components of the project.

Currently a large number of solutions exist for hosting open-source developments, or for building in-house hosting solutions. Some of these solutions offer both alternatives: hosting of open-source projects on their own premises, as well as offering the platform for in-house installations.

The main target of this deliverable was to offer a review of open-source repositories in order to support further decisions related with the open-source release and site for current subsystem, as well as for other subsystems of the project that can be released as open-source.

1. Review of Open-Source repositories

1.1. Open source software hosting facilities

1.1.1. Assembla (http://www.assembla.com)

Assembla[1] has a declared scope to provide tools and services for accelerating software development, with three types of businesses:

- *Tools*, related with workspaces being used by the teams;
- *Talent*, related with services for staff personnel for finding the perfect individuals or team for particular job-types;
- *Knowledge*, offering management consulting for preventing stalling of product release cycles, streamlining product strategy, consolidating initial development

[1] http://www.assembla.com/about

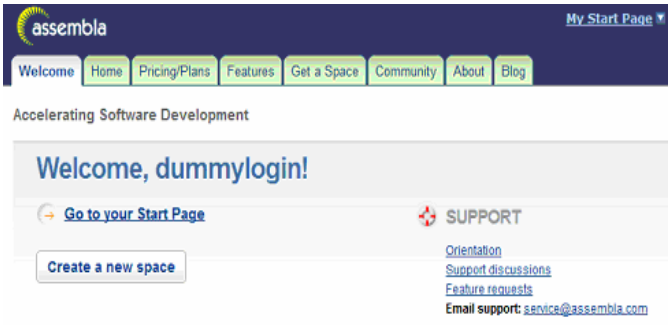
The company officially formed in 2005, headed by Andy Singleton -- creator of PowerSteering Software – was using a distributed agile process to link employees from multiple locations. Since October 2008, Assembla began charging for some of its services.

The Assembla philosophy states that the people behind the scenes were inspired by open-source by adapting the best practices from this type of development and applying professional recruitment and management, resulting in fast, iterative and globally-distributed development. Web 2.0 was mentioned as an inspirational source by releasing early and often, with fast reaction times. They also claim to have low overhead and promise to deliver the best developers.

Assembla is a paid service, offering a 30-days trial for each type of purchase. There are five different plans available with incremental pricing: Metered, Single, Group, Professional and Enterprise. Additionally, there is a private version of Assembla, including all its internal tools, the wiki, ticketing, repositories, source browsing, other collaboration tools, etc.

Registration process

Registration is easy to be achieved. Required information includes a valid e-mail address (an activation message will be delivered), and the choice for billing mechanism. Registration is simple and straightforward, once your account was created you will be taken to the account management page. Once account was activated, users can "*create a new space*" for project hosting.



Various features are available, including

- *Subversion Hosting with Integrated Tickets*,
- *Trac and Subversion Hosting*,
- *Team Collaboration*,
- *Subversion Repository* or
- *Git with Integrated Tickets*.

A full set of video tutorials are available, demonstrating the different functionalities of the platform.

1.1.2. BerliOS (http://www.berlios.de)

The BerliOS[2] project has been founded by FOKUS, a Fraunhofer Society Institute located in Berlin, in October 2000, for coordinating different interest groups in the open source software (OSS) field and for assuming a neutral coordinator function.

There are two main target groups for BerliOS:

- developers along with users of open source software;
- OSS-related companies.

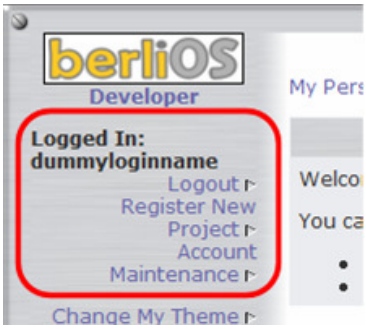
[2] http://www.berlios.de/

The project is funded by the German government (Bundesministerium für Wirtschaft und Arbeit – Federal Ministry for Economics and Labor) and is comprised of several subprojects[3]:

- *Developer*, a platform for hosting open source software, similar to SourceForge.net, GNU Savannah and JavaForge;
- *DocsWell*, a database for open-source related documentation;
- *SourceWell*, a news service for open source projects;
- *SourceLines*, dedicated to successful open source projects as a "best practice" database;
- *SourceBiz*, a list of open source companies;
- *DevCounter*, a database of open source developer profiles;
- *OpenFacts*, a knowledge-based database organised as a wiki (and using MediaWiki);
- *SourceAgency* (beta), a platform for coordinating open-source funding.

The target user groups for BerliOS are small and medium-sized enterprises (SME), as well as governmental organisations and departments. Target user groups are encouraged to communicate directly with the BerliOS team for identifying missing FS/OSS components in their field. Users are also encouraged to then become sponsors.

Registration process



Registration of a new project on BerliOS's *Developer* is simple and involves creating a new user account at http://developer.berlios.de/account/register.php (you must provide a valid e-mail address, as a validation link is sent there and you need to confirm the account by clicking the link) and choosing the *Register New Project* link.

Next step involves signing documents related to the scope of the project by pressing the *Services and Requirements*.

A similar confirmation is required for Step 2, in order to agree with the BerliOS Developer license. Step 3 involves writing a short description of the project (project purpose and summarization). With Step 4 you are invited to name your project, and define the "UNIX name" of the project. This is a key step, as after this step previous project information will be submitted for review to BerliOS staff.

The "UNIX name" will be used for creating a website at *unixname*.berlios.de, e-mail addresses at aliases@users.berlios.de, the CVS repository root of /cvsroot/*unixname*, and offering shell access to shell.berlios.de. Additionally, the project will be available for site search.

The Developer portal[4] provides developers of Open Source Software with various services enabling joint coordinated software development, presentation and deployment between people who live and work in different geographical areas. These services include:

[3] http://en.wikipedia.org/wiki/BerliOS
[4] https://www.berlios.de/supp_deve.php.en

- Web space for project specific websites;
- Database supporting dynamic web content;
- Discussion forums for developers and users;
- Bug, support, feature, and patch management;
- Task management;
- Project documentation management and Wiki;
- Surveys and developer rating;
- Project news;
- SCM repositories for versioning of code;
- FTP space for software distribution;
- File Release System;
- Screenshots;
- Mailing lists with archives supporting group communication;
- Searchable project directory.

Popular hosted projects

Some of the most popular projects registered with Berlios include Ctrax, HeWIT, aMule, Super Grub Disk, WiFi Radar, Konversation and others.

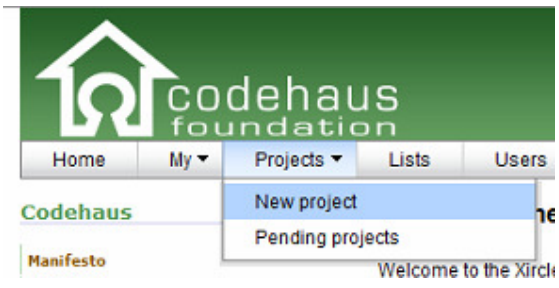
1.1.3. Codehaus (http://codehaus.org)

Codehaus[5] is "*a collaborative environment for building opensource projects with a strong emphasis on modern languages, focussed on quality components that meet real world needs*". All Codehaus projects have business-friendly licenses[6] or, in other words, supporting full usage of projects into potentially commercial (even closed-source) environments. LPGL is considered to be part of the business-friendly license model, however GPL is not part of it (it does not allow closed-source projects to take advantage of the GPL).

In the Codehaus manifesto[7] there are a few beliefs that belong to those behind the scenes, including high support for new projects, mature approach of all submissions and recognition of (as well as respect for) different levels of commitment from the users. According to their own description, the Codehaus approach is "*pragmatic*", and in fact usage of closed source is encouraged if it provides an advantage over open-source alternatives.

Registration process

Joining with Codehaus involves signing up via Xircles, a management tool that is being used for running various software projects. The signup link is https://xircles.codehaus.org/signup and allows you to register by offering some simple



[5] http://codehaus.org/
[6] http://codehaus.org/customs/licenses.html
[7] https://xircles.codehaus.org/pages/Manifesto

information, including an email address, full name information, and a preferred username.

An e-mail verification link is sent to the e-mail used for registration, after which you will need to click it and enter your password again for a successful signup. As soon as the account is activated, you can subscribe a new project by accessing the *Projects* | *New project* menu entry.

You will be prompted to enter all the project's required details, such as e-mail address, web address, project label, key and alternate key, project description, type of license, source code repository type, and if the project requires mailing lists or JIRA for tracking issues or Confluence for project information.

Popular hosted projects

Some of the most popular projects registered with Codehaus include Groovy, XFire, JIRA, StAX, Sonar, Jetty, OpenEJB and others.

1.1.4. GForge (http://gforge.org)

GForge is maybe one of the most complete project hosting systems available. According to GForge website, GForge Advanced Server is "*a modern, extensible platform with an intuitive interface that ties together a huge toolset, from Source Code Management (SCM) to extremely customizable Trackers, Task Managers, Document Managers, Forums, Mailing Lists.*"[8] The different components are built around a centralized permission system and they are maintained automatically by the system.

Even if GForge AS and GForge Professional are based on a monthly subscription, the features exposed through the GForge Community Edition or GForge Open-Source are still interesting for a project hosting solution.[9] GForge Group offers a free unlimited license for Academic Purposes, or Open Source Projects.

Among the new features offered via the GForge AS edition, we can mention:

- Workflow and process enforcement
- Permission and access control
- Enhanced personal space
- Project level and tracker enhancements
- Cruise control and build automation
- Visual studio, Eclipse and MS Project plugins.

However, most of these newly introduced features are not available in Community or Open-Source editions.

Registration process

Registration process is simple, and it is based on a set of required information (including user name, user identification, e-mail address and postal address information – optional), followed by a confirmation step for the user account.

After registering a project and the project was approved, different features are available via the Administrative tools, including:

[8] http://gforge.org/gf/
[9] http://gforgegroup.com/es/community-as-differences.pdf

- Trackers management
- 'Roles' and 'Observer' management (such as setting permissions and access levels)
- Adding members to a project
- Creating tasks in the 'Task Manager'
- Build and release code via the 'File Release System'
- Logging defects against releases, committing changes and linking changes to defects.

1.1.5. GitHub (http://github.com/)

As the GitHub motto says "*GitHub is for Public Open Source and Private Business Code*"[10], GitHub allows individuals or organizations to publish source code, covered by either open source licenses, or closed to authorized people. The main advantage of GitHub is the social movement that was built around the published open source software projects, and the resulting momentum.

All these were enabled by putting together web-based tools around the Git distributed SCM, thus encouraging programmers to join and contribute to their preferred projects.

Although it doesn't provide any bug-tracker or mailing-list support, it provides a wiki-like system that integrates in the repository itself, and excels at tracking source code changes, as for example:

- fork support by any user of any open source project (or close source if he has the rights), thus allowing him to develop new features or make bug fixes;
- network graph – displaying the overall progress by all developers, and helps the user have an overview of the branches and patches;
- patch-queues – allowing developers to better manage patches that have not been accepted in the upstream repository, but that are important to them.

GitHub also provides the classical source-code browser with support for syntax highlighting and commit diffs. Overall GitHub is recommended for the development community, and could be used successfully in cooperation with other web-applications that provide the missing features (mailing-list, bug-tracker).

Registration process

As GitHub is open for open-source, personal or business use, prior to joining with GitHub, you must select your pricing plan. Open-Source projects are allowed to have unlimited public repositories and collaborators, with a soft limit of 300 MB of disk space. Registration process is straightforward, after filling basic information, like preferred username, an email address, password, and an optional SSH public key. GitHub offers extensive guidelines via the online help system[11].

Popular hosted projects

Some of the most popular projects registered with GitHub include SubSonic, Kupfer, ikiwiki and others.

[10] http://github.com/
[11] http://github.com/guides/home, http://help.github.com/

1.1.6. Gitorious (http://gitorious.org)

As in the case of GitHub, Gitorious is also based on the Git distributed SCM. With little differences, all GitHub features are available for Gitorious, as well. However, in the case of Gitorious one can host only open source projects. Gitorious itself was provided as an open source project, thus enabling anyone to establish his own instance.

Additionally, it offers a wiki dedicated to the project. On the other hand, some interesting functionalities are still under development, like the support for bug-tracking.

Gitorious provides a Git-based open-source infrastructure for hosting open-source projects. In the case of Gitorious, the central entity is the project, containing one or more top-level repositories and any repositories managed by the project's contributors. This structure enables the project administrator to follow what people are working on in their individual clones of project's repositories, and lets administrators to merge or provide feedback on collaborator's contributions.

From contributor point of view, Gitorious provide a place to host contributions and provide feedback back into the projects ecosystem, and easily collaborate with others on the same project. Contributors will get their "*personal clone of the project on the site that you can work freely in and a way to package up your changes and notify the other project members about your changes*."[12]

The features provided by Gitorious include:

- Project hosting and hosting of official project repositories;
- Hosting of project repository clones;
- Project wikis;
- Public merge requests and code review;
- Project activity timeline;
- Developer profiles and activity timelines;
- Built-in notification systems.

Popular hosted projects

Some of the most popular projects registered with Gitorious include Amarok, StatusNet, wxWebKit, Banshee and others.

1.1.7. Google Code (http://code.google.com/projecthosting)

Google Code[13] is a development platform owned by Google, offering developer tools, APIs and technical resources. The site contains documentation on using Google developer tools and APIs, including discussion groups and blogs for developers. Most of Google consumer products have APIs exposed on this site, including Google Maps, YouTube, Google Apps and even Google Wave.

Google Code features a variety of development products and tools built specifically for developers:

- Google App Engine is a hosting service for web apps.

[12] http://gitorious.org/about
[13] http://code.google.com/

- Project Hosting gives users version control for open source code.
- Google Web Toolkit allows developers to create Ajax applications in the Java programming language.

Reference information for community based developer products where Google is involved in, like Android from the Open Handset Alliance and OpenSocial from the OpenSocial Foundation, are offered through this site.

Project Hosting on Google Code "*is a fast, reliable, and easy open source hosting service*"[14], allowing:

- instant project creation on any topic;
- Subversion + Mercurial code hosting (1 GB storage space + download hosting support with 2 GB of storage space);
- integrated source code browsing and code review tools;
- issue tracker and project wiki;
- starring and update streams for keeping track of projects.

Google Code's Project Hosting mission statement is: "*To support the open source community by providing a scalable, reliable and fast collaborative development environment for open source software, docs, and standards that promotes best practices in open source software engineering.*"[15]

Registration process

A Google Account is necessary in order to contribute to projects hosted on Google Code Project Hosting. Registration for a Google Account is free. Creating a new project is possible via the "Project Hosting on Google Code" page.

Project creation is completed with information related with the desired version control system (Mercurial or Subversion) and the source code license from one of those that are currently accepted.

In project management area different administrative tasks are available, including adding new members, checking project updates, organising downloads, editing your wiki, managing any issues and administering the source code.

Popular hosted projects

Some of the most popular projects registered with Google Code include Google Web Toolkit, Google Maps API, and others.

1.1.8. Launchpad (https://launchpad.net)

Launchpad[16] is a platform for software collaboration providing bug tracking, Bazaar-based code hosting, code reviews, Ubuntu package building and hosting, translations, mailing lists, answer tracking FAQs and specification tracking.

Launchpad is open-source software since July, 2009 and developers are allowed to contribute. Creating a new account is also free and can be done by providing an e-mail address, followed by an activation message delivered to specified inbox..

[14] http://code.google.com/projecthosting/
[15] http://code.google.com/p/support/wiki/MakingHostingBetter
[16] https://launchpad.net/

Registration process

Once registration was completed, it is possible to *Create a new project*, with the possibility to choose a new name for the newly created project. As an interesting feature, once a proper name was selected, Launchpad offers a similarity detection feature: your project is compared to already existing projects, and which look "similar" to the newly registered project.

Launchpad offers an extensive range of licenses, including: *Apache License*, *GNU Affero GPL v3*, *GNU LGPL v2.1*, *Simplified BSD License*, *GNU GPL v2*, *GNU LGPL v3* , *Creative Commons* - No Rights Reserved, *GNU GPL v3*, *MIT / X / Expat License*, *Academic Free License*, *Creative Commons* - Attribution Share Alike, *PHP License*, *Artistic License 1.0*, *Eclipse Public License*, *Public Domain*, *Artistic License 2.0*, *Educational Community License*, *Python License*, *Common Public License*, *Mozilla Public License*, *Zope Public License*, *Creative Commons* – Attribution and *Open Software License v 3.0*. Also, it is possible to specify other license types or even to use some proprietary licenses.

Popular hosted projects

Some of the most popular projects registered with Launchpad include Silva CMS, Bazaar, MySQL, Gwibber, or Rocrail.

1.1.9. Project Kenai (http://kenai.com)

Sun Microsystems' Project Kenai[17] is an environment for hosting open source projects and code and for collaboration between developers. It was still in beta at the time of this review.

According to the project's site[18] releases are coming every two weeks, making it one of the most active projects of this type available today. Furthermore, there is an undergoing effort in Project Kenai for maintaining current projects and cleaning up old ones.

Project Kenai offers the ability to setup a user profile immediately after signing up, search for projects in order to contribute or find information about them, discuss the project on up to five forums, add a project wiki, an instant messaging chat room, code hosting (maximum 5 SVNs, Mercurial, Git), mailing lists, issue tracking, a downloads area, a project website, statistics from Google Analytics, ability to publicize the project and NetBeans 6.7+ integration.

Sun Developer Network members can use their SDN accounts to log on to Kenai.com. Others can create an account easily by filling out a short form[19]. Project Kenai was built using JRuby, Glassfish V2, and MySQL databases.

Registration process

Signing up with Project Kenai is free and easy to accomplish. A valid e-mail address is required. Once submission is complete, simple e-mail verification will happen prior to creating a new project.

In order to create a new project some mandatory information, including project name, project title, project description, and optional project tags must be specified. An extensive

[17] http://kenai.com/
[18] http://kenai.com/projects/help/pages/KenaiOverview
[19] http://en.wikipedia.org/wiki/Project_Kenai

list of license types is available, including GNU, Apache or other open-source licenses, as well as proprietary licenses.

One can easily add different facilities, including new mailing lists, source code repositories, etc. or edit the existing chat rooms (by default there is one open chat room for the project created automatically). The management area offers access to the project settings, project logo (which can be defined by the project owner), its list of members, its features, e-mail templates, web hooks (for automatic notification of updates), software library and analytics.

Popular hosted projects

Some of the most popular projects registered with Project Kenai include The APIs for the Sun Cloud, JEDI: The Open Source Curriculum, RESTful Interface to Sun Grid Engine and others.

1.1.10. SourceForge (http://www.sourceforge.net)

SourceForge[20] is one of the most known and widely-used open-source hosting facilities today. As they claim on their website, "*SourceForge.net is the world's largest open source software development web site*", providing services that help people build open-source software and share it with the world. SourceForge.net is owned and operated by Geeknet, Inc., a publicly traded US-based company.

SourceForge is the global technology community's hub for information exchange, open source software distribution and services, and goods for geeks. SourceForge development stared in 1993. The innovation brought by SourceForge to the world-wide community was the combination of already-existing independent software[21], such as CVS/SVN, mail, bug tracking, FTP, Webserver/PHP, forums, all put together in a functional manner.

As of February 2009, the SourceForge repository hosted more than 230,000 projects and more than 2 million registered users, although not all are active. The domain sourceforge.net attracted at least 33 million visitors by August 2009 according to a Compete.com survey[22]. The SourceForge projects are categorized according to the *trove categorization*, meaning there is a trove map where all the records are accessible and each individual record is given a set of meta-tags, describing the record - the tags are generally pre-set, but it is possible to create them dynamically. The trove categorization is useful for facilitating searches and finding similar projects.

The site provides a web space and tools like code repository, bug trackers, etc. for managing software projects. A recently conducted analysis[23] has taken data from the SourceForge database dump and concluded that downloads have an approximately long-normal distribution, while most participation functions have exponential "long tail" distributions.

Registration process

Registration on SourceForge is free, provided that newly registered users must be at least 18 years old, or they have the consent of a Parent or Guardian to sign up.

[20] http://sourceforge.net/
[21] M. Hess, G. Tudosie: *Case Study: SourceForge.net*, 2007
[22] http://en.wikipedia.org/wiki/SourceForge
[23] N. Oostendorp, M. Kumaraswarmy, T. Hayden, Z. Lai: *An Exploratory Analysis of SourceForge.net Project Statistics*, April 9, 2008

After initial registration an activation e-mail is used for validating account. Access to the management area of newly created account is immediately available after validation.

Registration of a new project is possible from the management area. It is required to register a project that is open-source, or directly related to open-source; otherwise non-compliant projects are removed from the database.

Popular hosted projects

Some of the most popular projects registered with SourceForge include phpMyAdmin, Azureus, eMule, 7-Zip, webERP, Notepad++, DC++, BitTorrent, WinSCP, UltraVNC .

1.1.11. Tigris (http://www.tigris.org)

Tigris[24] is a mid-sized open source community focused on building better tools for collaborative software development, where every project fits into the Tigris mission and no dead projects exist. The Tigris.org mission is hosted by CollabNet, the sponsors of Subversion (it runs CollabNet Enterprise Edition) and involves attracting "*senior open source developers from many organizations*". On April 24, 2007, CollabNet acquired SourceForge Enterprise Edition from VA Software, and they are now actively selling CollabNet SourceForge, with the eventual plan to phase out CollabNet Enterprise Edition.

One of the most important project hosted by Tigris.org is Subversion. Although it is primarily focused on projects for collaborative software development, Tigris competes with the more well-known SourceForge. However, Tigris primary mission is to build open source software engineering tools. They are hosting such tools and offer information resources to software engineering professionals and students and are encouraging people with a similar vision to contribute to the existing projects.

Registration process

The first step towards contribution is registering as a new user (which is free of charge): provide your desired username, e-mail and use the activation e-mail received in your inbox. After additional setup of your account, you have access to the list of projects, organised into categories. The site is offering full information about projects and how one can participate in different projects.

Popular hosted projects

Some of the most popular projects registered with Tigris include Subversion, Subclipse, TortoiseSVN, ArgoUML, Frameworx, or RapidSVN.

1.2. Comparative analysis of open source hosting facilities

1.2.1. Version control system

Version Control System (VCS) is one of the most important criteria. With VCS software one can keep track of work done and changes committed for a set of files. Also, VCS software enables collaboration of several developers. Support for most important VCS solutions was investigated, including:

- Concurrent Versioning System (CVS) – is a free revision control system, one of the most popular VCS in the open-software world.

[24] http://www.tigris.org/

- Subversion (SVN) – is a version control system initially developed by CollabNet Inc. Its goal was to be a successor of CVS. Several open-source projects moved from CVS to SVN.
- GIT is a free distributed revision control system, initially developed by L.Torvalds for the development of Linux kernel.
- Mercurial is a distributed revision control system for software development. Initially it was implemented mostly in Python. It is a fully distributed, scalable, and decentralized system.

Table 1 Support for version control systems

Version control system	***CVS***	***SVN***	***GIT***	***Mercurial***	***Others***
Assembla	N	Y	Y	Y	n/a
BerliOS	Y	Y	Y	Y	n/a
Codehaus	N	Y	N	N	SVN, LDAP, JIRA, Confluence, Bamboo supported via Xircles
GForge	Y	Y	N	N	n/a
GitHub	N	N	Y	N	n/a
Gitorious	N	N	Y	N	n/a
Google Code	N	Y	N	Y	n/a
Launchpad	IMPORT	IMPORT	IMPORT	N	n/a
Project Kenai	N	Y	Y	Y	n/a
SourceForge	Y	Y	Y	Y	n/a
Tigris	Y	Y	N	N	n/a

1.2.2. Licensing and Copyright information

Different licensing policies apply for the different aspects of the platform.

One important aspect in taking a decision over the hosting facility is related with the type of license supported or agreed by the open-source hosting facility.

Several types of licensing are available and generally supported by various hosting sites:

- Apache Software License – ASL (different versions could be considered);
- Mozilla Public License – MPL (different versions);
- (GNU) General Public License – GPL (different versions and flavours are available; e.g. LGPL);

- Open Software License – OSL;
- Creative Commons – CC (different versions);
- MIT/BSD License;
- Commercial License or Other Licenses.

Table 2 Support for core open-source licenses

Licensing and Copyright	***ASL***	***MPL***	***GPL, LGPL***	***OSL***	***CC***	***MIT / BSD***	***Other***
Assembla	Y	Y	Y	Y	Y	Y/Y	Y
BerliOS	Y	Y	Y	Y	Partial	Y/Y	Limited
Codehaus	V2	Y	v2+CE, LGPL2, LGPL3	Y		Y/Y	Ruby
GForge	n/a	n/a	Y	n/a	n/a	n/a	n/a
GitHub	Y	Y	Y	Y	Y	Y/Y	Y (non open-source projects)
Gitorious	Y	Y	Y	Y	Y	Y/Y	Partial
Google Code	V 2.0	Y	v2, v3, LGPL	n/a	3.0 BY/BY-SA	Y/Y	n/a
Launchpad	Y	Y	Y	Y	Y	Y/Y	n/a
Project Kenai	V 2.0	1.1	2.0, LGPL 2.1	OSI-approved	n/a	Y/Y	Y (commercial use)
SourceForge	Y*	Y*	Y*	Y*	Y*	Y/Y*	OSI-approved
Tigris	Y*	Y*	Y*	Y*	Y*	Y/Y*	OSI-approved

As Assembla is a commercial solution, project specific licensing is allowed. BerliOS Developer allows for any type of Open Source Initiative-approved development license.

The Codehaus preferred development licensing scheme includes Apache Software License 2 and the Ruby license for Ruby-based programs. Other types of licenses for open-source or free projects are permitted, as well. Prohibited licenses include generic, Public Domain, Shareware and No license. Codehaus respects all copyrights of all third-parties.

Even if not specifically stated on GForge site, this solution is based on GPL Licensing. There is no information related with other licensing solutions.

Gitorious does not impose specific restrictions on what license is used for projects. However, the GPL/CC Licenses used for Gitorious itself impose specific limits for commercial licenses. Unlimited support is offered for any "royalty-free, non-exclusive" license.

Launchpad is free of charge for free software projects but also hosts commercial projects for an adequate fee. Also, terms of use specify that all copyrights for the data on the website belong to their respective authors. Launchpad suggest that in order to choose the appropriate license, the developer should "*mail the appropriate development list and ask -- the licensing of related projects may be relevant, due to license compatibility issues*".

In the case of Google Code, "*Google claims no ownership or control over any Content submitted, posted or displayed by you on or through Google services.*" *However,* "*you grant Google a worldwide, non-exclusive, royalty-free license to reproduce, adapt, modify, publish and distribute such Content on Google services for the purpose of displaying, distributing and promoting Google services. Google reserves the right to syndicate Content submitted, posted or displayed by you on or through Google services and use that Content in connection with any service offered by Google*"[25]. Google Code's Project Hosting allows a few types of licenses for the projects currently hosted, including: Apache License 2.0, Artistic License/GPL, Eclipse Public License 1.0, GNU v2, GNU v3, GNU Lesser GPL, MIT License, MPL 1.1, New BSD License and supports also a separate content license for each of these, including Creative Commons 3.0 BY/BY-SA.

Project Kenai recommends several OSI licenses, including ASL 2.0, GPL 2.0, LGPL 2.1, as well as Eclipse Public License, Common Public License 1.0, and others. However, other non-OSI (project specific) licenses could be used.

Finally, both SourceForge and Tigris.org supports any OSI-approved licenses[26].

1.2.3. Hosting facilities & Collaboration

The target set of open-source hosting facilities were checked against several relevant hosting features, including:

- Code hosting, and hosting limits;
- Availability of a bug tracking subsystem;
- Possibility for web hosting of a project-related site;
- Availability of a ticketing system;
- Support for project teams;
- Communication channels, including project wiki, project forum, mailing lists, and other communication media.

[25] http://code.google.com/intl/en/tos.html
[26] http://www.opensource.org/licenses/category

Table 3 Support for hosting facilities

Hosting facilities	***Code hosting***	***Bug tracking***	***Project site***	***Ticketing***	***Team mgmnt***
Assembla	Y (from 2G)	Y	N	Y	*Y*
BerliOS	Y (100 M soft quota)	Y	Y	n/a	*N*
Codehaus	Y	Y (JIRA)	Y	Y (JIRA)	*N*
GForge	Y (75M, 5 users)	Y	N	Y	*Y*
GitHub	Y (300M)	Y	Y	Y	*N*
Gitorious	Y	Y	N	N	*Y*
Google Code	Y (1 G)	Y	External	n/a	*N*
Launchpad	Y (bazaar)	Y	N	n/a	*Y*
Project Kenai	Y (limited to 5)	Y	Y	n/a	*N*
SourceForge	Y	Y	Y	n/a	*N*
Tigris	Y (unlimited)	Y	Y	n/a	*n/a*

Table 4 Support for communication channels

Communication channels	***Wiki***	***Forum***	***Mailing lists***		***Free***
Assembla	Y	Y	N		Monthly fee (from 24$)
BerliOS	Y	Y	N		Free (needs approval)
Codehaus	N	N	Y		Free
GForge	Y	Y	Y		Free (5 users limit) for private projects
GitHub	Y	N	N		Free for public projects
Gitorious	Y	N	N		Free for open-source projects
Google Code	Y	External	External		Free for open-source projects
Launchpad	Y	Y	Y		Free for open-source projects (mostly Ubuntu-based)
Project Kenai	Y (1)	Y (5)	Y (5)		Free for open-source

					projects (mostly java-based projects)
SourceForge	Y	Y	Y		Free
Tigris	Y	Y	Y		Free

1.2.4. Ranking and popularity

Tools for analyzing popularity of open-source hosting facilities include both page ranking, based on popular ranking tools, as well as "link popularity". These two classes of criteria will show how a project could be positioned in the context of the chosen hosting facility.

Ranking and popularity tools include:

- Google page rank (1 to 10, 10 is better);
- Google link popularity (number of links to analyzed site/system, higher is better);
- Yahoo link popularity (number of links to analyzed site/system, higher is better);
- Alexa ranking (popularity ranking of sites, lower is better).

Additionally, an estimation of existing users and projects was presented for most of these systems, based on information reported on different hosting facilities' sites.

Table 5 Positioning and ranking for open-source hosting facilities

Positioning and ranking	***Page rank***	***Link popularity***	***Link popularity***	***Page rank***	***#Users / #Projects***
	Google	*Google*	*Yahoo*	*Alexa*	
Assembla	6	162	199,520	12,604	>170,000 / >60,000
BerliOS	6	225	215,240	16,596	43,062 / 5,367
Codehaus	7	519	61,736	18,636	n/a / 274
GForge	6	82	5,821	1,459,799	n/a / 700
GitHub	7	1,680	1,816,414	2,012	>135,000 / n/a
Gitorious	6	626	100,136	54,174	n/a
Google Code	n/a	2,160	***5,276,129***	n/a	n/a
Launchpad	7	911	415,236	12,607	>250,000 / 15,071
Project Kenai	7	297	55,657	60,380	29,733 / 5,874
SourceForge	**9**	**12,900**	**8,075,686**	**177**	>2,650,000 / 156,141
Tigris	6	186	104,838	12,274	137,324 / 1,547

1.2.5. Integration

Integration with Eclipse IDE is available for most of open-source hosting facilities that were considered for this report. It is important to notice that CVS or SVN is a minimal condition for offering integration with Eclipse IDE.

Assembla, BerliOS and SourceForge offer MyLyn connectors for easy Eclipse integration (at least Eclipse Ganymede should be used). While BerliOS is based on SourceForge Alexandria codebase, and is using the same integration path as SourceForge[27], in the case of Assembla, an update-site for Eclipse was offered for the same purpose.[28]

GForge offers different integration connectors, including connectors for Eclipse, MS Project, MS Office, and others. However, these connectors are available via the GForge store.

In the case of GitHub and Gitorious, the EGit/JGit Eclipse plugin is available in order to enable Eclipse projects to be controlled by a Git repository.[29]

Launchpad is based on a Bazaar plugin in order to enable Eclipse integration.[30]

Project Kenai is natively integrated in SUN development tools, including Netbeans.

Finally, Tigris, as official development site for subversion, offers the official plugin for Eclipse integration: Subclipse, also supported as a Tigris project.[31]

1.2.6. Administrative tools

This section summarizes several features that are interesting from the point of view of project administrator. These features include:

- Management tools for project;
- Project recruitment: usually by a ‘project needs help’ or ‘ask for help’ feature;
- Activity history;
- Shell access;
- Virtual hosting, web tools: web scripting language, database support;
- Security support: support for SSH, SSL, TSL, certificates or others;
- Backup support: backup policy for projects.

Assembla is using the Scrum methodology. Support for management tools, as well as for activity history is granted.

[27] http://wiki.eclipse.org/Using_Sourceforge_with_Mylyn
[28] http://www.assembla.com/wiki/show/assemblamylyn/How_To_Use
[29] http://www.eclipse.org/egit/
[30] http://blog.launchpad.net/api/launchpad-plugin-for-eclipse-using-the-launchpad-api
[31] http://subclipse.tigris.org/

Table 6 Administrative tools for open-source hosting facilities

Administrative tools	*Mgmnt. tools*	*Ask for help*	*Activity history*	*Shell access*	*Virtual hosting*	*Security*	*Backup support*
Assembla	Y	Y	Y	N	Y (branding tools)	Amazon's EC2 datacenters	Amazon EBS
BerliOS	Y	Y	Y	Y (restrict)	Y	Y (basic)	n/a
Codehaus	Y	n/a	Y	N	Y	Basic (HTTPS, SSH key)	n/a
GForge	Y	n/a	Y	N	N	Basic (HTTPS, SSH key)	Fully backed-up and updated
GitHub	Y	n/a	Y	N	N	Basic (HTTPS, SSH key)	n/a
Gitorious	Y	n/a	Y	N	N	Basic (HTTPS, SSH key)	n/a
Google Code	Y	Contribute	Y	N	N (integration with Google Sites)	Basic	Based on Google App Engine Backup and Restore
Launchpad	Y	n/a	Y	N	N	Basic	n/a
Project Kenai	Y	n/a	Y	N	Y	Basic	n/a
SourceForge	Y	Y (dashboard)	Y	Y (on request)	Y	Basic (HTTPS, SSH key)	Y (routine) n/a per project
Tigris	Y	n/a	n/a	N (SSH tunnelling)	Y	Basic (SSH key)	Y

1.2.7. Developer tools

This section is related with the specific developer-related information maintained by the target solutions. This information could be used for identifying developer's profile, and help in accepting new developers in the course of a project.

Developer information will include:

- Personal information: a minimal level that must be accepted by any solution;

- Developer skills/experience: based on previous experience in other projects and/or components of the platform;
- Projects involved in: based on this information one could search for developer information in related projects;
- Assigned issues/submitted issues from trackers.

With Assembla users are able to fill their personal information, as well as a “Skills” profile, and they can express their interest in working in distributed projects. More, Assembla is integrated with several “Talent Partner” sites, for identifying qualified developers. Also, with Assembla one can track developer’s “activity in public spaces” (public Assembla projects). Tracking of issues is enabled via the integrated Trac system.

In the case of BerliOS, in addition to personal information, a “Peer rating” system was implemented. With this system it is possible to check three categories of rankings: Sitewide Rank, Aggregate Score, and Personal Importance. Also, the system keeps track of projects a developer is member in. The “request support” and “request features” offer a basic implementation of the issues subsystem.

Based on Xircles, Codehaus offers basic support for personal information and list of projects. Next, Codehaus integrates JIRA for bug & issue tracking.

GForge offer basic support for personal information, with links for projects. Issue tracking is available only from project’s page, tracker subsection.

For GitHub, developer’s profile includes basic personal information, list of public repositories, and list of public activity. Additionally, a list of followers can be accessed for each developer. Even if issues information is available via project page, they are presented in relation with inspected developer, providing a nice overview of developer’s activity in the frame of a project. Similar features exist for Gitorious, where one can identify the list of projects, list of repositories, and activities per developer. However, Gitorious is not offering personal information, and issue tracking is not available.

In the case of Google Code, minimal developer information is offered, and this information as well as issue tracking information, is directly available after accessing project information. In the case of Google Code, the interface is highly project-oriented, with minimal facilities for developer information.

Launchpad does not retain any personal information. Developer information is available after accessing a project the developer was involved in. However, the system keeps track of all relevant activity of a developer (in participation section, including bugs, answers, translations, code, blueprints, and branches) and computes a “karma” level per developer, based on its activity.

In the case of Project Kenai, no personal information is recorded. One can access the list of projects, and “interest” information. No specific issue tracking mechanism is implemented per user.

SourceForge encourages all of its users to contribute to existing projects, by using the “project help wanted” feature. Also, it supports development of users’ homepages. Personal information could be accessed via developer’s hosted homepage. Developer profile records information like: project updates, ticket activity, code commits, forum posts, or file releases.

Table 7 Developer tools for open-source hosting facilities

Developer tools	***Personal information***	***Skill / Experience***	***Projects involved in***	***Issues***	
				assigned	*submitted*
Assembla	Y	Skill profile	public	Y (trac)	Y (trac)
BerliOS	Y	Peer rating (Advogato)	Y	Y	Y
Codehaus	Y	n/a	Y	Y (JIRA)	Y (JIRA)
GForge	Y	n/a	Y	Y (project page)	Y (project page)
GitHub	Y	n/a	Y	Y	Y
Gitorious	N	n/a	Y	n/a	Y (activity page)
Google Code	N	n/a	Y (via project search)	Y (project page)	Y (project page)
Launchpad	N	Karma	Y	Y	Y
Project Kenai	N	Tags	Y	Bugzilla / JIRA	Bugzilla / JIRA
SourceForge	Y (homepage)	n/a	n/a	n/a	Y
Tigris	n/a	n/a	n/a	n/a	n/a

1.2.8. Community tools

This section summarizes different community features that are interesting for process development process. These features include:

- Project access, project classification and project search: the ability to access project sources, and search for projects;
- People search, team search and “help wanted” facilities: the ability to search for people, based on tags/keywords or skills, and to recruit people for project collaboration.

In the case of Assembla, projects can be public or private. For private projects, community features are limited to project team members. Assembla offers a “talent” search, for finding people with a skills profile and interested in working in agile distributed projects. Assembla search and “talent” search are based on project tags.

BerliOS offers two search capabilities in its Developer component: people search and project search. Also, a “project needs help” interface is offered, for project volunteer openings.

Codehaus search facilities have poor implementation on their main page. However, Codehaus presents “featured project” on this main page. All community tools have a good implementation via the Xircles interface (http://xircles.codehaus.org).

For GForge, search is offered for various aspects related with a project: news, releases, lists, wiki, documents, trackers and forums. Also, project classification is available by project categories.

GitHub offers three search directions: repository search (with specific filters), users search and code search, as well as a generic search. All searches could be conducted based on a specified programming language.

For Gitorious, full list of all projects and all teams are available as a starting point in searching. Also, a category-based search could be used.

Google Code’s starting points include “search open source projects” and “contribute to an open source project”. Also, one could apply labels to its own projects.

With Launchpad, one can search for projects, project groups, distributions, people and meetings. To notice that people search include both people and team search.

For Project Kenai, the cloud tag is used for project classification, and for enabling fast search capabilities. Both people and project search could be combined with cloud tag-enabled search.

Finally, SourceForge and Tigris offer a fully developed search interface for projects only (project finder). A “project looking for help” dashboard is available, as well as a category-based search.

Table 8 Community tools for open-source hosting facilities

Community tools	***Project***			***People***		
	access	*classification*	*search*	*search*	*Team search*	*“help wanted”*
Assembla	Y	tags	Y	Y	Y	Y
BerliOS	Y (checkout)	n/a	Y	Y	n/a	Y
Codehaus	Limited	tags	Y	Y	n/a	n/a
GForge	Y (checkout)	Categories	Y	n/a	n/a	n/a
GitHub	Y (checkout)	n/a	Y	Y	n/a	n/a
Gitorious	Y (checkout)	Categories	Y	Via team search	Y	n/a
Google Code	Y (checkout)	labels	Y	Per project	n/a	Contribute
Launchpad	Y (public branches)	n/a	Y	Y	Y	n/a
Project Kenai	Y (checkout,	Cloud tags	Y	Y	n/a	n/a

	download)					
SourceForge	Y (checkout, download)	Categories	Y	Per project	n/a	Y (dashboard)
Tigris	Y	Categories	Y	n/a	n/a	n/a

2. Other hosting facilities

Previous Section presented the most interesting solutions for project hosting available today. However, other interesting solutions could be considered, as well. These solutions are not as popular as those previously presented. Some of them are offering interesting features, and could be used as replacement solutions for specific requirements.

2.1. GridyZone (http://gridyzone.com)

The GridyZone project is built around Subversion (SVN), featuring project management and issue tracking. The selling point of GridyZone is not the features used in development, but in managing the project. Most important features available through this hosting facility include:

- Project roadmap and milestones and iterations;
- Source code branches, linked to roadmap milestones or iterations;
- Project process management, allowing manager roles controlling milestones;
- Issue / tasks prioritization;
- Integration between the project management, issue tracker and source code.

The core set of GridyZone services are offered free of charge, supporting different types of projects: commercial or open-source. GridyZone offers the necessary infrastructure for project hosting, protection of source code, support for highly iterated products, as well as a totally distributed environment.

2.2. GNU Savannah (http://savannah.gnu.org)

Savannah is the main source code repository for the GNU sub-projects, and for many non-GNU ones. As specified on Savannah main page it is the place for hosting "*free projects that run on free operating systems and without any proprietary software dependencies*"[32]

It is one of the oldest hosting facility, providing the full range of necessary tools: SCM's (SVN and CVS, but also Arch, Git or Mercurial); mailing-lists; issue-tracker; news; document management system; etc; and its stability allowed it to be chosen by the LCG/CERN project. Savannah has high project approval requirements, and quick response time for most support requests.

Savannah is offered in two flavours: the official site (http://savannah.gnu.org), for GNU sub-projects, and the alternative site (http://savannah.nongnu.org/), for the development of projects that are free software, but not part of the GNU project.

[32] http://savannah.gnu.org

2.3. KForge (http://www.kforgeproject.com)

KForge is not a hosting service, but it is providing enterprise architecture for project hosting. "*KForge is a stable, open-source, enterprise application for project hosting. KForge provisions project services on-demand, and controls access with a robust, role-based, single sign-on access controller* […] *KForge also provides a complete web interface for administration of project members and services, as well as a fully-developed plugin system so that new kinds of services can be added easily.*"[33]

KForge offer interesting features, including:

- Version Control Systems: SVN, Git, Mercurial;
- Wikis and mailing lists: Trac, MoinMoin, MailMan;
- Content Management Systems and Blogs: Joomla!, Wordpress;
- User and permission management: custom implementation;
- Plugin support;
- Web API support.

KForge offers an open-source solution (GPL License) for managing software and knowledge projects, re-using for its purposes some of best available tools.

2.4. OSOR.eu (http://www.osor.eu)

OSOR.eu (Open Source Observatory and Repository for European public administrations) is "*a platform for exchanging information, experiences and FLOSS-based code for use in public administrations.*"[34]

The Open Source Observatory and Repository (OSOR) is a Web Site launched by the European Commission under the IDABC programme, to support the distribution and reuse of software developed by or for public sector administrations across Europe, connecting EU services and Member States. As from September 2006 (kick-off) the delivery of the project was managed by a consortium led by UNISYS (Belgium), including also the United Nations University MERIT (Netherlands), the URJC University Rey Juan Carlos (Spain) and Gopa-Cartermill (Belgium).

OSOR forge currently hosts 121 projects, and 1,836 projects can be searched through the national federal forges. OSOR Repository and Forge aim to support and encourage the re-use of publicly-financed Open Source Software developments (OSS or FLOSS for "Free, Libre & Open Source Software") that are of particular use for public administrations in Europe. OSOR.eu is comprised of the following services:

- An information platform on OSS that includes news, events, cases studies and newsletters about on-going initiatives, projects, new applications and developments in European Members States and across the world, as well as advice/guidelines around the use of OSS and the OSOR.
- A repository and registry for providing visibility to European OS projects and initiatives in public administration, for allowing users to download software and search documentation.

[33] http://www.kforgeproject.com/
[34] http://www.osor.eu/

- A collaborative cross-border development environment that offers legal, organisational and technical support to enable collaborative development and share or exchange of knowledge and software by providing facilities for such tasks.

Registration on OSOR.eu is free of charge; however all the data submitted will be public and the user has to agree with this policy in order to subscribe. The site also offers various statistics like the top project downloads, recently registered users, most active users of the week and of all time, as well as top federated forges, and allows searching for specific items in its hosted projects.

2.5. SWiK.net (http://swik.net)

SWiK.net is "*a community driven resource for open source software*"[35], with information and news for thousands of open-source projects. It is a *SourceLabs* project (used for the wiki engine) for helping people document and tag, in a collaborative fashion, the open-source projects. SWiK.net is itself released as an open-source project.

The SWiK.net project aims towards making life easier for those interested in open-source projects, both in describing their functionality and offering advice about the best project capable of performing a certain computing task.

Registration is free and open to all participants. All visitors can contribute to the project, without even requiring registration. Registering however entitles the user to leave comments on the page and obtain credit for their work.

The SWiK.net wiki is different from a normal wiki from at least three main points of view: first, all pages are tags (for cross-referencing of pages within the wiki); second, pages have templates (such as blog pages, RSS feeds, bookmark pages, blog entry pages, wiki pages, open-source project pages, and user pages) and one page of a certain type can become of another type easily; third, RSS integration is strong (SWiK.net aggregates blog entries).

From a technical point of view, Ajax/Javascript are being used for making editing "*faster and easier*"[36], and the Textile markup language, a simpler and faster to write language than the classic HTML. In June 2008 an early version of http://books.swik.net/ was launched, for integrating the SWIK platform with books, collection of books and lecture in general.

The editing guidelines specify that spam, harassment, fraud, law-breaking and vandalism are not allowed, and that all tests should be made in the *sandbox* that SWiK.net offers. Also, all comments should be made on open-source projects or those related to the open-source community. Furthermore, posting in different languages is allowed, though English is the primary language.

[35] http://swik.net/
[36] http://swik.net/SWiK

3. Conclusion

This document offered a review of some of the existing facilities for hosting open-source projects. Different criteria were considered for this analysis, in order to help in taking decisions for choosing a solution for hosting subsystems of the Dehems project that can be released as open-source.

Support for Versioning Control System was an important criterion in this analysis. As SVN is currently used on the large scale, and GIT is offering an interesting alternative, support for both of these solutions is recommended.

Licensing policy of the hosting facility was another important criterion. Some of these facilities are offering limited possibilities for choosing the appropriate open-source licence. However, most of them support any type of modern open-source license, as specified on http://www.opensource.org/licenses.

All solutions offer good integration with the popular development media: Eclipse. However, there are some solutions that are offering integration with various project management tools. On the other hand, some of analyzed solutions are offering not only basic hosting facilities, but also the core packages can be used for custom installation in order to support project hosting on developer's premises. Some level of integration exists for most of the hosting facilities with the popular systems Trac or Git.

Interesting facilities like a project management web interface, developer ranking based on skills and/or contribution to different projects, project and people search, virtual hosting, or shell access could be also important in taking a decision for hosting different subsystem of the project that can be released as open-source.

Recommended open-source hosting solutions

Based on the analysis realized in Section 1.2, several best performers could be identified. Based on their performance for the different criteria in analysis, a list of "preferred" solutions could be identified. The best performing solutions include the following hosting facilities:

1. **SourceForge (1st recommended).** SourceForge is one of the most known and widely-used open-source hosting facilities offer the full range of tools, with good coverage for administrative, community or developer tools.

   With a complete support for hosting facilities, good coverage of OSI-approved licenses, and full support for the commonly used Version Control Systems, SourceForge is the ***first recommendation*** for hosting the open-source release and project site for this subsystem.

2. **Project Kenai (2nd recommended)**. Although Project Kenai is a recently developed open-source hosting facility, it offers good coverage of the different tools (administrative, community, and developer) in analysis. Project Kenai represents "*Sun Microsystem's onramp for the developer cloud experience of tomorrow, where you can host your open source projects and code, as well as find and collaborate with developers of like mind*."

   Offering the same support for OSI-approved licenses, commonly used Version Control Systems, Project Kenai is an interesting alternative for SourceForge hosting. It is our ***second recommendation*** for hosting the open-source release and project site for this subsystem.

3. **GForge (3rd recommended)**. GForge offer an interesting ***third alternative*** for the open-source release, even if some of its facilities are quite limited. Being initially a fork of SourceForge, GForge offer nice support for the required tools and facilities for hosting the open-source release.

   Additionally, GForge offer an interesting alternative installation: developers could optionally download one of GForge servers (Advanced Server or Community Edition) and host project development on their own premises.

4. **Google Code (4th recommended)**. Finally, ***fourth recommendation*** for hosting the open-source release and project site for this subsystem is Google Code. This solution met the basic requirements for project supporting tools, open-source licensing and versioning system. However, it requires external support for project site, virtual hosting, or mailing lists, support that could be offered by other Google developments. Thus, Google Code is oriented to the core facilities for project hosting and management.

5. **Assembla**. Assembla represents a fully developed solution for open-source hosting, offering a large number of facilities. Probably it is the most important competitor for SourceForge. However, it was removed from our recommendation because its facilities are not freely available.