Evaluation of SCM systems: SVN, Git and Mercurial

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1 Introduction

The main goal of this trade-off analysis is to recommend a suitable SCM (software configuration management) system for start-up called **Amiguetes S.L.**, to install in their own infrastructure (personal PCs, servers) and hold the development projects of the company.

1.1 Context Information

1.1.1 Overview

For a better understanding on how the trade-off analysis of the different SCMs was performed it is necessary first to know some context information about the people who started this analysis and their environment.

At the beginning of this year (2011) and due to the complex situation in the Spanish labor market, five friends decided to join efforts and begin a small start-up company called **Amiguetes S.L.** that may bring new professional opportunities to them.

The idea is to take advantage of the professional experience that each of them have in the Software development field, specially implementing Open Source solutions.

As currently the market of mobile applications is very active and Android[1] is the leading solution (according to the latest studies[2]) they decide to focus their business model in producing high-level add-ons to improve the functionalities of Android-based smartphones and tablets.

One detail to take into account is that these friends live in different parts of Spain, so they will work in a distributed way and not everyone will have the same role and dedication to the project, three of them (the most experienced) will be part of the "Core" of the developers layer (according to the "Onion Model"[3]) taking the responsibility of implementing moreless the 70% of the code and fully dedicated to the project; and the other two will be part of the "Co-developers" layer, with just part-time dedication.

Also the idea is to incorporate external contributors (the "Active Users" layer) from past projects, FLOSS communities interested in mobile applications development, friends etc.

To be able to coordinate the contributions of such heterogeneous group of developers they realize that it is going to be mandatory to use a SCM[4] system and from the existing FLOSS solutions they decide to perform a trade-off analysis of the following ones: Subversion[5], Git[6] and Mercurial[7], this document is the result of that comparison.

Some of the “core” developers have experience using CVS[8] so they would prefer to move to a more similar system like Subversion but others have heard about distributed SCMs and think it would better to try those kind of solutions (Git or Mercurial) due to the distributed nature of the project’s contributors.

1.1.2 Interactions

Which SCM to use is an important decision, but source code management is only a part of a software company’s infrastructure, and setting how this component interacts with others will uncover some aspects that should be desirable to be found in the used SCM.

- To facilitate the involvement of new developers in the community, the ”core developers” have the idea of setting up a common development environment that any commiter can setup locally and start contributing as soon as possible to the project, for that reason, it should be desirable that our SCM has:
  - Easy installer in most used desktop OS (Windows, Linux, MacOS), packaged bundles (.rpm, .deb etc...) will be preferable but also it should be possible to install the repository from sources.
  - Repository GUI clients, that make easier the management of code for those developers who are not very familiar with command-line clients and instead prefer to operate with the repository graphically.
  - As part of the common development environment setup, the core developers have already selected Eclipse as the development default IDE because it provides a dedicated Android plugin[9] that boosts implementation process. It would be good also to be able to integrate the SCM version management system into Eclipse so all the code management process gets unified in a single tool.
- To increase the visibility of the company repository, it would be useful if it is web browseable. This may be faced in two ways: whether the SCM provides a web browser interface, or the repository can be accessed in some way from the company’s website, written in Drupal[10] (for example, by a Drupal module to view repositories).
- The core developers want to try to bring new contributors to their community, therefore it would be nice if there are existing plugins to integrate the repositories with software forges, specially with bug tracking systems. They must decide in which public forge they prefer to host their developments, possible options they are evaluating include: Google Code[11], Launchpad[12], Sourceforge[13] or Github[14].
- To give more value to the SCM which they need to chose, the group of friends were wondering it would be good if the SCM could be integrated in a *virtual machine* like **VMWare**[1] or **VirtualBox**[2]. As we said before,

[1] http://www.vmware.com/
[2] https://www.virtualbox.org/

at the beginning they want to use a forge which could be integrate the appropriate SCM, but thinking in the future maybe to expand their business and buying their own machines this question is really interesting.

- Would be interesting to know if the SCM could have any system to make automatic backups in an easy way, could be an integrated system, a plug-in to add to the SCM, or using conventional scripts.

1.1.3 List of requirements

Here we list the above mentioned requirements, grouped in categories:

- Functionality: web browseable, distributed, with plugins for Eclipse and forges integration. Virtual machine integration, integration with backup systems.
- Usability: easy to use or similar to CVS, easy installer, GUI clients.
- Adoption: widely used tool (easy that new developers know it)
- Community: live and smart community, according with the desired image for a startup company.
- Documentation and support: easy to learn, not required to spend time in solving problems.

1.2 Research goals

These are the main goals of this research:

- Analyze the different SCM in order to know if they match our requirements (yes/no; degree)
- Provide a comparative report showing metrics explaining the appropriate degree to these requirements, following an standardized process.
- State in the report other important features of each SCM, to take into account despite of not being considered initially as requirements.
- Recommend the tool that best matches the company's requirements.
- Explain the weak points of the chosen tool, to take into account.
- Provide references on the data sources, methodology and process followed, in order to make this study reproducible.

2 Methodology

2.1 Data sources

For analyzing the different software configuration management systems and provide a reliable comparison, data from different sources will be used. In this section we present the most important ones; other sources will be referenced or explained directly (for example using a footnote) when the corresponding fact, metric or argument is discussed.

2.1.1 Existing work

Some of the members of Amiguetes S.L., had carried a previous research about this topic and fulfilled some OpenBRR sheets with metrics about Git, Subversion and Mercurial. We will analyze that existing work and take it as an initial point.

The original templates of the previous research and evaluation of SCMs, made by the students of Master on Libre Software of Universidad Rey Juan Carlos (Madrid, Spain) in 2011, may be downloaded from:

Git: `https://gitorious.org/mswl-eval/mswl-eval/blobs/master/ProjectEvaluation_Report/OpenBRR_Templates/BRR_Template_Git_mswl.ods`

Mercurial: `https://gitorious.org/mswl-eval/mswl-eval/blobs/master/ProjectEvaluation_Report/OpenBRR_Templates/BRR_Template_Mercurial_mswl.ods`

Subversion: `https://gitorious.org/mswl-eval/mswl-eval/blobs/master/ProjectEvaluation_Report/OpenBRR_Templates/BRR_Template_SVN_mswl.ods`

For more information about this topic you can visit the MSWL Project Evaluation Subject's Moodle site in `http://docencia.etsit.urjc.es/moodle/course/view.php?id=125`.

2.1.2 Official websites

The official websites of the SCMs provide reliable information about their functionality, history, documentation and support. These sites are listed below:

- Subversion: `http://subversion.apache.org`
- Git: `http://git-scm.com/`

- Mercurial: `http://mercurial.selenic.com`

2.1.3 Other data sources

Ohloh metrics will be taken into account. Ohloh[15] is a free public directory of open source software and people, owned and operated by BlackDuck Software Inc., a consulting company specialized in gathering and providing information about open source software projects. Some metrics present in Ohloh site are provided by Ohloh specific tools and others are provided by gathering the information provided by Ohloh users for their own projects or the projects they are interested in.

In addition to this, some metrics will be calculated directly inspecting the source code and history of the development of the different SCMs (that is, their own commit logs). For this task, FLOSSMetrics databases will be used. FLOSSMetrics[16] stands for Free/Libre Open Source Software Metrics, and it is an European Commission founded project with the goal to (among others) publish a large scale database with information and metrics about libre software development. The dumps for Git, SVN and Mercurial contain data about the development of each project until November 22nd, 2011.

2.2 Type of approach: OpenBRR

The Business Readiness Rating model (OpenBRR)[17] is intended to help IT managers assess which Open Source software would be most suitable for their needs. Open Source users can also share their evaluation ratings with potential adopters, continuing the virtuous cycle and "architecture of participation" of open source.

The initiative is lead by the Carnegie Mellon West University, Spike Source, Intel and O'Reilly's Code Zoo and offer proposals for standardizing different types of evaluation data and grouping them into categories.

The framework suggests the following metrics to be analyzed and evaluated:

- Functionality
- Usability
- Quality
- Security
- Performance
- Scalability
- Architecture

- Support
- Documentation
- Adoption
- Community
- Professionalism

The model is composed of the following phases:

- Phase 1 - Quick Assessment: defining and ranking of metrics and categories according to their importance within the product that is going to be evaluated.
- Phase 2 - Target usage assessment: Set the necessary category and metric weights according to the project's goals.
- Phase 3 - Data collection and processing: Gather data for each metric used in each category rating, and calculate the applied weighting for each metric, spreadsheets are used for this purpose.
- Phase 4 - Data translation: Use category ratings and the functional orientation weighting factors to calculate the Business Readiness Rating score and publish the software's Business Readiness Rating score.

The Business Readiness Rating model offers a trusted and open framework for software evaluation, this model aims to accelerate the software evaluation process with a systematic approach, facilitate the exchange of information between IT managers, result in better decisions, and increase confidence in high-quality open source software.

2.3 OpenBRR improvements with new metrics

Some OpenBRR requirements are evaluated with poor metrics. We are going to decide some more metrics to improve this evaluations.

2.3.1 Developers taking care of documentation

A new metric is introduced in the **Documentation** category. This category is measured in the original OpenBRR model with the existence of detailed documentation about the software, and the existence of user-to-user help. We also think that it is very important that while the software evolves, developers care about documentation updates. So we are going to introduce a new metric consisting in counting the number of commits with the word "documentation" in their log message. To normalize the metric we will divide the obtained sum by the total number of commits. The score assigned to this metrics will be:

- Less than 1% of total commits: 1
- Between 1% and 5% of total commits: 3
- More than 5% of total commits: 5

2.3.2 Distance between the two most active authors

A new metric is introduced in the **Community** category, consisting in measure the balance between the effort of the two most active authors of the project.

To calculate the metric we will divide the number of commits of each developer by the sum of the commits performed by the two of them, obtaining a percentage of the effort of the two more active developers. The raw score would be the difference between the two efforts.

We believe that depending too much on the main developer is a weakness for the a software developer community, since this individual may abandon the project and would be difficult to find a new leader. If most of the contributions are balanced between two persons, the weakness of depending on a certain individual would be less. On the other side, we need to take in account also the danger of having "two leaders" in a project: differences between them or disagreements in project roadmaps may lead to forks and damage the sustainability of the community. The same occurs when "no leader" can be clearly found: a project may lack of clear roadmap or nobody would assume responsibilities.

So the normalized scores to assign to this metric will be:

- More than 50%, or less than 10%: 1
- Between 20% and 30%: 5
- Other: 3

2.3.3 Longevity

A new metric is introduced in the **Community** category. This category is measured in the original OpenBRR model with the "Average volume of general mailing list in the last 6 months" and the "Number of unique code contributors in the last 6 months".

We think that the longevity of a given project must be measured combining two different criteria, in one hand the project's age, for example Subversion is more than ten years old and still alive which is a good point for that SCM. But apart from that, also it has to be analyzed if during the whole project lifecycle there has been development activity, a very old project with just a few activity is really useless for us :-)

Taking into account the previous assertions the normalized scores to assign to this metric will be:

- Young project (more than 1 year old) and increasing lines of code production : 1
- Medium project (more than 5 years old) and increasing lines of code production : 3
- Long project (more than 10 years old) and increasing lines of code production: 5

2.3.4 License

A new metric is introduced in the **Professionalism** category. This category is measured in the original OpenBRR model with "Project Driver" and "Difficulty to enter the core developer team".

We think it is a positive point that the SCM is licensed under an OSI-approved[3] FLOSS license. Also if the license allows to mix the product with proprietary code is an enhancement.

Taking into account the previous assertions the normalized scores to assign to this metric will be:

- Open Source but Non-OSI-Approved license: 1
- OSI-Approved and "GPL-like" license: 3
- OSI-Approved and "weak copyleft" license: 5

2.3.5 Programming Languages

This new metric is introduced in the **Architecture** category since we think is really important the way the SCM is building.

For us is important to give to new developers the possibility to be involved in a FLOSS project, if the project is completely building based in just one programming language is possible that a developer who doesn't know about the language used on it, can't collaborate in a FLOSS project which is really interesting for him, in the other side, if the project uses more programming languages is easier new developers can participate on it.

But also is important the amount of code used in a concrete programming language, wouldn't be good if we say that a FLOSS project uses three different programming languages when one of them just has 100 lines of code.

[3]http://www.opensource.org/licenses

To give a rating to value this new metric we are going to follow the next rules:

- 80% or more written in one language: 1
- 80% or more written in two languages: 3
- 80% or more written in three or more languages: 5

2.3.6 Contributors

This new metric is introduced in the **Community** category since we think is really important the way developers collaborate in the projects.

FLOSS projects are based in two different ways to collaborate, the *cathedral* and *the bazaar*, the first has very few group of developers who develop the entire application, the second one is based in much more collaboration from much more developers.

We prefer this last one option, we think is much more convenient and healthy for a FLOSS project if the effort is distributed as much as it can be possible, but we know that is really difficult because despite having projects with big amount of developers, a very important number of commits are done by the same developers following the *onion skin model*, so we are going to follow the next model to value this metric:

- 40% or more developed by less than 3 developers: 1
- 40% or more developed between 3 to 7 developers: 3
- 40% or more developed by more to 7 developers: 5

3 Analysis and Results

3.1 OpenBRR application

We are going to follow the "Business Readiness Rating for Open Source (Open-BRR)" whitepaper[17] to apply this model to the evaluation of the software configuration managements Git, Mercurial and Subversion.

3.1.1 Phase 1: Quick Assessment

This first phase has been already applied before our analysis, and three SCM passed it to further evaluation: Git, Mercurial and Subversion.

3.1.2 Phase 2: Target Usage Assessment

This second phase consists in, as explained before, setting the category and metric weights according to the company's requirements. The canonical OpenBRR model recommends to focus in not more than seven categories, but in order to provide a more general overview, we will consider the twelve categories present in the model.

If we were considering all the categories equal in importance, we should weight each one of them with 8,33%. Our assessment will consider this number, in order to weight more than 8% the categories considered relevant for the company, and less than 8% the categories considered not so relevant for the company.

The most important selected categories have been **functionality**, **usability** and **community**. Each one of them have been given a weight of 12%, so together they reach 36% of the total evaluation.

The OpenBRR model provides no ready-to-collect metrics for **functionality**, allowing the evaluator to create them in a tailored way according to the customer's requirements. This is an opportunity for us to measure here specific requirements as support for distributed environments and local repositories (important for Amiguetes S.L.) or support for branches, tags, diffs and merges (specific for SCM functionality). Other desirable functionality metrics for the SCM used in Amiguetes S.L. would be the existence of internationalization and multi-platform support, since the company wants to lower the access barrier to new developers, despite the language they speak or the operating system they use.

About **usability**, we already stated that Amiguetes S.L. need a SCM easy to learn so the developers may not invest too much time in infrastructure tasks and focus on developing software for Android.

The existence of an active **community** is also important for Amiguetes S.L.: it would be a marketing failure to choose an old, near-to-death or latter abandoned SCM for a young, starting company (plus the costs of migration to a new SCM if the currently used is being abandoned by their [formers] developers and active users.

Support and **documentation** are also desirable aspects, that ensure the liveness of the community of any piece of software, and also guarantee usability since good instructions and advices smooth out the difficulties of any tool. For this reasons this two categories have been weighted with 10%. With the same arguments we could consider **adoption**, but we also need to know that there are two influent factors in adoption: on one hand, we need time for any tool to be widely used, so a young SCM not very popular now, may in the future be the most used. On the other hand, "trends" have also influence in the IT world; and certain companies or tools come in a particular time to the crest of the wave, but quickly sink into obscurity due to the dynamism of the technologies environments. So adoption have been scored with 9%, still over the mean, but not so much.

About **security**, the given weight has been 8%, since Amiguetes S.L. has no particular requirements about this aspect, but it is a desirable feature specially for the future when new developers come to the community.

Performance and architecture are two categories weighted under the mean (6%). **Performance** is always good, but Amiguetes S.L. is a starting company and the intended pieces of software to develop are small widgets or applications, so it is not so important if there is a small lack of performance because the small projects would not suffer it. About **architecture**, it is true that some requirements have been mentioned about plugins to integrate the SCM with the Eclipse IDE and with software forges, but we consider those requirement very specific and it would be no good if a certain SCM have a very good architecture or many plugins but not the ones that we need.

The less important categories for this evaluation are **quality**, **scalability** and **professionalism**. These categories have been weighted with 5%, which makes a sum of 15% of total evaluation. This low weight does not mean that Amiguetes S.L. does not care about these aspects, but that the three evaluated SCM already provide high scores for these categories and the small differences between them are not so determinant to choose one or the other.

In conclusion, in table 1 we can present here the categories and their resulting weights for our evaluation.

Rank	**Category**	**Weight**
1	Functionality	12%
2	Usability	12%
3	Quality	5%
4	Security	8%
5	Performance	6%
6	Scalability	5%
7	Architecture	6%
8	Support	10%
9	Documentation	10%
10	Adoption	9%
11	Community	12%
12	Professionalism	5%
	TOTAL WEIGHT	**100%**

Table 1: OpenBRR Target Usage Assessment for SCM to be used in Amiguetes S.L.

3.1.3 Phase 3: Data collection and processing

The team have used the OpenBRR framework with a spreadsheet provided by the students of Master on Libre Software (Universidad Rey Juan Carlos, Madrid, Spain), as commented in section 2.1.1. This spreadsheet has an initial set of metrics for each OpenBRR category, allowing to ponderate each metric and providing a normalized score according to the possible values obtained in measurements. To the existing set of features, 6 more metrics have been added to the corresponding categories, in order to materialize the OpenBRR improvements explained in section 2.3. Category weights have been introduced in the sheets. Each metric within each category should have a weighting factor to differentiate the metric's importance withing that particular category. For simplicity, we have distributed equally the different weights when the particular set of metrics was not relevant according to the company's requirements, and followed a similar process as in phase 2 (target usage assessment) when the measured aspects were particularly relevant to the company's requirements. As a result, we have a new blank OpenBRR spreadsheet to use as template for the data collection and processing. This spreadsheet can be downloaded from:

`https://gitorious.org/mswl-eval/mswl-eval/blobs/master/ProjectEvaluation_Report/OpenBRR_Templates/BRR_Template_amiguetes.ods`

Each metric has been measured using one of the following methods:

- Trusting the metric score and reference provided by previous research (mswl templates) mentioned in section 2.1.1.
- Measuring ourselves the aspect or category using the data sources mentioned in section 2.1.
- Searching the Internet and getting the needed information from official mailing lists or websites (and referencing that link in the corresponding "Raw score" cell with a "comment" in the cell.

In most of the cases you can find a reference from were we obtained the metric by inspecting the "Raw score" cells (showing the cell comments). When a reference is not provided, it means that that metric could not be found or the own tool command line help or main website announces that aspect so it is easy to find.

For the unknown data, we have assigned the worst possible normalized score to the corresponding metric, so the results is not biased by unreliable information.

3.1.4 Phase 4: Representative Metrics and their Scoring

After collecting all the data and normalizing using the OpenBRR spreadsheet, scores for each category and a global score is automatically calculated. The resulting work can be downloaded from this URLs:

- Git OpenBRR spreadsheet: `https://gitorious.org/mswl-eval/mswl-eval/blobs/master/ProjectEvaluation_Report/OpenBRR_Templates/BRR_Template_Git_larjona_final.ods`
- Mercurial OpenBRR spreadsheet: `https://gitorious.org/mswl-eval/mswl-eval/blobs/master/ProjectEvaluation_Report/OpenBRR_Templates/BRR_Template_Mercurial_cvaliente_final.ods`
- Subversion OpenBRR spreadsheet: `https://gitorious.org/mswl-eval/mswl-eval/blobs/master/ProjectEvaluation_Report/OpenBRR_Templates/BRR_Template_SVN_eparrillae_final.ods`

The total results for each SCM are: Subversion 3.2215, Git 3.774, Mercurial 3.66. The SCM obtaining a better score is **Git**, being the one recommended to be used in Amiguetes S.L.

After analyzing Subversion we have reached the conclusion that although this SCM is quite stable and reliable and very easy to use its centralized design it is becoming a bit obsolete nowadays therefore it does not seem to be a good option for a start-up company like Amiguetes S.L. The company may need in the future certain functionalities that are not currently present in SVN and as the planned releases are not so frequent as in the other solutions it may take a bit longer until the tool is updated, also the fact that not all the most popular FLOSS forges provide support for SVN is a big disadvantage for this option as the company has in mind trying to move their code in the future to a public forge to try to join more contributors to its community, for that reason we discard SVN as a valid solution for Amiguetes S.L.

Once SVN is discarded, we had to choose between the other two distributed solutions Git or Mercurial, the main weaknesses for Mercurial compared to Git is the fact that it is not as known as Git and do not have behind such a huge community like the Linux Kernel development team. Also in the analysis of the contributors distribution we have seen that if one of the key ”core developers” leave Mercurial that could be problematic, this something that has to be taken into account by Amiguetes S.L.

3.2 Recommended tool

Git[6] is a cross-platform, distributed Open Source Software Configuration Management (SCM), focused in speed and high performance.

Current version is 1.7.8, released in December 2nd, 2011 [4], licensed under the terms of **GNU GPLv2**.

Among its main features we can mention that allows distributed development (local copies of the entire development history),support for different protocols, fast branching and merging, Unix-like toolkit design. There are multiple pieces of software, developed by the Git community an others, to integrate this SCM with other tools and extend its functionality.

3.2.1 Deployment

People of Amiguetes S.L. should read carefully the Appendix about Git to begin to learn the tool, specially from where to download, where are the main websites to obtain help and documentation for quickly learn to use the tool.

It would be nice if they create and maintain a wiki in their website dedicated to new developers, explaining the steps that they are following to learn an use the tool: the problems that newcomers to Amiguetes S.L. community face to use git for contributing may be similar to the problems that Amiguetes S.L.'s developer faced when they began to use the tool.

They can install git-core and later add some of its plugins or tools to get the integration that they wanted: eGit plugin to use with Eclipse, gitweb to offer their repositories as web browseable if they host a mirror of the repository in their webserver.

They can host their repositories in many software forges. If they decide to use GitHub, they can use certain references when committing to link GitHub issue tracker with git.

They can visit the page `https://git.wiki.kernel.org/articles/i/n/t/Interfaces,_frontends,_and_tools.html` to learn more about tools to integrate git with backups, continous integration systems, and other things they need.

They can use Agit application (`https://github.com/rtyley/agit`) to interact with their git repositories from their tablets and other Android devices.

They should set some rules about how to name branches and other type of git usage. The Note from the Git Maintainer[5] may be a good guide since git developers know very well how git works and how to take the best from it and use it in an elegant way.

Android source code is also developed using Git. This is an advantage: it would be easy for Amiguetes S.L. to integrate in the Android community since they use the same tools. The Android Open Source web pages about version

[4]`http://article.gmane.org/gmane.linux.kernel/1223707`
[5]`http://git-blame.blogspot.com/p/note-from-maintainer.html`

control (`http://source.android.com/source/version-control.html`) may also be very useful for them, since they can act as a good reference or guide to set the Git policy of Amiguetes S.L.

4 Conclusions and further work

4.1 Lessons learnt in this exercise

In this report we have learnt to evaluate three different SCMs following one of the evaluation methodologies we have seen in the "Project Evaluation" subject of the Master, the OpenBRR methodology.

We have to say that we believe this methodology covers most of the main aspects of a given project in terms of functionality, usability, scalability etc... so we think it is a very good way to start evaluating a given solution.

But while evaluating the metrics we saw that there were some analysis aspects that were out of the scope of OpenBRR templates done in the class and it was necessary to introduce new metrics to complete the report, specially we think the templates failed to provide a "community oriented" point of view, for that reason most of the metrics we have introduced are in the "Community" category.

In any case, this exercise provides a very valuable way to perform trade-off analysis of certain FLOSS products and the fact of having templates that automate the calculation of the overall score for each solution is really useful.

4.2 Reproducibility instructions

This study may be reproduced at any time with updated data, or little changes to adapt the OpenBRR model to different requirements.

To update the evaluation with new data, the steps to follow are:

- Obtain the new dumps from FLOSSMetrics or directly clone the repositories and pass LibreSoft CVSanaly tool to them.
- Create a database for each repository and dump the FLOSSMetrics data or the CVSanaly SQL data to it.
- Recalculate each metric by visiting the link present in each cell's comment, or following the steps mentioned in the corresponding section of this document.

- For measuring Functionality category, follow the OpenBRR Whitepaper[17].

If you just need to add a new SCM to the pool of projects evaluated, you can download a copy the "blank template" (tailored weights and functionality category) from here:

`https://gitorious.org/mswl-eval/mswl-eval/blobs/master/ProjectEvaluation_Report/OpenBRR_Templates/BRR_Template_amiguetes.ods`

Then you rename your copy to use it with the data of the new SCM, and fulfill the spreadsheet with the corresponding data (similar steps as updating the study with new data, explained before).

If the requirements change, it will be necessary to rewrite all the weights of OpenBRR categories and metrics, in order to match the new requirements. You can follow a similar process as has been done before (section 3.1).

4.3 About this study

4.3.1 People involved, resources invested

This trade-off analysis has been implemented by the following people of the MSWL:

- Cesar Valiente Gordo (cesar.valiente@gmail.com).
- Esther Parrilla-Endrino (eparrillae@gmail.com).
- Laura Arjona Reina (larjona99@gmail.com).

We have done this report using Gitorius as collaborative tool, the repository created by Laura can be found in the following location:

`https://gitorious.org/mswl-eval`

All work performed is licensed under the Creative Commons Attribution 3.0 License[6].

All sections of this report have been implemented by the three of us, with the exception of the specific SCM appendix that have been implemented by:

- SVN: Esther Parrilla-Endrino.

[6]http://creativecommons.org/licenses/by/3.0/

- Git: Laura Arjona Reina.
- Mercurial: Cesar Valiente Gordo.

About the new metrics introduced for OpenBRR improvements, each one of us write two new metrics:

- Laura Arjona Reina designed metric “Developers taking care of documentation” (explained in section 2.3.1 and integrated in the customized OpenBRR spreadsheet for Amiguetes S.L., category “Documentation”[18]), and metric “Distance between the two most active authors” (explained in section 2.3.2 and integrated in the customized OpenBRR spreadsheet for Amiguetes S.L., category “Community”[18]).
- Esther Parrilla-Endrino designed metric Longevity (explained in section 2.3.3 and integrated in the customized OpenBRR spreadsheet for Amiguetes S.L., category “Community”[18]), and metric “License” (explained in section 2.3.4 and integrated in the customized OpenBRR spreadsheet for Amiguetes S.L., category “Professionalism”[18]).
- Cesar Valiente Gordo designed metric Programming Languages (explained in section 2.3.5 and integrated in the customized OpenBRR spreadsheet for Amiguetes S.L., category “Architecture”[18]), and metric “Contributors” (explained in section 2.3.6 and integrated in the customized OpenBRR spreadsheet for Amiguetes S.L., category “Community”[18]).

5 Appendix I: SVN Analysis (Esther Parrilla-Endrino)

5.1 Overview

Subversion[19] (often abbreviated SVN) is a cross-platform Open Source Software Configuration Management (SCM) released by CollabNet Inc.[7] in October 2000. The purpose of the SVN project was an effort to write an open-source version-control system which operated much like CVS[8] but with improved functionality and easier usage.

In November 2009, Subversion was donated to the Apache Incubator and it became a top-level Apache project on February 17, 2010[9]. The current stable version of the project is 2.7.1 released last 5th of December 2011.

The tool is written in C and was initially licensed under a derivative of the Apache Software License, v1.1. Since version 1.7, SVN was relicensed under the Apache Public License v2.0[10].

5.1.1 Functionality

Subversion provides the basic features of CVS or any other centralized SCM:

- Source files add, commit, remove, diff, merge etc....
- Tagging and Branching.
- Local or remote access (custom "*svn://host/path*" protocol), with support for SSH secure layer if necessary.
- Client-Server architecture.

Also the the following improvements are provided by SVN:

- Commits as true atomic operations (single revision per commit).
- Renamed/copied/moved/removed files retain full revision history.
- Versioning for directories, renames, file metadata and symbolic links.
- Native support for binary files, with space-efficient binary-diff storage.

[7]http://www.open.collab.net/
[8]https://savannah.nongnu.org/projects/cvs/
[9]http://www.sdtimes.com/link/33886
[10]https://www.apache.org/licenses/LICENSE-2.0.html

- Easy branches/tags with simple "svn copy" operations.
- File locking for unmergeable files ("reserved checkouts").
- Path-based authorization.
- Language bindings for C#, PHP, Python, Perl, Ruby, and Java.
- Two types of repositories backend: Berkeley DB and Fast Secure File System (FSFS)[20].
- Support for WebDAV access (over http or https) using the mod_dav_svn module for Apache 2 HTTP server.

5.1.2 Website, documentation (where is everything)

The central point to access Subversion is its Apache project page[5], there I could find the following information:

- Project overview information, features[11], news[12] and future Roadmap[13].
- Documentation[14] for end-users and developers and FAQ[15].
- Source and binaries Download page with their corresponding release notes[16].
- Community resources like source code Contribution page[17], bugtracker[18], Mailing lists[19] and Wiki[20].
- The Subversion Reference Book[21] is available in HTML, PDF and DocBook formats.

5.2 Sustainability

5.2.1 Developers and contributors (individuals, organizations, companies)

As I said before, Subversion was created by CollabNet Inc. in 2000 who was its main sponsor until November 2009 when the project was accepted into the

[11] https://subversion.apache.org/features.html
[12] https://subversion.apache.org/news.html
[13] https://subversion.apache.org/roadmap.html
[14] https://subversion.apache.org/docs/
[15] https://subversion.apache.org/faq.html
[16] https://subversion.apache.org/download/
[17] https://subversion.apache.org/contributing.html
[18] https://subversion.apache.org/issue-tracker.html
[19] https://subversion.apache.org/mailing-lists.html
[20] https://wiki.apache.org/subversion/
[21] http://svnbook.red-bean.com/

Apache Incubator in order to become part of the Foundation's efforts. The incubation of Subversion was the first step to becoming an ASF Top-Level Project.

Both communities were very close as all of the ASF's projects use Subversion for source code version control, and Subversion itself relies on many Apache projects such as Apache Portable Runtime (APR) and HTTP Web Server, therefore both communities have benefited from open feedback channels, where requirements from the Subversion project have helped drive new features to various Apache projects, and vice versa[21].

In October 2009, WANdisco[22] announced the hiring of core Subversion committers as the company moved to become a major corporate sponsor of the project. This included Hyrum Wright[23], president of the Subversion Corporation and release manager for the Subversion project since early 2008, WANdisco has continued its active contributions to Subversion during these years[22].

As in other FLOSS projects, the collaboration between all partners involved in Subversion project has not been always easy, for example during January 2011 the Apache Software Foundation requested WANdisco to clarify their role in the Subversion effort[23].

5.2.2 Customers and Users

Due to its maturity, Subversion is a SCM widely used in many privative and Open Source projects like for example:

- The Apache Software Foundation projects[24].
- FreeBSD project[25].
- GCC project[26].
- Ruby project[27].
- PHP project[28].
- Django project[29].

Also Subversion is present in several forges including:

- Sourceforge[30].

[22]http://www.wandisco.com/
[23]http://www.hyrumwright.org/
[24]https://www.apache.org/dev/version-control.html
[25]http://svnweb.freebsd.org/base/
[26]http://gcc.gnu.org/svn.html
[27]http://svn.ruby-lang.org/
[28]http://php.net/svn.php
[29]https://code.djangoproject.com/
[30] http://sourceforge.net/apps/trac/sourceforge/wiki/Subversion

- Google Code[31].
- Microsoft Codeplex[32].
- Debian's Alioth[33].
- Assembla[34].
- GForge[35].
- BerliOS[36].
- Morfeo[37].
- Cenatic[38].

5.3 Timeline, Roadmap, Future

Since Subversion joined the Apache Software Foundation it adopted the same release policy[39] as the rest of the projects, in the "Making Subversion Releases" page[25] I find all the necessary information regarding this issue like:

- High-level release planning and policies, such as version numbering and compatibility. To get new features wide testing before the code enters the formal "stabilization period", alpha and beta versions are released, these versions are only for people who want to help test, and who understand that there may be incompatible changes before the final release. The stabilization period for a new release normally lasts four weeks, and allows to make conservative bugfixes and discover showstopper issues, once the code is in good shape it officially enters the release candidate path and will become an stable product ready to be downloaded.
- What steps to take when it is time to create a release.
- How to constructing a set of release tarballs. This section discusses the steps required to go from source code in the repository to a set of distributable .tar.gz or .zip files with the desired content. Subversion produces a set of release-like tarballs from the trunk development line every night, but these have no testing and are only recommended for users looking to run the bleeding edge, or test a particular bug fix, without building directly from the repository.

[31]https://code.google.com/p/support/wiki/SubversionFAQ
[32] https://blogs.msdn.com/b/codeplex/archive/2008/09/14/codeplex-launches-support-for-tortoisesvn.aspx?Redirected=true
[33]http://wiki.debian.org/Alioth/Svn
[34]http://www.assembla.com/features/subversion
[35]http://gforge.org/gf/project/gforge/scmsvn/
[36]http://developer.berlios.de/svn/?group_id=394
[37]http://forge.morfeo-project.org/scm/?group_id=28
[38]http://forja.cenatic.es/scm/?group_id=105
[39]https://www.apache.org/dev/release.html

In the Subversion Apache web site I can find also information of the project's Roadmap[26] with a tentative timetable for the next few upcoming releases, currently I can see there information about the already released SVN v1.7.0 from the 11th October 2011 and the planned 1.8.0/1.9.0/2.0.0 releases for the coming months/years. Also it is possible to get the release notes from previous deliveries[40].

Also in the same page there is an interesting table containing the list of "Most wanted features" (more requested bugfixes, useful enhancements etc...) and the planned version were those features will be included.

It is clear that Subversion is a very stable project (more than 10 years old) and most of the new features are pending bugfixes that represent no major changes in the way the tool works, taking a look at the planned releases I see no disrupting updates there which is something good as it ensures an stable status but may be bad also because it means the SCM is not going to evolve a lot and at some point it could become a bit obsolete compared with other solutions.

5.4 OpenBRR details and references

Taking as a baseline the OpenBRR SVN template that my class group implemented in the "Project Evaluation" subject, I have updated the features rating according to the requisites of our Amiguetes S.L. use case, the final version of the template is available in our collaborative repository under:

`https://gitorious.org/mswl-eval/mswl-eval/blobs/master/ProjectEvaluation_Report/OpenBRR_Templates/BRR_Template_SVN_eparrillae.ods`

The final score for SVN is 3, that means is an acceptable solution for Amiguetes S.L. but also means we may find a better SCM for us, the template contains comments in each cell to clarify why I have assigned the final scores based on the investigation in several sources such as Wikipedia[41], Ohloh[42], FLOSSMetrics data etc...

From the template results we can derive the following conclusions:

- **Functionality Rating**: This is a key issue in our analysis, in general we see that Subversion covers most of the functionalities needed by a SCM and it is specially good in the fact that it is easy to use and provides lots of graphical clients that makes this SCM the perfect solution for people who have little experience in source code version control. The most negative point in SVN is that it is not distributed and this is really a handicap if

[40]https://subversion.apache.org/docs/release-notes/
[41]https://en.wikipedia.org/wiki/Comparison_of_revision_control_software
[42]http://www.ohloh.net/p/subversion

the contributors of a given project need the flexibility to be able to work offline instead of having a single centralized repository.

- **Usability**: For Amiguetes S.L. it is essential that the selected SCM is easy to use as not everyone in the team is familiarized with version control tools. From the template we see that SVN is easy to install and use and provides several graphical clients that makes easier the work with the tool for newcomers.
- **Quality**: For a small company like Amiguetes S.L. which is using SVN for its own code management it is not required a top-level quality system, just if the tool it is in a stable status (and SVN it is) that allows its usage by the people in the company it is enough.
- **Security**: In terms of Security applies the same as above, it is important to cover the minimum baseline (allow remote secure access for example which is covered in the Functionality part) but no advanced security features are required.
- **Performance**: In terms of performances from the template analysis we see that SVN is not so fast as other SCMs such as Git and for Amiguetes S.L. we should take this into account.
- **Scalability**: In principle Amiguetes S.L. is going to be a small company and it is not intended in the future a huge grow, therefore scalability is not a key feature although it is covered in SVN
- **Architecture**: The most important aspect for Amiguetes S.L. is that SVN architecture is modular and provides a public API to implement your own enhanced plugins (see Functionality sheet for details).
- **Support**: For a small company like our example use case the support is an important factor, we see that although there is an active mailing list and the project's web page contains links to all necessary resources (see previous section about "Web Site and Documentation") there is no professional support for Subversion.
- **Documentation**: As we saw in the previous section "Web Site and Documentation" there are lots of resources for this (User Manual, Developers manuals, Wiki, FAQ etc...).
- **Adoption**: Here we see that SVN has been adopted as the reference SCM solution for several stable FLOSS projects (see previous section "Customers and Users for more details).
- **Community**: SVN is supported by an active community of developers coordinated by the Apache Software Foundation and that ensures the project sustainability in the future.
- **Professionalism**: Here again the fact that the Apache Software Foundation is the main supporter of Subversion is very important, also we see that following the ASF guidelines there is a very strict process to accept new contributors in the SVN core developers team.

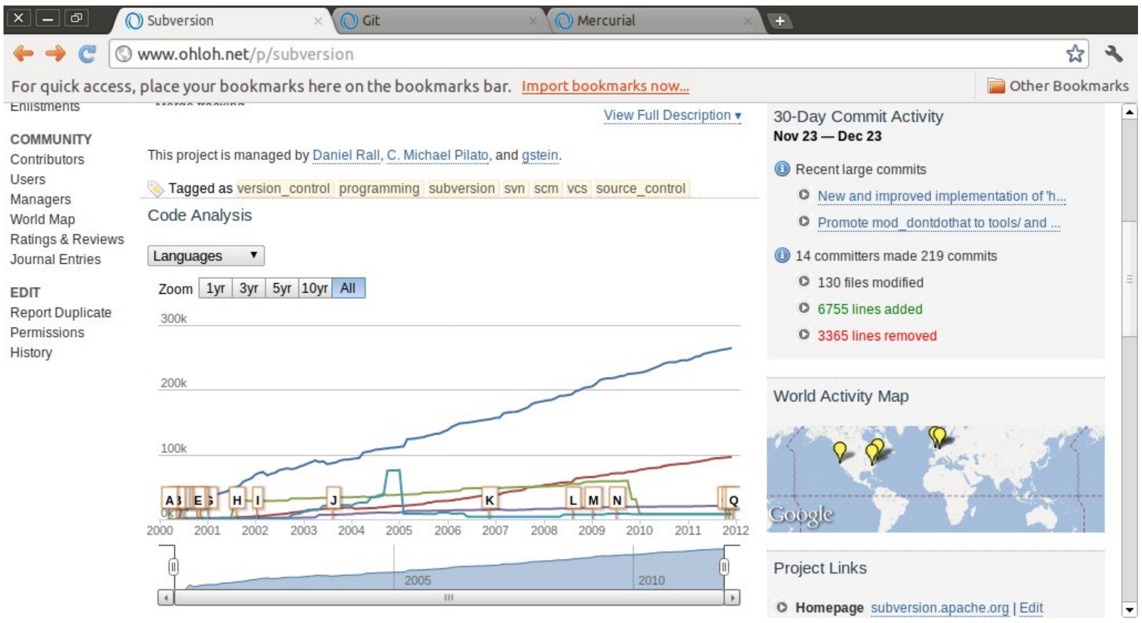
5.5 Additional metrics and evaluations

Apart from the metrics provided by OpenBRR we have also considered the following ones:

5.5.1 Longevity

According to Wikipedia[43] we can say that SVN is the oldest version control system as it was created in October 2000 whereas Git was released in April 2005 and Mercurial also in April 2005. At first sight this seems to be an advantage as it means the tool is very stable and with an active community that has been able to make grow and keep alive the project, that give us confidence to choose it as our Amiguetes S.L. SCM. But if we analyze the evolution of contributors commits in the last ten years we see also that due to the fact that SVN is stable the contributions in recent years have not grown so much as in the other SCMs.

Figure below shows the evolution of lines of code from SVN Ohloh statistics page[44]:



This project is managed by Daniel Rall, C. Michael Pilato, and gstein.

Tagged as version_control programming subversion svn scm vcs source_control

30-Day Commit Activity
Nov 23 — Dec 23

Recent large commits
- New and improved implementation of 'h...
- Promote mod_dontdothat to tools/ and ...

14 committers made 219 commits
- 130 files modified
- 6755 lines added
- 3365 lines removed

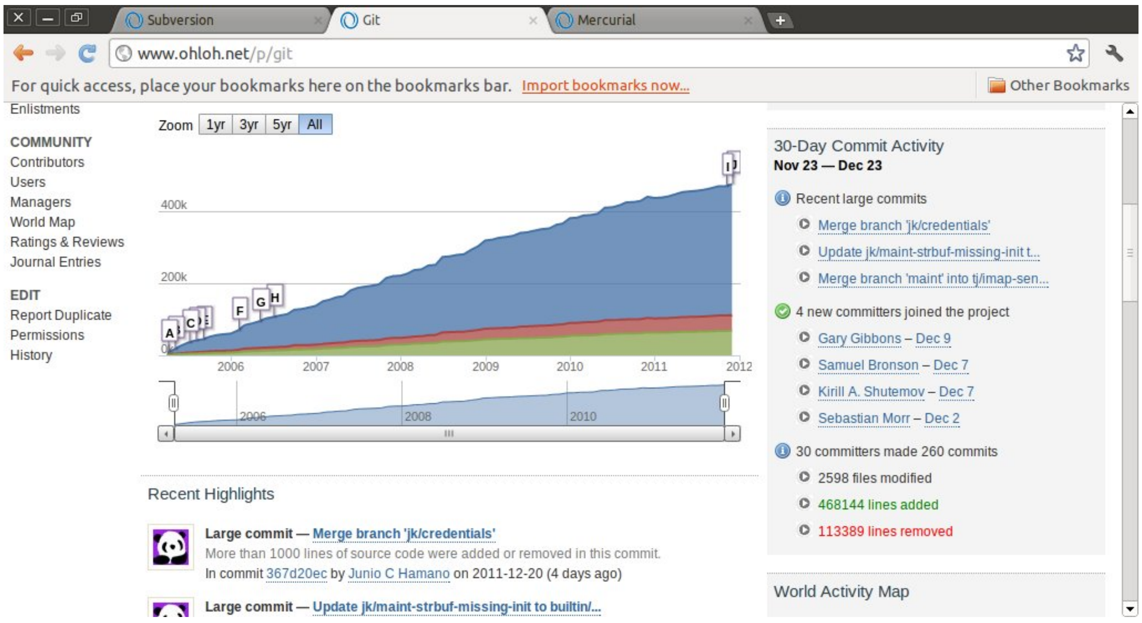
Homepage subversion.apache.org | Edit

Figure 1: *Subversion Code Evolution*

The next figure below shows the evolution of lines of code from Git Ohloh statistics page[45]:

---

[43] http://en.wikipedia.org/wiki/Comparison_of_revision_control_software
[44] http://www.ohloh.net/p/subversion
[45] http://www.ohloh.net/p/git



Enlistments

COMMUNITY
Contributors
Users
Managers
World Map
Ratings & Reviews
Journal Entries

EDIT
Report Duplicate
Permissions
History

30-Day Commit Activity
Nov 23 — Dec 23

Recent large commits
- Merge branch 'jk/credentials'
- Update jk/maint-strbuf-missing-init t...
- Merge branch 'maint' into tj/imap-sen...

4 new committers joined the project
- Gary Gibbons – Dec 9
- Samuel Bronson – Dec 7
- Kirill A. Shutemov – Dec 7
- Sebastian Morr – Dec 2

30 committers made 260 commits
- 2598 files modified
- 468144 lines added
- 113389 lines removed

World Activity Map

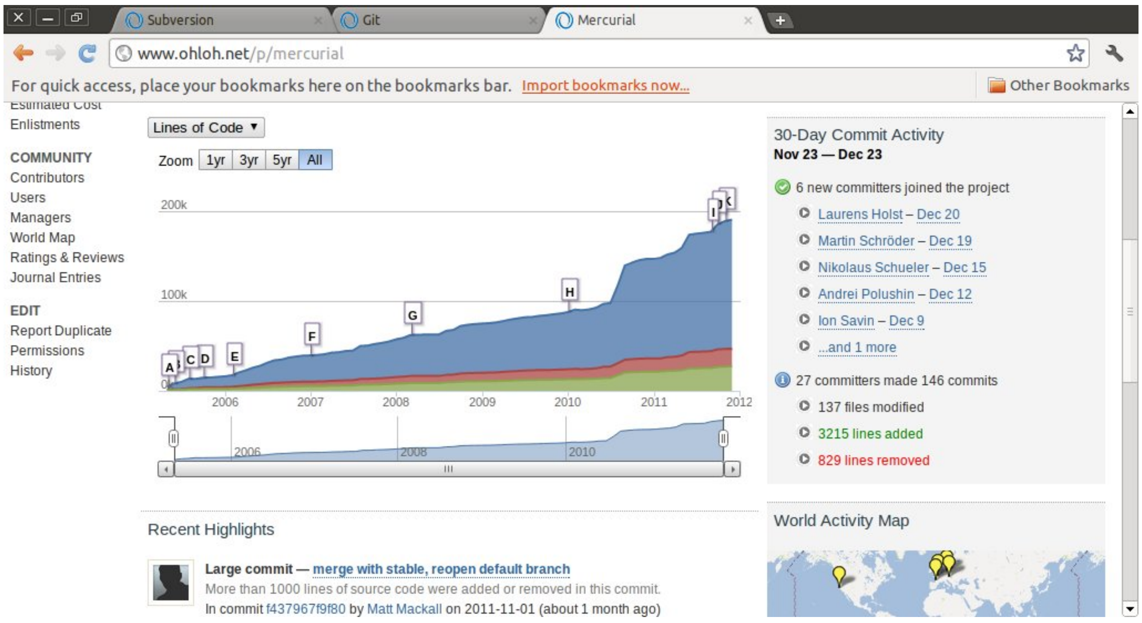
Recent Highlights

Large commit — Merge branch 'jk/credentials'
More than 1000 lines of source code were added or removed in this commit.
In commit 367d20ec by Junio C Hamano on 2011-12-20 (4 days ago)

Large commit — Update jk/maint-strbuf-missing-init to builtin/...

Figure 2: *Git Code Evolution*

Finally, figure below shows the evolution of lines of code from Mercurial Ohloh statistics page[46]:



Estimated Cost
Enlistments

COMMUNITY
Contributors
Users
Managers
World Map
Ratings & Reviews
Journal Entries

EDIT
Report Duplicate
Permissions
History

30-Day Commit Activity
Nov 23 — Dec 23

6 new committers joined the project
- Laurens Holst – Dec 20
- Martin Schröder – Dec 19
- Nikolaus Schueler – Dec 15
- Andrei Polushin – Dec 12
- Ion Savin – Dec 9
- ...and 1 more

27 committers made 146 commits
- 137 files modified
- 3215 lines added
- 829 lines removed

World Activity Map

Recent Highlights

Large commit — merge with stable, reopen default branch
More than 1000 lines of source code were added or removed in this commit.
In commit f437967f9f80 by Matt Mackall on 2011-11-01 (about 1 month ago)

Figure 3: *Mercurial Code Evolution*

[46]http://www.ohloh.net/p/mercurial

If we compare the three figures we see that the evolution of lines of code commited to Subversion is not so high as the ones in Git and Mercurial, also an interesting parameter shown by Ohloh is that in the last month for Git project four new committers have joined the project, for Mercurial six new committers have joined the project and for Subversion no new committers have joined. This could mean that Git and Mercurial are younger projects but currently are in a more active status than Subversion which is a disadvantage for SVN.

According to the metric scores previously defined, Subversion is a long project (more than 10 years old) that also has an increasing number of lines of code production (not so explosive as in Git or Mercurial that is true ;-)) therefore the score for Subversion in this metric is 5.

5.5.2 License

Subversion is released under the Apache Public License (APL) v2.0[47], all software produced by The Apache Software Foundation or any of its projects or subjects is licensed according to the terms of this license.

The Apache License is a "weak copy-left" license, being reciprocal in the same way that the GNU Lesser General Public License[48] and the Mozilla Public License[49] are, the reciprocal clauses of the license force that changes and modifications to APL-licensed code need to be contributed back. Subversion trademarks and logo is out of the APL and belongs to the Apache Software Foundation.

Currently the Free Software Foundation considers the Apache License compatible with the GNU Public License v3[50] but the Apache Software Foundation does not think the same[27], therefore it is not clear if Subversion code could be mixed with GPL code.

The fact that the Subversion license is one of the OSI-approved[51] FLOSS licenses is clearly a strong point in favor of this solution, also being a weak copyleft license allows to mix the product with proprietary code.

Therefore the final score for this metric is 5.

5.5.3 Programming languages

Figure below shows a pie diagram with the distribution of the different programming languages used in the implementation of Subversion:

[47]http://svn.apache.org/repos/asf/subversion/trunk/LICENSE
[48]http://www.gnu.org/licenses/lgpl.html
[49]http://www.mozilla.org/MPL/
[50]http://www.gnu.org/licenses/gpl.html
[51]http://www.opensource.org/licenses

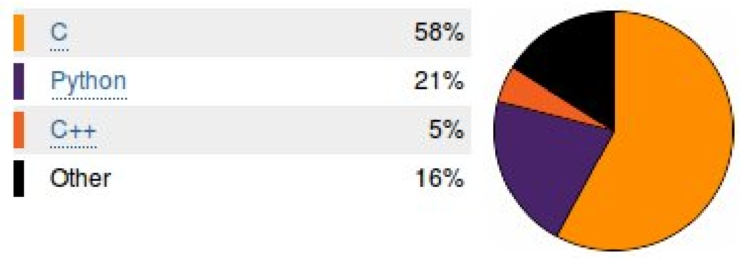


Figure 4: *Subversion Programming Languages (Data retrieved from Ohloh)*

As we see in the figure, the core component of the SCM is written in C[52] together with some C++ code (together they represent the 63% of the code), the rest of the implementations are done using Python (21%) or other languages (16%).

The languages used to implement Subversion (C, C++, Python) are part of the most popular ones according to the latest surveys[53]. Figure below shows Tiobe's survey on popularity of languages in December 2011:

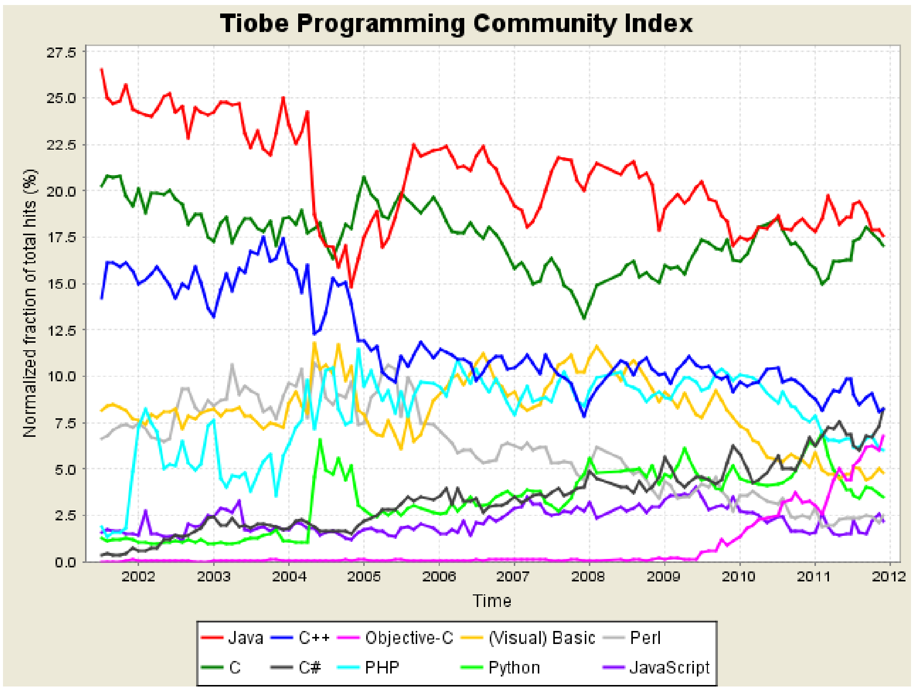


Figure 5: *Tiobe survey on most popular languages by Dec 2011*

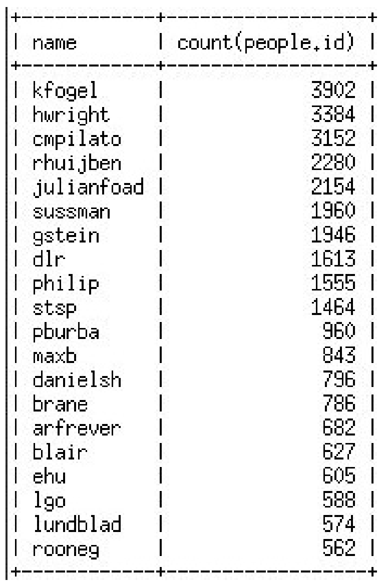
The usage of popular languages for its implementation makes easier to find

52http://subversion.apache.org/docs/api/1.6/modules.html
53http://www.tiobe.com/index.php/content/paperinfo/tpci/index.html

new developers to join the Subversion community, also as the core of the system is implemented using C/C++ which are very similar and stable languages that ensures a robust codebase for the tool.

5.5.4 Contributors

Regarding particular contributors, the project has a dedicated page[24] where people can find all necessary info to start working in the project as developer, translator etc... If I take a look at the FLOSSMetrics data provided[54] by Daniel Izquierdo (our teacher in this subject) for the Subversion project I can analyze that data using MySQL and R and get the total amount of commits within the project which is 40869 commits. Also, I can get list of top-20 contributors of the project:



```
+------------+------------------+
| name       | count(people.id) |
+------------+------------------+
| kfogel     |             3902 |
| hwright    |             3384 |
| cmpilato   |             3152 |
| rhuijben   |             2280 |
| julianfoad |             2154 |
| sussman    |             1960 |
| gstein     |             1946 |
| dlr        |             1613 |
| philip     |             1555 |
| stsp       |             1464 |
| pburba     |              960 |
| maxb       |              843 |
| danielsh   |              796 |
| brane      |              786 |
| arfrever   |              682 |
| blair      |              627 |
| ehu        |              605 |
| lgo        |              588 |
| lundblad   |              574 |
| rooneg     |              562 |
+------------+------------------+
```

Figure 6: *SVN Top-20 Commiters*

From the above table and taking into account what I have already learnt about the "Onion Model"[55] in FLOSS projects I can say that:

- There is a group of three developers (kfogel, hwright and cmpilato) which compose the "Core Team" of the project (by the way "kfogel" corresponds to Karl Fogel, the author of one of the reference Open Source books "Producing Open Source Software"[56]).

[54] http://docencia.etsit.urjc.es/moodle/mod/resource/view.php?id=6590
[55] http://docencia.etsit.urjc.es/moodle/mod/resource/view.php?id=4177
[56]http://producingoss.com/

- Also there is a group of active ”Co-developers” (from cmpilato to stsp) that is composed of those developers that contribute frequently to the project but do not have such an important role as the core.
- The rest of the contributors (from the 11th until the latest one) are part of the ”Active Users” layer, these are people that contributes occasionally to the project, mainly in specific parts of the code not so crucial.

With the total number of commits calculated before, I can easily calculate the total amount of effort of the Core and Covedelopers layers together, this effort is the 57% so I can say that the effort in Subversion project is well-divided between its members and if one of the key persons suddenly leaves the project that would be a problem but it would not put in risk the project as there are other people that can take the lead.

Figure below shows the density diagram of ”Developers vs Number of commits”, I can see that it confirms what I have stated in terms of effort division within Subversion, there is a big group of occasional commiters but also the small group of key commiters is uniform.

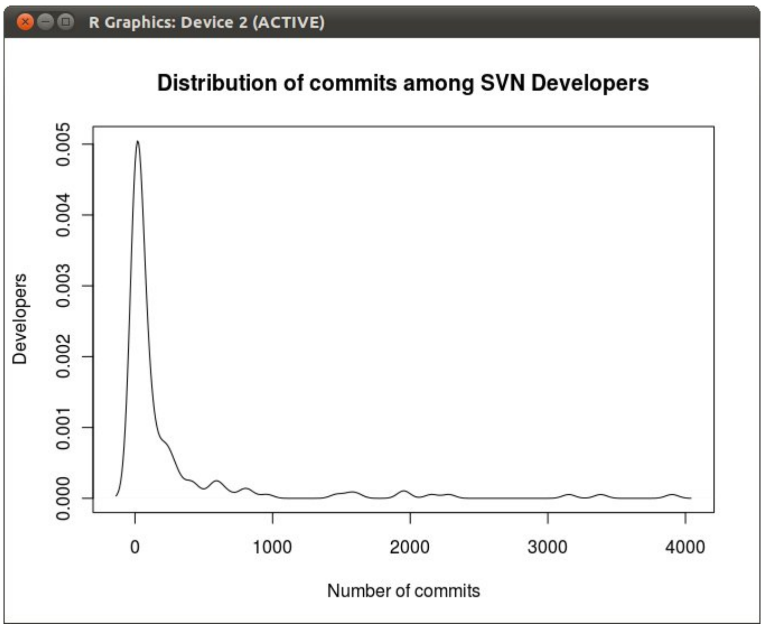


Figure 7: *SVN Developers vs Number of commits*

5.5.5 Developers taking care of documentation

Using the database dump from FLOSSmetrics for Subversion project, first we count the number of commits:

```
select count(*) from scmlog;
```

giving a total of 40869 commits. Now we count the commits mentioning the word “documentation”:

```
select count(*) from scmlog where message like '%Documentation%' or message like '%documen
```

giving a total of 783 commits. The relationship is 783/40869 = 0,019158, being between 1 and 5% and so giving a score of 3 in the metric.

5.5.6 Distance between the two most active authors

Using the database dump from FLOSSmetrics for Subversion project, we count the commits of the two most active authors

```
select people.id, people.name, count(*) as numcommits from scmlog , people
where people.id = scmlog.committer_id group by committer_id
order by numcommits desc limit 2;

+-----+---------+------------+
| id  | name    | numcommits |
+-----+---------+------------+
|   2 | kfogel  |       3902 |
| 120 | hwright |       3384 |
+-----+---------+------------+
2 rows in set (0.26 sec)
```

For normalizing the metric, we calculate the percentage of effort for each author: kfogel performs 3902 / (3902 + 3384) = 0,5355 (53,55% of the two-people team effort). Hwright performs 3384 / (3902 + 3384) = 0,4644 (46,44%). So the distance is 53,55 - 46,44 = 7,11%, giving a score of 1.

5.6 SWOT analysis

Figure below shows the SWOT[30] diagram for Subversion:

	Strengths	Weaknesses
Internal Analysis	Maturity/Stability (+10 years), Sustainability (ASF main supporter), Easy to use, Many GUI and IDE plugins, Good documentation (Books, Wiki, FAQ), Active Community (Mailing Lists)	Not centralized, No planned disrupting updates, Slow roadmap
	Opportunities	Threats
External Analysis	Supported by the ASF, Present in the main Spanish forges	May become obsolete, Supported by less forges in the future

The diagram summarizes the strong/weak points of Subversion that we have seen in our previous analysis and also the opportunities/threats that come together with this solution, this diagram is crucial for Amiguetes S.L. as it provides the overall picture of Subversion and helps to decide if this SCM covers what is expected or not:

- **Strengths**: The main strengths of Subversion are derived from the fact that it is really easy to use and provides lots of GUI and IDE plugins and also the project stability after more than 10 years of its creation, during this time the project has been able to create a very active community around it that ensures its future.
- **Weaknesses**: Because the project it is in a stable status no major updates are planned and this is a disadvantage because we may need that a certain functionality which is important for us to be included as soon as possible in the next stable release but that next release is planned for a long time, also disruptive features that could be included in other less-mature SCMs as Git, Mercurial or Bazaar possibly will be included in SVN later than in the other tools. Another big challenge (possibly the biggest one) for SVN is that nowadays due to the distributed nature of many FLOSS projects it is desirable to use a distributed SCM and SVN is not like that and upgrading the tool to make it distributed is not a trivial change that I am not sure if the ASF is ready to implement at this stage of the project.
- **Opportunities**: The biggest opportunities for Subversion users comes with the support of the ASF, changes like the one we said before about doing SVN distributed can only be implemented by a huge community like the ASF, with their support the project could start boosting its development and bring brand new features that can compete with the rest of the SCMs. Apart from this, in the particular case of Amiguetes S.L., as we have seen the most important Spanish forges (Morfeo, Cenatic etc...) are supporting Subversion and this could be a change to move easily their code to one of this forges and start working with the forge in a straightforward way.
- **Threats**: Because SVN is one of the oldest SCMs this could cause that it may become obsolete compared to the other solutions if its community

is not able to implement on time new features that users are requesting, this thread will cause that less forges will include SVN support.

6 Appendix II: Git Analysis (Laura Arjona Reina)

6.1 Overview

Git[6] is a cross-platform, distributed Open Source Software Configuration Management (SCM) originally written by Linus Torvalds to be a replacement for BitKeeper[57] SCM in the **Linux kernel**[58] project. Git is focused in speed and high performance.

The development started in the beginning of April 2005. The first "official" release was in December 2005, but it was used long before in production environments (for example, the Linux Kernel development)[59]. The last "feature" version is 1.7.8, released in December 2nd, 2011 [60].

The current leader is Junio C. Hamano (Linus Torvalds announced him as official Git maintainer few months after the development started[61] and Hamano lead the project since then).

The software is mainly written in C and Perl languages.

Git is licensed under the terms of **GNU GPLv2**.

6.1.1 Functionality

Git is distributed version control system focused on speed and high-performance. Among its main features we can list:

- Distributed development. Each developer may have a local copy of the entire development history, and commit changes while being disconnected.
- Support for different protocols: HTTP, FTP, rsync, git (plain and with SSH).
- Fast branching and merging, which allows strong support for non-linear development.
- Cryptographic authentication of history.
- Toolkit design (collection of many small tools and scripts in the low-level-end) and related tools and plugins (as Graphical User Interfaces, Version Control Interface layers. . .) as frontends.

[57] http://www.bitkeeper.com/
[58] https://www.linux.com/
[59] `http://marc.info/?l=git&m=113515203321888`
[60] `http://article.gmane.org/gmane.linux.kernel/1223707`
[61] `http://marc.info/?l=git&m=112243466603239`

6.1.2 Website, documentation (where is everything)

You can find git source code in many different forges. Some of them are Google Code (`http://code.google.com/p/git-core/`), GitHub (`https://github.com/gitster/git`), Kernel.org (`git.kernel.org/?p=git/git.git`) and all its mirrors of course, SourceForge.net (`http://git-core.git.sourceforge.net/git/gitweb.cgi?p=git-core/git-core`), SourceForge Japan (`http://git.sourceforge.jp/view?p=git-core/git.git`).

The main source of information for Git is the README file in any mirror of the repository. In that file links to further sources of information can be found:

```
[..]
Please read the file INSTALL for installation instructions.
[...]
See Documentation/gittutorial.txt to get started
[...]
Many Git online resources are accessible from http://git-scm.com/
including full documentation and Git related tools.

The user discussion and development of Git take place on the Git
mailing list -- everyone is welcome to post bug reports, feature
requests, comments and patches to git@vger.kernel.org. To subscribe
to the list, send an email with just "subscribe git" in the body to
majordomo@vger.kernel.org. The mailing list archives are available at
http://marc.theaimsgroup.com/?l=git and other archival sites.

The messages titled "A note from the maintainer", "What's in
git.git (stable)" and "What's cooking in git.git (topics)" and
the discussion following them on the mailing list give a good
reference for project status, development direction and
remaining tasks.
```

There is no official website of the project, as we can see, but we can consider 3 important websites to learn about the project:

- `http://git-scm.com/`, maintained by Scott Chacon, is a very good compilation of the most important information and links. We can say that it is user-oriented.
- `https://git.wiki.kernel.org/` is the meeting point of the git and Linux Kernel developers, and information about the community, integration with other tools, events and news are found. We can say that it is developer-oriented.
- `http://git-blame.blogspot.com/` is the blog of Junio Hamano, Git Maintainer. Most of the information posted there is about Git: announces of new releases, project new challenges, open discussions...

6.2 Sustainability

6.2.1 Developers and contributors (individuals, organizations, companies)

Git is a “community-driven” free software project in the sense that it is not a product from any software company, however, some of the main developers are paid developers for maintaining Git or git-related projects in important companies (Junio Hamano and Shawn Pearce in Google[62], Jeff King in GitHub[63]).

6.2.2 Users

Many software projects use Git as software configuration management system. Among them we can find[6]:

- Git itself of course
- Linux Kernel
- Perl
- Eclipse
- Gnome
- KDE
- Qt
- Ruby on Rails
- Android
- PostgreSQL
- Debian
- X.org

On the other side, we can find that Git repositories are supported in many used software forges (either for libre or privative software projects):

- GitHub[14]: 1,216,063 people hosting over 3,586,678 git repositories
- Google Code[11] supports Git since July, 2011.
- Gitorius

[62]http://www.ohloh.net/accounts/gitster and http://www.ohloh.net/accounts/spearce
[63]https://github.com/blog/766-jeff-king-peff-is-a-githubber

- BitBucket
- Assembla
- JavaForge

Among the important forges that do not support Git (yet), we have Launchpad and CodePlex.

6.3 Timeline, Roadmap, Future

Since Git is a community driven project, there is not a clear long-term Roadmap for the new features to include: the volunteer developers work on what they want[64].

However, one of the main worries of the Git developers are to facilitate the work of the Linux Kernel development, and subsequently, enhance the main features of this SCM: speed and high performance specially for big projects.

From Git Maintainer's blog `http://git-blame.blogspot.com/` we can learn that important features to include in next release (1.7.9) are[65]:

- Better and more auditable communication in pull based workflow by supporting electronically signed pull requests that records more meaningful branch description;
- More pleasant end-user experience by providing credential helper API to allow platform native keychain implementations to supply authentication material during "git push" and "git pull";
- i18n of messages out of the end-user facing programs;
- Better large-contents support.

Junio Hamano also announces in his blog the different releases, and when one release is announced, the development cycle time estimation for the next release is announced too.

6.4 OpenBRR details and references

Taking as a starting point the OpenBRR Git template that my class group implemented in the "Project Evaluation" subject, the spreadsheet has been changed or improved in several ways:

[64]There is an interesting discussion about this topic in the git list (message `kerneltrap.org/mailarchive/git/2010/11/16/44916` and follow-ups)

[65]`http://git-blame.blogspot.com/2011/12/moving-forward-to-179.html`

- All weights in Category Ranking and Category Rating and Metrics sheets have been changed to match Amiguetes S.L. requirements (more details in section 3.1).
- Functionality sheet has been rewritten with functionality aspects that match Amiguetes S.L. requirements.
- The "Quality" category was not fulfilled in the original template. This category is measured with two metrics related to software releases and four more metrics related to bug tracking. The metrics about software releases have been fulfilled, but the ones about bug reporting and tracking are difficult to measure in Git project, since the community does not use a bug nor issue tracking system, but only the official mailing list. Even the bugs are not numbered and the subject of the mail messages related to a reported bug change frequently (and the recommended tag [BUG] is rarely used). This does not mean that the developer community does not care about bugs in Git project, but the handling of the reported issues is not standardized, which is in fact a limitation for improving the quality of the project. For this reason, bug-related metrics have been marked with the lowest score.
- Other categories' metrics have been fulfilled or corrected (Performance tuning, Professional support, 3rd party plugins, difficulty to enter the core developer team) and references for metric sources added to other metrics.
- New metrics have been included and scored according to the descriptions in section 2.3.

The final version of the template is available in our collaborative repository under:

`https://gitorious.org/mswl-eval/mswl-eval/blobs/master/ProjectEvaluation_Report/OpenBRR_Templates/BRR_Template_Git_larjona.ods`

The final score for Git is 3,59, that means is good solution for Amiguetes S.L.

From the template results we can derive the following conclusions:

- **Functionality Rating**: This is a key issue in our analysis, and Git obtains an extraordinary good result, because "git-core" can be configured to make many different things and the design is very modular and efficient, with many tools or commands that extend the functionality.
- **Usability**: For Amiguetes S.L. it is essential that the selected SCM is easy to use as not everyone in the team is familiarized with version control tools. Git is basically a set of command-line tools, easy to install and use, once you learn the basics. For people needing graphical clients, many tools are available so each person may decide the one that suites best to her skills.

- **Quality**: This seems a weak point of Git. The software has proven its quality (by being used in many production systems with strong requirements, as the Linux Kernel Development), but that quality is threatened by the fact that the development depends on a very small set of committers (and highly on the Git maintainer), and the handling of bugs, support requests, roadmap etc is performed in a very home-made way, without tools that standardize the workflows and allow the scalability of the development community. However, quality is a low-weight category for the requirements of Amiguetes S.L. so the low score of Git in this aspect does not affect too much to the global score.

- **Security**: In terms of Security applies the same as above. There are not recent public security holes discovered in Git; this may mean that it is a secure tool, but also that security holes are not handled in a standardized way. But no advanced security is required for Amiguetes S.L. so Git passes well this "test".

- **Performance**: Git obtains a good score in performance, indeed this is one of the main goals of this SCM.

- **Scalability**: In principle Amiguetes S.L. is going to be a small company and it is not intended in the future a huge grow, therefore scalability is not a key feature although it is well covered in Git, specially because of its distributed nature.

- **Architecture**: Git's modularity and popularity have made possible to find many plugins and tools to integrate Git with development IDEs, forges, continuous integration systems... This category is low-weighted in the Amiguetes OpenBRR sheet since main functionality is measured in the "Functionality" category/sheet, but Git still obtains the highest possible score in the Architecture category.

- **Support**: For a small company like our example use case the support is an important factor. Git obtains the best possible score in this category, for two main reasons: following the very active Git mailing list, where you don't need to be subscribed to send emails and even patches, you obtain the most important feedback from the community. On the other side, Git's popularity and the increasing adoption have created a business niche for many companies offering git hosting along with git training and support, so although the Git Developer teams does not provide professional support, many of their members work as paid git developers in some companies or give training or talks about git in a professional way, but also making publicly available all the documentation (talk slides, videos, even books published with Creative Commons licenses), so the support is available for small git users too, not only for the companies able to pay for it.

- **Documentation**: As we saw in the previous sections there are different publications and web sites available with Git-related documentation. Everybody is allowed to participate in the Git mailing list and the git developers, a small team, discuss and decide which changes to include in the "master" branch, so they act as quality filters to the information and features developed. We also find that the git maintainer and git developers also care about documentation, not only the source code.

- **Adoption**: Here we see that Git has been adopted as the reference SCM solution for several stable FLOSS projects and public forges. In addition to this, books about Git have been published, and GitHub, the biggest software forge with git support, has been a key factor to improve the adoption of this tool in the software environments.

- **Community**: Git is supported by an very active, small community of developers plus a long-tail group of many contributors, in a typical "onion model" software project. This makes the project advance, and the only weak point is the fact that the git maintainer, Junio Hamano, is performing most of the work in the development team, what puts the project in danger if he gets out for some time, for any reason. But fortunately, it seems he is happy with the ongoing of the project and his plans are continuing working in Git (indeed he has ben hired by Google to ensure this).

- **Professionalism**: The project is driven by individuals, the git developers and the git maintainer, what is not well considered in this category. However, the team works well and reviews all the submitted work from external contributors, which ensures professionalism despite of being a certain company behind Git or not.

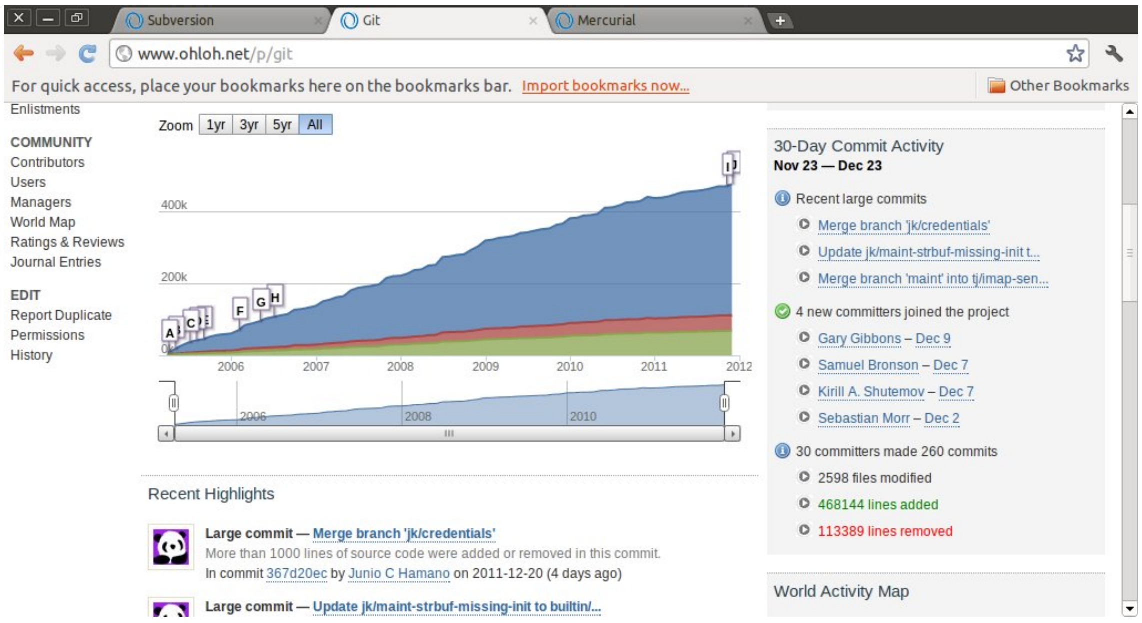
6.5 Additional metrics and evaluations

6.5.1 Longevity

As mentioned before, Git development began in April 2005, and it was quickly put in production sites.

Figure 8 shows the evolution of lines of code from Git Ohloh statistics page[66]:

[66]http://www.ohloh.net/p/git



30-Day Commit Activity
Nov 23 — Dec 23

Recent large commits
- Merge branch 'jk/credentials'
- Update jk/maint-strbuf-missing-init t...
- Merge branch 'maint' into tj/imap-sen...

4 new committers joined the project
- Gary Gibbons – Dec 9
- Samuel Bronson – Dec 7
- Kirill A. Shutemov – Dec 7
- Sebastian Morr – Dec 2

30 committers made 260 commits
- 2598 files modified
- 468144 lines added
- 113389 lines removed

Recent Highlights

Large commit — Merge branch 'jk/credentials'
More than 1000 lines of source code were added or removed in this commit.
In commit 367d20ec by Junio C Hamano on 2011-12-20 (4 days ago)

Large commit — Update jk/maint-strbuf-missing-init to builtin/...

Figure 8: *Git Code Evolution*

An interesting parameter shown by Ohloh is that in the last month for Git project four new contributors have joined the project[67].

According to the metric scores previously defined, Git is a medium-aged project (between 5 and 10 years old) that also has an increasing number of lines of code production therefore the score for Git in this metric is 3.

6.5.2 License

The fact that the Git license (GPLv2) is one of the OSI-approved[68] FLOSS licenses is a strong point in favor of this solution, although being a strong copyleft license it does not allow to mix the product with proprietary code.

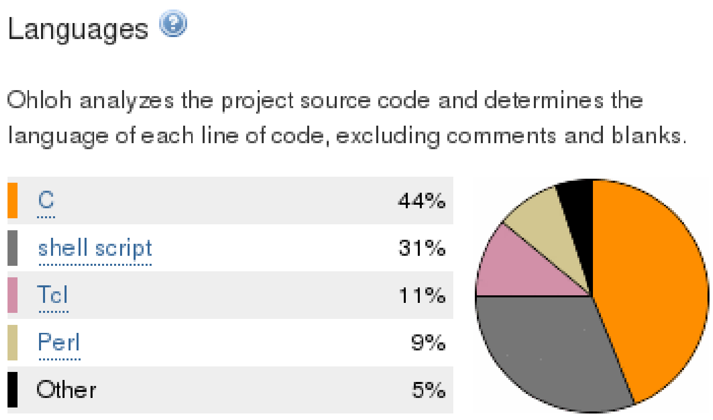
Therefore the final score for this metric is 3.

6.5.3 Programming languages

Figure 9 shows a pie diagram with the distribution of the different programming languages used in the implementation of Git:

[67]Ohloh mentions the word “committer” for them, but if we look at their “commits”, we find that their commits have been signed off by other committers (mostly the Git maintainer Junio Hamano)

[68]http://www.opensource.org/licenses


Languages

Ohloh analyzes the project source code and determines the language of each line of code, excluding comments and blanks.

🟧	C	44%
⬛	shell script	31%
🟪	Tcl	11%
🟨	Perl	9%
⬛	Other	5%

Figure 9: *Git Programming Languages (Data retrieved from Ohloh)*

As we see in the figure, the core component of the SCM is written in C together with shell scripts.

C is one of the most popular languages according to the latest surveys[69]. Figure 5 showed Tiobe's survey on popularity of languages in December 2011, and we can conclude that the usage of the C popular language for its implementation makes easier to find new developers to join the Git community, but we also need to consider that some parts are written in Tcl which is not a popular language nowadays, and also we cannot determine anything about the "shell scripts", since they are popular among sysadmins but not much used by developers.

6.5.4 Contributors

Git is an excelent example of a project that matchs the Onion Model[3], with its leader performing a huge part of the work (we will see it later), a small set of people with commit permissions and co-developing the tool[70], and a very big group of contributors submitting patches (the rest of "authors")[71].

We can query the FLOSSMetrics data in order to obtain the top-20 contributors and their commits in the history of the project:

```
 select people.name, scmlog.author_id, count(*) as numcommits
from people, scmlog where people.id = scmlog.author_id
group by people.id order by numcommits desc limit 20;
```

[69] http://www.tiobe.com/index.php/content/paperinfo/tpci/index.html
[70] In FLOSSMetrics database: select count(id) from people where id in (select distinct committer_id from scmlog); gives 30
[71] In FLOSSMetrics database: select count(id) from people; gives 957.

```
+-------------------------+-----------+------------+
| name                    | author_id | numcommits |
+-------------------------+-----------+------------+
| Junio C Hamano          |         5 |      10502 |
| Shawn O. Pearce         |       224 |       1327 |
| Linus Torvalds          |         1 |       1101 |
| Johannes Schindelin     |        54 |        729 |
| Jeff King               |       179 |        695 |
| Jonathan Nieder         |       530 |        557 |
| Jakub Narebski          |       189 |        488 |
| Eric Wong               |       118 |        466 |
| *var Arnfj*r* Bjarmason |       798 |        419 |
| Nicolas Pitre           |        16 |        349 |
| Johannes Sixt           |       227 |        328 |
| Paul Mackerras          |        13 |        323 |
| Rene Scharfe            |        17 |        289 |
| Christian Couder        |       184 |        283 |
| Simon Hausmann          |       298 |        252 |
| Nguyen Thai Ngoc Duy    |       300 |        252 |
| Brandon Casey           |       274 |        244 |
| Petr Baudis             |         4 |        221 |
| Thomas Rast             |       529 |        210 |
| Alex Riesen             |        96 |        210 |
+-------------------------+-----------+------------+
20 rows in set (0.27 sec)
```

If we sum the commits of Junio Hamano and Shawn Pearce, we find that they perform more than 40% of total commits. We believe that this distribution of effort is a little bit risky for the sustainability of the community (it would be positive for other aspects, however). So for this metric of Community git has a low score: 1.

6.5.5 Developers taking care of documentation

Using the database dump from FLOSSmetrics for Git project, first we count the number of commits:

```
select count(*) from scmlog;
```

giving a total of 28029 commits. Now we count the commits mentioning the word “documentation”:

```
select count(*) from scmlog where log like '%Documentation%'
                            or log like '%documentation%';
```

giving a total of 2371 commits. The relationship is 2371/28029 = 0,08459, being more than 5% and so giving a score of 5 in the metric.

6.5.6 Distance between the two most active authors

Using the database dump from FLOSSmetrics for Git project, we count the commits of the two most active authors

```
select people.id, people.name, count(*) as numcommits from scmlog , people
where people.id = scmlog.author_id
group by author_id order by numcommits desc limit 2;

+-----+-----------------+------------+
| id  | name            | numcommits |
+-----+-----------------+------------+
|   5 | Junio C Hamano  |      10502 |
| 224 | Shawn O. Pearce |       1327 |
+-----+-----------------+------------+
2 rows in set (0.18 sec)
```

For normalizing the metric, we calculate the percentage of effort for each author: Junio C. Hamano performs 10502 / (10502 + 1327) = 0,8878 (88,78% of the two-people team effort). Shawn O. Pearce performs 1327 / (10502 + 1327) = 0,1121 (11,21%). So the distance is 88,78 - 11,21 = 77,57%, giving a score of 1.

6.6 SWOT analysis

Table below shows the SWOT[30] diagram for Git:

	Strengths	**Weaknesses**
Internal Analysis	Easy to use, Many GUI and IDE plugins, Good documentation (Books, Wiki, FAQ), Active Community , Distributed, Strong copyleft license guarantees new versions be FLOSS	High dependence on Git Maintainer, Uncertain roadmap, No professional handling of bugs and vulnerabilities
	Opportunities	**Threats**
External Analysis	Great level of adoption, Present in the main forges and modern ones, Existence of external support and services	Not guaranteed economic sustainability, Companies may get much influence in the project by hiring the Git maintainer Goodness of the “core” product does not mean goodness of the 3rd party tools and wrappers

Most of the different aspects of this SWOT table have already been explained in former sections. The table may help Amiguetes S.L., in the case of deciding to deploy Git for their infrastructure, to pay attention to certain aspects that may announce future dangers of the Git project, and so, they would take advance in moving to a different SCM and not fail with Git, in this is the case.

7 Appendix III: Mercurial Analysis (Cesar Valiente Gordo)

7.1 Overview

Mercurial[72] is a distributed version control system. This SCM was started with the intention to be a replacement for BitKeeper[73] in the **Linux**[74] project in April 19, 2005 by Matt Mackall.

Mercurial is mainly implemented in **Perl**, and **Python**. It's supported on Windows and Unix-like systems as Linux, FreeBSD, MacOS X, etc. Mercurial is basically a command line program but there are some GUIs[75]

Mercurial is licensed under the terms of **GNU GPLv2**[76].

7.1.1 Functionality

Mercurial was designed to provide high performance and scalability is decentralized, allows fully distributed collaborative development, is robust handling managing both plain text and binary files, and has advanced branching and merging capabilities, while remaining conceptually simple.

As a important things which Mercurial has into an account are it has an integrated web interface and has also taken steps to ease the transition for **SVN** users.

Mercurial uses **SHA-1** hashes to identify revisions. For repository access via network, Mercurial uses *HTTP-based protocol* that seeks to reduce round-trip (RTT) requests, new connections and data transferred. Mercurial also work over **ssh** where the protocol is very similar to the HTTP-based protocol. By default, it uses a *3-way merge*[29] before calling external merge tools.

7.1.2 Website, documentation (where is everything)

The Mercurial website where any user can find all information regarding the packages to install, different versions, etc. is `http://mercurial.selenic.com/`. This website besides the mentioned information also includes the next sites:

[72]http://mercurial.selenic.com/
[73]http://www.bitkeeper.com/
[74]https://www.linux.com/
[75]Graphic User Interface
[76]http://www.gnu.org/licenses/gpl-2.0.html

- Download the binaries[77].
- Download the source code[78].
- A guide[79].
- Extensions to use with Mercurial[80].
- News and wiki[81].
- Information about the Mercurial sponsors[82].

7.2 Sustainability

As we've said before, in the Mercurial website we can find the major sponsors[83] which give Mercurial the assurance to be sustainable for long time. The most important of them are the *Gold Sponsors* which investment $20000 and above, they are:

- *Google*[84].
- *Fog Creek Software*[85].
- *Microsoft*[86].

After them we can find the *Silver Sponsors* with an investment between $5000 to $19999, they are:

- *Atlassian*[87].
- *Jane Street Capital*[88].
- *Allston Trading LLC*[89].

And finally, we have the *Bronze Sponsors* with an investment between $1000 to $4999 like:

[77] http://mercurial.selenic.com/downloads/
[78] http://selenic.com/hg
[79] http://mercurial.selenic.com/guide/
[80] http://mercurial.selenic.com/wiki/UsingExtensions
[81] http://mercurial.selenic.com/wiki/
[82] http://mercurial.selenic.com/sponsors/
[83] http://mercurial.selenic.com/sponsors/
[84] http://www.google.com/
[85] http://www.fogcreek.com/
[86] http://www.microsoft.com/en-us/default.aspx
[87] http://www.atlassian.com/
[88] http://www.janestcapital.com/
[89] http://www.allstontrading.com/

- *Mozilla Foundation*[90].
- *Symbian Foundation*[91].
- *Python Software Foundation*[92].
- *Jet Brains*[93].

7.3 Users

Mercurial is used as the SCM for a lot of important software projects, also is included in very important privative forges and FLOSS.

An example of projects which use Mercurial are:

- Adium.
- Illumos.
- Mercurial.
- Mozilla.
- Netbeans.
- OpenJDK.
- OpenIndiana.
- OpenOffice.org.
- Python.
- Symbian OS.
- Nokia Maps.
- Tuenti.
- Vim.
- W3C.

And forges which use Mercurial:

- CodePlex[94].
- Google Code[95].
- SourceForge[96].

[90]http://mozilla.org/
[91]http://symbian.org/
[92]http://python.org/psf
[93]http://www.jetbrains.com/
[94]http://www.codeplex.com/
[95]http://code.google.com/
[96]http://sourceforge.net/

- GNU Savannah[97].
- BerliOS[98].

As we can see very important projects and very important forges use Mercurial, so this is very good for the health of Mercurial project.

7.4 Timeline - Roadmap - Future

In the Mercurial website regarding the *project roadmap*[99] we can see how since December 31, 2007 in the version 1.0 we don't have new features for new ones, but we can see the planned new features (unknown dates):

- Partial Clone[100].
- Nested Repositories[101]
- inotify on Windows/OS X.
- Improved merging workflow.
- Fix case collision bugs.
- Some translations in place.
- Experimental support for history punching (TrimmingHistory)
- Faster incoming (rsync-like algorithm)

We think this road map is not updated, since the last *new features* info in 2007, and after that this information, we can not being too confident about it.

7.5 OpenBRR details and references

As previously we did in the appendices 5 and 6 taking as a baseline the OpenBRR Mercurial template implemented in the "Project Evaluation" class and completing the sheets that we didn't have finished, I have updated the features rating according to the requisites of our Amiguetes S.L. use case, the final version of the template is available in our collaborative repository under: `https://gitorious.org/mswl-eval/mswl-eval/blobs/master/ProjectEvaluation_Report/OpenBRR_Templates/BRR_Template_Mercurial_cvaliente.ods`

[97]http://savannah.gnu.org/
[98]http://www.berlios.de/
[99]http://mercurial.selenic.com/wiki/RoadMap
[100]http://mercurial.selenic.com/wiki/PartialClone
[101]http://mercurial.selenic.com/wiki/NestedRepositories

We can see now a brief summary about the twelve different methodologies used and how they fit in Mercurial.

- **Functionality Rating:** This is the most important feature in our SCM study, Mercurial covers the most important things we need to cover Amiguetes S.L. requisites, but also provides a new and important feature if we compare this SCM with others like SVN or CVS, and is the distributed functionality of this SCM. Distributed SCM like Mercurial or Git are maybe more versatile because the allow developers of different location work with is own copy of the repository (a complete copy), in his own computer to later merge the changes to the global branch, having the complete copy also means that the developer has all data, like different versions, can create studies based in all changes, etc.
- **Usability:** This is also a very important point in the deploy and use of this SCM in Amiguetes S.L. the people who are going to use this SCM are used to use CVS and not distributed SCM, but they are willing to learn about these kind of *news* distributed SCM, Mercurial is not difficult to use but as all transitions to new technologies is very important if the people want to learn and use it quickly.
- **Quality:** Amiguetes S.L. tries to be a software company a startup, and tries to be a flexible company which they don't want to spend a lot of time in quality process regarding their SCM, they prefer a SCM which will be flexible, stable and easy to use, in fact another one to fit to several standards but in the other side will be really difficult to use, anyway, Mercurial fits perfectly with a good level of quality and a prove of that is the amount of clients and users who use this SCM along the world.
- **Security:** Like the previous point, Amiguetes S.L. needs a SCM which offers a good point of security, but is not really mandatory that Mercurial will be the most secure SCM, anyway, with plugins Mercurial offers extra functionality which covers this part.
- **Performance:** Mercurial offers a good ratio of performance and being distributed the charge in the network also will be decreased.
- **Scalability:** As a distributed SCM the scalability is a fact in Mercurial, as a distributed system, the scalability is completely possible and in fact is the reason to be in Mercurial.
- **Architecture:** Mercurial is building to be a complete SCM by itself but also provides a set of plugins which give more functionality, and sturdiness to this SCM, plugins like the ones which offer PGP, or integration with MyLyn, or another tools are very important for any FLOSS community or company.
- **Support**: Mercurial has a really big community behind it so is easy to find the fix for near any problem you have with this SCM, also and we think ant the beginning for Amiguetes S.L. is not necessary, it's possible to find companies which offer professional support for Mercurial[102].

[102]http://www.clearvision-cm.com/mercurial.html

- **Documentation:** This feature is really close to the previous one and as a well known FLOSS project is possible to find a lot of documentation *"official"* in its own website and created by third parties (developers or companies).
- **Adoption:** As we can see in the **section 7.3 (Users)** Mercurial is used by a lot of customers (developers and companies) along the world, between this companies we can find since developer communities, SME's or big enterprises. Little by little this kind of SCM (like Git) are growing a lot in comparison with the older CVS or SVN SCMs.
- **Community:** As a well known FLOSS project used by thousand of people around the world, Mercurial has a very important and big community around it, not only the mainly developers, but others who use Mercurial in their projects, write in forums, write documentation, ask questions, etc. As a bad point Mercurial is not under the manage of any FLOSS foundation, it's managed by its main developer and the others who develop Mercurial with him, so is much better if the project would have a foundation as SVN with Apache Software Foundation, to preserve the rights, code, brands, etc.
- **Professionalism:** The way to work in Mercurial is not the way as work in bigger and well organized FLOSS communities like Apache Software Foundation, so as the previous point, would be much better if the project would be managed by a similar foundation, but anyway, the way to work in Mercurial is as we can see in the data about developers is similar to any other FLOSS projects, with contributors, main developers, users, etc. following the Onion Skin way.

7.6 Additional metrics and evaluations

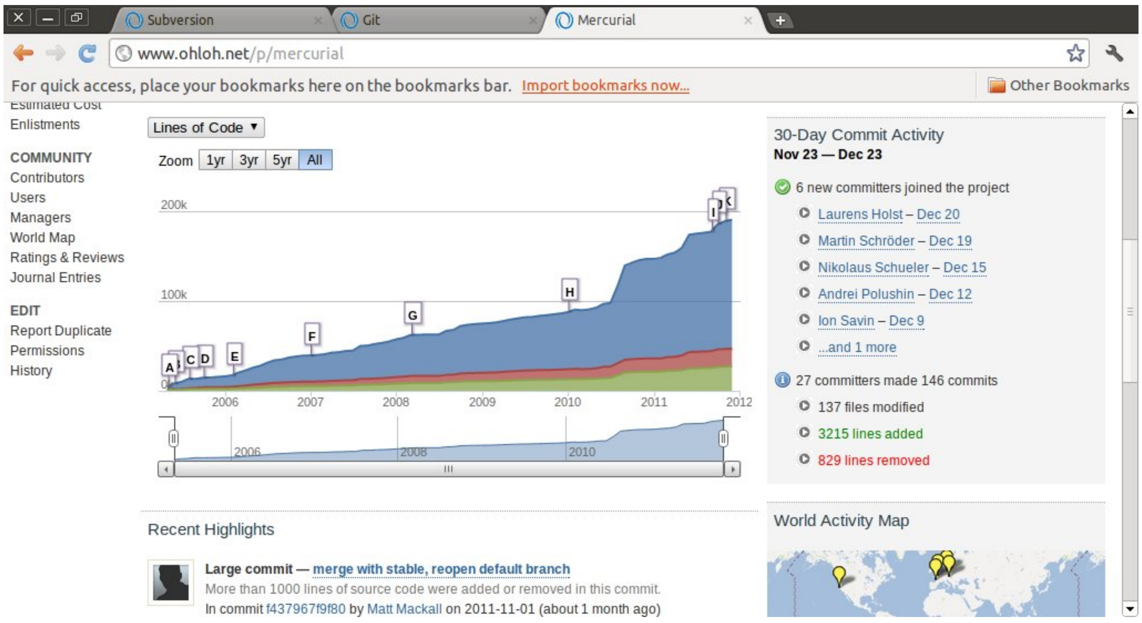
To know data about the way how is building Mercurial and data regarding the code, we can use the website **Ohloh**[103] and **FLOSSMetrics**[104] where we can check and study the following aspects:

7.6.1 Longevity

As we've seen in the **Appendix 5** the oldest SCM we've studied is SVN, which is a really good thing, but as we've said in that section, the distributed SCM as Mercurial and Git are much more actives, this is really good, but as we've said for a company usually is much better having a really stable and robust product.

The figure below shows the evolution of lines of code from Mercurial Ohloh statistics page[105]:

[103]http://www.ohloh.net/
[104]http://flossmetrics.org/
[105]http://www.ohloh.net/p/mercurial



For quick access, place your bookmarks here on the bookmarks bar. Import bookmarks now...

Estimated Cost
Enlistments

COMMUNITY
Contributors
Users
Managers
World Map
Ratings & Reviews
Journal Entries

EDIT
Report Duplicate
Permissions
History

30-Day Commit Activity
Nov 23 — Dec 23

6 new committers joined the project
- Laurens Holst – Dec 20
- Martin Schröder – Dec 19
- Nikolaus Schueler – Dec 15
- Andrei Polushin – Dec 12
- Ion Savin – Dec 9
- ...and 1 more

27 committers made 146 commits
- 137 files modified
- 3215 lines added
- 829 lines removed

Recent Highlights

Large commit — merge with stable, reopen default branch
More than 1000 lines of source code were added or removed in this commit.
In commit f437967f9f80 by Matt Mackall on 2011-11-01 (about 1 month ago)

World Activity Map

Figure 10: *Mercurial Code Evolution*

As we've seen in the three appendix (SVN) is being developed now much slower than the other two (Git and Mercurial which both are younger projects), but it doesn't mean that the project is being to be abandoned, as we know, SVN is being developed since long time ago, and it's really stable, the other two, are stables also but are growing.

According with the rating we talked before, Mercurial is a project with new and lot of changes with an very high grow but is not as old as SVN so the score for Mercurial in this metric is 3.

7.6.2 License

As we've said in the Mercurial introduction, this SCM is licensed under the terms of **GNU GPLv2** so is a reciprocal (strong) FLOSS license, that it means is not possible to release derivative products under another license neither release it under any privative license (is a copyleft license).

This license is approved for the three most important FLOSS communities/organizations, **FSF**[106], **OSI**[107] and **Debian Free Source Guidelines (DFSG)**[108].

As this project (Mercurial) we pretend to use in the company Amiguetes

[106]http://www.gnu.org/copyleft/gpl.html
[107]http://www.opensource.org/licenses/alphabetical
[108]http://wiki.debian.org/DFSGLicenses

S.L. and for enterprises we think the permissive licenses give more liberty to the users, and because this license is FSF, OSI, and DFSG compatible we give a final score of 3 for this metric.

7.6.3 Programming languages

As we can see in the *Figure 11*, Mercurial is developed using basically Perl and Python with more of 90% in total.

The rest is for C and shell script languages (and in a minor way Vim script).

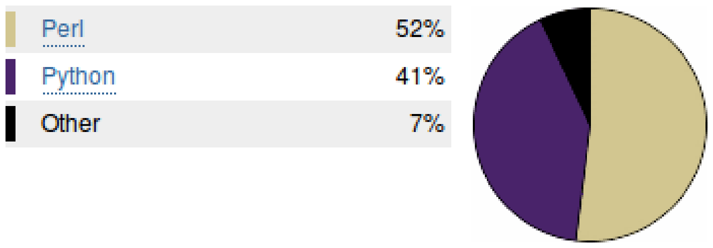


Figure 11: *Programming languages used in Mercurial*

As an interesting thing about the programming languages used in this project, we can think about how it easy would be to be involved in this project if for instance a developer would wish, here the language programming used is really important since if the project uses languages with not a really hard barrier to learn if you don't know about it the collaboration will be easy, in the other side, if the project use a language which is difficult to understand and you don't know about it, you, surely, will think a lot about to be involved in this project or going to another different.

As we see, Mercurial is developed in Python at most and in Perl, both really famous and easy going languages programming, besides, in the *FLOSS world* these both languages are really used in a lot of different projects, so is really easy that a developer who want to be involved already know about it.

In the other side we need to have into account the number of different programming languages, I think, personally, that a FLOSS project which uses more than one language programming is very important and enriches the project, because give the opportunity to other developers who maybe don't know about one of the languages used but any other used yes to be involved in a project who thinks is really interesting.

As a curious thing in the Wikipedia report regarding Mercurial[28], we can see how it's written *"It is mainly implemented using the Python programming* *language, but includes a binary diff implementation written in C"* this affirmation was true, but not since **September 2010** when Perl language programming exceeded to Python as the most important programming language used in Mercurial. As we can see in the **Figure 12** now in **January 2012**, the most important language is Perl following of Python, being C which Wikipedia says is the 2nd most important language the 3rd one.

So finally, and following the mentioned valuation way to value this metric, Mercurial has a score of 3.

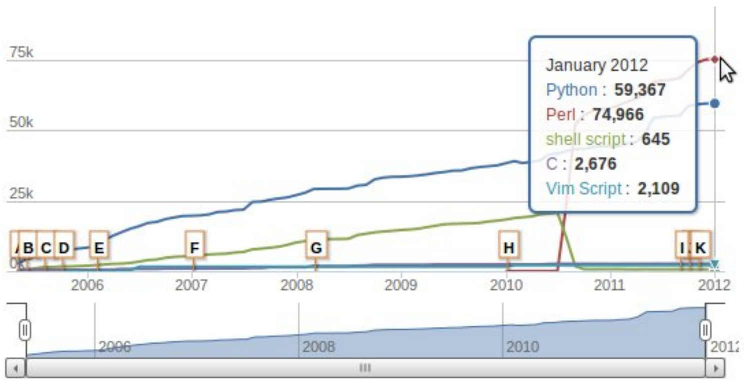


Figure 12: *Programming languages evolution used in Mercurial*

7.6.4 Contributors

Along the entire life of this project it has a lot of developers, but as most of FLOSS project we have a set of main developers who perform the most number of commits, this stats are regarding since the 1st day of the project until December 8th, 2011 (this month).

The total amount of commits in Mercurial is **15590**, and the most important developers are:

- Matt Hackball: 3571 commits, 22%.
- Martin Geisler: 1351 commits, 8%.
- Thomas Arendsen Hein: 1004 commits, 6%.
- Patrick Mezard: 972 commits, 6%.
- Benoit Boissinot: 933 commits, 5%.
- Adrian Buehlmann: 322 commits, 2%.
- Christian Ebert: 242 commits, 1%.

- Idan Kamara: 141 commits, 0%.
- Others: 7054 commits, 45%

To help us to see much better this we can check the **Figure 13**:

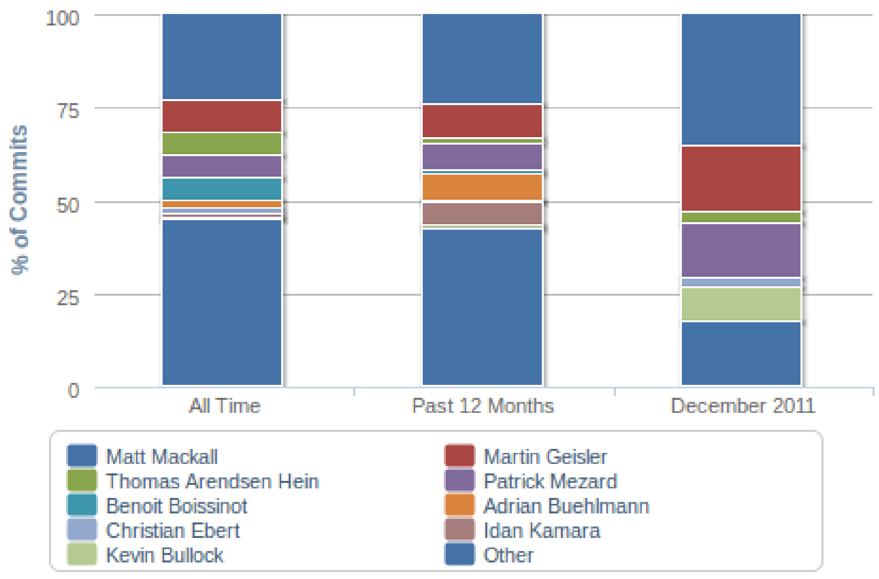


Figure 13: *Commits in Mercurial*

As we can see the most important developer is **Matt Hackball**, Mercurial creator, is close to the quarter of the total of commits, after him is *Martin Geisler* but really far from his commits, and if we following seeing the list we can appreciate how the **onion skin** model in FLOSS projects also is really appreciate here in this project, with a very strong and important group of developers (here maybe the top 5) and the rest, but one thing is true, almost the half of the commits are from others developers who maybe commit a few times, so this project although has a top group of developers, without the rest of them, this project won't be possible.

As a not, we can see how the sum of the percentage is not 100%, is a 95%, so the rest of the 5% unknown commits could be from different developers who they are unknown (also is different the commit author than the authorship).

Following the mentioned before about the valuation of this metric, Mercurial has a score of 3 (four developers have developed at least 40% of the code).

7.6.5 Developers taking care of documentation

Using the database dump from FLOSSmetrics for Mercurial project, first we count the number of commits:

```
select count(*) from scmlog;
```

giving a total of 15555 commits. Now we count the commits mentioning the word "documentation":

```
select count(*) from scmlog where log like '%Documentation%' or log like
'%documentation%';
```

giving a total of 78 commits.

The relationship is 78/15555 = 0,00501, being less than 1% and so giving a score of 1 in the metric.

7.6.6 Distance between the two most active authors

Using the database dump from FLOSSmetrics for Mercurial project, we count the commits of the two most active authors

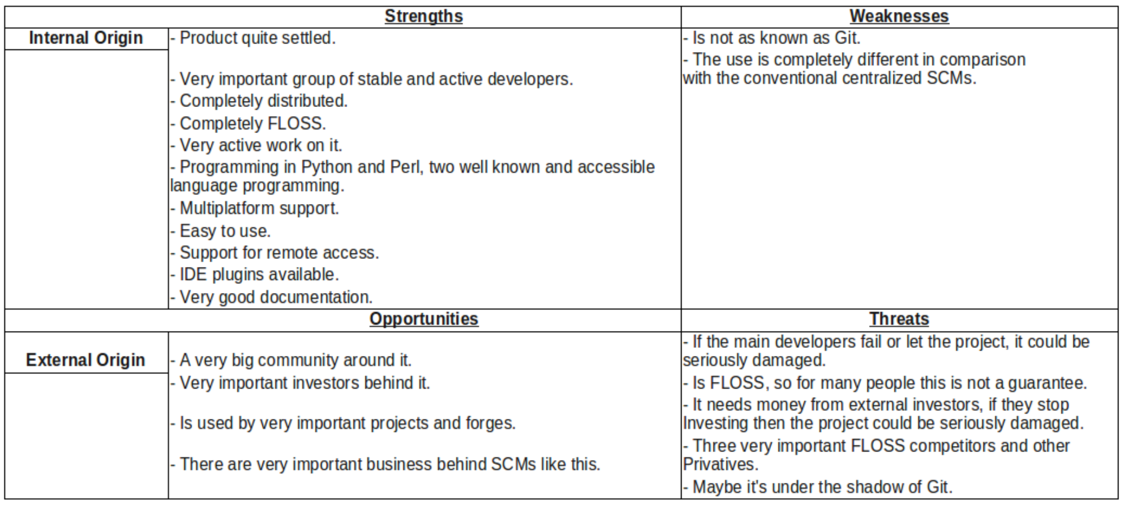
```
select author, count(*) as numcommits from scmlog
group by author order by numcommits desc limit 2;

+---------------------------------------------+------------+
| author                                      | numcommits |
+---------------------------------------------+------------+
| Matt Mackall <mpm@selenic.com>              |       2778 |
| Thomas Arendsen Hein <thomas@intevation.de> |        999 |
+---------------------------------------------+------------+
2 rows in set (0.76 sec)
```

For normalizing the metric, we calculate the percentage of effort for each author: Matt Mackall performs 2278 / (2278 + 999) = 0,6951 (69,51% of the two-people team effort). Thomas Arendsen Hein performs 999 / (2278 + 999) = 0,3048 (30,48%).

So the distance is 69,51 - 30,48 = 39,03%, giving a score of 3.

7.7 SWOT Analysis

In this section we are going to show a **SWOT analysis**[30] where we'll able to see the most important things about this kind of analysis regarding Mercurial.



	Strengths	**Weaknesses**
Internal Origin	- Product quite settled. - Very important group of stable and active developers. - Completely distributed. - Completely FLOSS. - Very active work on it. - Programming in Python and Perl, two well known and accessible language programming. - Multiplatform support. - Easy to use. - Support for remote access. - IDE plugins available. - Very good documentation.	- Is not as known as Git. - The use is completely different in comparison with the conventional centralized SCMs.
	Opportunities	**Threats**
External Origin	- A very big community around it. - Very important investors behind it. - Is used by very important projects and forges. - There are very important business behind SCMs like this.	- If the main developers fail or let the project, it could be seriously damaged. - Is FLOSS, so for many people this is not a guarantee. - It needs money from external investors, if they stop Investing then the project could be seriously damaged. - Three very important FLOSS competitors and other Privatives. - Maybe it's under the shadow of Git.

Figure 14: *SWOT Analysis*

As we can see, there are more good points than bad points, both in *strengths* and *opportunities* in comparison with *weaknesses* and *Threats*.

In fact there are, under our point of view, just two pints which are dangerous for our project:

- The usage is completely different in comparison with distributed SCMs.
- The necessity to have investors to maintain the project, economically talking.

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