The idea of free and open source software (F/OSS) is an attractive one. However, F/OSS must be robust if it is to be adopted on a large scale. Thus effective F/OSS assessment methodology and tools are enormously important, says QUALOSS Project Coordinator **Jean-Christophe Deprez**

Measuring the quality of open source

Launched in the early 1980's, the free software movement lobbied to allow computer users to change, manipulate and adapt software to suit their individual specifications without needing to endlessly purchase new programmes from suppliers.

It has undergone several mutations since, and indeed the concept of open-source software – whereby users have the opportunity to learn how the software works and develop new programmes themselves – is now familiar to many. Since the early days there have been instances of both successful and unsuccessful Free/Open-Source Software (F/OSS) development endeavours. Of the more-than 100,000 projects on SourceForge – the world's largest F/OSS forge – a majority show neither recent activity nor downloads. It is therefore crucial that we develop a better understanding of how we can make F/OSS more durable if it is to provide a robust service to its user community.

Formed specifically with this goal in mind, QUALOSS, an FP6 European Project, is leading research into open source adoption. Through this project, CETIC (Centre of Excellence in Information and Communication Technologies) aims to ensure that the European software industry – and the Belgian one in particular – adopts the best possible F/OSS programmes at the fastest possible rate. We aim to help the European software industry develop robust, reliable software solutions based on F/OSS components capable of adapting rapidly to the ever changing needs of the worldwide market. In order to achieve this goal, QUALOSS has developed a methodology to assess F/OSS development endeavours in terms of their ability to provide a robust, long-lasting service. It is important to note that the QUALOSS methodology assesses F/OSS development endeavours, not just F/OSS programmes. Assessing an F/OSS endeavour includes evaluating the F/OSS programme and the F/OSS community involved, its development process, and the tools used to support, produce and run the F/OSS programme.

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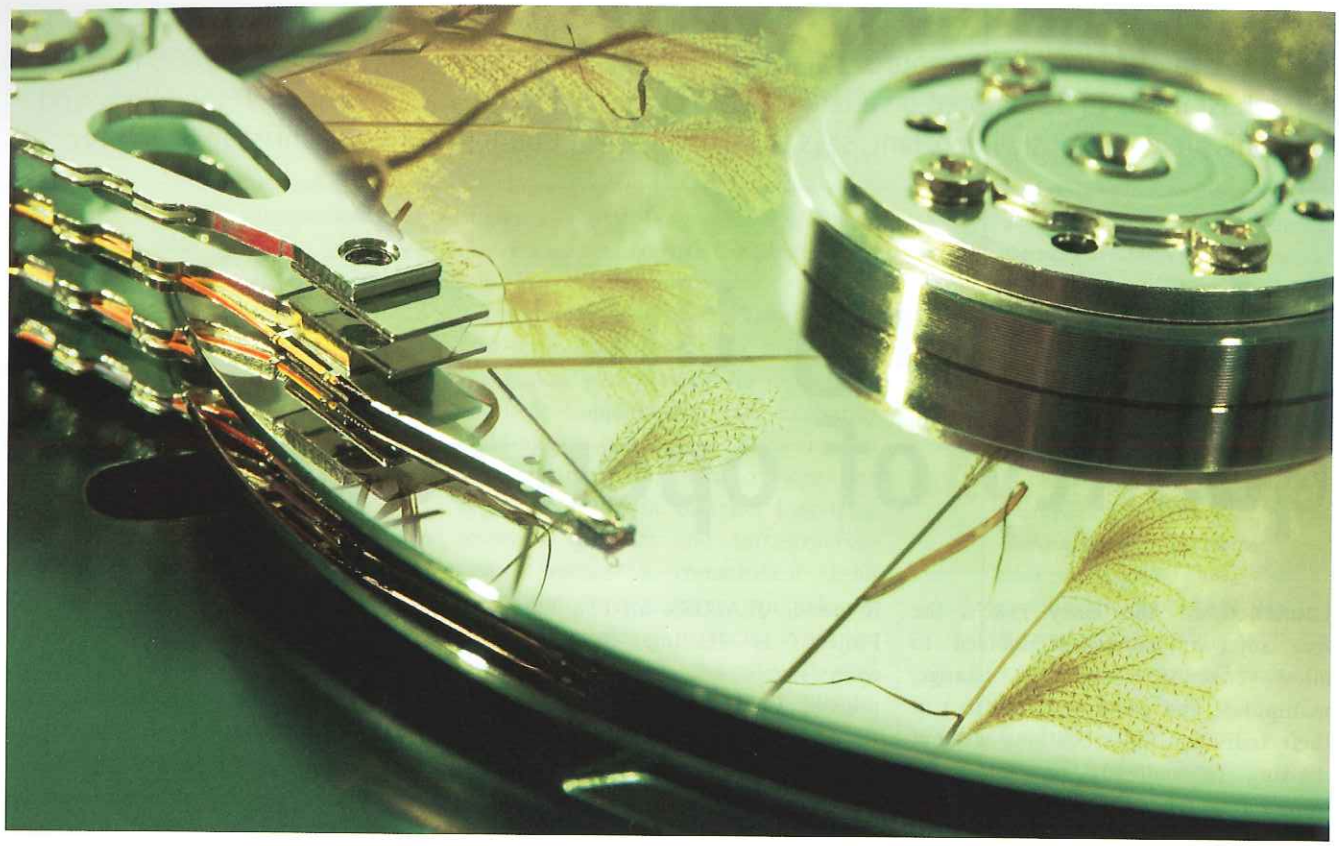
Software costs are not negligible, even F/OSS software. Usually, licence costs only account for around a third of the total cost of software acquisition. The remaining two-thirds are taken up by selecting the appropriate software product, installing it, configuring it, performing administrative tasks, migrating old data, porting side macros and programmes to the new product and finally, training users on the new product. From this viewpoint, it is clear that selecting inappropriate F/OSS solutions the first time around can lead to huge financial losses and extreme frustration. Indeed, making the right choice can mean the difference between success and failure for some enterprises.

Many enterprises currently restrict their ad-hoc analysis of F/OSS solutions to functionality needs. This is much too limited to obtain a reliable risk assessment profile of F/OSS endeavours. Indeed, an F/OSS solution with a larger functionality set may not always be the wisest choice if it is unstable, inflexible, and its community displays uncommitted, erratic behaviour that does not inspire trust. A more reliable methodology would evaluate the robustness and evolvability of entire F/OSS endeavours, not just F/OSS programmes, something QUALOSS is working towards.

Assessing QUALOSS's progress

The first year of the QUALOSS project was dedicated to reviewing past work and creating a prototype assessment



methodology. Prototyping has helped us identify the most important requirements for our methodology, thus ensuring that the final methodology will address the needs of a wide range of users. The prototyping phase consisted of:

1. Studying existing work on software quality assessment to identify the relevant quality criteria related to the evolvability and robustness of F/OSS endeavours
2. Creating a metrics system to help measure the quality criteria
3. Searching for analysis and measurement tools that could automate our metrics system's computations
4. Evaluating five F/OSS endeavours
5. Validating the various outcomes of our prototype phase.

Although an improvement over existing solutions, there are still problems with the existing prototype. Firstly, our quality model was not cohesive enough to show a clear relationship between the key elements of an F/OSS development: work products, community members, development processes and tools. Secondly, our overall methodology still lacks clarity concerning how to scope the datasets to measure for a given F/OSS endeavour, while the prototype metrics system only uses simple metrics and requires too much manual computation. In response we have developed an approach whereby our final quality model will present a unified view of quality criteria to show that they must be taken together to obtain a complete impression of the evolvability and robustness of an F/OSS endeavour. Our final methodology will document how data from various repositories must be scoped so as to be aggregated correctly. The QUALOSS platform will be developed in line with our final methodology which will automate the aggregation of results computed by measurement and analysis tools.

Like OpenBRR and QSOS – two F/OSS assessment methodologies similar to QUALOSS – a third weakness of our prototype is that it proposes only broad, fairly shallow assessments. However, the final version of our methodology will propose several levels of granularity for assessments. The flyweight assessment will be broad and shallow, it will require no expertise in measurement theory, and independent people will be able to apply it based on the documentation provided – it will already be a real improvement on OpenBRR and QSOS.

The middleweight version will add the results obtained from measurement and analysis tools to the flyweight version. It will require a sophisticated understanding of how to scope the raw F/OSS data by creating appropriate heuristics and filters.

The level of heuristics and filters required varies between individual F/OSS development endeavours, hence our final methodology will only give guidelines on how to create them, leaving the creation of the heuristics to evaluators. This is why measurement tools will only be used in the middleweight assessment. Finally, a heavyweight assessment will be developed for a few selected themes, particularly security, verification and validation, maintainability, reliability and development processes. For these highly important topics, our final methodology will propose a framework focussed on performing very thorough analysis, often aided by advanced tools. However, the use of these tools and the interpretation of their results will require a high level of expertise, in addition to an intense manual effort.

Importantly, the flyweight and middleweight assessments of the QUALOSS methodology will each propose a metrics

system based on a standard threshold so that the degree of evolvability and robustness of various F/OSS development endeavours can be uniformly compared. The results of the heavyweight assessment are therefore not to be compared with other F/OSS development endeavours, rather they are intended for individual F/OSS endeavours to let them know where they can improve in terms of evolvability and robustness.

Who will benefit from QUALOSS methodology?

QUALOSS is designed to help both industry and F/OSS communities. In most cases, companies will compare F/OSS endeavours using the QUALOSS assessment methodology. They are likely to apply lightweight or middleweight assessments to various F/OSS endeavours so as to identify the one that best meets their specific needs.

The lightweight methodology is designed to help those who need to profile several F/OSS programmes within a limited timescale. We aim to be able to perform a lightweight assessment of an F/OSS programme in somewhere between half a day and a full day. Market research tells us that this is the kind of time organisations are willing to devote to selecting important, but not crucial software solutions. When searching for F/OSS components that will be closely tied to their core business, organisations are willing to invest. They may want to augment the lightweight assessment with deeper analysis of the F/OSS repositories available, such as version control, bug tracker, mailing list and forums. Organisations usually want to contract such work out – especially the analysis – so as to guarantee the validity of results based on the rigorous measurement of properly scoped datasets.

Companies behind F/OSS endeavours are usually keen to monitor the health of their work and identify possible improvements. Thus they will want to apply the middleweight and heavyweight assessments. The consortium also plans to contact those enterprises ready to be trained on the methodology. This will create a cluster of accreditors – organisations aiming to make a profit from QUALOSS assessments.

The main remaining challenge is to validate our metrics systems. We must ensure that the metrics used to evaluate abstract quality criteria are coherent and that the thresholds correctly indicate whether a quality criterion has been fulfilled. For example, what are adequate metrics and thresholds to evaluate criteria such as product complexity or developer liveliness? QUALOSS will perform such validation empirically. The metrics and metric thresholds proposed in the lightweight and middleweight assessment will be validated on 20 F/OSS endeavours by the end of QUALOSS's second year and at least 50 F/OSS endeavours by the end of the project. Progress is being made, but we are well aware that work remains if F/OSS endeavours are to reach their goal of meeting the needs of modern business, a goal QUALOSS is determined to help them fulfil. ★

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At a glance

Objectives:
QUALOSS plans to automate the quality measurement of open source software. The QUALOSS platform uses tools to analyse two types of data:
1.) Source code
2.) Project-repository information

Project partners:
Centre of Excellence in Information and Communication Technologies (CETIC (BE)
Facultés Notre Dame de la Paix Namur (BE)
Universidad Rey Juan Carlos (ES)
Fraunhofer IESE (DE)
ZEA Partners (BE)
MERIT (NL)
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Duration
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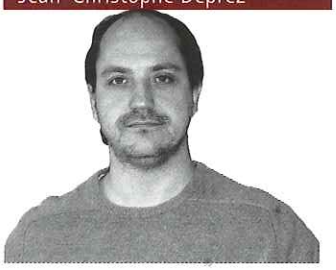

QUALOSS Project Coordinator

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