

How GRASS development reflects Free Software history and what to expect next.

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1 Introduction

When in the early 80s the US CERL started to develop a geographical information system they did so being in a typical situation to start a Free Software project. They could not find or buy the solution they wanted. Talent and time was available so development was initiated as Hastings writes in the GRASS FAQ [8]. The result is the continuing success story of the Geographical Resources Analysis Support System (GRASS). GRASS is not the only Free Software with a history. This article will explore similarities to other Free Software projects and Free Software history in order to obtain an idea what might lay ahead in the future of GRASS.

2 History of Free Software

"In the beginning all software was free!" [7] reasonably describes that Free Software is as old as computers itself. This is not a surprise as the first computers were mainly operated by scientists. Sharing their result directly relates to the free flow of information which is necessary for the scientific method. When companies sold computer in the beginning this included hard and software. The unbundling of the software happened when the U.S. started an anti-trust case against IBM in 1969 [6]. Still the first software producers were tightly coupled with hardware vendors. In the end of the seventies the proprietarisation of software progressed. Richard Stallman witnessed this shift of policy and subsequently thought to preserve the ability to help other people through sharing code. In the mid 80s he came up with the term "Free Software" and a definition by the following four freedoms ¹:

- 0. freedom** The freedom to run the program, for any purpose;
- 1. freedom** the freedom to study how the program works, and adapt it to your needs;
- 2. freedom** the freedom to redistribute copies;
- 3. freedom** the freedom to improve the program, and release your improvements to the public, so that the whole community benefits.

Access to the source code is a prerequisite for freedom one and three.

2.1 GNU-Project

In September 1983 the GNU-Project was announced [12]. Its plan was to write a complete Free Software operating system one piece after another. Work on this started in 1984 and the Free Software Foundation was founded 1985 as legal framework for the project. Main early components of the GNU-System are the Emacs text editor, the GNU C-Compiler, the GNU C-Library and the GNU Debugger. Other components like the TeX typesetting system and the X11 windows system were adopted. In the beginning of the 90s one major component was still to be completed: a kernel. Fortunately another kernel named Linux got available and the combination of the GNU-System and this kernel lead to complete Free Software operating systems which would properly be called GNU/Linux.

¹Due to historical reasons counting starts with zero.

2.2 Terminology

In 1997 the Debian Free Software Guidelines [11] got written as an attempt to explain what Free Software means regarding software licenses. Later these criteria were picked up by the Open Source Initiative (OSI) and turned into its own definition. The proclaimed goal of the OSI is to be a marketing program for Free Software [10]. The idea was to explain the short-term technical advantages first and then the long term implications of sharing software. OSI did not reach that goal yet. From the non technical point of view the term "Free Software" is to be preferred as it creates less misunderstanding about the underlying concepts and implication going far beyond the technology. Its didactical value is a lot higher for this reason. Additionally the term has the longer history and more scientific background being in use for over 15 years.

However it is to note that regarding licenses the terms "Free Software" and "Open Source" almost describe the same set. This was by design of the open source definition. Due to the nature of changing laws and court rulings there is a constant need to evaluate new or changed licenses regarding this status which sometimes leads to differences among experts. This is normal even within scientific communities with a broad consensus.

Regarding the communities the situation is different as people from the Free Software community often distinguish themselves from the perceived "Open Source" community. The significant difference is that using Free Software is an ethical value which is ranked higher as the immediate technological superiority for the Free Software community. The open source community typically only focuses on the technological aspects neglecting the long term perspectives for humanity, society and economics.

2.3 Rise of commercial Free Software

With the advent of the first complete GNU/Linux-System more commercial offerings started to come up. This led to a widespread availability of GNU/Linux-Distributions and growing support offerings for Free Software solutions. Free Software entered the mainstream business stage again end of the 90s and it now seen more and more as a rivaling concept to proprietary Software which has been dominating the previous 20 years. There are quite some advantages for businesses in using Free Software [13] beside the ethical values which also are interesting for the companies ethics. The commercial success of Free Software is difficult to measure as traditional market shares for licensing sales are not available. The number of installations can only be estimated in most cases as nobody is forced to register or control the number of deployed copies. In general the good economic effects of Free Software are indirect and less visible. Companies often do not announce their usage of Free Software and there is no vendor in whose marketing interest it would be to publish these success stories. Additionally many companies cannot put numbers on how much they really profit from using better software.

2.4 Three phases

There are three periods in the overall history of Free Software. It starts with Free Software being the natural thing which is done without much theory behind the concept. Then comes a long period where proprietary software entered the state and grew an enormous market. Meanwhile Free Software got an theoretic background and its advantages slowly spread again until we reach the third phase where it now is a mainstream concept which is well known and effects the software world significantly.

3 How GRASS became Free Software

Some historical notes about the motivation behind the US Army CERL to start developing GRASS can be found in the documents of the the GRASS Documentation Project [5], the history section of Hastings' FAQ [8] and the foreword of [9] by Goran. The development started as early as 1982 for multiple reasons. There was no system which could fit the needs for land management. Decision makers did not want to buy into a huge investment for existing proprietary software and its hardware demands. Skilled people were available for software development. It is beyond the scope of this article to bring a full record of the various technical releases and capabilities of GRASS during the time CERL lead the development. The USA has a long standing tradition to have everybody

benefit from work done with federal money. Works by the U.S. Government are not eligible for U.S. copyright protection².

They fall into the Public Domain³. This was also the status of GRASS' source code for several years and made GRASS being Free Software from the beginning. The GRASS source code was published and distributed with all four freedoms attached. In the mid 90s CERL stopped active support for GRASS and the University of Baylor, Texas took responsibility for the Website and support infrastructure. Later University of Hannover (Germany) and now the Instituto Trentino di Cultura (Italy) have become the center of the GRASS development.

The key year is 1999 when GRASS adopted the GNU General Public License (GPL). Before 1999 the status of the GRASS source code was a bit unclear to outsiders. Being in the Public Domain does not offer protection for the freedom attached to the source code. Anybody can modify the source code and claim copyright about the derived work and make it proprietary. This way GRASS development was forked a couple of times with the results being lost for the community in the long run. The author of this article started to participate to GRASS in 1999 and found that no clear statement about the status of the source code or its license could be found. The source code files and available add-on sources contained various copyright and licensing statements which quite a number did not qualify for Free Software. Obviously some of the 4.x releases have been made without paying much attention to this aspect.

The years 1994 up to 1999 probably constitute a time for GRASS where its popularity and visibility was sinking. This is main due to CERL stopping support for the application⁴ and the confusing state of development and license afterward. The proprietary derivatives added to this.

When the GRASS development team decided after some discussion which can be found in the mailing list archives in 1999 to protect its freedom regarding the GRASS sources a process of copyright and license clarification was started. The clear licensing statement of the GPL make GRASS a lot more attractive to Free Software developers. In the last three years GRASS development infrastructure and source code quality was significantly improved. GRASS also seems to profit from the availability of usable GNU/Linux-Systems.

4 Similarities

The history of GRASS also can be divided into three parts:

1. Leadership of CERL. Innovative implementation and under Public Domain. GRASS was leading the GIS field.
2. Transition period where CERL did not support GRASS anymore and the status was unclear. GRASS lost popularity, developers and users to proprietary software packages.
3. Comeback with an international team. Free Software under GNU GPL with a modern development model. GRASS is rediscovered.

The uprise of commercial Free Software and the concept itself together with the spread of the Internet as development infrastructure have favored GRASS again. We can see in the three periods a similarity to the three phases in Free Software history. Though the second GRASS period is also related to the point where the original developers stopped supporting their package and had to handle over their work. The new maintainers had to be found and then needed to build up their own infrastructure and way of working. This important point is faced by many Free Software projects sooner or later. The success of the project itself depends in how good that transition can be handled. The Gimp [4] project also had a time where most releases (v0.6) were not stable and more external developers took over the main development [2]. As this will happen several times for a Free Software project within time the first transition bears the highest danger for the project. This is especially true when the development resources where only controlled by one group or person. If that group or person drops out for several reasons this might cause an interruption for the progress of the project. Since 1999 GRASS development is handled in an open manner over CVS and several mailing list. The servers also are located at several places.

²<http://www.copyright.gov/circs/circ1.html#piu>

³It might be one of the reason why the U.S. is a leading country in GIS technology. Quite some software and data was available.

⁴It is beyond the scope of this article to explore the reasons why and how deliberately CERL stopped support for GRASS.

As with the Free Software movement GRASS profited from a clear concept about the legal implication and the long protection of the freedom gained by a license like the GPL. This was a precondition to build software which is technologically solid and promote its usage.

A nice attribute of Free Software is that it is encouraged to take the source code and build upon it. Apache for example is now at the heart of the Internet web services and several vendors support many versions with it. Almost everything that can make sense has been interfaces to apache. One example are the various programming languages and databases for which modules exist. The Apache Software Foundation [1] now hosts several projects around serving information over the web. GRASS also has become a software cornerstone.

As we can conclude from the foreword in [9] the original development team did not expected commercial usage. For Goran GRASS is not present on the marketplace and more an academic effort. This bears similarities to the common misunderstanding that Free Software is not commercial. Nonetheless it is on constant rise in the business sector.

5 GRASS' position among Free GIS

GRASS is the heavyweight of Free Software geographic information systems. It has a long history, an enormous code and user base. Still GRASS cannot solve all tasks related to geographic informations and it might not fit restraining conditions like programming language if a particular software solution is sought. Many other Free Software packages have therefore been developed. The FreeGIS-Project [3] tries to maintain a comprehensive list. There is a tendency for these application that they are developed in a way that they can work together with GRASS. Examples for this maybe the GDAL and OGR library by Frank Warmerdam or the PostGIS database and web-mapping components.

6 Conclusions

GRASS is coupled to the overall tendencies of Free Software. Thus we will see GRASS usage getting more widespread in the future. More commercial usage and commercial offerings for GRASS will become available. It will go unnoticed at first. One of the challenges of the community will be to shed light on the commercial usages and turn them into success stories.

GRASS will be extended even further in several directions. Possibilities to use and connect GRASS with other Software will grow. This is natural for a powerful Free Software. The development and users infrastructure will play an important role to preserve coherence of the project. A fragmentation of the user and code base is a danger and has to be avoided.

Having managed the transition from the initial developer group to an open development model with an international team the future for GRASS looks quite positive. The project managed the first major and critical change in maintainers and gained some development redundancy through the international team which directly gives good chances of survival.

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