

# Open Source and Healthcare in Europe – Time to Put Leading Edge Ideas into Practice

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**Abstract.** Free/Libre and Open Source Software (FLOSS) is a process of software development, a method of licensing and a philosophy. Although FLOSS plays a significant role in several market areas, the impact in the health care arena is still limited. FLOSS is promoted as one of the most effective means for overcoming fragmentation in the health care sector and providing a basis for more efficient, timely and cost effective health care provision. The 2008 European Federation for Medical Informatics (EFMI) Special Topic Conference (STC) explored a range of current and future issues related to FLOSS in healthcare (FLOSS-HC). In particular, there was a focus on health records, ubiquitous computing, knowledge sharing, and current and future applications. Discussions resulted in a list of main barriers and challenges for use of FLOSS-HC. Based on the outputs of this event, the 2004 Open Steps events and subsequent workshops at OSEHC2009 and Med-e-Tel 2009, a four-step strategy has been proposed for FLOSS-HC: 1) a FLOSS-HC inventory; 2) a FLOSS-HC collaboration platform, use case database and knowledge base; 3) a worldwide FLOSS-HC network; and 4) FLOSS-HC dissemination activities. The workshop will further refine this strategy and elaborate avenues for FLOSS-HC from scientific, business and end-user perspectives. To gain acceptance by different stakeholders in the health care industry, different activities have to be conducted in collaboration. The workshop will focus on the scientific challenges in developing methodologies and criteria to support FLOSS-HC in becoming a viable alternative to commercial and proprietary software development and deployment.

**Keywords.** open source software, free/libre open source software

## 1. Introduction

Health care IT has evolved over decades and is currently considered an integral part of modern health care delivery systems. However, compared to other sectors or industries, like finance, telecommunication, logistics or general business processes, health care IT lags behind in terms of integration and interoperability. Historically, health care IT has

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evolved from a facility-centric tool used to manage patient data primarily for administrative purposes to the present multitude of different disconnected systems. Modern hospitals often use more than 100 different software applications. Standards like HL7 [1], DICOM [2] or initiatives such as Integrating the Healthcare Enterprise (IHE) [3] or the Continua Health Alliance [4] allow for exchange of data and aim at interoperability and interconnectivity. However, communication across sectors in a hospital is only possible in a rudimentary way and exchange of data with external stakeholders is often not possible. One of the major challenges is to move to a more patient centric system that integrates often competing facilities like hospitals, physician offices, home health care providers, laboratories, rehabilitation centers and health insurers into a regional network that can easily share and exchange patient data and allow collaborative care around the patient. Indispensable conditions to achieve this are openness and transparency. Openness is needed not only in respect to open standards. Openness in respect to the source code allows the user to be in control of the software and to adapt the application to local needs and prevent the user from vendor lock-in. Transparency is needed to meet the necessary quality criteria.

## 2. Free/Libre Open Source Software in Health Care

### 2.1. Basics of FLOSS

The roots of FLOSS can be found in the early days of computing and software development, when software was often delivered for free when purchasing hardware. In the 1980s, Stallman founded the Free Software Foundation (FSF) and the GNU Public License (GPL) [5] was created to give the user rights to access the source code, and to modify and redistribute the software. The ideas and principles on which the FSF are based are more than just from a philosophical point of view. From these roots, Perens created the “Open Source Definition” [6] and Raymond contributed to its popularity with the classic “The cathedral and the bazaar” [7], which discusses models of software development.

### 2.2. The Potential of FLOSS in Health Care (FLOSS-HC)

FLOSS is not new, and both the development of the Internet and much of its present day functionality are largely achieved in an “open” manner. FLOSS products such as Apache (web server), MySQL (database), Linux (operating system), or programming languages such as PHP, Perl or Java are the predominant tools that have contributed to the success of the internet.

Although FLOSS has been employed in health care for over a decade [8], its use is still very limited. The health care sector provides special challenges for FLOSS applications. Hospital Information Systems (HIS) are very complex systems often comprising numerous different small applications. Frequently, each sector within the hospital has its own standards and tools, and this has led to a fragmentation in the IT sector which hinders an effective information exchange between sectors or other health professionals that participate in the care process. For FLOSS applications there are several additional barriers to the general IT implementation issues. They include:

- lack of professional support;

- executives lacking knowledge about the benefits of open source;
- legal and licensing issues (IT administrators need someone to sue in case of failure);
- functional gaps;
- lack of a road map for sustainability.

The main motivations for using FLOSS-HC are:

- reduced total cost-of-ownership (TCO);
- faster delivery of systems;
- systems being more secure;
- elimination of vendor lock-in;
- control over the software (possibility of adapting to local needs).

### 2.3. A Strategy for the Advancement of FLOSS-HC

Reviewing the conclusions of the “Open Steps” meeting in 2004 and the outcome of the 2008 STC, it becomes evident that the perceived barriers to adopting FLOSS and the challenges for pushing open source had changed minimally in almost five years. Looking deeper into the specific problems and at open source from a global perspective reveals that open source in general was a tremendous success. A report from OPTAROS, a Swiss based research company devoted to open source, found out that ‘open source is in wide usage across industries, is generating significant financial and other benefits in many companies and yet is hampered by major obstacle’ and that the obstacles are ‘less about the viability of the technology and more about how the technology is perceived by the executives who hold the IT purse strings.’ [9] This is supported by a recent study from Pare et al., which found out that ‘key factors for not adopting an open source solution were closely linked to the orientations of ministry level policy makers and a seeming lack of information on the part of operational level IT managers concerning commercially oriented open source providers’ [10]. Products such as ClearHealth [11], MirrorMed [12], OSCAR [13], OpenClinica [14] have shown that open source is a viable alternative to proprietary products. Other projects such as iPATH [15], OpenMRS [16], DHIS [17], MEDICAL [18] and CHITS [19] have shown that FLOSS also works well in developing countries and emerging economies. Despite these success stories there is limited adoption of FLOSS in health care in many parts of the world, and the adoption rate particularly in Europe is very low. However, FLOSS promises to be the solution for the still existing interoperability problem. While open standards like HL7, DICOM, ISO/CEN 13606, etc. are widely used in health care IT, open standards alone are not sufficient to solve the problems. Openness and transparency are needed to allow the customer a maximum of flexibility, control over the software and preventing the customer from being locked-in by the vendor, with subsequent problems in long-term data migration.

To transform FLOSS-HC from a grassroots development into a position acceptable to health care managers requires collaborative action. The following four steps depict a possible strategy for the advancement of FLOSS-HC:

- 1) FLOSS-HC inventory. A useful starting point for such a resource is the Wikipedia list of open source software in healthcare [20].
- 2) FLOSS-HC Communication platform.

- a) FLOSS-HC software repository (applications and information about FLOSS-HC);
  - b) FLOSS-HC use case database (reports and studies on the impact of different packages) ;
  - c) FLOSS-HC knowledge base (descriptions of modules and their capabilities; simple database of FLOSS software is not sufficient).
- 3) FLOSS-HC network of networks. There is not one “FLOSS-HC community”, but many communities around specific projects or stakeholder groups, which should collaborate more.
  - 4) FLOSS-HC dissemination activities. The development of evaluation procedures, independent quality criteria and the provision of tools to support these tasks could be a field where scientific activity and researchers can contribute.

### **3. Outline of the Workshop**

This workshop is facilitated by members of the EFMI LIFOSS Working Group and is supported by the IMIA Open Source Working Group, the IMIA-NI Open Source Nursing Informatics Working Group, and CHIRAD, an Academic Institutional member of IMIA and EFMI. All presenters and facilitators were members of the EFMI STC 2008 Programme and Organising Committees, or have since become actively involved in the activities arising from the event and the work of the EFMI LIFOSS WG. The workshop will be chaired and discussion will be facilitated by Dr Helen Betts, UK. The following activities will form the workshop:

1. Main outputs of the 2004 Open Steps workshops and the EFMI STC 2008 – Peter Murray
2. Building the FLOSS-HC Community – A strategy for the advancement of FLOSS in health care – Thomas Karopka
3. Open Source Business Rule Management System (BRMS) – A implementation in the breast cancer screening program DORA – Andrej Orel
4. Discussion session – All Participants
5. Final round table – All Participants

### **4. Educational Goals**

At the end of the workshop, participants will be able to:

1. recall the outputs and recommendations of the 2004 Open Steps workshops and the 2008 EFMI Special Topic Conference, as well as other related events;
2. discuss both changes and ongoing issues of the perceived focus of open source activities by groups such as the IMIA and EFMI open source working groups;
3. cite several examples of activities and projects that might contribute to raising awareness of free/libre and open source in European healthcare;
4. contribute to ongoing discussions and activities on the exploration and development of free/libre and open source software, approaches globally, and in particular in Europe.

## 5. Who Should Attend

Anyone who is interested in the use of free/libre/open source software and approaches in health, healthcare and health informatics in Europe and more widely internationally.

## References

- [1] Health Level Seven (HL7), <http://www.hl7.org>.
- [2] NEMA, Digital Imaging and Communications in Medicine (DICOM), <http://medical.nema.org/>.
- [3] IHE International, Inc., Integrating the Healthcare Enterprise (IHE), <http://www.ihe.net/>.
- [4] Continua Health Alliance, <http://www.continuaalliance.org/>.
- [5] Free Software Foundation, GNU General Public Licence (GPL), <http://www.gnu.org/copyleft/gpl.html>.
- [6] Perens, B. *The Open Source Definition*, <http://perens.com/OSD.html>.
- [7] Raymond, E.S. (1999) *The Cathedral & the Bazaar*. O'Reilly Media, Beijing.
- [8] Carnall, D. *Open Source Software in Healthcare*, <http://www.hi-europe.co.uk/files/2000/carnall.htm>.
- [9] Walli, S., von Rotz, B., Gynn, D. (2005) *The Growth of Open Source Software in Organizations*. Optaros, [http://optaros.com/en/publications/white\\_papers\\_reports/the\\_growth\\_of\\_open\\_source\\_software\\_in\\_organizations](http://optaros.com/en/publications/white_papers_reports/the_growth_of_open_source_software_in_organizations).
- [10] Pare, G., Wybo, M.D., Delannoy, C. (2009) Barriers to open source software adoption in Quebec's health care organizations. *Journal of Medical Systems* 33:1–7.
- [11] ClearHealth Inc., <http://www.clear-health.com>.
- [12] MirrorMed, <http://www.mirrormed.org/>.
- [13] OSCAR, <http://www.oscarcanada.org/>.
- [14] Akaza Research, OpenClinica, <http://www.openclinica.org>.
- [15] Brauchli, K., O'Mahony, D., Banach, L., Oberholzer, M. (2005) iPath – A telemedicine platform to support health providers in low resource settings. *Studies in Health Technology and Informatics* 114:11–17.
- [16] Wolfe, B.A., Mamlin, B.W., Biondich, P.G., Fraser, H.S., Jazayeri, D., Allen, C., Miranda, J., Tierney, W.M. (2006) The OpenMRS system: Collaborating toward an open source EMR for developing countries. *AMIA Annual Symposium Proceedings 2006*, 1146.
- [17] Garrib, A., Stoops, N., McKenzie, A., Dlamini, L., Govender, T., Rohde, J., Herbst, K. (2008) An evaluation of the district health information system in rural South Africa. *South African Medical Journal* 98:549–552.
- [18] MEDICAL, <http://medical.sourceforge.net/>.
- [19] Tolentino, H., Marcelo, A., Marcelo, P., Maramba, I. (2005) Linking primary care information systems and public health information networks: Lessons from the Philippines. *Studies in Health Technology and Informatics* 116:955–960.
- [20] Wikipedia list of open source healthcare software, [http://en.wikipedia.org/wiki/List\\_of\\_open\\_source\\_healthcare\\_software](http://en.wikipedia.org/wiki/List_of_open_source_healthcare_software).