

# Free/Libre and Open Source Software in Health Care

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<sup>4</sup> EFMI Libre/Free and Open Source Software in Health Informatics WG

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2012

## FLOSS in Health Care

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# Overview

## Subject and Objective

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## Subject

Free/Libre and Open Source Software and its utilization in Health Care

## Objective

- Review relevant definitions, pros & cons
- Show available resources and selected projects
- Introduce existing initiatives
- Get your feedback and discuss

*Link to this presentation:* <http://goo.gl/pDrB5>

# Disambiguation

## Free Software vs. Open Source

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- Free Software (Free Software Foundation)
- Open Source (Open Source Initiative)
- “Open source is a development methodology; free software is a social movement.”<sup>1</sup>
- Most licenses in this field compliant to both definitions
- Free/Libre<sup>2</sup> and Open Source Software (FLOSS)

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<sup>1</sup><http://www.gnu.org/philosophy/open-source-misses-the-point.html>

<sup>2</sup>The word “libre” is used to indicate the concept of “liberty” (freedom) and not free in the sense of price. ↻

# Free Software Definition as defined by the Free Software Foundation

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- 1 The freedom to run the program, for any purpose.
- 2 The freedom to study how the program works, and change it to make it do what you wish.
- 3 The freedom to redistribute copies so you can help your neighbor.
- 4 The freedom to distribute copies of your modified versions to others.

More information:

<http://www.gnu.org/philosophy/free-sw.html>

# Free Software Foundation (FSF)<sup>4</sup>

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- Non-profit organization, founded in 1985 by Richard M. Stallman
- “Social movement”
- Primarily American organization with sisters in France, Latin America, Europe and India
- Free Software compliant licenses: GNU General Public License (GPL) and many more, see <http://www.gnu.org/licenses/license-list.html>

Recent activity (03/2012): Announcement of the 2011 Free Software Awards<sup>3</sup>

- Award for the Advancement of Free Software: Yukihiro Matsumoto (aka Matz) for Ruby
- Award for Projects of Social Benefit: GNU Health (EMR, HIS), Luis Falcon of GNU Solidario

<sup>3</sup><http://www.fsf.org/news/2011-free-software-awards-announced>

<sup>4</sup><http://www.fsf.org/>

# Open Source Definition

as defined by the Open Source Initiative

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- 1 Free Redistribution (also as component)
- 2 Source Code (availability and access)
- 3 Derived Works
- 4 Integrity of The Author's Source Code
- 5 No Discrimination Against Persons or Groups
- 6 No Discrimination Against Fields of Endeavor
- 7 Distribution of License
- 8 License Must Not Be Specific to a Product
- 9 License Must Not Restrict Other Software
- 10 License Must Be Technology-Neutral

More information: <http://www.opensource.org/docs/osd>



# Open Source Initiative (OSI)<sup>7</sup>

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- Non-profit public benefit corporation, founded in 1998 by Eric S. Raymond and Bruce Perens
- "...to dump the moralizing and confrontational attitude that had been associated with Free Software"<sup>5</sup>
- International (marketing) organization
- Open Source compliant licenses:  
<http://www.opensource.org/licenses/index.html>

Recent activity (02/2012): OSI Governance Reform<sup>6</sup> – twelve non-profit communities as initial Affiliates (Linux Foundation, KDE, Drupal, etc.), greater collaboration by connecting communities, unified OS voice for united community, promote understanding of open source through shared academic and advocacy activities

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<sup>5</sup><http://www.opensource.org/history>

<sup>6</sup><http://www.opensource.org/node/604>

<sup>7</sup><http://www.opensource.org/>

# Advantages of FLOSS

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- Market-oriented development, by users for users
- Flexibility in form of customization
- Collaborative development
  - “Crowd sourcing”
  - Open exchange of knowledge and code
- Independence from a specific vendor
- Price, primarily license costs

# Disadvantages of FLOSS

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- No guaranteed support
- No warranty or liability
- Obscure Open Source 'market'
  - Which products are available? What functionality is offered?
  - In which direction will the project evolve?
- Not much professional service providers, non-working ecosystem (in health care)
- Advanced skills and additional resources required

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Health care domain is very specialized also in terms of software:

- dedicated and substantial communication and information representation standards
- numerous and diversified terminologies and encoding systems
- profound legal regulations
- unique requirements regarding the maintenance and availability
- dynamic and ever changing environment concerning underlying medical knowledge and regulatory implications
- criticality to life

# Introduction II

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However health care is also a field, in which nearly everyone has to cope with similar problem:

- nowadays nearly every workflow is assisted by or based on software
- strong cost pressure
- heavy workload
- new requirements constantly arise
- highly dynamic field of expertise
- “Big Data”

# Introduction III

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What about *collaborative software development* and the *open and free/libre exchange of code and related knowledge and expertise*?

Physicians are adhering to this principle since centuries, regarding their professional medical knowledge and skills.

# References in literature

## Any relevance in medical informatics?

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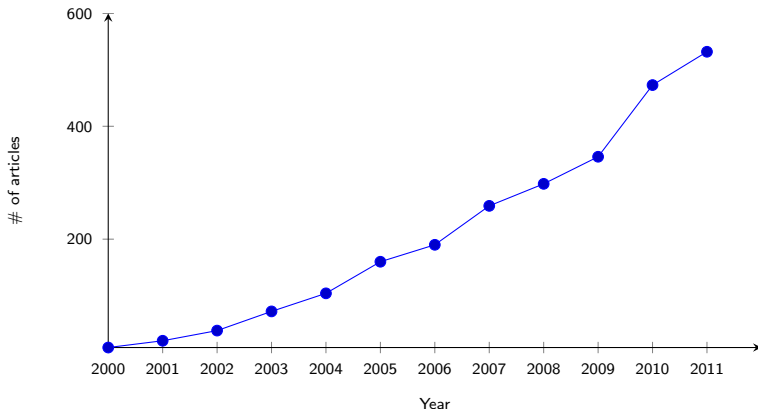
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Number of publications containing the keyword “Open Source” at PubMed<sup>8</sup>



<sup>8</sup><http://www.ncbi.nlm.nih.gov/pubmed/>



# IT executives' perspective of German and European university hospitals

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Attitude	Total (in %)			n=
	+	0	-	
IT executive	<b>58.8</b>	29.4	11.8	17
Board	21.1	<b>68.4</b>	10.5	19
User	16.7	<b>83.3</b>	0	18
Participate in	<b>53.8</b>	23.1	23.1	13

- IT executives are mostly in favor of Open Source
- Board in general neutral, with a slight tendency towards Open Source primarily due to cost savings
- Users are neutral, they do not care and are just interested in functionality
- Significant number would participate in an Open Source project

*More information on Friday, 20th of April, 11.00-12.20, STC 2012 - Session "Open Source Systems".*

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## Veterans Affairs VistA (EHR, HIS)<sup>9</sup>

- Initiated in the 1970s, meanwhile consisting of 160 integrated software modules
- Public domain EHR utilized in the Veterans Health Administration (VistA) and Indian Health Service (RPMS)
- Community editions: ClearHealth, WorldVistA, RPMS EHR, OpenVistA, vxVista etc.
- Deployed at 2500 sites, about 30 million patient records within the US [1] (including community editions), various deployments in more than 13 other countries

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<sup>9</sup>Links: <http://www.hardhats.org/>, <http://www.osehra.org>, <http://vistapedia.net/>, <http://en.wikipedia.org/wiki/VistA>

# Projects II - Electronic Medical Record

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GNU Health (EMR, HIS), <http://health.gnu.org/>

- GPL licensed, based on Tryton (three-tiers high-level general purpose application platform), written in Python
- Received the Free Software Award 2011 for Projects of Social Benefit by the Free Software Foundation

OSCAR McMaster (EMR, PMS), <http://oscarmcmaster.org/>, see also [2]

- GPL licensed, Java based EMR with Web UI
- More than 8 companies offering professional service and support
- More than 1,000 users in Canada, according to EMR Advisor<sup>10</sup> 16.6 % market share in Ontario

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<sup>10</sup><https://www.emradvisor.ca/compare>

# Projects - Imaging

## Outstanding projects

OsiriX (PACS Workstation), <http://www.osirix-viewer.com/>, see also [3]

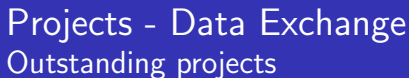
- LGPL licensed, Objective-C/Cocoa based DICOM Viewer and image processing software
- FDA cleared/certified version available (costs money)
- 50,000 users, 200 official reference sites worldwide<sup>11</sup>

ITK (Toolkit), <http://www.itk.org/>, see also [4, 5]

- BSD licensed image processing toolkit, written in C++, more than 2 million LOC
- Public investment of \$ 14 Mio.
- Community of more than 1,500 registered users<sup>12</sup>

<sup>11</sup><http://www.osirix-viewer.com/Users.html>

<sup>12</sup><http://2011.rmll.info/IMG/pdf/itk.pdf>



<sup>13</sup><http://www.mirthcorp.com/products/mirth-connect/faq>       

# Projects - Telemedicine

## Outstanding projects

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iPath Telemedicine Platform (Telemedicine),  
<http://sourceforge.net/projects/ipath/>, see also [7]

- GPL licensed, written in PHP and Java
- Case based collaboration platform, designed especially for telemedicine (microscopy)
- About 3,700 active users<sup>14</sup>

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<sup>14</sup><http://www.ipath-network.com/ipath/statistics/general> 

# Project repositories

## Databases of available medical FLOSS projects

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- Medfloss.org, <http://www.medfloss.org/> (267 projects)
- OLEX OpenLogic Exchange, <http://olex.openlogic.com/> (529 projects<sup>15</sup>)
- Sourceforge.net, <http://sourceforge.net/> (1,054 projects<sup>16</sup>)
- 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) (about 50 projects)

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<sup>15</sup> projects tagged with "Medical Science Apps."

<sup>16</sup> projects tagged with "Medical Science Apps."



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## What Medical Free/Libre and Open Source Software (FLOSS) is out there?

- No comprehensive repository (database) of FLOSS dedicated to health informatics available
  - Comparability not given: no sufficiently structured information about projects available, no unified terminology used
  - Relevant projects for specific purpose cannot be identified or narrowed down
- Original homepages of projects may lack detailed further information like number of deployments, reference sites/success stories, professional service providers and scientific publications.

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*Medfloss.org provides a comprehensive and structured overview of FLOSS projects in the domains of medical informatics and health care. It is an open information portal that aims to foster the exchange of ideas, knowledge and experiences about existing projects and the related ecosystem.*

- Projects: 267 (started with originally 120)
- Professional service providers: 87
- Scientific publications: 144
- Further sources: 43
- Unique visitors (per month): 4,000 with 14,000 page views

Provided in cooperation with the IMIA OS WG, EFMI LIFOSS WG, Helmholtz Zentrum München and the University Hospital Heidelberg.

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## Content types that can be interlinked:

- Tags in numerous categories, like Application Type (e.g. “PACS”), Enterprise Function [10] (e.g. “Medication Management”), supported Standard (e.g. “HL7”), ...
- Projects
- Service providers (companies)
- Publications
- Organizations and other resources (web sites, NGOs, ...)
- Events (conferences, trade shows)
- Linux distributions (*Debian Med*)

# Linux Distributions

## offering ready-to-run medical FLOSS projects

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Packaging teams who create one-click install packages (like .DEB or .RPM files) for popular Linux distributions:

- Debian Med:  
<http://www.debian.org/devel/debian-med/>
- openSUSE Medical:  
<http://en.opensuse.org/Portal:Medical>
- Fedora Medical:  
<http://fedoraproject.org/wiki/SIGs/FedoraMedical>

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- International Medical Informatics Association (IMIA) - Open Source Health Informatics working group (OS WG)<sup>17</sup> [11], chaired by Thomas Karopka
- European Federation for Medical Informatics (EFMI) - Libre/Free and Open Source Software in Health Informatics working group (LIFOSS)<sup>18</sup>, chaired by Thomas Karopka

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<sup>17</sup><http://www.imia-medinfo.org/new2/node/147>

<sup>18</sup>[http://www.helmholtz-muenchen.de/ibmi/efmi/index.php?option=com\\_content&task=view&id=1076&Itemid=260](http://www.helmholtz-muenchen.de/ibmi/efmi/index.php?option=com_content&task=view&id=1076&Itemid=260)

# Working Groups II

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- American Medical Informatics Association (AMIA) - Open Source working group (OS-WG)<sup>19</sup> [1], chaired by Senthil Nachimuthu
- International Society for Telemedicine and eHealth (ISfTeH) - Collaborative Care Team in Open Source working group<sup>20</sup>, chaired by Etienne Saliez

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<sup>19</sup><http://www.amia.org/programs/working-groups/open-source>

<sup>20</sup><http://www.chos-wg.eu/>

# Non-Profit Organizations I

formed by companies and health care providers

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Open Health Tools, <http://www.openhealthtools.org/>

- Non-profit trade association
- *Vision*: “Enable a ubiquitous ecosystem where members of the Health and IT professions can collaborate to build open, standards-based interoperable systems . . .”
- Over 60 members from industry and health care providers, very few European members (Ándago, Cardiff University, Linköping University, NHS Connecting for Health)
- Recently partnered with HIMSS<sup>21</sup>

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<sup>21</sup>Healthcare Information and Management Systems Society (HIMSS), see  
[http://press.himss.org/article\\_display.cfm?article\\_id=5384](http://press.himss.org/article_display.cfm?article_id=5384)



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Open eHealth Foundation, <http://www.openehealth.org/>

- Non-profit organization
- *Mission*: “The mission of Open eHealth is to create, perpetuate, and share open source software components and tools for the healthcare ICT industry.”
- 3 European members (Agfa, ICW and University Hospital Heidelberg), 2 software projects

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- LinuxMedNews, <http://linuxmednews.com/>
- Open Health News, <http://openhealthnews.com/>
- Health channel at opensource.com, <http://opensource.com/health/>

# Websites

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- Free and Open Source Software for Health!,  
<http://www.foss-for-health.org/portal/>
- Open Source Community for Healthcare (NHS),  
<http://www.ehealthopensource.org/>
- Collaboration, Open Solutions & Innovation (COSI) in Healthcare, <http://sites.google.com/site/cosihealthit/>
- Open Source Resource Center,  
<http://osrc.blackducksoftware.com/>

# Books

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- Eric S. Raymond “The Cathedral & the Bazaar. Musings on Linux and Open Source by an Accidental Revolutionary.” (2001) [12]<sup>22</sup>
- Glyn Moody “Rebel Code: Linux and the Open Source Revolution” (2002) [13]
- Andrew M. St. Laurent “Understanding Open Source and Free Software Licensing” (2004) [14]<sup>23</sup>

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<sup>22</sup>Online version available from <http://www.catb.org/~esr/writings/cathedral-bazaar/>.

<sup>23</sup>Open book available from <http://oreilly.com/openbook/osfreesoft/book/index.html>.

# How to create good open source software

## “The Cathedral and the Bazaar” by Eric S. Raymond [12]

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### Excerpt of described guidelines:

- Every good work of software starts by scratching a developer's personal itch.
- Good programmers know what to write. Great ones know what to rewrite (and reuse).
- When you lose interest in a program, your last duty to it is to hand it off to a competent successor.
- Treating your users as co-developers is your least-hassle route to rapid code improvement and effective debugging.
- Release early. Release often. And listen to your customers.
- Smart data structures and dumb code works a lot better than the other way around.

# Code Repositories

## Popular project hosting platforms

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Popular source code repository that mostly offer additional functionality for version control, bug tracking, release management, mailing lists and Wiki-based documentation:

CodePlex ( <a href="http://www.codeplex.com/">http://www.codeplex.com/</a> )	28,307 projects	<a href="#">Microsoft, Inc.</a>
GitHub ( <a href="https://github.com/">https://github.com/</a> )	4,656,680 projects	<a href="#">GitHub, Inc.</a>
Google Code ( <a href="http://code.google.com/hosting/">http://code.google.com/hosting/</a> )	250,000 projects	<a href="#">Google, Inc.</a>
Joinup ( <a href="https://joinup.ec.europa.eu/">https://joinup.ec.europa.eu/</a> )	407 projects	<a href="#">European Commission</a>
Launchpad ( <a href="https://launchpad.net/">https://launchpad.net/</a> )	26,862 projects	<a href="#">Canonical Ltd.</a>
Savannah ( <a href="http://savannah.gnu.org/">http://savannah.gnu.org/</a> )	3,428 projects	<a href="#">FSF</a>
Sourceforge ( <a href="http://sourceforge.net/">http://sourceforge.net/</a> )	324,000 projects	<a href="#">Geeknet, Inc.</a>
<i>Statistics as of 04/2012, no recent data available for Google Code (last info dated 03/2011).</i>		

Detailed overview is available e.g. at Wikipedia “Comparison of open source software hosting facilities”:

<http://en.wikipedia.org/wiki/>

[Comparison\\_of\\_open\\_source\\_software\\_hosting\\_facilities/](#)

# Joinup

## former EU Open Source Observatory and Repository

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- New collaborative platform created by the European Commission and funded by the European Union
- Only for FLOSS that is either used or developed by a public body, also non-EU
- Project hosting (code, versioning, issue tracker, wiki, docs, forum) and software directory
- European Union Public License (EUPL)
- Topical communities / socializing
- Knowledge base (news, library)

<https://joinup.ec.europa.eu/>



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- First choice in emerging economies primarily due to non-existing licensing costs, fulfillment of essential needs and easy customization to local requirements
- Challenges in industrialized countries due to issues related to liability, legal regulations, lack of support and strong lobby of proprietary software vendors
- Numerous and major projects do exist
- Related valuable resources are available

# Feedback

## Help us to complete the picture of FLOSS

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Which aspects/projects/resources/initiatives did we miss?

- General FLOSS in Russia and other countries
  - ... all federal institutions shall start migration to Open Source by 2014<sup>24</sup>
  - “Community of Open Government in Russia”<sup>25</sup> at EU Joinup
- Medical FLOSS in Russia and other countries
  - ...
- Are you already utilizing FLOSS?
- What hinders you in the adoption of FLOSS?
- Which expectations haven't been addressed in this talk?

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<sup>24</sup>[http:](http://www.h-online.com/open/news/item/Russia-to-switch-to-open-source-by-2015-1170201.html)

[//www.h-online.com/open/news/item/Russia-to-switch-to-open-source-by-2015-1170201.html](http://www.h-online.com/open/news/item/Russia-to-switch-to-open-source-by-2015-1170201.html)

<sup>25</sup><http://joinup.ec.europa.eu/community/cogr/home> ◀ ◻ ▶ ◀ ◻ ▶ ◀ ≡ ▶ ◀ ≡ ▶ ≡ ↺ 🔍 ↻

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## Thank you for your attention!

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