Free as in Freedom
Free and Open Source Software

Dr Colin Turner

19th April 2012

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Context of this talk

On the 15th October 2008, Sir Reg Empey opened the Open Source Solution Centre in the SRC in Newry. His speech provided some useful local context.

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Sir Reg Empey
Open Source Solution Centre, 15th October 2008

"... Today's event is a tangible illustration of further progress and is a timely development, given the strategic importance of Open Source software to the long term sustainability of our software sector.

It is clear that Free and Open Source Software will become fundamental to building and maintaining future market share. The FOSS model can therefore provide start-ups with a fast and efficient way to build a client base and thus gain market advantage. "

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Sir Reg Empey

Open Source Solution Centre, 15th October 2008

"... Open source also adds value to the Northern Ireland software industry by providing impetus to their product and process innovation, resulting in faster delivery."

"... The days of conventional commercial software companies holding a monopoly position over society are over."

"... I would like to reinforce the message that Open Source solutions will in the future represent an important contribution to building and maintaining market share for the business and other sectors. The fact that all of us are gathered here today demonstrates the commitment of government to embrace this new climate of opportunity."

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Neelie Kroes
European Union Competition Commissioner, 10th
June 2008

"I know a smart business decision when I see one - choosing Open Standards is a very smart business decision indeed."

"There is a democracy issue as well. No citizen or company should be forced or encouraged to use a particular company's technology to access government information. No citizen or company should be forced or encouraged to choose a closed technology over an open one, through a government having made that choice first."

This talk explores the issues of

- what "free" or "open source" software means;

- why it is important;

- a little about GNU/Linux or Linux;

- more specific information about Debian GNU/Linux, a Linux distribution;

Terms and their usage

It's worth noting at this early stage that we should not take it for granted that people understand the meaning of free or open source software. Even in the FOSS community, there are some divergences of opinion and usage here.

So, with apologies to those for whom this is all well understood, we shall introduce the definitions in most common usage.

Free as in Freedom

The Oxford English Dictionary (Reference Version) has 19 definitions of the word free. Here are a few:

- unrestricted, unimpeded; not restrained or fixed;
- unconstrained;
- available without charge; costing nothing.

Most people think the last of these is what "free" software pertains to, but no, it is the former two which have a higher priority that the latter, although often strong restrictions on cost exist. As the FSF (http://www.fsf.org) say, it is Free as in Freedom.

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Terms and their usage

The Free Software Foundation (http://www.fsf.org)
defines free software as providing you with the following
freedoms with software:

Freedoms in Free Software

0 the right to run it for any purpose;

1 the right to study it and adapt to your needs;
(which implies open source)

2 to redistribute it, so you can help others;

3 to release improvements, so everyone benefits.

Specifically, note, money is not mentioned, but freedom 2
and 3 normally imply freedom from cost.

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Terms and their usage

Other types of software include

- Open Source:
  Most people use this term synonymously with free, but some mischievous people use this to literally mean: read access to the source.

- Custom :
  Software created "in house" which isn't being licensed for distribution - closed source, but without ethical entanglements normally.

... and

Terms and their usage

- Proprietary :
  The "normal" model, software that is licensed, often in extraordinary ways that grants very little in return for the money. Having said that, again money might not be involved at all here, a lot of "freeware" and "shareware" software still grant none of the freedoms mentioned above.

  "Crowley had been extremely impressed with the warranties offered by the computer industry, and had in fact sent a bundle Below to the department that drew up the Immortal Soul agreements, with a yellow memo form attached just saying: 'Learn, guys'"
  Pratchett & Gaiman, Good Omens

Note that money is not part of the definition here.

Software we would have (and still would) cause Freeware and Shareware is not necessarily FOSS.

FOSS (libre software) can, and is used to make money.

Proprietary software can be free of charge (gratis software).

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Why is Freedom important?

It might seem that this is a fairly academic distinction. After all, if the software is free in price, why should we care? Software that is free in price but not in licence is usually that way for a reason.

- Internet Explorer, alleged to be free in a simple (successful) bid to crush Netscape,

- Media Player, alleged to be free to crush the opposition.

These products have tended to help the market position of MS Windows (understandably, to be fair to Microsoft that was they they were developed), but such commercial power has been the undoing of many competitors (e.g. OS/2). Is a mono-culture a healthy thing?

Why is Freedom important?

There are other reasons:

- Mozilla rose from the ashes of Netscape, and now
  Mozilla Firefox is a highly popular extendable browser
  with open source so that it is available in almost
  identical form on many platforms.

- In 2004 the developer of the PWC (Linux) webcam
  driver withdrew his propietary driver (which was only
  available for the x86 platform) and his open source
  driver. It was judged by the kernel developers that
  hooks to closed source drivers could not be included for
  reasons of maintenance and cross platform support.

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Why is Freedom important?

- Free software implies free, or at least open standards, allowing users to avoid lock-in with one vendor. Consider that many governments are now insisting on only "open" formats being used to store information in their work. Why?

- What happens when the software you rely on for your research project belongs to a company that goes bust?

- Free software is often considered more secure. This is security by design rather than security through obscurity. More pairs of eyes can see the code in free software applications, and bugs are not hidden.

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How much free software exists?

This talk was prepared entirely with free software:

- on a free operating system (GNU/Linux (Debian));
- with a free editor (Emacs), using free extensions;
- compiled with a free document preparation system (LATEX);
- with free extension packages (beamer);
- checked with a free PDF file viewer (xpdf, evince);
- occasionally I looked up resources with a free browser (Mozilla Firefox).
- and I store the files in my version control system (subversion).

And for almost all of these tasks I had several free alternatives. I could simply have used OpenOffice.

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But, but I run Windows?

Really? Well, you are not alone...

- Special organisations do exist to help wean you off powerful dependencies to harmful addictions;

- you could always try one of the GNU/Linux distributions for those that like its strong similarity to Windows, at least visually;

- you could run dual boot with a free operating system on another parititon of your hard disk;

- you could run a live CD of a free operating system, but long term it's no way to live;

- Much free software can be compiled and run on Windows, but this is only a very limited kind of freedom.

The Free Software Foundation

In 1984 Richard Stallman (author or the emacs editor)
launched the Free Software Foundation or FSF
(http://www.fsf.org).

- Software produced by the FSF was often branded
  GNU. GNU stands for Gnu's Not Unix and was an early
  example of one of many self-referential acronyms to
  come;

- The FSF intended to produce a complete free operating
  system — which was to be codenamed the Hurd. The
  intention was that this would be a free Unix like system.

- The software would be released under a licence known
  as the GNU General Public Licence or GPL
  (http://www.gnu.org/copyleft/gpl.html).

The Free Software Foundation

Currently, the most recent version of the GPL is v3, but v2 is
still widely used. It is one of the licences used for free
software, though there are many others. See
http://www.gnu.org/licenses/gpl-faq.html.

- Not all GPL programs are GNU;

- Users are free to modify the GPL code as they wish;

- The licence ensures that any improved, or modified
  version of the code must also be released under the
  GPL (it cannot be closed);

- It is permissible to sell GPL programs;

- However, anyone with the software has the right to give
  it away.

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The Free Software Foundation - Other Licenses

- There is also the Lesser GPL or LGPL, formerly known as the library GPL. In a nut shell, it offers similar features to the GPL itself, except that code built on top of such software does not "catch" the GPL. It lacks the viral nature of the GPL.

- This license is used strategically where no benefit is obtained from using the GPL proper, for example, when there is an existing alternative to the software in the proprietary sphere that will otherwise be used.

The Free Software Foundation - Other Licenses

- Note, it is perfectly legitimate to build custom software on top of GPL code which is not distributed. It is not free, but it does not break the terms of the license. That has important consequences for web applications. An alternative license that could be used for such an application of the Affero GPL.

This is specifically designed to close the loophole (if you consider it as such) of Software as a Service (SaaS).

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Other Significant Licenses

- The other significant family of licenses is the BSD license. Historically there have been several versions, but a recent one omits advertising clauses.

- The BSD license essentially allows third parties to do whatever they like with the code. It can be used in free software, proprietary software, and changed versions need not be distributed.

- For example, it is believed the original Microsoft TCP/IP stack was built upon BSD code.

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GNU's not unix

- Years passed and Gnu produced a great deal of excellent and famed software, mostly under the GPL;

- Much of this software runs on Unix distributions of all makes;

- The Gnu C Compiler (GCC) becomes extremely popular (although now GCC stands for the Gnu Compiler Collection since it supports many languages);

- But the OS kernel does not appear in any meaningful way.

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The rise of Linux

And then...

- In 1991, a Finnish student called Linus Torvalds began work on a new kernel to provide a freeware unix kernel for people to play with.

- It was (perhaps) based on an attempt at a free version of Minix, which was a x86 based kernel for students to explore, produced by Andrew Tanenbaum.

- Linus initially claimed that it would never be portable, but at the time of writing it is ported to many platforms and version 3.4 of the kernel is imminent. Linux is released under GPL v2.

This filled the missing gap in the movement.

Tensions in the Open Source /
Free Software Community

Even this altruistic bunch of people have their own politics.
At the front page of the GNU website
(http://www.gnu.org) you will find a reference to why
Linux Operating Systems should be known as GNU/Linux
Operating Systems at
(http://www.gnu.org/gnu/linux-and-gnu.html).

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Richard Stallman on "Linux"

*"If we tried to measure the GNU Project's contribution in this
way, what would we conclude? One CD-ROM vendor found
that in their "Linux distribution", GNU software was the
largest single contingent, around 28% of the total source
code, and this included some of the essential major
components without which there could be no system. Linux
itself was about 3%. So if you were going to pick a name for
the system based on who wrote the programs in the system,
the most appropriate single choice would be "GNU"."*

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Linus Torvalds on "GNU/Linux"

"About the GNU/Linux argument; have you talked with Richard Stallman about this?"

"Linus: rms asked me if I minded the name before starting to use it, and I said "go ahead". I didn't think it would explode into the large discussion it resulted in, and I also thought that rms would only use it for the specific release of Linux that the FSF was working on rather than "every" Linux system. I never felt that the naming issue was all that important, but I was obviously wrong judging by how many people felt very strongly about it. So these days I just tell people to call it just plain "Linux" and nothing more."
(http://kde.sw.com.sg/food/linus.html)

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Free versus Open Source

Richard Stallman also draws a sharp distinction between Free and Open Source software:

"The fundamental difference between the two movements is in their values, their ways of looking at the world. For the Open Source movement, the issue of whether software should be open source is a practical question, not an ethical one. As one person put it, "Open source is a development methodology; free software is a social movement." For the Open Source movement, non-free software is a suboptimal solution. For the Free Software movement, non-free software is a social problem and free software is the solution."

More can be read at http://www.gnu.org/philosophy/free-software-for-freedom.html

Debian, Bruce Perens and the DFSG

One major GNU / Linux distribution, Debian, was for a time
headed up by Bruce Perens, who worked at Pixar at the
time (hence the Debian release names). He headed up the
initiative to define free software for Debian: The Debian Free
Software Guidelines, part of the Debian Social Contract.
Essentially these are a more explicit statement of the FSF
rules, and they became the Open Source Software
Definition (http://www.opensource.org/docs/osd).
Two somewhat polarised camps now exist: free software,
and open source software, with subtly different goals and
motivations, using different terminologies for the same
concepts.

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Free vs Open Source

- Free software advocates (e.g. Stallman), generally stress ethical issues, and want freedom to the the main, clear issue.

- Open Source advocates (e.g. Torvalds, Perens), generally stress the practical benefits of such software.

- Most people confuse free software with free of charge, and some mischeviously use the phrase open source when material is not free (as in freedom).
  Consequently, terms like FOSS (free and open source software) are used to be inclusive.

Business Models

- The proprietary business model is based around code secrecy, and the sale of executable binaries derived from it, so a product is being sold.

- FOSS models are based around code expertise, and therefore a service is being sold. This is usually in the form of consultancy, service level agreements, hosting and so on.

- FOSS models tend to be symbiotic, since code contributed by one project (e.g. Red Hat) becomes available to others, even compitetors in some cases.

- A popular business model is using FOSS for the creation of embedded devices.

Relationship between copyright and Licenses

Let's start to explore the issues of "Intellectual Property" or "IP" which it should be noted is not even a term many recognise. Let's start with the idea of Copyright.

- Copyright is automatic, but ensure it is enforceable;
- Copyright holders can change the licensing, or offer dual or more licenses;
- Sometimes copyright has to be assigned away.

Copyright law itself is controversial, but it's difficult to see how the model can be changed at this time.

DRM and GPL v3

The TiVo video system was built around linux, and was used to enforce (via a subscription fee) access to a service. This (and similar practices) have become known as DRM - Digital Rights Management. The FSF and many others call this Digital Restrictions Management since in fact it is a system to deprive you of your rights, particularly freedom 0 - the right to run software for any purpose.

As part of the drafting of version 3 of the GPL `http://gplv3.fsf.org/draft` some restrictions on DRM are planned, to help prevent free software being used to restrict freedom of other kinds.

The wording is necessarily legalistic, and has been interpreted by Linus Torvalds in a particular way.

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DRM and GPL v3

3. Digital Restrictions Management.
As a free software license, this License intrinsically disfavors
technical attempts to restrict users' freedom to copy, modify, and
share copyrighted works. Each of its provisions shall be
interpreted in light of this specific declaration of the licensor's
intent. Regardless of any other provision of this License, no
permission is given to distribute covered works that illegally
invade users' privacy, nor for modes of distribution that deny
users that run covered works the full exercise of the legal rights
granted by this License.
No covered work constitutes part of an effective technological
protection measure: that is to say, distribution of a covered work
as part of a system to generate or access certain data constitutes
general permission at least for development, distribution and use,
under this License, of other software capable of accessing the
same data.

Why is DRM a potential problem?

DRM has many potential uses, but consider just one. DRM can be used to ensure that the hardware of a computer will only run crypographically signed software. This could in principal, in some situations be a good thing (e.g. digital voting machines, if you think they are a good idea anyway). However, it could easily be used to design PCs that are locked into using only one version of one operating system. This can deprive you of freedom 1, the right to study and adapt to your needs.

DRM has subsequently been involved in controversies including the mp3 formatted files from music vendors, e-books and phones.

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Software Patents?

Software patents pose another potential danger, particularly to free software. At present they can be obtained in the USA but not within Europe. What are the issues?

- patents protect big companies, and much less small companies and individuals;
  since big companies play patents off against each other

- free and open source software is by definition available for inspection, while proprietary software is not; making it easier to find, or invent, violations in the former;

- patents in software don't increase innovation, they kill it.

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Software Patents?

Microsoft recently sued TomTom for infringement of a number of patents. It's worth noting that TomTom runs on top of a Linux kernel.

Microsoft's operating systems do not support any filing systems but their own, a luxury one can easily have in a monopoly position. All of these filing systems have patent entanglements, and arguably, much more advanced alternatives exist. However, in order to support the Microsoft machines, all memory sticks or differents brands and types all have to support MS filing systems.

As a result, to allow support on other OSs, support for patent entangled filing systems needs to be added, and this has allowed this law suit.

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Success Stories

In its short life span, FOSS is already causing a revolution.
Products like the Apache web server have more market
share than any other competitor. PHP, Python, and Perl are
powerful programming languages, which have been free
software from their inception. Java is now free.
Many web applications are built on the LAMP stack (Linux,
Apache, MySQL, PHP).
Linux exists on many architectures from embedded devices
(routers, storage devices) through desktop machines,
servers right up to the fastest supercomputers on the planet.

Success Stories

Linux itself is a fascinating example of development by programmers from all over the world, in the bazaar method of software development (all the development is the open). In a recent report, the Linux Foundation announced: *The linux kernel grows by 3,621 lines of code a day on average, being developed by nearly 1000 developers working for more than 100 companies.*
"Never before in the history of computing have there been so many companies, users and developers united behind one project, specifically one that has seen so much commercial success. This rate of innovation is unsurpassed in software." Jim Zemlin, executive director at The Linux Foundation.

Influence on Society

It is hard to argue that FOSS has not directly influenced and enabled many other initiatives:

- open content: wiki and wikipedia in particular;
- creative commons;
- open hardware (e.g. RepRap, self replicating printer);
- OLPC (one laptop per child) project;
- open development (Cathedral vs. Bazaar (Eric. S. Raymond));
- Virgin Galactic to use "open architecture" development.

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FOSS @ UU

We have released a number of free software packages here
at Ulster.

- OPUS, our placement management system;
- Pace, our personal development system;
- UUWAF, our common web application framework.

Read more in an interview I gave the FSFE.
http://www.fsdaily.com/Community/FSFE_
Fellowship_interview_Colin_Turner

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foss.ulster.ac.uk

We have installed a local sourceforge for our development, and we encourage student development.
Foss offers

- Version Control;
- Support, Bug and Task tracking;
- Download areas;
- News facilities;
- Mailing lists and more.

Summary

- We have seen some of the motivation in the creation of open source and free software, and that there is a subtle distinction between the two.

- There are varying grades of militancy in the support of OSS, and this can even be seen in the various Linux / GNU/Linux distributions available.

- The free software movement is stronger than ever, with vast projects spanning continents, and frequently world leading products like Apache.

http://xkcd.com (Creative Commons)

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What is unusual
about Debian?
Installing Debian
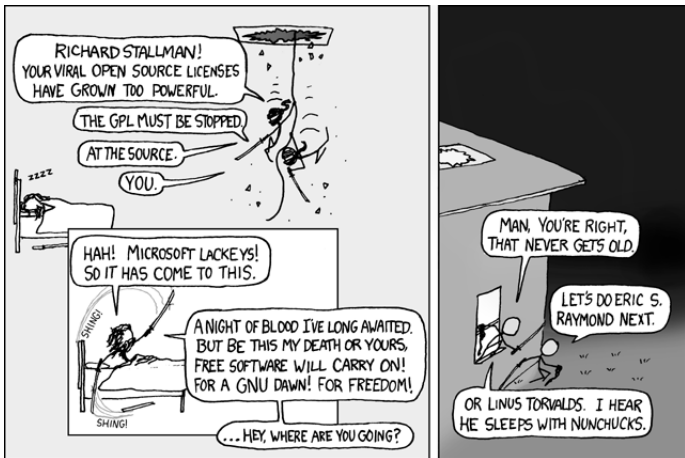
Debian GNU/Linux

Debian is one of the many distributions of Linux, although in fact Debian emphasises the fact that it is GNU/Linux (a bit of digging will reveal that the FSF sponsered its early development), and that it is being developed to run with other free kernels (such as the Hurd or BSD).

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The Debian Social Contract

The Debian project is quite forceful in its support of the free software model, and has published the following Social Contract
(http://www.debian.org/social_contract).

- **Debian Will Remain 100% Free Software**
  We promise to keep the Debian GNU/Linux Distribution entirely free software. As there are many definitions of free software, we include the guidelines we use to determine if software is "free" below. We will support our users who develop and run non-free software on Debian, but we will never make the system depend on an item of non-free software.

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Debian
What is unusual
about Debian?
Installing Debian

The Debian Social Contract

- We Will Give Back to the Free Software Community
  When we write new components of the Debian system,
  we will license them as free software. We will make the
  best system we can, so that free software will be widely
  distributed and used. We will feed back bug-fixes,
  improvements, user requests, etc. to the "upstream"
  authors of software included in our system.

- We Won't Hide Problems
  We will keep our entire bug-report database open for
  public view at all times. Reports that users file on-line
  will immediately become visible to others.

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- **Our Priorities are Our Users and Free Software**
  We will be guided by the needs of our users and the
  free-software community. We will place their interests
  first in our priorities. We will support the needs of our
  users for operation in many different kinds of computing
  environment. We won't object to commercial software
  that is intended to run on Debian systems, and we'll
  allow others to create value-added distributions
  containing both Debian and commercial software,
  without any fee from us. To support these goals, we will
  provide an integrated system of high-quality, 100% free
  software, with no legal restrictions that would prevent
  these kinds of use.

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- **Programs That Don't Meet Our Free-Software Standards**
  We acknowledge that some of our users require the use of programs that don't conform to the Debian Free Software Guidelines. We have created "contrib" and "non-free" areas in our FTP archive for this software. The software in these directories is not part of the Debian system, although it has been configured for use with Debian. We encourage CD manufacturers to read the licenses of software packages in these directories and determine if they can distribute that software on their CDs. Thus, although non-free software isn't a part of Debian, we support its use, and we provide infrastructure (such as our bug-tracking system and mailing lists) for non-free software packages.

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The Debian Free Software Guidelines

Debian produces a set of guidelines known as the Debian Free Software Guidelines (DFSG) which was subsequently adopted with some minor changes by the free software community as the Open Source Definition. The latter is produced here:
Open source doesn't just mean access to the source code. The distribution terms of open-source software must comply with the following criteria:

- Free Redistribution
  The license shall not restrict any party from selling or giving away the software as a component of an aggregate software distribution containing programs from several different sources. The license shall not require a royalty or other fee for such sale.

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- **Source Code**

  The program must include source code, and must allow distribution in source code as well as compiled form. Where some form of a product is not distributed with source code, there must be a well-publicized means of obtaining the source code for no more than a reasonable reproduction cost preferably, downloading via the Internet without charge. The source code must be the preferred form in which a programmer would modify the program. Deliberately obfuscated source code is not allowed. Intermediate forms such as the output of a preprocessor or translator are not allowed.

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The Debian Free Software Guidelines

- Derived Works
  The license must allow modifications and derived works, and must allow them to be distributed under the same terms as the license of the original software.

- Integrity of The Author's Source Code
  The license may restrict source-code from being distributed in modified form only if the license allows the distribution of "patch files" with the source code for the purpose of modifying the program at build time. The license must explicitly permit distribution of software built from modified source code. The license may require derived works to carry a different name or version number from the original software.

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- No Discrimination Against Persons or Groups
  The license must not discriminate against any person or group of persons.

- No Discrimination Against Fields of Endeavor
  The license must not restrict anyone from making use of the program in a specific field of endeavor. For example, it may not restrict the program from being used in a business, or from being used for genetic research.

- Distribution of License
  The rights attached to the program must apply to all to whom the program is redistributed without the need for execution of an additional license by those parties.

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- License Must Not Be Specific to a Product
  The rights attached to the program must not depend on
  the program's being part of a particular software
  distribution. If the program is extracted from that
  distribution and used or distributed within the terms of
  the program's license, all parties to whom the program
  is redistributed should have the same rights as those
  that are granted in conjunction with the original
  software distribution.

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- License Must Not Restrict Other Software
  The license must not place restrictions on other
  software that is distributed along with the licensed
  software. For example, the license must not insist that
  all other programs distributed on the same medium
  must be open-source software.
- License Must Be Technology-Neutral
  No provision of the license may be predicated on any
  individual technology or style of interface.

Source (http://www.opensource.org/docs/
definition_plain.html).

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Debian Pros & Cons

Debian as a whole has some of the following advantages:

1. strongly pro-free software, so an excellent choice for this priority with thousands of packages;
2. exceptional support of bug tracking, package management etc.;
3. excellent for servers, easy to maintain.

However, there are some downsides:

1. it is not the most "friendly" distribution to install;
2. makes little effort to provide the kinds of charged services that other distributions provide (e.g. printed manuals, telephone support).

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Installing Debian is a big topic unfortunately, but here are
some pointers

- A lot of information canbe found at
  `http://www.debian.org/distrib/`.
- There is a link to a manual for any one of 11
  architectures at `http://www.debian.org/`
  `releases/stable/installmanual`.
- Always take particular care when installing a dual
  operating system machine that you have fully read the
  instructions for installing the boot loader and
  partitioning.
- Be careful to pick the appropriate distribution (stable,
  testing, unstable, experimental).