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Open Source / Free Software: Towards Maturity

Guest Editors: Joe Ammann, Jesús M. González-Barahona, Pedro de las Heras Quirós

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“Knowledge Management”

The Debian GNU/Linux Project

Javier Fernández-Sanguino Peña

The Debian GNU/Linux project is currently one of the most ambitious Free Software projects, involving a large number of developers from far and wide who work together with one aim: to create a totally free operating system.

Keywords: Debian, Operating System, Linux, Free Software

1 Introduction

Debian began as a project founded in August 1993 by the GNU project¹ of the Free Software Foundation², led by Ian Murdock, to build an operating system based entirely on free programs.

An operating system is the set of basic programs utilities which make a computer work. At the heart of an operating system lies the kernel. The kernel is the computer's most important program; it performs all the basic maintenance functions and enables it to run other programs. Debian is independent of the kernel. It currently uses the Linux kernel³, but Debian can also function with a Hurd kernel⁴.

Debian has grown a great deal since its beginnings and now has an estimated close to one million users. Also, thanks to Debian's philosophy of delivering a distribution made up entirely of Free Software (a commitment reflected in its Social Contract⁵), all the packages comprising the main part of the system are free, as they are available in source code.

Here are some of Debian's milestone dates:

- versions 0.01-0.90 came out between August and December 1993
- release 0.91 came out in January 1994, was the work of nearly 30 developers and featured a primitive packaging system
- version 0.93R5 emerged in March 1995, containing the program dpkg
- release 0.93R6 appeared in November 1995, the work of nearly 60 developers; it supported the system a.out and had the first version of dselect
- version 1.0 was never released. It later became release 1.1
- Buzz, version 1.1, came out in June 1996, with 474 packages, kernel 2.0 from Linux and full support of ELF
- Rex (1.2) appeared in December 1996 with 848 packages and 120 developers
- Bo (1.3) came out in July 1997, with 974 packages and 200 developers
- The Hamm version (2.0) emerged in July 1998, boasting more than 1500 packages on which more than 400 developers worked. It has full support of libc6, though it still has libraries for programs compiled with libc5
- The next version, Slink (2.1), was distributed on 9 March 1999. Featuring more than 2500 packages, it consists of four cd-roms, two of binaries and two of sources. In order to

solve security problems that were discovered and Y2000 errors, as many as five revisions of this release were made

- The current release, Potato (2.2), was distributed on 15 August 2000. It has more than 4000 software packages and in binaries alone matches the previous version's tally of binaries and sources. There have been three revisions of this version, solving the serious problems and security deficiencies that were detected
- The version currently under development, Woody (3.0), is soon to be launched. It improves on the previous version with over 6000 software packages.

Debian has grown not only in the number of programs included in the distribution, but also in the number of people working on it; it currently has more developers than any other GNU/Linux distribution. And it has been internationally recognised by a host of organisations:

- The Australian Government⁶
- HP⁷
- IBM Global Services⁸
- Compaq⁹
- France Telecom¹⁰
- Corel¹¹
- eBay¹²
- VA Linux Systems¹³
- Linux Hardware Solutions¹⁴

Moreover, Debian has received a great many donations of equipment from a multitude of companies: Novare, VA Linux, Compaq, and Sun, to name but a few.

Debian is the only important GNU/Linux distribution maintained solely by volunteers, that is, without any commercial end. This has its advantages and its disadvantages.

First of all the people who work with Debian are all highly motivated collaborators, and the distribution is upgraded on a daily basis as they constantly develop new software packages.

Javier Fernández-Sanguino has been a member of the Debian Project since January 1998. Within the project he is coordinator of the project for the internationalisation of Spanish in the Debian GNU/Linux release, a member of the Web site working group, and he also maintains more than sixty software packages ranging from end user applications to development and security tools. He is also a regular contributor to magazines related to GNU/Linux. <jfs@computer.org>

They also share a commitment to quality; nobody wants to distribute software with errors. This is why the release of Debian 2.0, for example, was put back while they ironed out the bugs, caused by problems arising when all the programs were converted to libc6, and by the holes in security which were subsequently discovered. RedHat¹⁵, for example, around that same time decided to press ahead with their release and so were forced to distribute RedHat 5.1 immediately after 5.0 to fix many of the security problems found in its programs.

Secondly, because of its open arms attitude, encouraging everyone to take part in a spirit similar to that originally shown by Linux, there are constantly people joining Debian to participate and contribute their grain of sand, not only by making packages of programs, but by collaborating on the web server, translating Debian documentation, documenting errors, or helping users to solve any problems they might have with the distribution, through mailing lists¹⁶ or other tools, like FAQ-omatic¹⁷.

This service is, without a doubt, much faster, more agile and more effective than that offered by many software companies.

On the downside it has to be said that Debian has a greater technical component than other distributions. Also, given the voluntary nature of the developers' work, certain packages may not be upgraded as often as they should be, perhaps because their original developers have stopped doing so and nobody else has taken over. However, this is something all developers try to avoid and, while each developer maintains its own packages, it is not uncommon for another developer (or even a user) to send an upgrade of a package to fix a problem or bring it up to date.

2 Organisation

Debian's organisation may appear to be non-existent for anyone who doesn't know the group, but this is not the case. Debian is backed by a not-for-profit association called Software in the Public Interest¹⁸ (SPI), which is based in the USA and whose aim is to help organisations develop and distribute open software and hardware. The association was founded on 16 June 1997. Debian is not the only project backed by this organisation; there are also:

- GNOME¹⁹ (GNU Network Object Model Environment), the project which aims to develop a user friendly desktop environment based on Free Software.
- LSB²⁰ (Linux Standard Base) is a project which develops and promotes the definition of standards to facilitate compatibility between Linux distributions and allow applications to work on any one of them. It also coordinates efforts to encourage software companies to develop and port applications to Linux.
- Open Hardware²¹, a certification system for hardware to provide compatible device controllers for free operating systems.
- Berlin²², a window environment developed by members of the Free Software community which aims to make the user environment as flexible and as powerful as possible.
- SPI manages the registered trademarks: Open Source, Open Hardware, and Debian.

However, Debian also has its own organisation, with a president (currently Ben Collins), a Secretary and a Technical Committee, as well as a large number of people responsible for different areas of Debian's development, from the production of CDs, through security, to the error (bug) tracking system.

And then there are all the developers who, like those mentioned above, volunteer part of their time for no monetary gain, in order to contribute to the distribution. There are different kinds of contributions but their basic aim is to follow the policy of creating packages of programs to include in the distribution. The ease with which new developers can contribute to the distribution and introduce new programs has been instrumental in Debian's growth over the years it has been in existence.

Debian has, at the time of writing this article, nearly 600 developers (check out the Debian developer world map²³) all around the world. Of course not all of them have the same degree of commitment: some of them are working exclusively for Debian (financed by outside companies) while others collaborate from time to time.

Developers take the decisions necessary to run the Project by means of a voting system which was first used to vote for the association's Constitution and has been used on many occasions since then: to elect new presidents, to choose the logo, to make Debian policy decisions, etc.

Most discussions are carried out via e-mail since it's the only way that enables so many people to coordinate in an organised fashion.

Debian developers are involved in a great many different tasks, including the administration of the Web Server²⁴ and FTP Server²⁵, graphic design, legal analysis of software licences, drafting of documentation and, of course, the maintenance of software packages.

By way of "spreading the word" and in order to attract developers who believe in the principles that Debian stands for, the Debian Project has published a number of documents explaining our values and setting the guidelines for what being a Debian Developer means:

- Debian's Social Contract²⁶ is a commitment statement from Debian to the Free Software Community. Anyone who is willing to abide by the Social Contract can become a developer²⁷. Any developer can add new software to Debian provided that it fulfils the criteria of being Free Software and meets its standards of quality.
- The Debian Free Software Guidelines document²⁸ is a clear and concise statement of Debian's Free Software criteria. The DFSG has a great influence on the Free Software movement and provides the bases for Open Source Definition²⁹.
- The Debian Policy³⁰ is a comprehensive specification of quality standards for the Debian Project.

Debian developers are also involved in other projects; some are specific to Debian, while in others part or all of the Linux community are involved. Among examples of these projects are:

- Linux Standard Base³¹ (LSB). LSB is a project whose aim is to standardise Linux's basic system, which would enable outside software and hardware developers to develop pro-

grams and device controllers easily for Linux in general, rather than just for a particular Linux release.

- Filesystem Hierarchy Standard³² (FHS) attempts to standardise the distribution of Linux's file system. FHS will enable software developers to concentrate on designing programs, without having to worry about how a package will be installed in different Linux releases.
- Debian Jr.³³ is our own internal project, aimed at ensuring that Debian has something to offer for our younger users.

For more general information about Debian, see Debian FAQs³⁴.

3 The Distribution

Debian's philosophy and methodology, GNU tools, the Linux kernel, and other important Free Software, all come together to make up the unique software distribution known as Debian GNU/Linux. This release is made up of a large number of packages. Each of the release's packages has executables, scripts, documentation, and configuration information, and has a maintainer who is the main person in charge of keeping the package upgraded, following up bug reports, and keeping in touch with the software package's chief writers. Our large user base, together with our error tracking system ensure that errors are quickly discovered and fixed.

Debian's attention to detail means we can produce a high quality, stable and scalable distribution. The installation is easy to configure for many different tasks, from minimal firewalls with the minimum of essential services, to scientific work stations and top range web servers.

What makes Debian stand out from other GNU/Linux distributions is its package management system. These tools give the Debian system administrator complete control over packages installed in their system, including the ability to install one single package or completely upgrade the whole operating system. Individual packages can also be protected against upgrading. You can also tell the package management system what software you personally have compiled and what dependencies it has.

To protect the system against Trojan horses and other malevolent programs, Debian checks that packages come from their real Debian maintainers using public key systems. Debian packagers also take great care to configure them securely. If a security problem occurs with any submitted packages, patches are usually readily available. With Debian's simple upgrading system you can download and install security-fixes automatically over the Internet. Users can also check whether downloaded software has been manipulated since they contain the same public key mechanisms to check on their integrity.

The main and the best way to get support for a Debian GNU/Linux system and to communicate with Debian Developers is by means of the many release lists³⁵ kept by Project Debian (there are currently more than 90 at the time of writing).

4 The Latest Stable Release: Debian 2.2

All Debian architectures, from Debian 2.2 on, are based on the Linux 2.2.16 kernel (latest stable release), and on the new release 2.1.2 of the GNU C library. Although the new glibc

means that new packages are uninstalleable on the previous release, it preserves backward binary compatibility with the old packages compiled with glibc 2.0 of Debian versions 2.1 and 2.0, and almost complete source compatibility with those older sources.

In this release most of the system's basic utilities have begun to use PAM, Pluggable Authentication Modules, which provides system administrators with a powerful means of controlling system access and authentication methods. PAM allows you to administrate authentication and account management from a single point. If you wish to change your authentication programs to a different model (e.g. OPIE, Kerberos, etc...) you only need to modify the PAM configuration files for those programs, rather than having to recompile the program itself.

Debian 2.2 is Debian's first release to include complete support for our Japanese users, who had to use add-on Debian JP packages up to now to get multi-byte character support. The level of internationalisation has also been increased and support for most "non Latin" languages has been improved. Support for European languages has also improved, with more and better translations into a great many languages.

The main release now includes around 4000 packages, an increase of over 50% over the previous release as is customary (there are, in fact, 1500 new packages). Among the new packages are:

- postfix. A new secure mail transport agent.
- openssh. A free secure shell implementation.
- openldap. LDAP client and server packages.
- w3m. A new text based browser that supports tables and frames.
- gdm. GNOME window manager.
- cvsup. An efficient mirror system for CVS.
- everybuddy. An integrated messenger client.
- reportbug. A tool for reporting problems to Debian GNU/Linux.
- zope. A web application server for dynamic sites.
- xmms. The multimedia X system.
- kaffe. A free Java virtual machine, JIT enabled.
- gnupster. An interface for the popular MP3 file-sharing system.
- And, last but not least, 56 new games.

Of the 800 upgraded packages the following are perhaps the most interesting:

- C Library 2.1.3
- XFree86 3.3.6
- GCC 2.95.2
- GnuPG 1.0.1
- Perl 5.005.03
- Python 1.5.2
- PAM 0.72
- ncurses 5.0
- teTeX 1.0.6
- Emacs 20.7
- XEmacs 21.1.10
- GNOME 1.0.56

As was the case when release 2.0 was upgraded to 2.1, most of the changes from 2.1 to 2.2 are of an incremental nature. Many new packages are included along with new versions of old packages, and there is a of new features and bug-fixes. The same dpkg+apt packaging system is still used for performing the upgrades, and we have made every effort to make the transition as painless and as flawless as possible.

apt, now at version 0.3.19, which is used in conjunction with dpkg, now at version 1.6.13, is the preferred package installation tool, as it has support for several different package sources (CD-ROMs and other removable disks, local or network-mounted hard drives, or remote Internet FTP or HTTP sites). It can be used either from the command-line as apt-get, or as a package acquisition method in dselect, to install new or upgrade existing binary (or source) packages.

The Official CD-ROM release ships as three binary package CD-ROMs, containing the sections "main" and "contrib". If your vendor adds "non-US/main" or portions of the "non-free" and/or "non-US/non-free" sections to the CD set, there could be four binary CDs.

The first and second CD-ROM disks from the set are bootable in the architectures that support them, and are usually used for starting new installations.

All of the CDs are self-contained, which means you can insert any one of them and operate with its contents, without needing to mess about with the others. apt-cdrom is used to manage multiple CDs, either through the command line interface, apt-cdrom, or the apt access method for dselect.

Project Debian has always striven to be the base for more specialized releases, and last year that goal was achieved, when Debian's system was chosen as the base for commercial Linux releases. Among other companies Corel Corporation, Libra Computer Systems, Stormix Technologies and Progeny Linux Systems are releasing distributions based on Debian, and more are in the pipeline. Debian GNU/Linux CDs have been released and several books about Debian have been published, too.

Lastly, but by no means least, this latest release has been dedicated to the memory³⁶ of a member of the project who is sadly no longer with us, Joel Klecker, who died suddenly at the age of 21. Since July 1997, Joel had been a Debian developer, and for most of this time he had been bedridden by his illness. Joel's death was the end of a lifelong battle against Duchenne Muscular Dystrophy³⁷. This is why the latest version is called Debian 2.2 "potato", the "Joel 'Espy' Klecker" release.

5 The Difference Between Stable and Unstable Releases

In the development and release of its versions Debian follows some clearly defined steps. To begin with there is a development version, known as "unstable", to which new programs and new versions of programs are added and bugs and errors are taken out. After this period the unstable version is "frozen", and from then on new programs are no longer accepted. All efforts are then directed towards carrying out various intensive test cycles, together with error notification and correction. Once all critical bugs are corrected, or all those applications whose critical errors there was not time to correct are withdrawn, it is then released as the stable version.

However "unstable" in Debian does not mean "dangerous" or "insecure", but "under development". For non-critical uses it is perfectly usable and generally speaking a user will often find that an unstable Debian release is no more unstable than definitive versions of many commercial distributions. That said, for critical services it is advisable to use the stable release, which is the version that has undergone intensive testing and debugging.

A new Debian release's time to market is long due to its strict debugging processes, the absence of commercial pressures, its dependence on the developers' unremunerated work in their spare time, and the enormous number of packages which recently have become a little difficult to handle. The aim of Debian's stable release is not to be state of the art, but rather to release a robust and reliable system with as few glitches as possible. Anyone who needs access to the programs' latest versions and to new applications can use the unstable release or else look for unofficial packages, or even write the package or compilation themselves.

6 Conclusions

There may well be many pros and cons to Debian but the biggest reason for supporting Debian, by using it, by collaborating in its documentation, or by contributing new packages, is that it's a project which welcomes all kinds of initiatives. Unlike other commercially oriented distributions, in which resources which should really be concentrated in just one distribution are often split among several, this does not occur in Debian.

A well known example of this is all the duplicated effort that went into releases derived from RedHat in the Spanish speaking market, like Esware, Hispafuentes, or Eurielec Linux. Because there was no way for the efforts of many developers to be incorporated into the "original" distribution, a large number of divergent products were developed. The releases derived from RedHat in more global environments like SuSE or Mandrake are similar examples.

Debian is on the other hand a rallying point. It can be seen as a white dwarf, instead of exploding like a supernova dispersing its debris all over the known universe, or sucking everything within its reach into oblivion, like a black hole, Debian will continue to absorb material, thanks to its strong gravitational pull, and thus will live on for much, much longer.

7 Further Information

More information about the Debian Project can be found from:

- Debian's main server³⁸
- The pages of the latest stable release³⁹
- Information about how to get Debian⁴⁰
- Debian's project documentation⁴¹

Links

- 1 <<http://www.gnu.org>>
- 2 <<http://www.fsf.org>>
- 3 <<http://www.linux.org/>>
- 4 <<http://www.gnu.org/software/hurd.html>>
- 5 <http://www.debian.org/social_contract>

- 6 <<http://www.debian.org/News/2001/20010727>>
- 7 <http://http://www.computerworld.com/cwi/story/0,1199,NAV47_STO60507,00.html>
- 8 <<http://www.debian.org/News/weekly/2000/20000408>>
- 9 <<http://www.debian.org/News/weekly/2000/20000302>>
- 10 <<http://www.debian.org/News/weekly/1999/19990917>>
- 11 <<http://www.debian.org/News/weekly/1999/19990421a>>
- 12 <<http://www.debian.org/News/weekly/1999/19991020>>
- 13 <<http://www.debian.org/News/weekly/1999/19991012>>
- 14 <<http://www.debian.org/News/weekly/1999/19990225a>>
- 15 <<http://www.redhat.com>>
- 16 <<http://www.debian.org/MailingLists>>
- 17 <<http://www.debian.org/cgi-bin/fom>>
- 18 <<http://www.spi-inc.org>>
- 19 <<http://www.gnome.org>>
- 20 <<http://www.linuxbase.org>>
- 21 <<http://www.openhardware.org/>>
- 22 <<http://www.berlin-consortium.org>>
- 23 <<http://www.debian.org/devel/developers.loc>>
- 24 <<http://www.debian.org/>>
- 25 <<ftp://ftp.debian.org/>>
- 26 <http://www.debian.org/social_contract>
- 27 <<http://www.debian.org/doc/maint-guide/>>
- 28 <http://www.debian.org/social_contract#guidelines>
- 29 <<http://opensource.org/osd.html>>
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- 31 <<http://www.linuxbase.org/>>
- 32 <<http://www.pathname.com/fhs/>>
- 33 <<http://www.debian.org/devel/debian-jr/>>
- 34 <<http://www.debian.org/doc/FAQ/>>
- 35 <<http://www.debian.org/MailingLists/>>
- 36 <<ftp://ftp.debian.org/pub/debian/doc/dedication-2.2.txt>>
- 37 <<http://mdausa.org>>
- 38 <<http://www.debian.org>>
- 39 <<http://www.debian.org/releases/stable/>>
- 40 <<http://www.debian.org/distrib/>>
- 41 <<http://www.debian.org/doc/ddp>>