Software & Book Review Section

Poseidon Linux 3.x - The Scientific GNU/Linux option

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Abstract. This software review is about the newest version of Poseidon Linux (3.x). The current Poseidon Linux is a remastering from Ubuntu LTS family (Long Term Support), with extra specific software applicable to many areas of scientific research and education. It contains specialist software for GIS/Mapping, bathymetry, numerical modeling, 2D/3D/4D visualization, bioinformatics, chemistry, statistics, as well as tools for creating simple and complex graphics and programming languages. It also includes basic packages as would be expected on a normal desktop, such as a complete office suite, internet browser, e-mail client, instant messaging, chat, multimedia and many other tools. Poseidon Linux can run in two modes, as a live-DVD or installed on the hard disk. There are versions for 32 and 64 bit computers, and support for Brazilian Portuguese, English, Spanish, French, Greek, Italian and German languages.

Resumo. Poseidon Linux 3.x – A opção científica GNU/Linux. Esta resenha trata da nova versão do software Poseidon Linux (3.x). A versão atual é uma remasterização a partir do sistema operacional Ubuntu, família LTS (Suporte de Longo Prazo), com pacotes extras para várias áreas da ciência e educação. Contém programas específicos para SIG/mapeamento, batimetria, modelagem numérica, visualização 2D/3D/4D, bioinformática, química, estatística, bem como ferramentas para elaboração de gráficos simples e complexos e linguagem de programação. Inclui também os programas necessários encontrados num sistema operacional desktop, tais como suporte completo para escritório, navegador de internet, programas para envio e recebimento de mensagens instantâneas, multimídia e várias outras ferramentas. O Poseidon Linux pode ser utilizado de duas formas: diretamente do DVD, sem instalá-lo, ou instalando-o no disco rígido do computador. É apresentado nas versões 32 e 64 bits e pode ser totalmente configurado em Português do Brasil, Inglês, Espanhol, Francês, Grego, Italiano e Alemão.

History

The Poseidon Linux project started in Brazil, in September 2004 with the goal of building a GNU / Linux distribution for academic and scientific use. It was originally based on Knoppix/Kurumin until 2006, because of the live-CD and Portuguese language support (Ferreira et al. 2006). Three versions were publicly released then (1.2, 1.3 and 2.0). Version 2.0 (from late 2005) was extremely popular within Brazil, receiving excellent reviews from Brazilian press and it was recognized and supported by people like John "Maddog" Hall (Linux International), government institutions like

the Brazilian National Spatial Research Institute (INPE – http://www.inpe.br/), among others. However, requests from scientists and students outside of Brazil pointed out the need for a version with greater language support.

By early 2008, a new version was ready. This version (3.0) was a complete redesign, based on Ubuntu 8.04 with Long Term Support – LTS (Canonical Ltd., 2008), which represents a mature Linux distribution, for the first time supporting multiple languages. This helped Poseidon Linux (3.0) to achieve a wider distribution being used in many universities and research institutes around the

world. Along with the release of Poseidon Linux 3.1, a 64 bit version had also debuted, altogether with the "standard" 32 bit version.

Advantages of this GNU/Linux distribution

As it was created by young scientists for scientific use, this ensures that Poseidon Linux reflects, in most cases, the needs and wishes of this community. It contains several must-have programs for daily use at any college, school or within the laboratory (see Table I). Scientists are able to make suggestions and requests for additional bundled software or additional features by contacting the team at http://www.poseidonlinux.org. This encourages users to take an active interest in their software and should ensure that Poseidon Linux continues to improve and provide for the needs of this community.

Poseidon Linux is composed of free, and open source software (with some rare exceptions), that mean that the users are assured of the four principles of GNU General Public License or just GNU-GPL (GNU Project, 2007): freedom to run the program, for whatever purpose; freedom to study how the program works, and adapt it to their needs; freedom to redistribute copies; freedom to improve the program, and release their improvements to the public. This assures the right to employ Poseidon Linux for any kind of use: academic, professional, and of course, personal home use.

Following the trend started by Knoppix (Knopper, 2003), Poseidon Linux comes as a Live-DVD that allows the potential user to evaluate the software by running it directly from the optical drive, without installing it on to the hard-drive of his/her computer. Most of the software included runs well from the DVD, but slower than when installed on a hard-drive. If the user likes Poseidon Linux then it is highly recommended to install it on the hard-drive for maximum performance. One possibility is to install Poseidon Linux in parallel with another operating system, such as Windows or Mac OS X, and choosing which system to use from a boot-manager (included).

Being open source software, Poseidon Linux has zero cost. Within the current financial global situation, governments and academic institutions have a higher need to reduce expenditure. One option, then, is the use of open source - free software. The saving to a department in software costs becomes particularly apparent when we analysis the costs of common scientific software needed today in academic work. By using such a system as Poseidon Linux, an institution may save several thousand Euros in software costs and/or licenses. The following table (Table I) shows partially the current software included, and is also used to illustrate an estimated saving by using Poseidon Linux compared to "proprietary" software (prices may vary, but the idea is still valid).

Some real cases of Use, to exemplify the usability

GIS example. Seabed relief maps in three dimensions from off the Brazilian coast (and some oceanic islands) were produced by Ferreira et al. (2005) and Madureira and Ferreira (2007), using open source software included in Poseidon Linux (Fig. 1). The analysis and visualization was carried out using bathymetric data collected along several scientific acoustic fisheries surveys conducted between 11° and 34°S in the South Western Atlantic. Additional data was obtained from data sets made available on the Internet and used to increase the resolution showing in greater detail many undersea features. These structures were named following the guidelines of GEBCO's Sub-Committee on Undersea Feature Names (SCUFN).

These 3D maps show a real application of open source software in Oceanography/Bathymetry. The main software used was: GMT (for filtering and grid interpolation) and GRASS (for grid manipulation and visualization in 3D). This was proven to be a robust, fast and stable combination, allowing analysis and visualization of really large data-sets.

Bioinformatic example. Poseidon Linux and its included software were used extensively by Vaz et al. (2008). Part of the work involved sequencing a specific gene from the catfish *Rhamdia quelen* (GH - growth hormone) and development of 3D models of the tertiary structure from the resulting protein (Fig. 2).
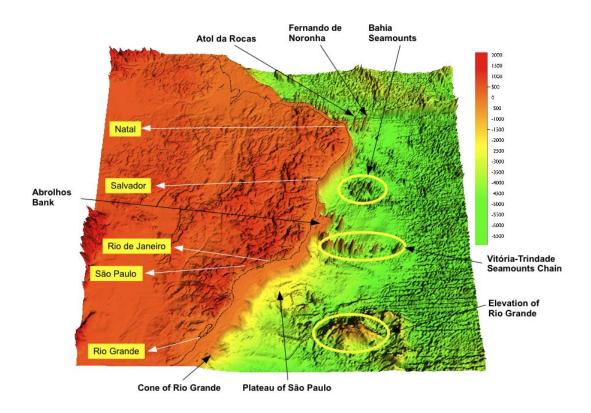
Specific software used: ClustalX: was used to align sequences of Growth Hormone (GH) gene querying obtained from Genbank; PerlPrimer: was used to design degenerated primers; Sequin: DNA Sequence Submission Tool was used for submission of the gene sequence to Genbank; PyMol Molecular Graphics System: was used to analysis 3D molecular models of proteins.

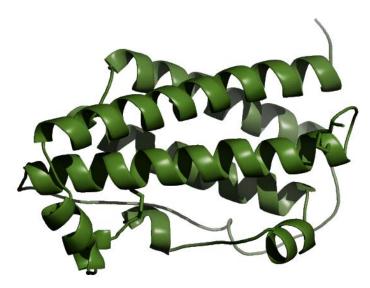**Table I**. Estimated costs of proprietary software compared to some software included in Poseidon Linux.

Free Software	Proprietary Software	Estimated Price (US$)	Area
GRASS	ArcInfo + modules 3D and Spatial + ENVI + Fledermaus	30,000	GIS
SPRING	ArcEditor	10,000	GIS
QGIS / Terraview	Arcview	1,500	GIS
GMT	Surfer	600	GIS
PROJ + GDAL + OGR	ArcToolbox (in ArcGIS)		GIS
MB System	Caraibes	25,000	Bathymetry and Multibeam processing
OpenDX	BYVision	3,500	Visualization in 2D/3D/4D
Octave	Matlab + modules for finance, signal analysis and statistics	4,400	Numerical Modeling
Maxima	Mathematica	2,495	Math
R + Rcmdr + RKward	STATISTICA ADVANCED	12,120	Statistics/Math
Gperiodic	The Elements and Isotopes	300	Chemistry
GPSDrive and GPSMan	Microsoft MAPPOINT GPS 2009	343.19	GPS maping
Dia	MS Visio Professional 7	559.95	Diagram
QTIPlot	OriginPro 8	1,875	Graphics
Lyx or Kile	Scientific Word	875	Professional Typesetting
GChemPaint	Symyx Draw	777	Draw Chemical Molecules
Fityk	PeakFit	575	Curve Fitting
QCAD or SAGCAD	AutoCAD LT	900	CAD/Engineering

Table I. Estimated costs of proprietary software compared to some software included in Poseidon Linux (continued).

Free Software	Proprietary Software	Estimated Price (US$)	Area
Virtualbox	Vmware	189	Desktop Virtualization
Blender	Maya or 3D Studio	3,500	Computer Graphics and Animation
Audacity	Sound Forge	300	Multimedia
PostegreSQL or MySQL	Oracle 10g (Enterprise)	40,000	Database
PostGIS	ArcSDE	1,800	Database for GIS
GCC	Intel C Compiler	400	Programing
G77	Intel FORTRAN Compiler	700	Programing
ClustalX, NCBI Tools, TreePuzzle, TreeView, and others	Vector NTI Advance + Sequence Analysis Software Ruo	4,800 + 10,000	Bioinformatic
Cn3D	Hyperchem	1,494	Bioinformatic
Softwares for a normal desktop (internet, mail,office, etc)	Windows, Antivirus, Office, Corel Draw, Photoshop, DVD, CD Burner, Firewall, PDF, HTML, Publishing, etc...	15,000	Softwares for Workstation
MapServer	ArcIMS	10,000	Webmapping
	TOTAL (in US$)	**168,859.95**	**For 1 license of each proprietary software**

Figure 1. Map from the South Brazilian coast (Ferreira *et al.* 2005).

Figure 2. 3D model from *Rhamdia quelen* Growth Hormone (two disulfide bonds in detail) performed - from modeling to drawing - under Poseidon Linux.

Conclusions and Remarks

The philosophy behind Poseidon Linux is the same as mainstream science: free access to new technologies and the freedom to exchange knowledge between scientists and the general public. This allows people from developed to developing countries to have the same access to high quality scientific software.

Born out of a local effort (in Brazil), to initiate and encourage the use of high quality free software for academic and scientific purposes, Poseidon Linux has evolved and gone far beyond the original aims of the project. Even when there was only a single Portuguese language website, it scored

the millionth access hit in 2006 (after only two years of existence), with hits recorded from all over the world. Today's version 3.1 has support for 7 languages and websites in three languages (check http://www.poseidonlinux.org/). Poseidon Linux has confirmed users in North and South America, several countries in Europe, and Asia. Many of these users are using Poseidon Linux as their main tools and operating system for scientific computing.

With these facts in hand, we can conclude that Poseidon Linux has filled an existing gap to provide scientists an alternative to proprietary software and proprietary operating systems (like MS Windows, Mac OS X and UNIX). But Poseidon Linux is not just for scientists; it offers a stable, mature and secure platform for everyday computing. Being Open Source software it offers the student high quality software of the same standard as the academic department they are studying without undue financial burden. Also, for the home user, it offers all the ordinary software for communication, internet, multimedia experience, production packages, and even some games. For more advanced users, it may be a chance to study and improve the tools, since the source code is readily available, and a chance to take open source tools to new and unexplored areas of science and knowledge. Finally the Poseidon Linux team sees it as a solution to avoid the use of pirate software, and all the potential problems that this causes to the academic world.

Poseidon Linux can be downloaded from: http://g3pd.ufpel.edu.br/mirrors/poseidon/

Acknowledgements

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