

The Debian-Med project

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Debian

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Structure

- 1 What is Debian-Med
 - Motivation
 - Community
 - Why Debian
- 2 Realisation
 - Available packages
 - Techniques
- 3 Status
 - Experiences
 - Debian-Med for service providers
 - Prospectus

Motivation

- Free Software in medicine not widely established yet
 - Some subareas well covered
 - Medical data processing more than just practice and patient management
 - Preclinical research of microbiology and genetics as well as medical imaging
- Pool of existing free medical software

Profile of the envisaged user

- Focus on medicine not computers
- Unreasonable effort to install upstream programs
- No interest in administration
- Interest reduced onto free *medical* software
- Easy usage
- Security and confidence
- Native-language documentation and interface

Community

- Quality correlates to number of users and developers
- Promotive
 - University environment
 - Organised support
- Obstructive
 - Advertising for proprietary software
 - Different preferences of initiators

Differences to commercial distributions

Commercial distributor

Company

Employees

CDs, Service

Business plan

Certified

Beginners

Rpm

Market

Structure

Persons

Sells

Release

Oracle, SAP, etc.

Preferred by

Packages

Customisation

Debian

Organisation

Volunteers

Nothing

If 0 RC-bugs

Runs in principle

Administrators

Deb

Do-O-Cracy

Customising Debian

- Debian > 10000 packages
- Focus on *medical subset* of those packages
- Packaging and integrating other medical software
- Easy installation and configuration
- Maintaining a general infrastructure for medical users
- General overview about free medical software
- Propagate the idea of Free Software in medicine
- Completely integrated into Debian - **no fork**

Basic ideas

*Do not make a separate distribution but
make Debian fit for medical care*

*No development of medical software - just
smooth integration of third-party software*

*Debian-Developer = missing link between
upstream author and user*

Debian - adaptable for any purpose?

- Developed by about 1000 volunteers
- Flexible, not bound on commercial interest
- Strict rules (policy) glue all things together
- Common interest of each individual developer:
Get the best operating system for himself.
- Some developers work in the field of medicine
- In contrast to employees of companies every single Debian developer has the freedom and ability to realize his vision
- Every developer is able to influence the development of Debian - he just has to *do* it.

Do-O-Cracy = "The doer decides"

Packages Microbiology

BioPerl Collection of Perl modules featuring computational methods routinely used in bioinformatics

BioPython Python tools for development of applications for computational molecular biology which address the needs of current and future work in bioinformatics.

BioSQUID Library of C code functions for sequence analysis including a number of small utility programs to convert, show statistics, manipulate and do other functions on sequence files.

BLAST2 Official NCBI version #2 of this standard program for nucleotide and protein sequence alignment.

Packages Microbiology (continued)

Boxshade Rendering graphics of protein or DNA sequence alignments (output of alignment programs like ClustalW) to enable incorporation into text processing software.

ClustalW Simultaneous alignment of many nucleotide or amino acid sequences. ClustalW recognises which format is being used and whether the sequences are nucleic acid (DNA/RNA) or amino acid (proteins). It outputs alignments in various formats such as the PHYLIP one.

Dialign Multiple alignment of protein or DNA sequences from gap-free pairs of similar segments of the sequences.

Packages Microbiology (continued)

e-PCR Electronic PCR feature to test a DNA sequence for the presence of sequence tagged sites. e-PCR looks for STSs in DNA sequences by searching for subsequences that closely match the PCR primers and have the correct order, orientation, and spacing that they could plausibly prime the amplification of a PCR product of the correct molecular weight.

fastDNAmI Attempt to solve the same problem as DNAML (from PhyLip), but to do so faster and using less memory, so that larger trees and/or more bootstrap replicates become tractable.

GROMACS Versatile package to perform molecular dynamics, i.e. simulate the Newtonian equations of motion for systems with hundreds to millions of particles. It is primarily designed for biochemical molecules like proteins and lipids that have a lot of complicated bonded interactions.

Packages Microbiology (continued)

- ...
- in total more than 40 packages
- Overview at <http://www.debian.org/devel/debian-med/microbio>
- Software developed among others by
 - [National Center for Biotechnology Information \(NCBI\)](#)
 - [Sanger Institute](#)
 - [The Institute for Genomic Research \(TIGR\)](#)
 - ...

Packages medical imaging

CTN *Central Test Node*: DICOM implementation which was designed to be used at the RSNA (Radiological Society of North America) annual meetings to foster cooperative demonstrations. The goal was to provide a centralized implementation that facilitated vendor participation based on the evolving DICOM standard.

CTSim Interactive computed tomography simulator. CTSim has very educational trace modes for viewing the data collection simulation as well as the reconstruction.

DCMTK DICOM-toolkit: collection of libraries and applications implementing large parts the DICOM standard for medical image communication. It includes software for examining, constructing and converting DICOM image files, handling offline media, sending and receiving images over a network connection, . . .

Packages medical imaging (continued)

Niftilib Set of I/O libraries for reading and writing files in the NIfTI-1 data format. NIfTI-1 is a binary file format for storing medical image data, e.g. magnetic resonance image (MRI) and functional MRI (fMRI) brain images.

MedCon Medical Image Conversion provides a flexible command-line utility and a neat graphical front-end. The supported formats are: Acr/Nema 2.0, Analyze (SPM), Concorde, DICOM 3.0, Ecat/Matrix 6.4, InterFile3.3, GIF and raw/binary data. The library (libmdc) can be used by other programs for import and export and is extendable for other formats.

Packages medical practice

- GNUmed
 - Practice management with focus on medical documentation
 - Internationalised
- Currently only client packaged
- Server following soon
- There are many alternative projects → dissipation
- GNUmed seems quite suitable for Debian-Med
- Others might follow

What are packages

- Main part of the work of a distributor
- Contains
 - Executable programs
 - configuration
 - `{pre/post}install + {pre/post}remove` **scripts**
 - Relations to other packages
- More than just an archive of files
- Enables easy handling
 - Ensures compliance of all dependencies
 - Clean upgrades
 - Easy handling of security updates
- Basis of modern GNU/Linux distributions

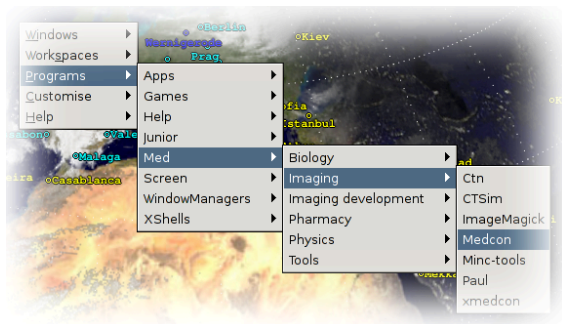
Problem: Increasing number of packages

Meta-packages and DebTags

- Debian-Med builds package sets via dependency relation
- Installation of “meta-packages” for certain tasks
- Additional user menu
- Adapted configuration (optional)
- Classification of applications via DebTags

Role based user menus

- User in role *med* gets additional menu



- Good overview about relevant software
- Every package features own entry
- Other users are not affected

Top 10 preconditions about Debian-Med

- 1 Debian-Med is a practice management system *itself*
- 2 Is only interesting for doctors
- 3 Not interesting for mikro-biologists / medical physicists
- 4 Should be installed by health care professionals
- 5 Debian-Maintainer are programming software for doctors
- 6 Debian-Med does not need supporter
- 7 Can be used on SuSE Linux
- 8 Medical software can not be free
- 9 Debian-Med is just ready
- 10 Debian-Med is the philosophers stone

Service providing using Debian-Med

- Need for commercial support
- Needs specific knowledge of medicine computer scientists
- Business model: Service providing for medical Free Software
 - Software free of charge
 - Merits for
 - Consulting
 - Installation
 - Support
 - Updates

future

- There are good requisites in Debian
- Needed: High quality Open Source applications for medicine
- Strong interest of developers and users
- Base for service providers in health care

This talk is available at
<http://people.debian.org/~tille/talks/>
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