Computational and cognitive neuroscience boosted by Debian

Michael Hanke

Debian Developer, Otto-von-Guericke University of Magdeburg

Debian for Scientific Facilities Days
European Synchrotron Radiation Facility, Grenoble, France

Jun 25, 2012

Just using Debian is not enough

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Acknowledgements

- Yaroslav Halchenko
- Debian contributors
- Debian Med
- Debian Science
- Jim Haxby

Background: Neuro-imaging

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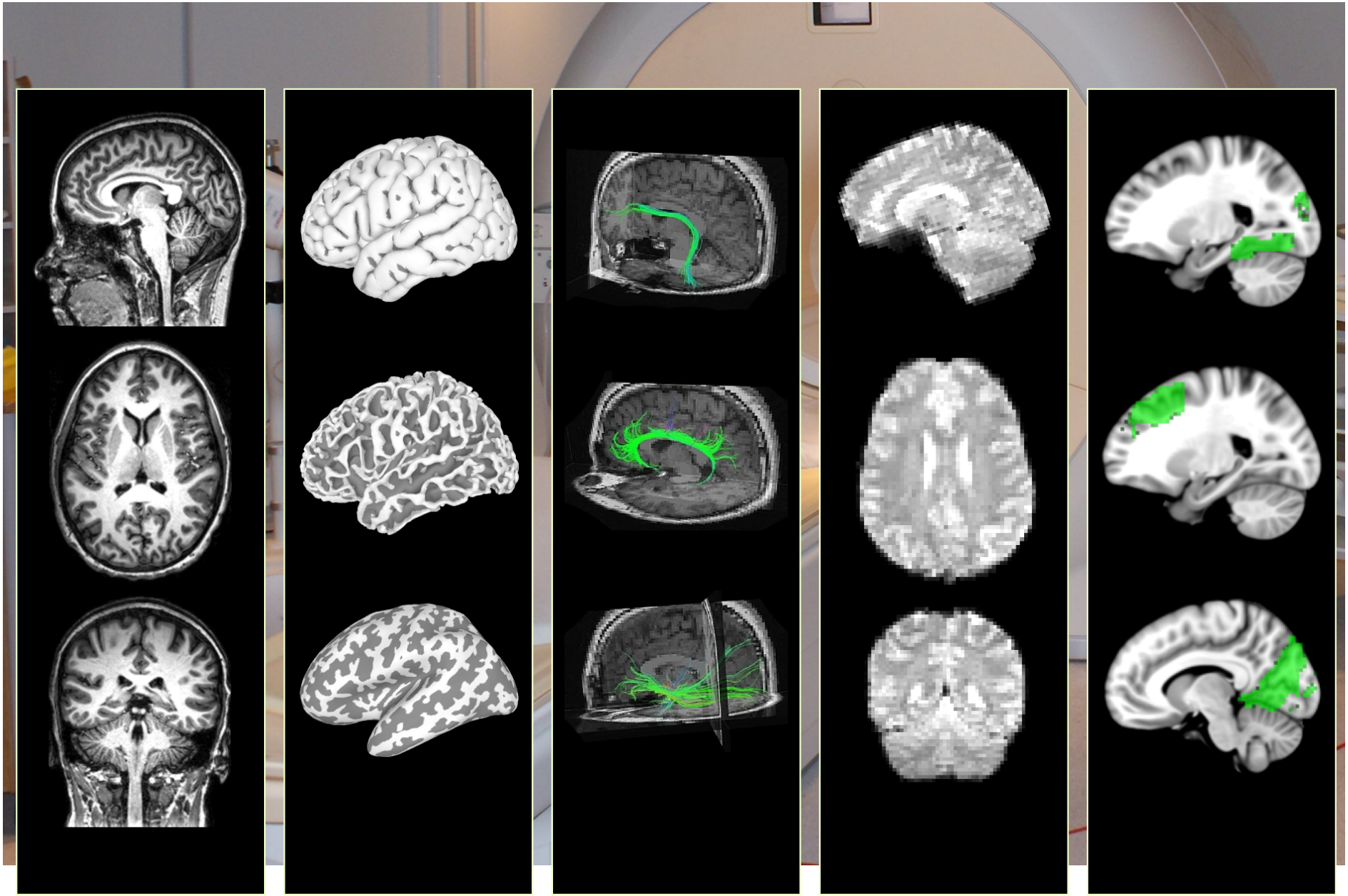

Issues

. . . most Unix-based neuroscience software produced by research organizations fails to meet even the simplest expectations one might have for quality software. Let me clarify that I am not referring to the actual code, which is generally quite good, and is a testament to the skills and intelligence of the authors. No, I am talking about how the process of compiling and installing a well-reputed piece of neuroscience software is fraught with confusion, hassle and worse. There is absolutely no excuse why it should be this way.

Common issues

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– Kevin B. McCarty, Post-doc in physics, software and Debian developer, sysadmin

http://starplot.org/articles/physics-software-rant.html

The grand plan

Problem Complicated, non-standard, or non-existing installation and update procedures

Solution Debian package(s) in a dedicated neuroscience software repository

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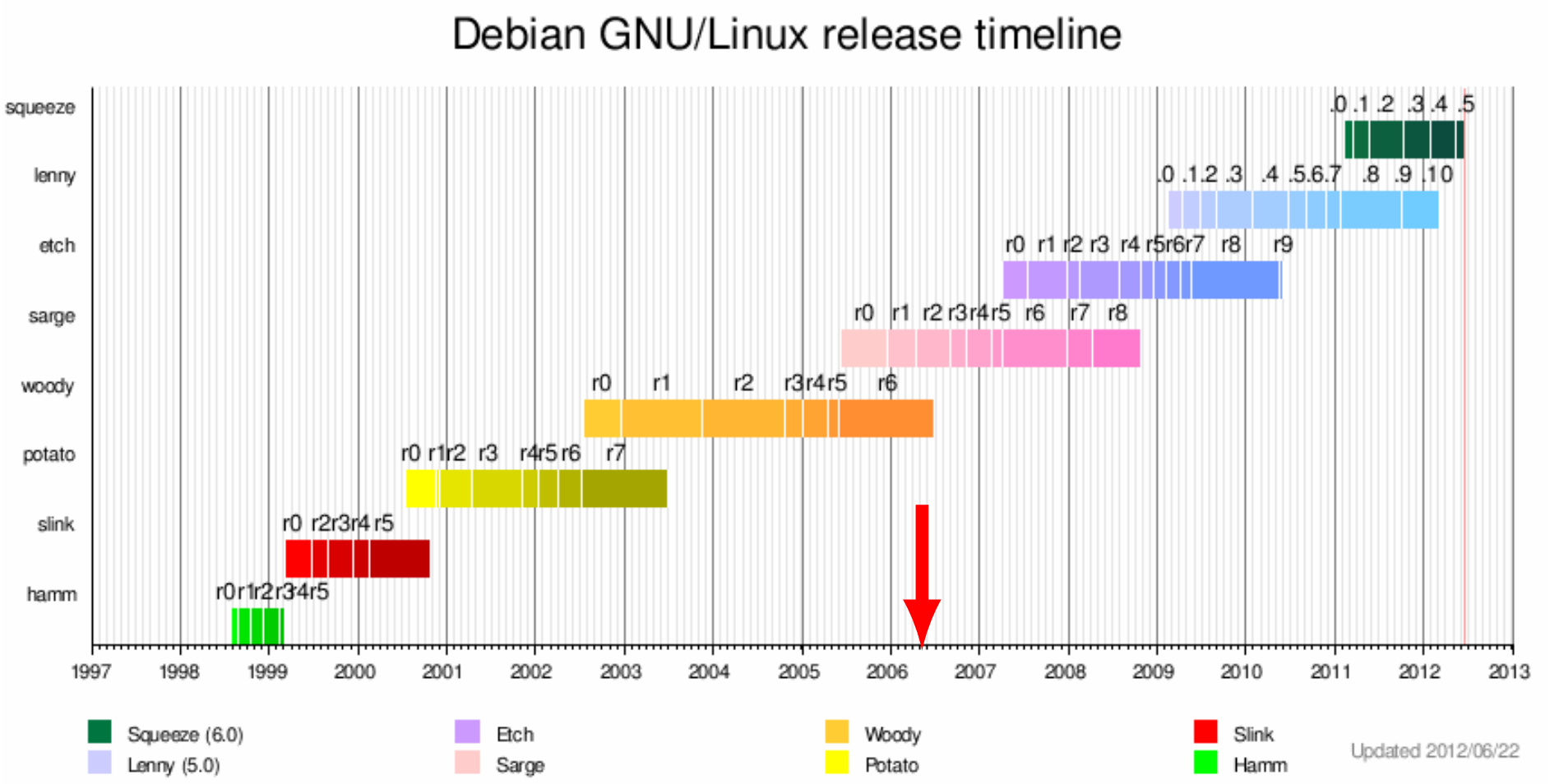
N.B.: Why Debian?

`http://www.pymvpa.org`

```
% apt-cache dump|grep '^Package: python-'|cut -d'-' -f2,2|sort|uniq|wc -l
1320
```


Debian GNU/Linux release timeline
squeeze
lenny
etch
sarge
woody
potato
slink
hamm
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Squeeze (6.0)
Lenny (5.0)
Etch
Sarge
Woody
Potato
Slink
Hamm
Updated 2012/06/22

The grand plan (continued)

Problem Complicated, non-standard, or non-existing installation and update procedures

Solution Debian package(s) in a dedicated neuroscience software repository **[SOLVED]**

The grand plan (continued)

Problem Complicated, non-standard, or non-existing installation and update procedures

Solution Debian package(s) in a dedicated neuroscience software repository **[SOLVED]**

Problem A lot of complex analysis software suites, with limited, non-uniform set of "supported platforms" by upstream

Solution Talk upstream into supporting Debian better

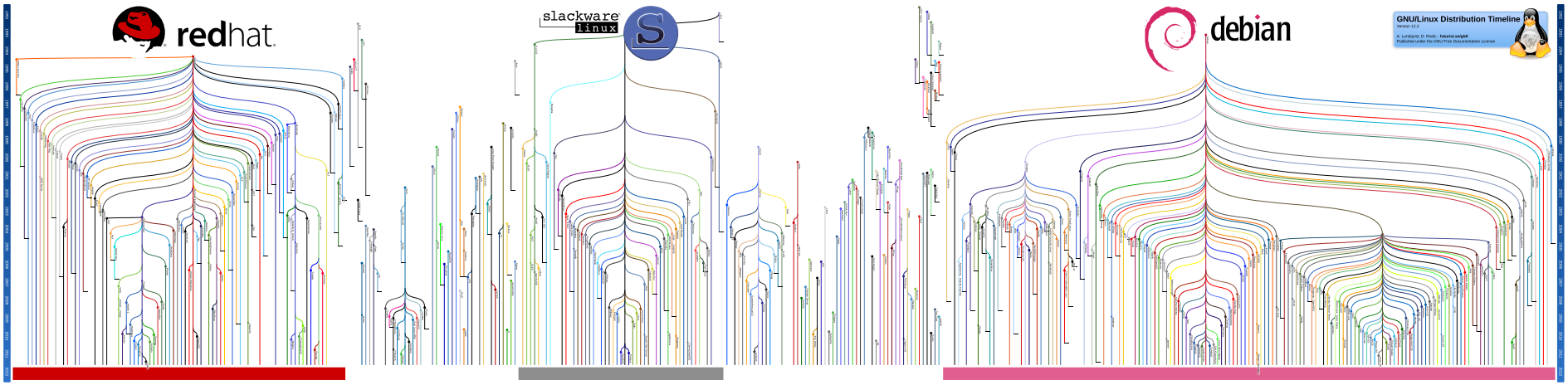
Problem No time, not enough man power to adapt to a constantly changing software environment; lack of robustness

Solution Attract contributors

Problem Upstream doesn't/cannot spend resources on hypothetical future users

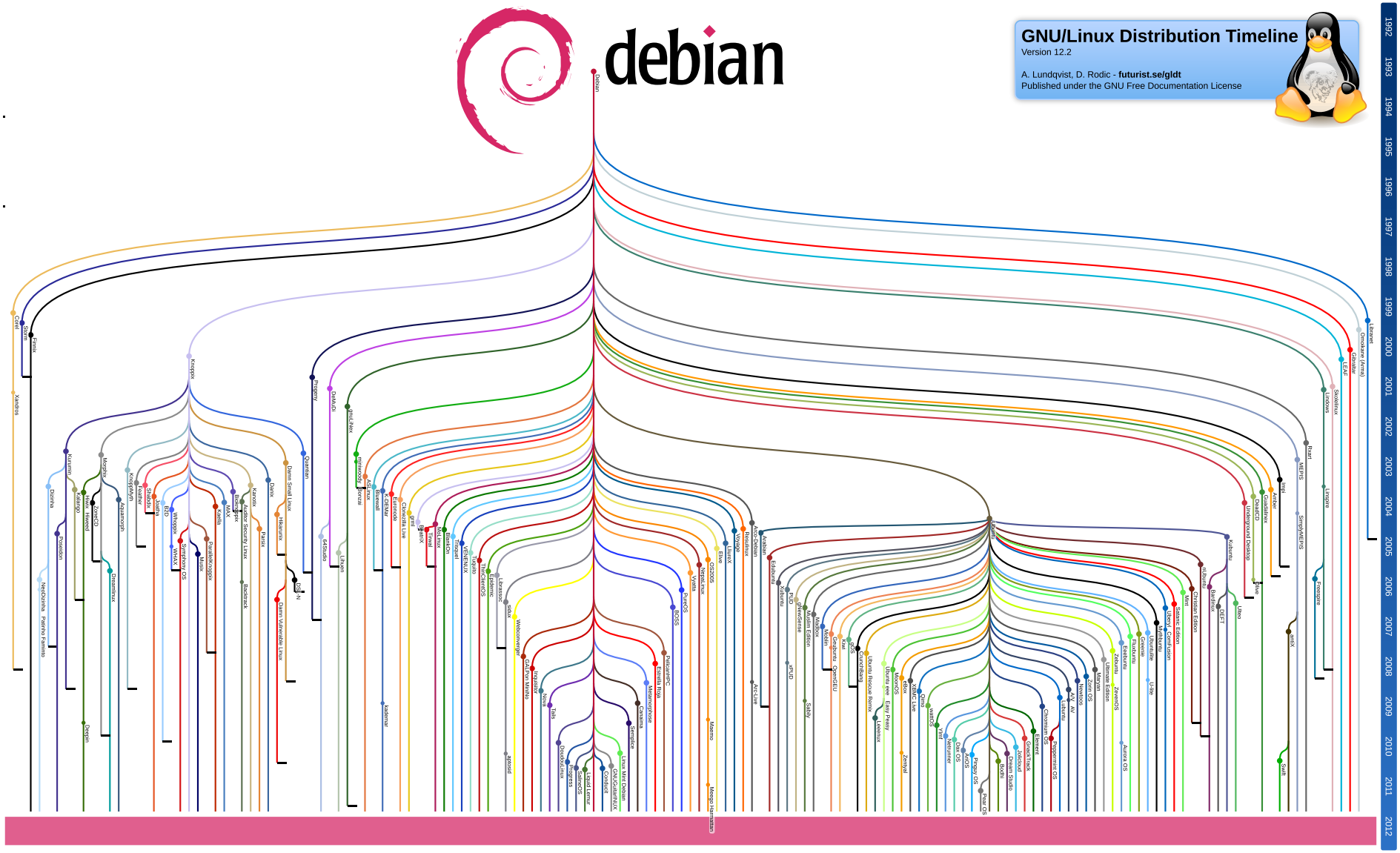
Solution Get a grant for large-scale software maintenance, maybe?

The big picture



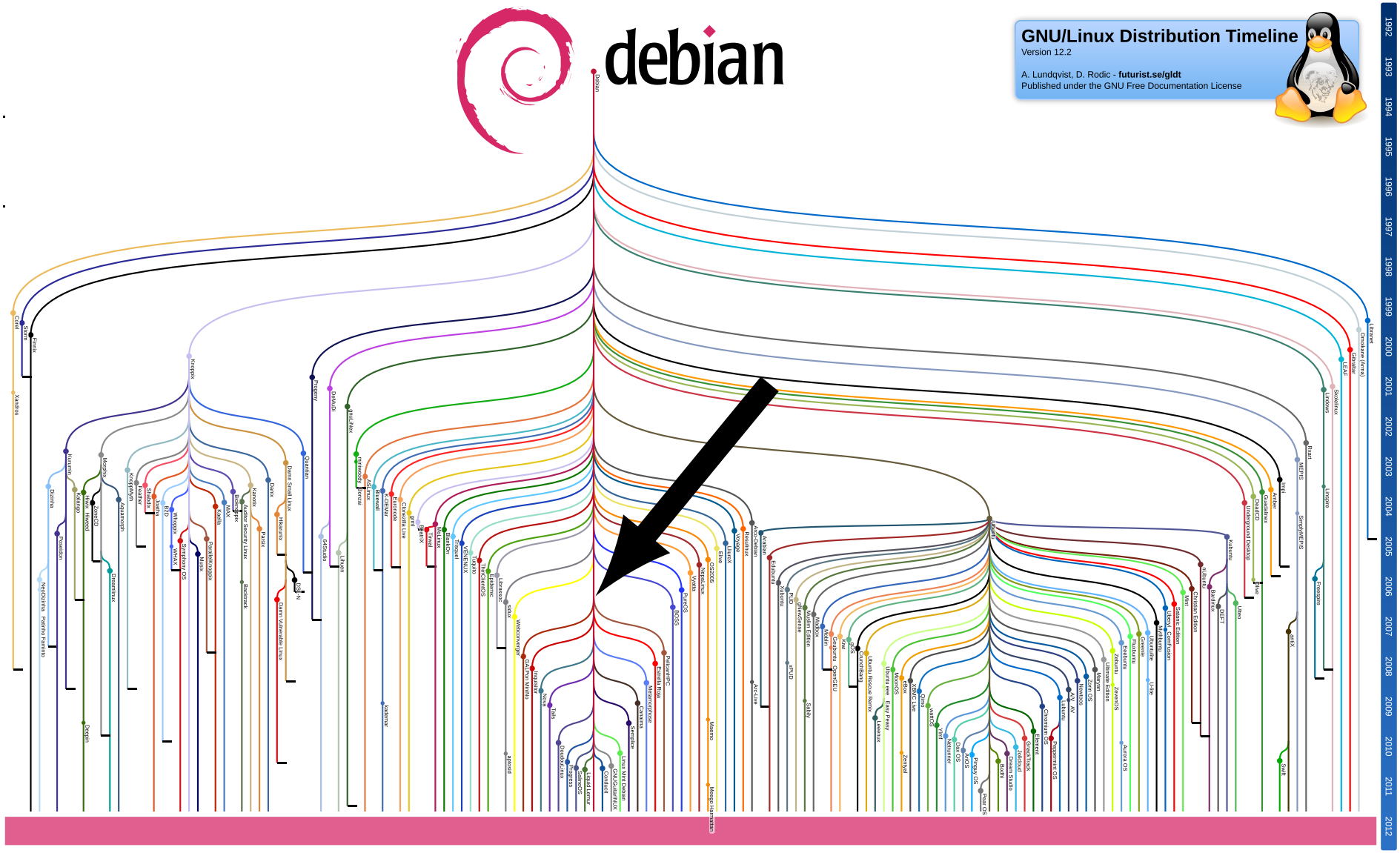
http://futurist.se/gldt

The big picture



http://futurist.se/gldt

The big picture



http://futurist.se/gldt

Debian: opportunity for a unique approach

Convenience and abundance

- % sudo apt-get install cheese and wine
- 5-digit number of source packages

Proven standards

- Known to scale with complexity, and adapt over time
- Two decades of continuous releases

Collaboration in a do-ocracy

- Open to anyone and any contribution*
- Independent organization of individuals
- No 2nd-class citizens

* within the limits set by Debian's Social Contract

A better plan

Debian proper as software platform for neuroscience consolidation

- Developers integrate software into Debian (with mentoring)
- Most software is in Debian, hence most researchers use Debian
- Users report bugs using built-in tools, they get tracked publicly
- Neuroscience software gets exposed and integrated with the open-source community
- Interested developers outside the projects can contribute without domain knowledge (e.g. QA efforts)
- Software quality and longevity increases

NeuroDebian: A familiar face

NeuroDebian: A tailored View on Debian

Debian || Neuroscience : Software | Datasets | Virtual Machine | FAQ | Testimonials 9 Comments | next

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Welcome to the Ultimate Platform for Neuroscience

> *NeuroDebian provides an excellent platform for software distribution [...]*
>
> — **Prof. Bennett Landman** [2010-08-31]
> Director of the Center for Computational Imaging, Vanderbilt University Institute of Image Science, Nashville, Tennessee, USA

NeuroDebian provides a turnkey software platform for neuroscience that is created by integrating research tools with the Debian operating system. If you are using such software on Debian or its derivatives, such as Ubuntu, chances are that you are already using NeuroDebian.

This website provides a *supplementary repository* with both unofficial or prospective packages which are not (yet) available from the main Debian archive, as well as backported or simply rebuilt latest versions of software. NeuroDebian serves as an "upstream" to some *derivative* projects. Please see the *Frequently Asked Questions* for more information about the goals of this project, and *read what people say about it*. Take a look at the *list of our current and planned projects* if

NeuroDebian: (Omni)presence

Conferences, INCF data sharing, NITRC CE, job ads for (Neuro)Debian

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OPINION ARTICLE

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Open is not enough. Let's take the next step: An integrated, community-driven computing platform for neuroscience

Yaroslav O. Halchenko[1, 2, 3] and Michael Hanke[3, 4, 5*]

1 Center for Cognitive Neuroscience, Dartmouth College, USA
2 Department of Psychological and Brain Sciences, Dartmouth College, USA
3 Debian Project
4 Department of Experimental Psychology, Otto-von-Guericke-University, Germany
5 Center for Behavioral Brain Sciences, Germany

The last five years have seen dramatic improvements in the collaborative research infrastructure. A need for open research tools has been identified (Ince et al., 2012), and one solution has been clearing houses, such as the INCF Software Center[1], and the NITRC[2] portal, which facilitate efforts of peer-to-peer software and data sharing that were previously limited to only well-funded formal consortia (see Poline et al., 2012, for a recent summary of the status quo). However, collecting these resources into a centralized clearing-house addresses only one necessary aspect on the way to a sustainable software ecosystem for neuroscience – availability. Unfortunately it does not ensure ease of deployment, nor does it offer a sustainable model for long-term maintenance.

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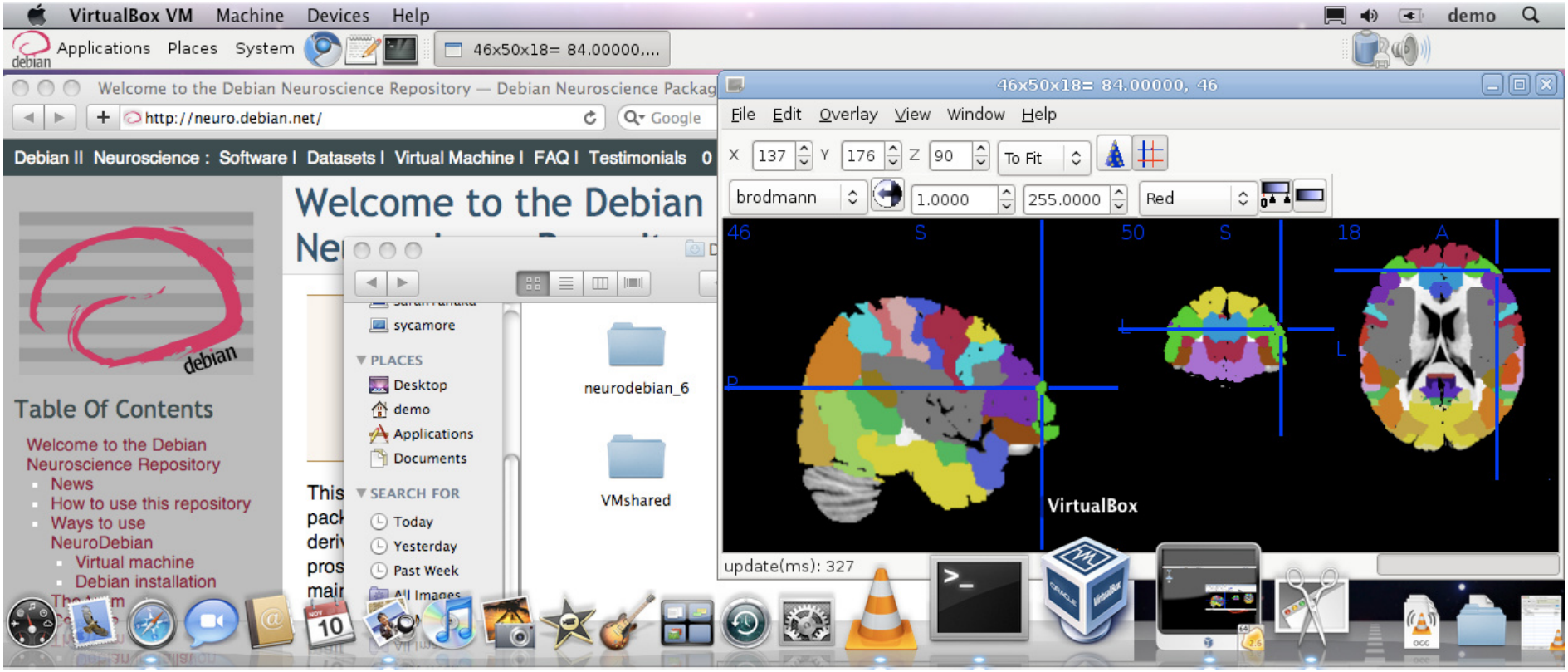
Statistical learning analysis in neuroscience: aiming for transparency
Michael Hanke, Yaroslav O Halchenko, James V Haxby and Stefan Pollmann

Neuroscience Runs on GNU/Linux
Michael Hanke and Yaroslav O Halchenko

Nipype: A Flexible, Lightweight and Extensible Neuroimaging Data Processing Framework in Python
Krzysztof Gorgolewski, Christopher D. Burns,

http://www.frontiersin.org/Neuroinformatics/10.3389/fninf.2012.00022/full

NeuroDebian: Something ready to use

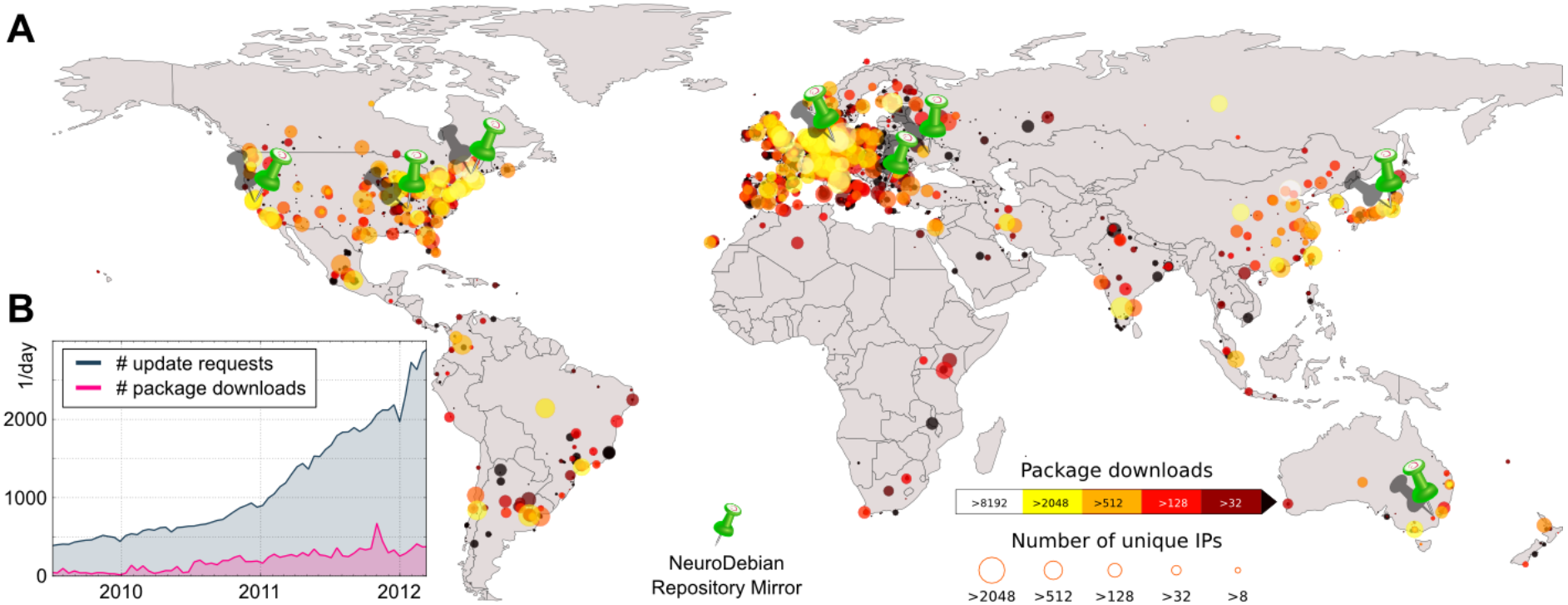


- Virtual machine image based on Debian stable

`http://neuro.debian.net/vm.html`

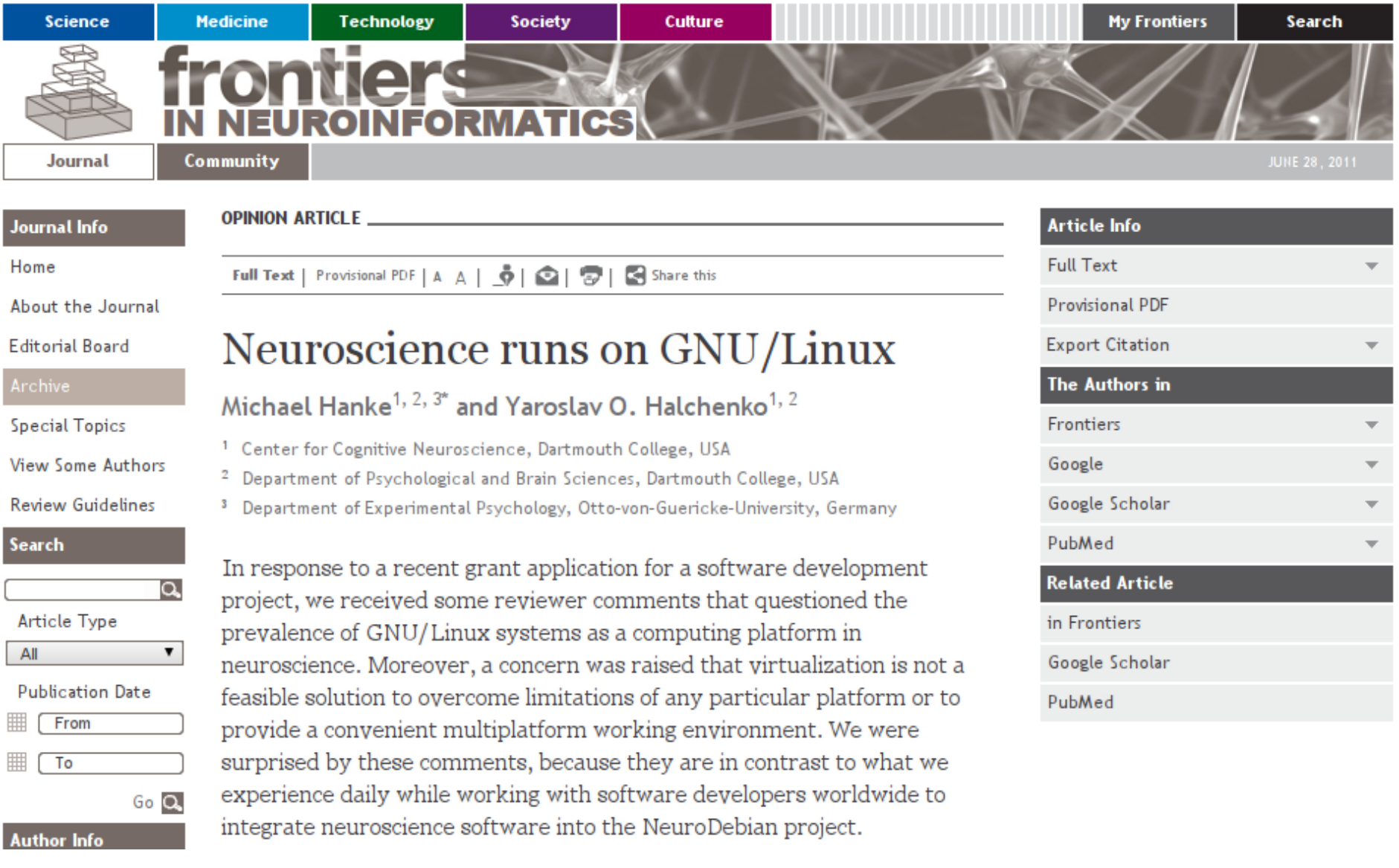
NeuroDebian: Reduce latency

- Repository with backports for Debian and Ubuntu releases
- Prospective packages
- Large data packages
- A common source package



Halchenko and Hanke, Frontiers in Neuroinformatics, 2012

And it seems to work. . .



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OPINION ARTICLE

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Neuroscience runs on GNU/Linux

Michael Hanke[1, 2, 3*] and Yaroslav O. Halchenko[1, 2]

[1] Center for Cognitive Neuroscience, Dartmouth College, USA

[2] Department of Psychological and Brain Sciences, Dartmouth College, USA

[3] Department of Experimental Psychology, Otto-von-Guericke-University, Germany

In response to a recent grant application for a software development project, we received some reviewer comments that questioned the prevalence of GNU/Linux systems as a computing platform in neuroscience. Moreover, a concern was raised that virtualization is not a feasible solution to overcome limitations of any particular platform or to provide a convenient multiplatform working environment. We were surprised by these comments, because they are in contrast to what we experience daily while working with software developers worldwide to integrate neuroscience software into the NeuroDebian project.

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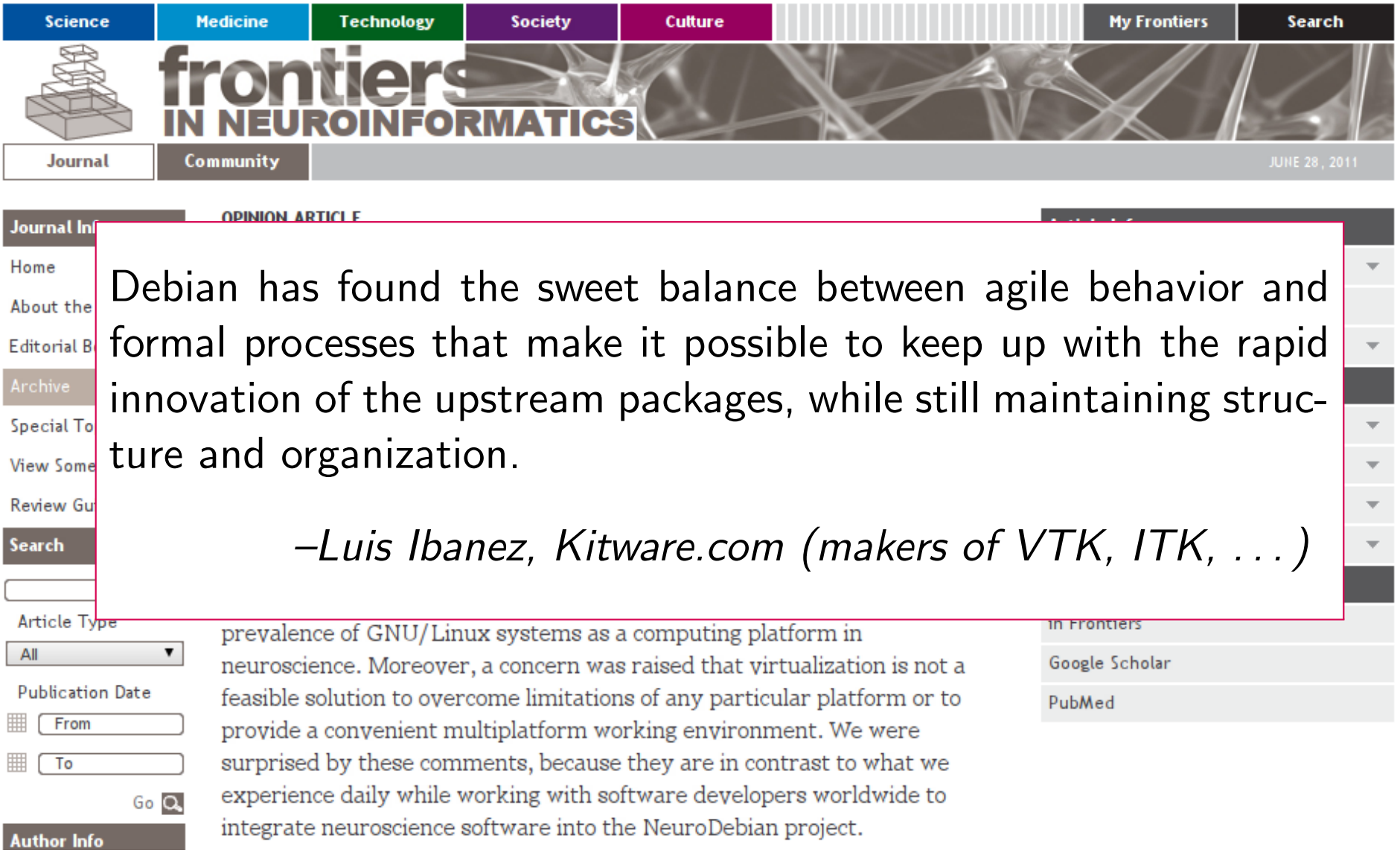
And it seems to work. . .

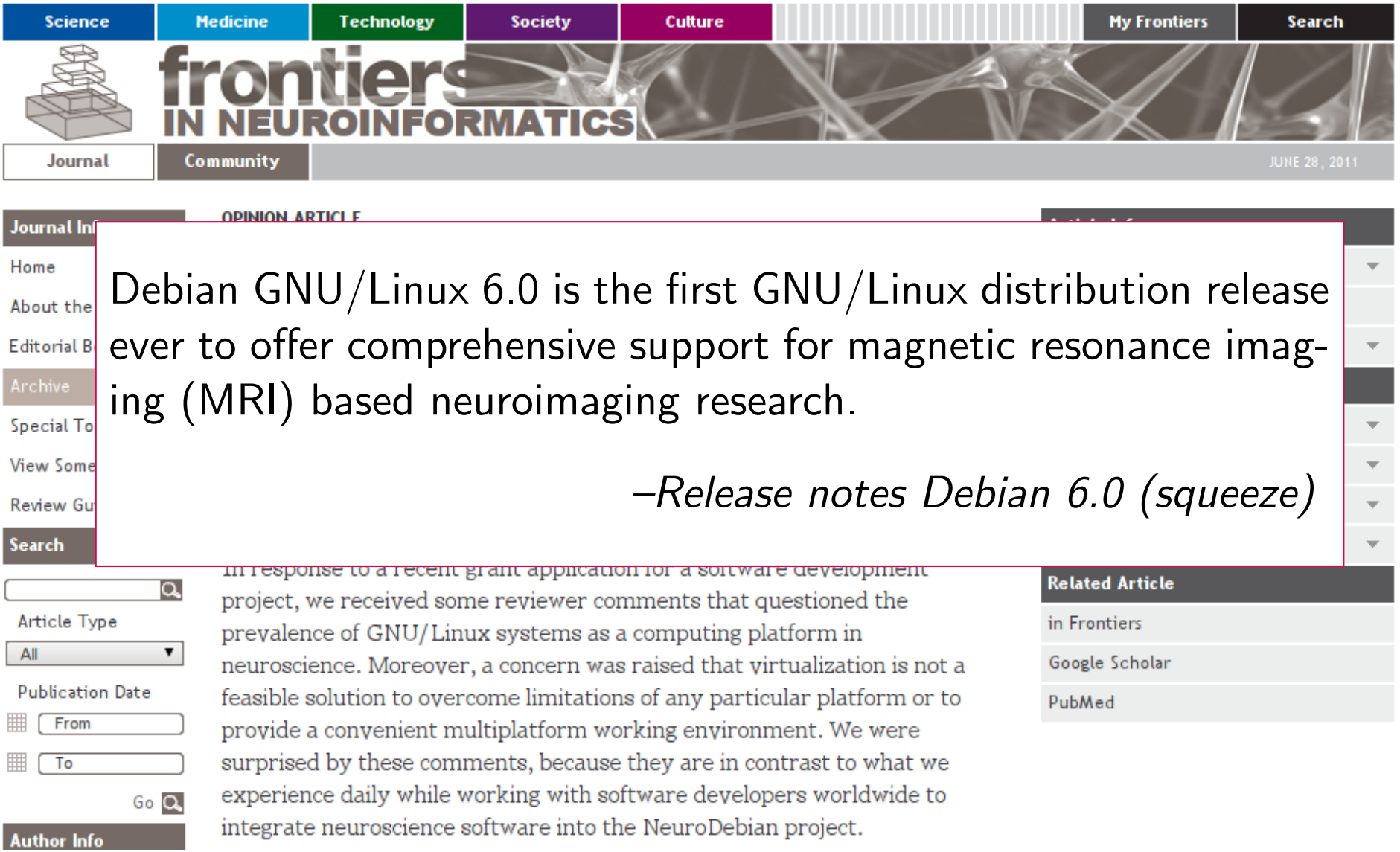


Debian has found the sweet balance between agile behavior and formal processes that make it possible to keep up with the rapid innovation of the upstream packages, while still maintaining structure and organization.

–Luis Ibanez, Kitware.com (makers of VTK, ITK, . . .)

http://www.frontiersin.org/Neuroinformatics/10.3389/fninf.2011.00008/full

And it seems to work. . .



Debian GNU/Linux 6.0 is the first GNU/Linux distribution release ever to offer comprehensive support for magnetic resonance imaging (MRI) based neuroimaging research.

–Release notes Debian 6.0 (squeeze)

http://www.frontiersin.org/Neuroinformatics/10.3389/fninf.2011.00008/full

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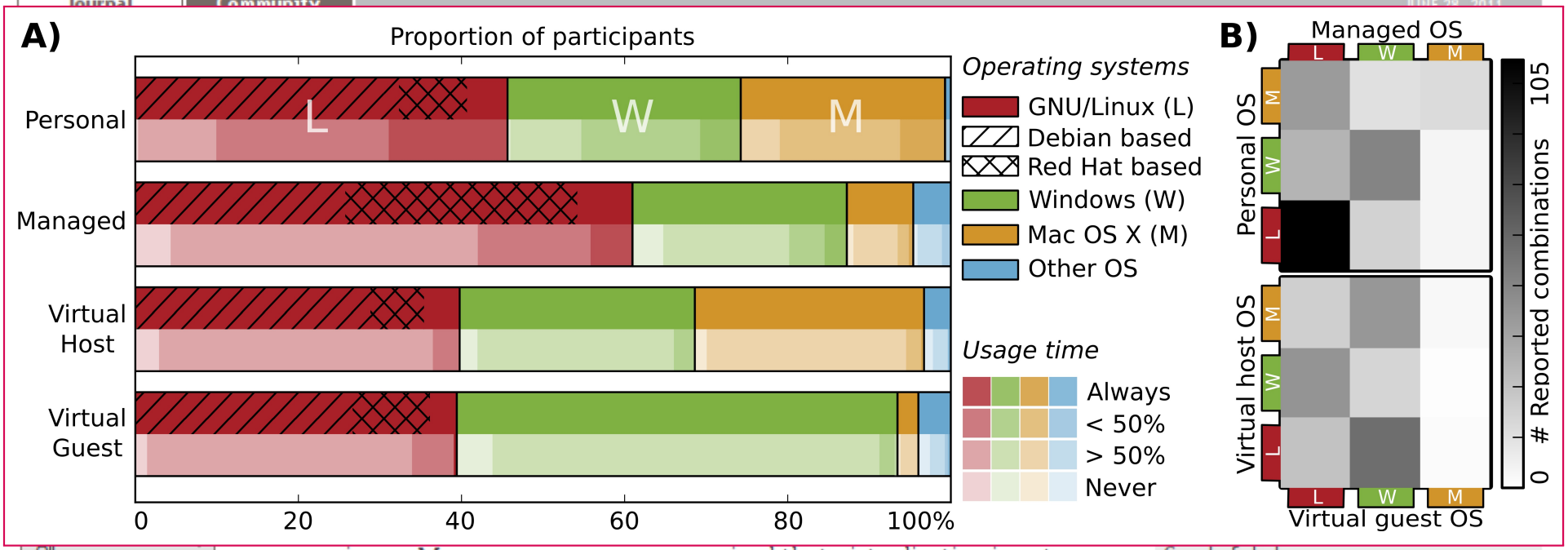

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http://www.frontiersin.org/Neuroinformatics/10.3389/fninf.2011.00008/full

Conclusion

If you don't have 3000 bored employees

Get all software you care about into Debian!

Thanks!

Michael Hanke
mih@debian.org
http://mih.voxindeserto.de

about the slides:
available at http://neuro.debian.net/#publications