The road to hardware free from restrictions: how hardware vendors can help the free software community

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1 Introduction

The computer hardware market is steadily evolving towards a more standardized ecosystem based on unrestricted hardware. Already, smaller vendors are realizing increased sales by ensuring that their hardware works optimally with free software and that drivers are easy to develop and maintain. Industry leaders have already been realizing these benefits in the server market, but have yet to make the same commitment for consumer hardware.

Vendors who understand this evolution will reap the benefits of leveraging the free software community. Vendors who fail to realize this will be left behind in the marketplace by more nimble competitors.

2 Free software drivers

One of the biggest problems facing the free software community today is the lack of free software drivers for common hardware. Significant advances have been made in providing drivers for GNU/Linux systems, either by tacit support from manufacturers or by an arduous process of reverse engineering. Two citadels of binary-only drivers still remain: wireless network interfaces

and video cards. There is wide community support for free software drivers for all hardware.[1]

Almost all current wireless cards and USB devices either require binary firmware loaded by a free software driver, or require the use of Windows drivers via a free software emulation layer (Ndiswrapper). Ndiswrapper is an inefficient use of processor cycles. The binary drivers it requires are often of poor quality, which can lead to stability problems and support headaches.

Most video cards won't perform at their full potential without binary drivers, especially in 3D applications.

The usual problems with proprietary software apply. Bugs in the proprietary drivers can result in a security vulnerability in the system itself that cannot be corrected without vendor intervention. Bugs noticed by the community can take months to be fixed—if they are fixed at all. Vendors regularly ignore the concerns of users who have already purchased their product. For instance, in the specific case of the binary NVidia drivers, there have been several high-profile security vulnerabilities that remained unpatched for far too long.

Hardware that requires binary firmware with a free software wrapper simply circumvents the issue by moving all intelligence into a black box that the user cannot open. This is merely smoke and mirrors—it creates the illusion that the hardware vendor respects freedom while the concerns of the community remain marginalized.

2.1 How hardware vendors can help

- Hardware vendors could require that full low-level technical documentation be made available for the hardware that goes into their products. This documentation should be made available in an unrestricted way, as used to be common practice.

- Vendors could encourage the development of free software drivers for their hardware either by writing the drivers themselves or by supporting community development efforts.

- Vendors could work with the community to get these drivers included

[1] The Free Drivers Petition to hardware producers currently has over 5,000 signatures. See `http://www.petitiononline.com/mod_perl/signed.cgi?zxcv7nm`.

in the standard version of the kernel, Linux. Doing this makes driver maintenance and upgrades much easier for developers as well as users.

2.2 How will this improve the situation for the vendor?

Hardware that is well-documented and supported by free software drivers will be significantly more useful to both the members of the free software community and the wider public. A reputation for hardware free of restrictions equates to positive product reviews, a stronger brand image and increased sales.[2]

Respecting the users' freedom is a mark of an ethical company.[3]

3 Proprietary BIOS locks

There are a number of serious issues with the proprietary BIOSes that are shipped commonly with consumer systems from the big vendors. Two particularly glaring problems are:

- The lock on the use of minipci cards in laptops

  Several major vendors use code in the BIOS to lock down their machines' otherwise completely standard minipci slots so that they only accept a couple of pre-approved extension cards. This is a major problem, particularly because the pre-approved cards are often manufactured by vendors that are hostile to free software, like Broadcom.

- Disabling of the hardware virtualization functionality in modern CPUs

  It has been reported that some machines with CPUs supporting hardware virtualization have those features disabled in the factory BIOS. One vendor claimed that virtualization had not been tested on its product, which is why the feature was disabled.[4]

[2] "In the survey of 1,800 young people, released by Cone Inc. and AMP Insights, two Boston marketing companies, 89 percent said they are likely to switch from one company's brand to another if the second brand is associated with a good cause." Chronicle of Philanthropy, 2006.11.09, Peter Panepento

[3] Free software is a matter of freedom: people should be free to use software in all the ways that are socially useful. See `http://www.gnu.org/philosophy/`.

[4] See "Business support forums - nw8440 - VT disabled in bios," `http://lnk4.us/za3D`.

It is worth noting that no OEM motherboard manufacturer implements similar restrictions.

3.1 How hardware vendors can help

The vendor should not deliberately cripple hardware through BIOS locks or DRM in the BIOS.

3.2 How will this improve the situation for the vendor?

By removing artificial restrictions, users will be free to use their hardware to its maximum potential, including the freedom to combine hardware as they see fit. To a large tech-savvy community like the free software community, this freedom makes or breaks purchasing decisions.

4 Free BIOS support

There is a movement underway to replace proprietary BIOSes with a free BIOS. The major community effort is behind LinuxBIOS.[5]

4.1 How hardware vendors can help

- Hardware vendors could support the community by providing access under a permissive license to all the low-level hardware documentation necessary to port a free BIOS to their systems, and ideally offer engineering support.
- Hardware vendors could ship hardware with a free BIOS instead of a proprietary BIOS. The free software community values hardware that can be run fully with free software from the BIOS up, and is willing to pay for it.

4.2 How will this improve the situation for the vendor?

It is in the hardware vendors' best interest to support a free BIOS, because it offers a number of advantages over proprietary BIOSes:

[5] See `http://linuxbios.org`.

- Most of the code is written in C, which is much easier to maintain than assembly code.
- It runs almost entirely in 32-bit protected mode.
- Rather than continuing design decisions made in the 1970s, it is based on modern architecture.
- Revolutionary new features are possible, like embedding an entire kernel in the ROM chip.
- Boot-up time is only a couple of seconds, which is a fraction of the time an average proprietary BIOS takes.
- The vendor is not dependent on one proprietary BIOS vendor for any changes and fixes to the code.
- Since it is licensed under the GPL, there are no patent or per-board royalties, or licensing fees.

5 The "Microsoft tax"

It is nearly impossible to purchase consumer hardware without a Microsoft operating system pre-installed. The vendors that do offer such systems usually discourage their purchase by hiding them. Vendors that pre-install GNU/Linux often only list the option for select systems. In neither case do vendors commonly provide a discount, even though they save money by not including an OEM Microsoft license.

5.1 How hardware vendors can help

- Vendors could offer "no operating system"as an option on all their systems, including consumer systems, and particularly laptops.
- When "no operating system" is selected, vendors should reduce the price of the system by the cost of the Microsoft OEM license.
- Vendors could offer some GNU/Linux distributions as an option on systems, including consumer systems, and particularly laptops. These systems should be tested for subsystem functionality like ACPI.

5.2 How will this improve the situation for the vendor?

By selling and promoting more hardware without a pre-installed operating system, or with a GNU/Linux operating system, vendors will become less dependent on Microsoft. Millions of people are already using GNU/Linux systems. The free software community will undoubtedly support vendors that sell hardware without subjecting their customers to the "Microsoft tax." Lower costs to the vendor mean lower prices and increased sales.

6 Digital Restrictions Management

The free software community opposes the imposition of Digital Restrictions Management (DRM). As current software implementations of DRM have proved insecure, arduous and unmanageable, this anti-consumer technology is increasingly moving into hardware. Traditionally, hardware vendors have encouraged innovative uses of new technology and media, not restricted them. This culture of innovation is what the entire computer hardware industry is based on.

6.1 How hardware vendors can help

Hardware vendors could resist pressure by the media companies to stifle this innovative culture, and actively lobby for laws that protect consumers' rights.

6.2 How will this improve the situation for the vendor?

The free software community will flock to any vendor that protects the rights of the consumer by delivering "hardware free from restrictions." Vendors that sell equipment that is "defective by design" will see their sales and community support diminished.

By steering clear of DRM hardware, vendors would also remain free to innovate, rather than having to clear every new product with Big Media.

7 Conclusion

By making the recommended changes in any or all of these five areas (free software drivers, proprietary BIOS locks, free BIOS support, the "Microsoft

Tax," Digital Restrictions Management) hardware vendors will help establish a mutually beneficial relationship with the free software community. Vendors will realize increased sales, and the free software community will have hardware that meets its ethical requirements.

The Free Software Foundation is eager to assist hardware vendors interested in making the changes recommended in this paper. Vendors should not hesitate to take advantage of this largely unexplored opportunity.