

Linux as a Mature Digital Audio Workstation in Academic Electroacoustic Studios – Is Linux Ready for Prime Time?

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Abstract

GNU/Linux is an umbrella term that encompasses a revolutionary sociological and economical doctrine as well as now ubiquitous computer operating system and allied software that personifies this principle. Although Linux quickly gained a strong following, its first attempt at entering the consumer market was a disappointing flop primarily due to the unrealistic corporate hype that ultimately backfired relegating Linux as a mere sub-par UNIX clone. Despite the initial commercial failure, Linux continued to evolve unabated by the corporate agenda. Now, armed with proven stability, versatile software, and an unbeatable value Linux is ready to challenge, if not supersede the reigning champions of the desktop computer market. Perhaps this time around, the era of Linux is truly at hand.

1 Introduction

Linux, the flagship operating system of the GNU (recursive acronym that stands for *GNU is Not Unix*) movement that spawned both the sociological and economical revolutions across the World, shaking the very foundations of even the ostensibly untouchable Redmond giant, has in its 14 years of existence grown into one of today's leading software platforms. The rapid pace of development fueled by the millions of volunteers and contributors alike made *Linux* penetrate industrial, corporate, and consumer markets.

While its entry role to the computer industry was as a server and/or an affordable number-crunching cluster (i.e. *Beowulf*), *Linux*'s more recent uses foreshadow its increasing prominence in the desktop market. Some of the latest examples include *Pixar*'s hit *Finding Nemo* that utilized *Linux* as both the rendering engine and the desktop interface for the rendering software, while the latest animated movie hit *Sinbad* was the first such endeavor entirely done in *Linux*.

Today, *Linux* dominates the server and mainframe market, most notable example being the ubiquitous *Google* search engine. *Linux* mainframes are also commonly found on the top-500 supercomputer list, a number of which are

members of the most prestigious top-10 chart. *Linux* is also used in a small but steadily growing number of multimedia consumer devices (*Lionstracks Multimedia Station*, *Hartman Neuron*, *Digeo's Moxi*) and handhelds (*Sharp's Zaurus*).

Through the comparably brisk advancements of the most prominent desktop environments (namely *Gnome* and *K Desktop Environment* a.k.a. KDE) as well as the accompanying software suite, *Linux* managed to carve out a niche desktop market. Purportedly surpassing the *Apple* user-base, *Linux* now stands proud as the second most widespread desktop operating system in the World. Yet, apart from the boastful achievements in the various markets, in the realm of sound production and audio editing its widespread acceptance has been conspicuously absent, or has it?

2 Common Misconceptions

2.1 Free Beer vs. Free Speech

Before we can even begin [re]evaluating *Linux* as a viable multimedia platform it is important to first dispel some of the commonly perpetuated misconceptions that may suggest its ineptness as a desktop operating system or simply lack of understanding of the power it offers. One of the most common problems is realizing the true value of *Linux*. Rather than simply suggesting that *Linux* and its allied software is free as in "free beer" (suggesting that user is a mere consumer), its greatest strength is that it enables the end-user to gain a full control over their own computer without the implied limitations, obfuscated EULA's (*End-User License Agreements*), or the dependency on the companies whose longevity (and consequently software support) isn't guaranteed. This means that *Linux* stands as a free as in "free speech" architecture that imposes virtually no limitations to its free use.

2.2 User-Unfriendly

In the past many *Linux* advocates advertised the ease of use where there was none, in part because the majority of initial *Linux* consumers were highly literate computer users.

Linux only recently attained the levels of user-friendliness that were touted years ago. Conversely, many early adopters got burned by the deadly combination of wrong expectations and the lack of documentation. Although *Linux* has come a long way since and in its current state in terms of its user-friendliness is virtually comparable to the commercial desktop environments, I would still like to caution potential newcomers when approaching *Linux*. Even in its current state interface still has some inconsistencies and unpolished edges (something that can arguably be said for every single software/OS on the market) but most of them are quickly becoming either obsolete or insignificant enough to have no bearing to the every-day productivity.

2.3 Compiling from Source

Another common misconception regarding *Linux* is that it requires compiling software from the source, therefore demanding a high level of computer literacy from its user. The truth is that *Linux* has some of the most powerful software installation and maintenance frameworks that are not only capable of deploying binary versions, but are also able to resolve any dynamic linking dependencies. For instance, the *Mandrake* uses an extended version of RPM (*Redhat Package Manager*) called URPMI that does exactly that. Provided that computer is properly configured, installing software such as the multitrack audio editor *Audacity* requires either a couple of mouse clicks using the GUI installer or a simple shell command: “urpmi audacity.” In a matter of seconds (depending upon the speed of the Internet connection) the software will be ready for use. It is worth mentioning that in addition URPMI, there are also other intelligent installation/update engines, some of which can be used interchangeably, such as the *apt-get* (*Debian*), *yum* (*Yellow Dog & Fedora*), and *emerge* (*Gentoo*).

2.4 Commercially Unviable

Finally, there is the revolving myth that with *Linux* no one can make money due to its license limitations and therefore it cannot be viewed as a competitive replacement for the commercial offering. Not only is there a number of commercially profitable companies which thrive on selling the *Linux* support and similar allied services, but also many closed-source commercial software companies openly support *Linux* with their products, such as the professional rendering tools (*Maya* and *Softimage*), cross-platform emulators (*Win4Lin* and the *Crossover plugin*), as well as a number of entertainment software titles (such as *Quake* and *Unreal Tournament* series). Naturally, such software is not supplied with its source code nor is it GPL-compliant (*GNU Public License* that enforces the revolutionary concept of “copyleft”). Nonetheless, its use in no shape or form collides with the GNU license in terms of coexistence on the same system. Furthermore, if one opts for designing their own software, most of the *Linux* tools that pertain to the software development offer the option of LGPL (*Lesser*

GNU Public License) which allows such libraries to be linked to and utilized in closed-source commercial endeavors.

2.5 A Leap of Faith

Considering that time is one of our most valued commodities, it is important to emphasize that *Linux* has come a long way and now offers a much smoother install, configuration, and maintenance experience. Furthermore, many *Linux* distributions nowadays offer the so-called “Live CD’s” which contain entire operating systems and run them completely from the CD. This way a user can test how well a particular distribution runs on their computer before ever touching their hard drive and/or altering their system in order to make room for the new operating system.

3 The Power of Choice

The fact that *Linux* is fostered under the GPL/LGPL licenses ensures that, when distributed, it is bundled with its source. Such packaging coupled with *Linux*’s reputable portability streak ensures its timelessness due to fact that its existence is unhindered by the current dominance of a particular hardware vendor or by the economic hardships of the overall computer industry. Furthermore, it facilitates the end-user’s complete independence from the software provider. For instance, if a consumer were to encounter a bug in the software that minimizes or completely obstructs its applicability within the user’s context, they would have the choice to intervene and/or troubleshoot the code since it is readily available with the software on various levels, whether that be altering code themselves, seeking help from other contributors, or hiring programmers to do the work for them. Such reinvestment in the GPL-ed software ultimately yields improvement to everyone’s benefit and should be highly encouraged.

4 Rich Software Offering

By gaining an impressive following, *Linux* has generated an audience that reaches into every market sector. As a result of such interest, a huge number of offspring projects came into being focusing on providing the sought functionality. Nowadays, we have literally thousands upon thousands of various software applications, some which are incomplete and others that are somewhat buggy, many of which offer overlapping features, and finally those who are true mature counterparts to the commercially available products, but most importantly whose overall gamut ensures that *Linux* can cover just about every demand of a modern desktop user.

4.1 Getting There...

Although many *Linux* software applications (most of which are distributed under GPL) do not necessarily possess

the flexibility, user-friendliness, and/or standardized layout of their commercial counterparts, all of these issues are being addressed on a daily basis through continuous interactions between the end-users and developers. Ultimately, such trend leads towards the conclusion that in the long-run GPL-ed software ought to surpass any commercial offering simply because of its inherent portability and updatability that is completely devoid of the capitalist agenda. This fact alone speaks of the incredible long-term potential of *Linux* and associated GPL-based software. After all, the history of commercial endeavors has repeatedly shown that the closed-source model leads only to troublesome reinvention of the wheel, coupled by the unreasonable, yet unavoidable upgrade paths and associated fees, as well as the counterproductive breaking of the backwards-compatible software model.

4.2 ...Already There

A good number of the current software offering have advanced to the point where they at least match their commercial counterparts. There is *Ardour*, the *Protools*-like software that offers impressive performance and functionality, and *Pure Data*, the open-source brethren to the ubiquitous *Max/MSP*. *Supercollider 3* now runs comfortably in *Linux*, and audio editors such as *Sweep*, *Audacity*, *ReZound*, *Snd*, and *Mxv* offer commercial-grade quality sound processing engines as well as user-friendly (or at worst adequate) interfaces. There is a strong presence of the *Music-N*-like scripting languages, such as *Csound*, *RTcmix*, *CLM*, *CMN*, *CM*, etc. *Linux* has the VST-equivalent framework titled LADSPA (*Linux Audio Development Simple Plugin Architecture*) with already hundreds of high quality plugins available, and as of recent is furthermore capable of natively running Win32 VST and even VSTi plugins. *Linux* boasts with a long list of high-quality software synthesizers some of which pose also as formidable samplers, such as *amSynth*, *Alsa Modular Synth*, *Spiral Synth Modular*, *RTSynth*, *Bristol*, *Ultramaster Juno6*, *ZynAddSubFX*, *SoundFontCombi*, *Horgand*, *gmorgan*, as well as the impressive *LinuxSampler*, and many more. In the recent years, several scoring software packages began taking shape, and although none of them match the power of *Sibelius* or *Finale*, they keep getting better and better. Sequencing software, namely *Rosegarden*, *Muse*, and *Brahms* have grown into adequate alternatives to the MIDI giants, such as *Logic*, *Sonar*, and *Cubase*. *Linux* also hosts some of the more commercially-oriented DJ-ing software (*TerminatorX*) and beat-pattern editors, such as *Hydrogen*. Open-source initiatives have also resulted in alternative forms of audio compression, namely *FLAC* and *Ogg Vorbis* formats. Latter according to the latest research offers the best fidelity among the “lossy” audio formats. In visual arts there are rendering solutions (*Blender*, *POV-Ray*) graphics software (*GIMP*, the Photoshop-like editor), as well as video editing suite, such as the astonishing *Cinelerra*.

4.3 Alternatives Where There are None...

Although this course of action is generally not encouraged as it may demean the efforts of the native software offering, in the situations where a particular software is still lacking, *Linux* can in many cases substitute by emulating the Windows and or Mac environments using the various emulators (i.e. *WINE*) and allowing end-users to seamlessly switch between the two platforms without having to resort to the dreaded reboot button. There are success reports of running *Finale*, *Sibelius*, and many other pivotal applications that are commonly used in the music studios.

4.4 ...And Exclusive Perks

Finally, it is important to emphasize that whereas the majority of the *Linux* software falls into the category of either “adequate” or “comparable” in respect to their commercial siblings, there is a small, but steadily growing number of applications and frameworks that provide exceptional functionality, while being either better than their commercial alternatives or simply inherent solely to *Linux*. For instance, *ALSA (Advanced Linux Sound Architecture)* driver framework allows users to define multiple soundcards (that have means of hardware syncing with each other) as a single meta-soundcard and as such use them in any *ALSA*-aware software application. Another example, the *JACK (JACK Audio Connection Kit)* interface provides low-latency sample-accurate audio routing and mixing while ensuring audio sync between various *JACK*-aware audio applications that would otherwise tend to drift apart. There are several interesting *JACK*-aware software applications that provide simple but powerful functionality, such as the *timemachine* that maintains an easily-retrievable buffer of the events past, *Freqtweak*, a real-time audio processing engine, *JAMin*, a professional audio mastering interface, and many more.

5 Other Benefits...

5.1 Performance

Recent benchmarks have shown that *Linux* offers the fastest performance in network-related tasks as well as one of the most advanced kernel-level task distribution between multiple central processing units. In addition, its optimized version of the kernel offers latency that in many ways is hindered only by the hardware limitations (such as of the now outdated *PCI* bus, as well as the hardwired soundcard buffers).

5.2 Support

The *Linux* community, although sometimes deemed as an elitist geek-like cult, generally is a productive environment for exchange of concepts, ideas, and most

importantly solutions. Internet mailing lists and forums, chat rooms, and discussion boards teem with activity and nowadays more often than not contain answers to many troubleshooting topics. As such, they are invaluable support resource that offers prompt responses and generally fruitful interaction. Furthermore, a number of commercial distribution software companies, such as *Suse* and *Mandrake*, offer phone and/or e-mail-based product support and even contracted system maintenance at competitive prices. Therefore, *Linux* can now offer studio integration that does not necessarily require a leap of faith as it used to only a few years ago.

5.3 Maintainability

As mentioned earlier, *Linux* is an architecture that incorporates some of the most impressive software updating engines. Such framework nowadays makes *Linux* one of the most maintainable, upgradeable, and user-friendly operating systems in terms of installing new and upgrading the existing software. *Linux* machines seldom, if at all require complete reinstall and its distributions do not intimidate the end-users with silly key protections, online (re)activations, and incessant changes in licensing terms.

5.4 Customizability

Many potential adopters justly avoid dramatic overhauls in their studios because such actions imply steep learning curves and require acclimatization to the new user interface. This problem is almost entirely alleviated in *Linux* because most of its desktop environments offer incredible levels of customizability. Just a brief glance at one of the “desktop themeing” websites will reveal that *Linux* can be altered to look very similar to *Windows*, *Mac*, or just about any other desktop environment. Furthermore, such flexibility allows users to have a full control over the visual “eye-candy” that some find to be wasting valuable CPU cycles, while others require it, believing that it improves their productivity.

6 ...and Caveats

Although *Linux* offers a great deal of benefits, like any other product in the ever-changing world of computers, it is not perfect. While for the first time in its somewhat brief history its advantages far outweigh the shortcomings, it is still important to point out some of the most common issues that may cause inconvenience for a new *Linux* adopter.

6.1 Documentation

One of the most anemic aspects of *Linux* is documentation whose lack may impede user’s ability to harness the full potential of the software. Although things are slowly improving, this continues to be one of its greatest weaknesses. In the long-run the problem will likely solve itself, but for the time-being the best solution is to encourage involvement of as many users as possible.

6.2 Bugs

It is inevitable that one will eventually stumble upon a bug that will crash an application and possibly even ruin one’s work. Obviously, it is important that one uses “stable” software releases whenever possible (especially since a majority of the *Linux* community adheres to the “release early, release often” motto) but also, knowing that bugs are an unavoidable part of every-day computing experience it is vital for users to play an active role in the community and report the bugs whenever they encounter them, especially because many developers, in order to improve applications, often rely upon the user feedback and/or contributor help in order to track-down bugs and fix them.

6.3 Bleeding-Edge Hardware

The hardware market is saturated by the ever-changing standards and proprietary aspects. It is therefore likely that if *Linux* is going to be installed on just-released hardware it may not run some of the critical kernel aspects correctly potentially rendering the OS useless. Currently, there is no solution to this problem other than sticking to at least a couple-months-old hardware which in the end may work out for the best as it will allow the consumer to reassess the true value of a potential investment.

7 Pointers for Newcomers

This chapter that includes a how-to for obtaining, installing, and deploying *Linux* has been omitted due to space limitations. For the complete document that includes this chapter please visit author’s homepage.

8 Conclusions

Although the gamut of the newly-found benefits associated with *Linux* is certainly impressive, many will still question whether its adoption in the electroacoustic studio environment is a worthwhile endeavor. Even for such justifiably wary potential adopters it is certainly feasible to introduce a single *Linux* machine of limited scope and functionality, or simply test *Linux* out by using one of the “Live CD” distributions in order to reassess many of the aforementioned advantages as well as the viability of a larger-scale deployment. With such an approach, one could still taste the great benefits of the *Linux* platform without sacrificing too much of the studio and/or monetary resources, or their own valuable time. Unhampered by the licensing limitations and fortified by open and affordable architecture that perfectly fits the increased demands and shrinking budgets of modern electroacoustic studios, *Linux* truly poses as the artist’s tool, a hyperinstrument that bridges the gap between the proprietary technology and the freedom of human inspiration. Let the new era of computer music begin!

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