

Daniel James introduces the 64 Studio project

The 64-bit question

With Apple's recent announcement that it is switching to x86 processors, forsaking loyal G4 and G5 users in the creative industries, there is effectively only one mainstream desktop computing architecture left. The 64-bit extensions to the x86 instruction set developed by AMD, and subsequently adopted by Intel, have been adopted far more readily by Linux developers than their proprietary software counterparts. Microsoft only released a transitional x86_64 version of Windows XP this year - running mostly 32-bit applications - while fully-native Linux distributions have been available for some time.

Serious audio software users, needing plenty of processing power and RAM to take advantage of real-time processing on multiple tracks or streams, are obvious candidates to benefit from the switch to the 64-bit desktop - and yet there has been very little native software available to date. For proprietary software houses, who create most of the tools used in recording studios around the world, the emphasis is often on bespoke DSP cards as the solution for compute-intensive loads. But with powerful 64-bit CPUs available on the commodity market for the first time, the processor-agnostic nature of most free software and its source availability makes a host-based approach using Linux a potentially viable alternative.

Despite the availability of x86_64 Linux distributions, the lack of native x86_64 software

create a fully native x86_64 Linux distribution with support for the hardest possible real-time audio performance. The lead developer on the project is Free Ekanayaka, who is also the maintainer of the AGNULA/DeMuDi codebase.

An alpha version of the 64 Studio distribution is already available for download, and while it is far from complete, test reports indicate that it provides a stable JACK audio server environment for running applications such as Ardour and Jamin. It also provides a selection of other creative applications for 2D and 3D graphics, publishing and video work, with additional areas including animation to be added in future. Some of the specialist packages which are rarely found in mainstream distributions are included by default, such as the multichannel audio mixers for RME and M-Audio soundcards.

ENDING THE COMPATIBILITY CURSE

Due to the need to support old binaries, when source code is simply not available, proprietary platforms are often forced to support legacy technologies. To offer just one example, Microsoft has had to provide work-arounds in Windows XP x64 Edition for 16-bit software that still persists in many proprietary application installers. In the case of 64 Studio, it was decided that the change of architecture could provide a clean break with the past. There is currently no support provided for 32-bit binaries at all, which has had the side effect of forcing out most of the proprietary applications found

Serious audio users are obvious candidates to benefit from the 64-bit desktop

for audio and other multimedia work has also persisted in the free software domain. A mainstream distribution such as Ubuntu, openSUSE or Fedora Core does not have out-of-the box support for real-time audio production - if multimedia is supported at all, it is from the point of view of an end-user rather than a content creator. There are specialised distributions for audio work, including the Debian-based AGNULA/DeMuDi and the Studio... to Go! product created by Fervent Software, but for the time being these distributions are compiled for 32-bit Intel architecture machines. With these factors in mind, I launched a project earlier this year to

on other Linux desktop systems, such as Adobe Reader or Macromedia's Flash player. Rather than compromise the design, free software alternatives to these applications are being considered for inclusion.

Making recent hardware a requirement also allows the project to drop support for legacy interfaces, such as the ISA bus, or the long-deprecated Open Sound System drivers. Many audio applications for Linux, in particular the proprietary ones, still only support sending audio to the /dev/dsp/ target specified by OSS, even though the Advanced Linux Sound Architecture drivers have been merged into the mainline Linux kernel for years. Rejecting

applications which do not support contemporary standards, such as JACK or ALSA, also allows the project to identify which applications are effectively unmaintained.

BUILDING ON DEBIAN

64 Studio is a Custom Debian Distribution, which means that it is a 'remix' of Debian packages rather than a derivative or fork. This in turn means that binary compatibility is preserved with the main Debian archive of over 15,000 packages. Debian was chosen as a basis for 64 Studio due to the high quality of its unofficial 'Pure 64' port, its support for seamless upgrades with apt-get, and its open community development process.

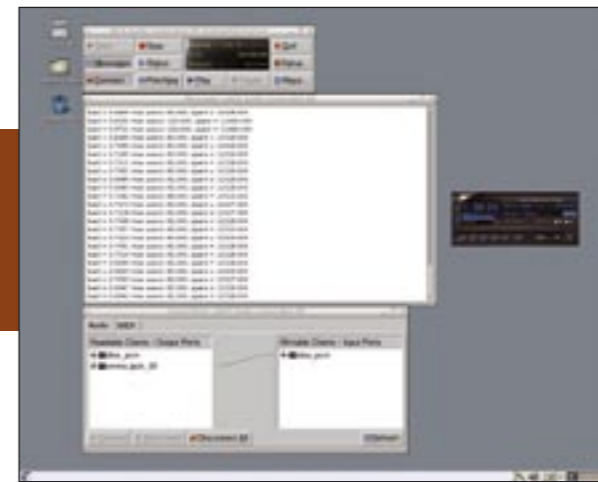
The 64 Studio alpha releases currently contain less than 800 packages and can therefore install from a single CD, but once installed can add any package from a mirror of Debian's testing distribution, known as Etch. A deliberate decision was made to work upwards from a small distribution rather than throw every possible package at the user, and this has meant making some hard choices. In the original alpha releases, the only desktop provided was the

free software at a serious disadvantage for recording studio users.

THE REAL-TIME KERNEL

At the time of embarking on the 64 Studio project, none of the native x86_64 Linux distributions for desktop machines had shipped with a kernel featuring patches designed to reduce audio latency, or had attempted to approach hard real-time performance. While the Linux 2.4 kernel was tried and tested for low-latency audio work, the newer 2.6 series has better support for the hardware that the 64 Studio project is targeting. Red Hat hacker Ingo Molnar's real-time work with the 2.6 kernel was encouraging, but at one time his patches would not even compile on x86_64 systems. The decision was taken to begin with the 2.6.12 kernel release, add Molnar's patches and test the result in a JACK environment. Fortunately, it worked even better than expected, offering reliably low audio latency so far. An updated 2.6.13 kernel package has now been produced, including Molnar's patch set and other code not found in standard Debian kernels.

Low-latency kernels also need a permissions mechanism to allow the non-root users of a system to give their audio processes high priority over other tasks.



The moment of truth, as low-latency audio runs on the fully native 64 Studio desktop for the first time

Without this priority, audio output might glitch while the CPU completes other work - an outcome which is annoying for typical desktop users, but

minimalistic Fluxbox window manager, but doubts over the lack of a graphical file manager led to a switch to Gnome. Most of the key applications in 64 Studio are based on the GTK+ toolkit, so Gnome was a more obvious choice than KDE - although several KDE applications are also included by default, such as the Rosegarden 4 sequencer and the K3B CD and DVD burning tool.

Not being part of the official Debian project offers greater flexibility to 64 Studio, particularly in the case of audio interface firmware. This type of binary, uploaded when the device is switched on, is an essential part of the driver for most of the latest external audio interfaces. The Debian project has taken the decision that it will not ship binary firmware, as it is not user-modifiable. While this decision is highly consistent with the Debian project's policy guidelines, it means that these devices cannot be made to work out of the box with a standard Debian system, putting

completely unacceptable in a professional audio context. In the 2.4 kernel era, the realtime-lsm approach was favoured by many Linux audio developers, but was never merged into the mainline kernel tree. It had been hoped that realtime-lsm would be merged into the 2.6 series kernels, but the core kernel developers favoured a rival technology known as rlimits. As of the 2.6.12 release, the rlimits patch is now in the mainline kernel tree, but it requires a patch to the PAM authentication code to work. However, we were unable to get the modified version of PAM to build properly, so for the time being the 64 Studio distribution ships with the more traditional realtime-lsm code.

THE TROUBLE WITH PATENTS

Perhaps the reason why we haven't seen the mainstream Linux distributions fully engage with multimedia production, other than the fact that it is a niche market, is the difficulty

created by the use of proprietary media distribution formats - and the so-called open standards which in fact are so patent-encumbered that they might as well be proprietary. Even the free software encoders for the widely used MPEG formats cannot practically be included in Linux distributions, because they attract per-unit patent royalties. MPEG decoders also attract patent royalties, but since they are required to be spread as widely as possible among end-users for a particular format to remain successful, patent enforcement for decoders appears to have been more lenient so far. Nevertheless, companies such as Red Hat have long had a policy that neither MPEG encoders nor decoders are shipped, while Debian takes a reactive approach, removing packages when patent enforcement is threatened.

The 64 Studio project has taken a proactive approach to the patented formats issue, removing decoders for formats such as MP3 from Debian packages before redistributing them. This will leave the distribution with support for the free codecs of Ogg Vorbis, FLAC and Speex for audio, and Theora and Dirac for video. There is also support for the GStreamer framework, which means that proprietary formats could optionally be supported using the plugins

developed by Fluendo (see Audio Libre, LinuxUser & Developer issue 50). On the media production rather than distribution side, the Advanced Authoring Format designed for vendor-neutral project interchange could be of great benefit to Linux users who need to collaborate with content creators on proprietary platforms - and so we hope to build in support for it.

Even with the relatively restricted range of x86_64 hardware currently available, the widest possible testing of 64 Studio is needed to help ensure system stability. Third-party contributions are actively encouraged - all 64 Studio development therefore takes place on a public mailing list, and there are no restrictions on downloads of the install CD image. In future, the 64 Studio project hopes to go further than packaging and integration work to fill some of the gaps that remain among the free software creative tools.

Key links

- 64 Studio homepage <www.64studio.com>
- Debian x86_64 port <www.debian.org/ports/amd64/>
- Fluendo plugins <www.fluendo.com>