

## Emulating Legacy Game Platforms

# Bygone Battles

Do you miss your trusty Sinclair Spectrum? Do you long for the Commodore you know only in your history books? Old platforms come alive using the tools of the retro-gamers. **BY IAN POINTER**

**B**efore the computer industry settled on the IBM PC, there were many different types of computers with exotic-sounding names like Enterprise, Oric, Dragon, Electron, Spectrum, and Amiga. Although these machines are no longer with us, most of these legacy systems still have ardent fans that keep their memory alive. These fans prefer the simplicity of the older era – when programs had to fit inside tiny quantities of memory and programmers had to use every trick they could imagine to get the most out of a computer – to the fast processors and gigabytes storage of today.

These enthusiasts are more common than you might think; the coming of the Internet has allowed people from all across the world to reminisce about the past, and for the last eight years, a Classic Gaming Expo (<http://www.cgexpo.com>) has been held in America, with exhibitions from big arcade firms like Midway and Konami, plus lectures from hardware geniuses such as Steve Wozniak, co-founder of Apple.

While purists will be satisfied with nothing less than the real machines, in many cases this is not practical or possible, and so the enthusiasts started writing programs called *emulators*, which allow old computers to be simulated on today's hardware. These programs often go beyond the original's capabilities, for example allowing the state of the computer to be saved for later use (useful when playing games), or providing the ability to communicate with other copies of the emulator over the Internet.

This article will explain where to obtain some of the more popular Linux-based emulators (starting with the early 8-bit systems then moving on to 16-bit computers and consoles), where to get software to run on them, and how you



© Gavin Barnes, www.isipix.com

can even use Linux to develop new programs for these old computers.

## Sinclair Spectrum

The Spectrum, released in 1982, was the most popular home computer in the UK, and it is fondly remembered for its strange rubber keyboard. Despite its limited color and sound abilities, it built up an impressive software library, comprising thousands of games and other types of applications. It went through multiple revisions, starting with the humble original with 16 Kilobytes of RAM, to a version with a 3" inch disk drive, a proper keyboard, an improved sound chip, and 128 Kilobytes of RAM. The Spectrum also flourished in the Soviet Union; the plans for the machine were smuggled across the Iron Curtain, leading to the production of many illegal clones.

Fuse is a Spectrum emulator for Linux that can be found at <http://fuse-emulator.sourceforge.net>. Like all the emulators in this article, it works best with the SDL libraries, which can be

found at <http://www.libsdl.org>. It is probably best to download the source and build it manually, so you can be sure it doesn't use older graphics systems like *svglib*.

Fuse emulates all the major revisions of the Spectrum, including the American Timex versions plus some of the Russian clones. It also has a method of recording applications you are using for later playback, so you can send proof that you have completed Jet Set Willy to all your friends. The interface is a little esoteric; the menu system within the emulator is custom built and accessed via the function keys. This makes reading the accompanying documentation almost essential, although for most cases, pressing F1, 'F' for File, and 'O' to load a Spectrum image file will be enough to get by.

World of Spectrum [1] is a repository for Sinclair information, and it contains scans of magazines and copies of the manuals, as well as thousands of games and other software. Five games that are worth seeking out are: 3D Deathchase,

Jet Set Willy (seen in Figure 1), Dan Dare III, Robocop, and Chaos.

## Commodore 64

While the Spectrum was the computer of the UK and Russia, in the rest of the world the Commodore 64 was the most popular 8-bit system. For its time, it had wonderful graphics, a proper keyboard, and a sound chip that still sounds impressive today. Over ten thousand applications were released for it during its lifespan, and the addition of a disk drive meant that it had more ambitious applications than the Spectrum, for example GEOS, a primitive GUI windowing system.

There are several C64 emulators for Linux, but the most comprehensive is VICE (<http://www.viceteam.org>). Not only does VICE emulate the C64, but it also includes emulators to run the PET, VIC-20, C-16, the Plus/4, and the C128 machines as well, which is almost every Commodore machine up until the release of the Amiga.

VICE can record snapshots for later playback, and it also allows the video and audio streams to be recorded in MPEG form, as long as the *ffmpeg* library is present. The user interface is rather confusing; menus are accessed via holding the left or right mouse buttons, and you must select the item before releasing the button.

There are also some installation issues; I built VICE from source and used *make install* as usual, but when running the emulator, I found I couldn't type anything on the C64 screen. It turned out that I needed to set a *keymap* file individually via the right-mouse button menu. Apart from those glitches, VICE is a very good emulator.

For C64 games, C64.com [2] is a good resource. It isn't as thorough as World of Spectrum, but it contains most of the best games available for the system. The site has downloads available as tape and disk images. From this archive, five recommended games are: International Karate +, Little Computer People, Wizball, California Games, and Impossible Mission (shown in Figure 2).

## Commodore Amiga

The Amiga furthered Commodore's reputation for making impressive computers

into the 16-bit era. It was popular with filmmakers due to a hardware add-on called the Video Toaster, which allowed the Amiga to mix digital effects with video, and was used to generate some of the special effects for TV series such as SeaQuest DSV and Babylon 5.

There were many different versions of the Amiga, from the original Amiga 1000 in 1985, the more common Amiga 500 model, and even ending up as the insides of a CD-ROM based console, the unsuccessful CD-32. The Amiga is something of a survivor, with a committed user base that has stuck by it as it was passed from company to company following the collapse of Commodore in 1994. The Amiga is now owned by the Amiga Corporation, which is trying to market the technology for use in mobile devices.

A Linux emulator called Unix Amiga Emulator (UAE) has existed for several years, but for the past year, development has focussed on the Windows port, WinUAE, and the original version has been neglected. Richard Drummond forked the original codebase, and maintains what he calls Experimental UAE at <http://www.rcdrummond.net/uae>, which incorporates many of the recent additions to WinUAE.

Unfortunately, you can't just download the emulator and expect it to work straightaway. The Amiga stored part of its operating system on a ROM chip known as Kickstart, and EUAE requires a copy of this ROM. While the Spectrum and C64 ROM images have been released for free distribution, the Amiga ROM is the property of Amiga Corporation and is still protected by copyright laws. You can, however, buy a copy of the Kickstart ROMs from the Amiga Forever website [3], at the price of \$29.99.



Figure 1: Jet Set Willy running on FUSE.



Figure 2: Impossible Mission on VICE.

EUAE is rather complex to use; it has the standard GTK library for its user interface, but because there are so many different varieties of Amiga, each of which can have different amounts of hard drives, disk drives, and even types of memory, the emulator has an overwhelming amount of options available. However, for most games, the standard options will suffice.

Like the ROM, most Amiga games are not freely available, but certain companies have given permission for their games to be distributed at no charge. You will find several at the Amiga In A Box website [4]. Another good resource is Aminet [5], which contains a vast array of public domain/shareware/GPL games and utilities. Commercial games you should try and seek out are Sensible Soccer (shown in Figure 3), Midwinter, Cannon Fodder, Formula 1 Grand Prix, and Gravity Power.

## Atari ST

Atari's answer to the Amiga was the ST, a similar machine in some respects as it used the same CPU, but it lacked the Amiga's custom-built sound and graphics chips. However, a dedicated MIDI interface on the machine made the ST the system of choice of musicians around the world. Like the Amiga, it went through several revisions, eventually metamorphosing into the Atari Falcon, an ill-fated machine that would be the last Atari computer.

Hatari, found at <http://hatari.sourceforge.net>, is an ST emulator for Linux. It is in the beginning stages of development, but although it isn't complete, it is advanced enough to run many programs.

Like the Amiga, the ST had its operating system stored on a ROM chip, and again this isn't freely available. To get around this, Hatari includes a free re-implementation of the ROM that uses none of Atari's code, so it doesn't need any more files (although you can supply a proper ST ROM image if you have one). Again, this emulator uses a custom menu system, accessed by pressing F12. Although the ST also came in many flavors, Hatari's menus are easy-to-follow and straight-forward to use.

Little Green Desktops [6] contains links to public domain and shareware ST games, while the Cinemaware site (<http://www.cinemaware.com>) has a Vault section where its old ST games are available for free download. Also, the Dungeon Master Encyclopaedia page (<http://dmweb.free.fr/FTLGames.htm>) contains Amiga and ST versions of Dungeon Master that can be downloaded. Apart from Dungeon Master, interesting games to find are Populous, Carrier Command, Stunt Car Race, and Oids (shown in Figure 4).

## Genesis

The Sega Megadrive (known as the Genesis in America) was the first and most popular 16-bit console. With its mascot Sonic The Hedgehog, it ran rings around Nintendo's graphically superior SNES. The system also sported a number of add-ons in its later years, including a CD drive called the Mega-CD, which brought full-motion video and the huge capacity of CDs to the console, and the 32X, which provided an upgrade to the graphics and CPU subsystems so the Megadrive could run complex 3D games like Virtua Racing and Star Wars Arcade.

Gens is a Megadrive emulator that says it can run 32X and MegaCD games in addition to standard ones. You can

find Gens at <http://gens.consolemul.com>. However, every attempt I made at loading a game caused a crash on my Fedora Core 2 machine. I found another emulator, Generator (<http://www.squish.net/generator>), with fewer features and no 32X/Mega-CD support, that could load games without crashing. It is basic, but it runs games at a reasonable speed. I would recommend trying Gens to see if it works, since it claims a higher compatibility rate and more complete emulation than Generator.

It is very hard to find legal games for the consoles. Many titles are being re-released for newer systems like the Playstation, and so the games companies are very protective of their intellectual property. Some public domain games can be found at Zophar's Domain [7], a general emulation site. Figure 5 shows Generator playing Moonwalker, an action game based around Michael Jackson's film of the same name. Other interesting games include: Sonic, Mortal Kombat, Strider, and Gunstar Heroes.

## SNES

The SNES was the other major 16-bit console. Although it was second in popularity to the Megadrive, its specialized graphics and sound chips meant that there were many impressive titles available for the system, like F-Zero, Chrono Trigger, Starfox, Super Streetfighter 2, and Super Mario World (shown in Figure 6). Unlike the Megadrive, there were no add-on improvements to the original hardware; Sony and Nintendo worked together on a CD-ROM add-on, but the companies fell out, and Sony took their side of the project and re-made it as the Playstation.

ZSNES is a Windows SNES emulator that has been around for several years now, and it has been ported to Linux. It



Figure 5: The Generator emulator running Moonwalker.

emulates most of the SNES's features, including the Super FX chip, which appeared in later games like Super Stunt Race FX and the SNES version of Doom. It also includes an option for having multiple players playing the same game over the Internet, which opens up game playing possibilities that never existed on the real console. The Linux version of ZSNES can be found at <http://ipherswipside.com/zsnnes>.

As with the Megadrive, the ROM images of game cartridges are not available to legally download. Again, however, there are several public domain games for downloading on Zophar.

## Development

Even though these machines are no longer made (except for the Amiga), all of them still have thriving development communities. Even the Spectrum and Commodore 64 have programmers dedicated to squeezing the last drop of performance from their aging graphics and sound capabilities, producing fabulous animations known as demos. Some of the best of these can be found at <http://www.c64.ch> and <http://www.zxdemo.org>.

The advent of emulators means that you no longer need to own the original machine to write for them; everything can be written on a current machine and then tested in the emulator. The Amiga and ST have ports of GCC available, but if you want to program for the consoles or the 8-bit systems, you will have to delve into assembler programming.

Each machine uses a different CPU, so you'll have to learn different types of assembler for each one, as well as dis-



Figure 3: UAE running Sensible Soccer.



Figure 4: Oids on the Hatari emulator.

covering how to drive the custom chips. Thankfully, the Internet has collected most of the information, turning this from an impossible task into a merely hard one. Programmer's Heaven contains guides for lots of different systems, and USENET groups like *comp.sys.sinclair* can offer help for people wishing to program old systems.

While retro-programming is mostly done for love, there are a few companies that actually make some money out of it. For example, various firms make money selling cartridges of new Atari 2600 games at Atari Age (<http://www.atariage.com/store/index.php>).

### Conclusion

Hopefully this article has introduced you to the world of emulation. The emphasis has been on old games, since this is the source of

most of the activity in the retro scene. As you can imagine, many more emulators are available for Linux. If you go to <http://linuxemu.retrofaction.com>, you will find many links to other emulators, from gaming systems like the NeoGeo Pocket, to more historical projects, such as an emulator for the famous 1949 Manchester Baby. ■

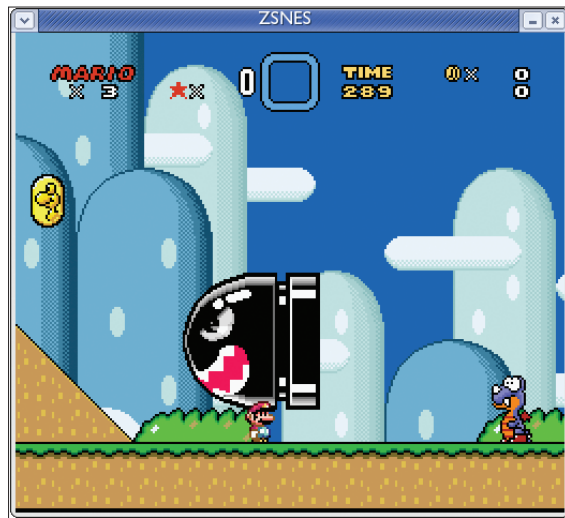


Figure 6: Super Mario World on ZSNES.

### THE AUTHOR

Ian Pointer is a Computer Science graduate from the University of Manchester. He grew up with a Spectrum 48K, until it melted after a 16-hour gaming marathon. These days, he's upgraded to a Linux box.



### INFO

- [1] World of Spectrum: <http://www.worldofspectrum.org>
- [2] C64.com: <http://wwwwww.64.com>
- [3] Amiga Forever: <http://www.amigaforever.com>
- [4] Amiga In A Box: <http://aiab.emuunlim.com>
- [5] Aminet: <http://wuarchive.wustl.edu/~aminet>
- [6] Little Green Desktops: <http://www.atari.st>
- [7] Zophar's Domain
- [8] Programmer's Heaven: <http://www.programmersheaven.com/zone8/index.htm>

# Want to know what's up next?

## Subscribe to Linux Magazine Preview, our free monthly email newsletter!

