Gaming with Linux

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Who am I?

- Professional technologist
- Humble maintainer of a handful of packages in the Fedora Project
- Contributor and package maintainer for Mageia Linux
- Contributor to Unity Linux
- Contributor to RPM, DNF, and various related projects
- Diligent follower of the telecommunications industry
- Systems Engineer at Datto, Inc.

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Where it all began...

Games and UNIX

- From the very beginning, UNIX and its derivatives (notably, the Berkeley System Distribution) have had games as part of the system.
  - Some UNIX derivatives (such as AIX), stripped out most, if not all of them from the standard install media.
- For the most part, these games used text user interfaces (TUIs) instead of graphical user interfaces (GUIs) that are more common today.
- Most Linux systems include the BSD (Berkeley System Distribution) variant of many of these classic games
  - RPM-based package: bsd-games / Debian-based package: bsdgames

A bit more on classic UNIX games...

- Despite environments running UNIX to be mostly business or academic centric, games were continually developed.
- They were often developed as a diversion from their regular work, to explore capabilities of computers and networks, or simply to have fun with each other.
- One of the very first online Real-Time Strategy (RTS) games was developed this way. The game *Empire* was developed by Walter Bright (creator of the D programming language) to play war games on a PDP-10. It spread like crazy and ended up in the PDP-11 and VMS, where it jumped to other platforms and inspired games like *Sid Meier's Civilization*.
- One particular favorite of UNIX users in academic circles was *Rogue*, a dungeon crawling video game developed in 1980. This game favored exploration of the dungeon rather than following a specific objective, and inspired other games, including *NetHack*, which arrived in 1987 and continues to be developed today. It has influenced popular games like *Diablo* too.
    - Both *Rogue* and *NetHack* are available in Linux distributions as *rogue* and *nethack* packages.
- The development of UNIX itself was started by Ken Thompson and Dennis Richie as part of the process to bring his game *Space Travel* (a game that simulated travel throughout the solar system) to the PDP-7 from the Multics system that was being taken away from them. *Space Travel* is considered the very first UNIX application.

The Age of Linux...

The Linux Desktop...

- In the early 90s, the majority of video game development moved away from PCs to consoles, and games that were developed for PCs shifted from cross-platform (Unix, DOS, Mac OS, etc.) to single-platform (Windows).
- From the very beginning of Linux's advancement as a platform, there were those who recognized that games were required to make it successful as a mass-market environment.
- To that end, a number of companies sprung up to try to either develop games straight for Linux and bring games from other platforms to Linux.
    - The most famous examples are Linux Games Publishing, Ltd. and Loki Software, Inc.
- A number of games made it this way to Linux: *Civilization: Call to Power*, *Quake III Arena*, *Unreal Tournament*, *Sim City 3000: Unlimited*
- Most of these companies are no longer in business.

Linux gaming gets Steam...

- As Valve revolutionized how gaming was done on PCs, they brought the Steam platform to Linux in 2013 after Microsoft's Windows 8 integrated its own platform for games deeply into the platform.
- With that, they've developed an SDK to make it simpler to build games.
- Today, nearly 1,700 games are available through Steam, and even more are available through other mechanisms (distribution repositories, web sites, etc.)

Technology of Linux Games

X11 and OpenGL

- The primary means of rendering images on Linux is to use something that uses the X11 subsystem for 2D.
- The weaknesses of X11 are well-known, particularly in regards to ensuring fast-paced games work reliably. This is addressed by libraries and toolkits by using techniques to bypass the X server.

- The API used on Linux for 3D is OpenGL-based. The common implementations of OpenGL on Linux are GLX and EGL.
- Unlike competitor DirectX, OpenGL is quite flexible for supporting high end professional 3D and lower end high-motion 3D video games.
- It is the common API used across all platforms, including game consoles (with the notable exception of the Microsoft Xbox 360 and Xbox One).

ALSA, PulseAudio, and OpenAL

- ALSA is the “Advanced Linux Sound Architecture”
- It is the low-level subsystem in Linux that handled audio hardware and exported a common interface for applications to use.

- PulseAudio is the higher level application that handled mixing audio streams and network transparency.
- It is designed to enable desktop audio use-cases.
- OpenAL is the “Open Audio Library”, developed originally by Creative Labs for audio production and gaming, designed for their sound cards. It was later ported to run on top of PulseAudio/ALSA so that it wasn’t bound to hardware like the original implementation.

Simple DirectMedia Layer

- SDL is a cross platform library used to abstract out all the various subsystems and APIs involved in games. It was written originally by Sam Lantinga while working at Loki Software.
- It abstracts all display, audio, input, networking, and process threading implementations so that code relying on SDL can work across many platforms with ease.
- It is the one of the most popular ways that games are made cross-platform, and is used even in console games, too.

So if the stack is there, why aren't there more games?

- Well, it's not quite actually there. While inputs, audio, and process management is quite strong these days, hardware support for graphics tends to be a sticking point.
- In Linux, there's an integrated graphics stack fundamentally centered on an OpenGL implementation library called Mesa3D. Mesa3D also contains the hardware accelerator drivers for various graphics cards.
- However, due to the lack of adoption of Linux on the desktop, this stack was a bit neglected compared to the rest. The nature of the Linux kernel (the kernel-internal interfaces are intentionally not frozen to enable rapid development and continual optimization of the stack) makes it difficult to maintain drivers independently of the kernel.
- Some companies (*cough*NVIDIA*cough*) don't feel that improving the built-in systems because all improvements typically benefit all graphics cards, and tend to break things by swapping things out with their own stack.
- Stuff like this tends to make Linux look worse for gaming than it actually is.

How to Game on Linux

Playing games on Linux is easy!

- Contrary to popular belief, getting and playing games is quite easy on Linux.
- Most Linux distributions include a large variety of games in their repositories, both classic and new ones.
- Of course, there’s Steam too. Steam is well-supported across multiple Linux distributions. Depending on your distribution, it may be a 1 to 3 step process to get going.

And the OS full of Steam...

- While most consoles have roots in BSD and quite locked down, Linux based systems are pretty versatile and are typically multi-purpose.
- Valve has embraced this particular philosophy and developed a set of programs to augment a Linux system to make it particularly friendly as the primary device for playing games in the living room. These programs are the foundations of SteamOS.
- SteamOS systems can be used as traditional computers, too!
- More importantly, it’s even possible to make your own Steam machine, with your favorite Linux distribution.

The End

Any Questions?