Hacking the Linux Kernel to get moar FPS

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Linux kernel development model

- Linux kernel development has no roadmap, people develop as they need
- Use case driven
- If no developer/company cares about something, it will never appear on Linux
- People need to push new use cases

Play on Linux

- People have been always playing on Linux, but struggling at times
- Some native ports along the years (with some troubles), notably Source Engine
- BioShock Infinite: Proton version way better than native one
- On and off
- Slow progress, no clear financial interest

Proton Era

- Announced in August 2018 by Valve
- Valve paying community developers and consultancies to enhance Linux gaming
- Linux, Mesa, Wine, DirectX translation layers, etc
- Big speed up

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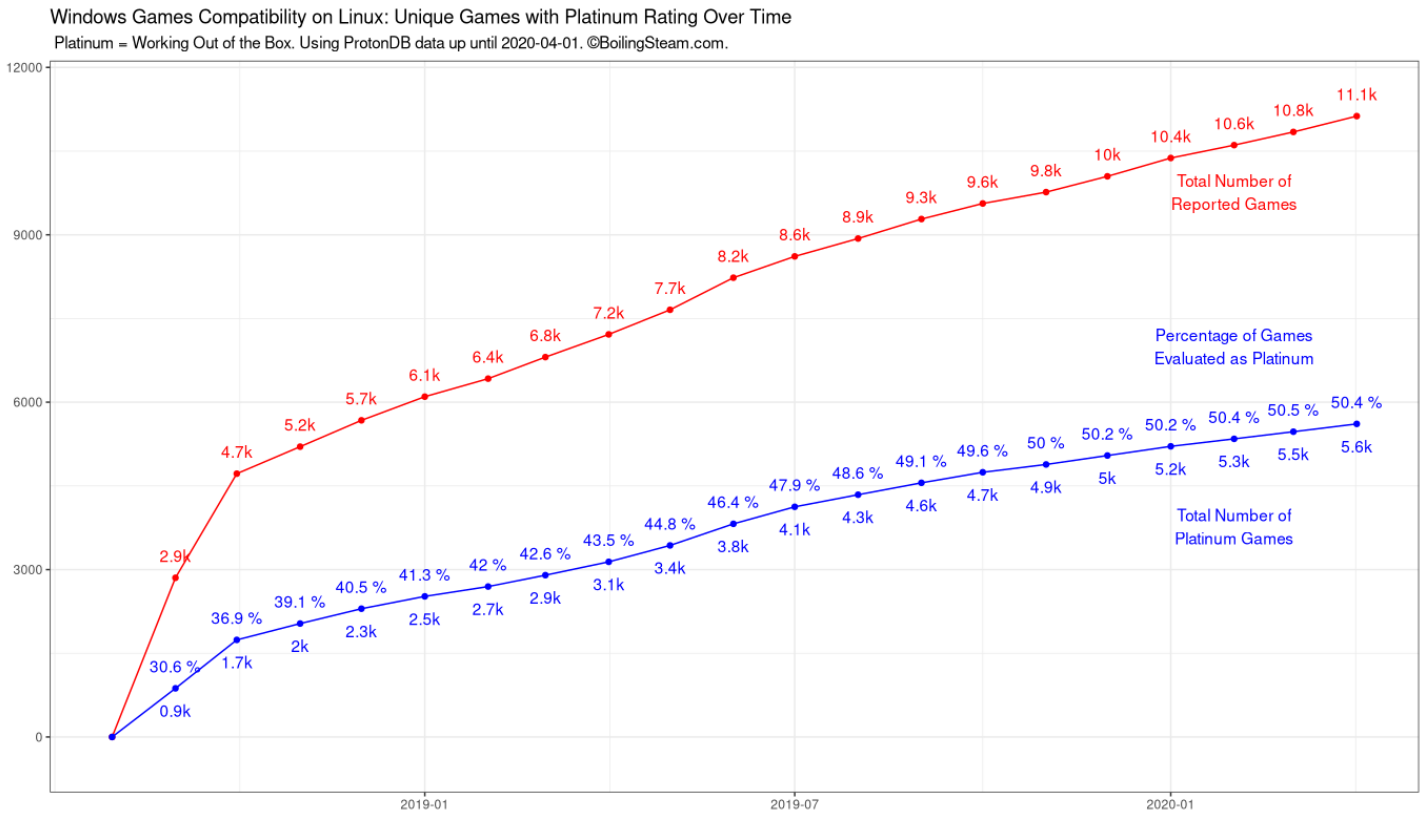
Proton Era



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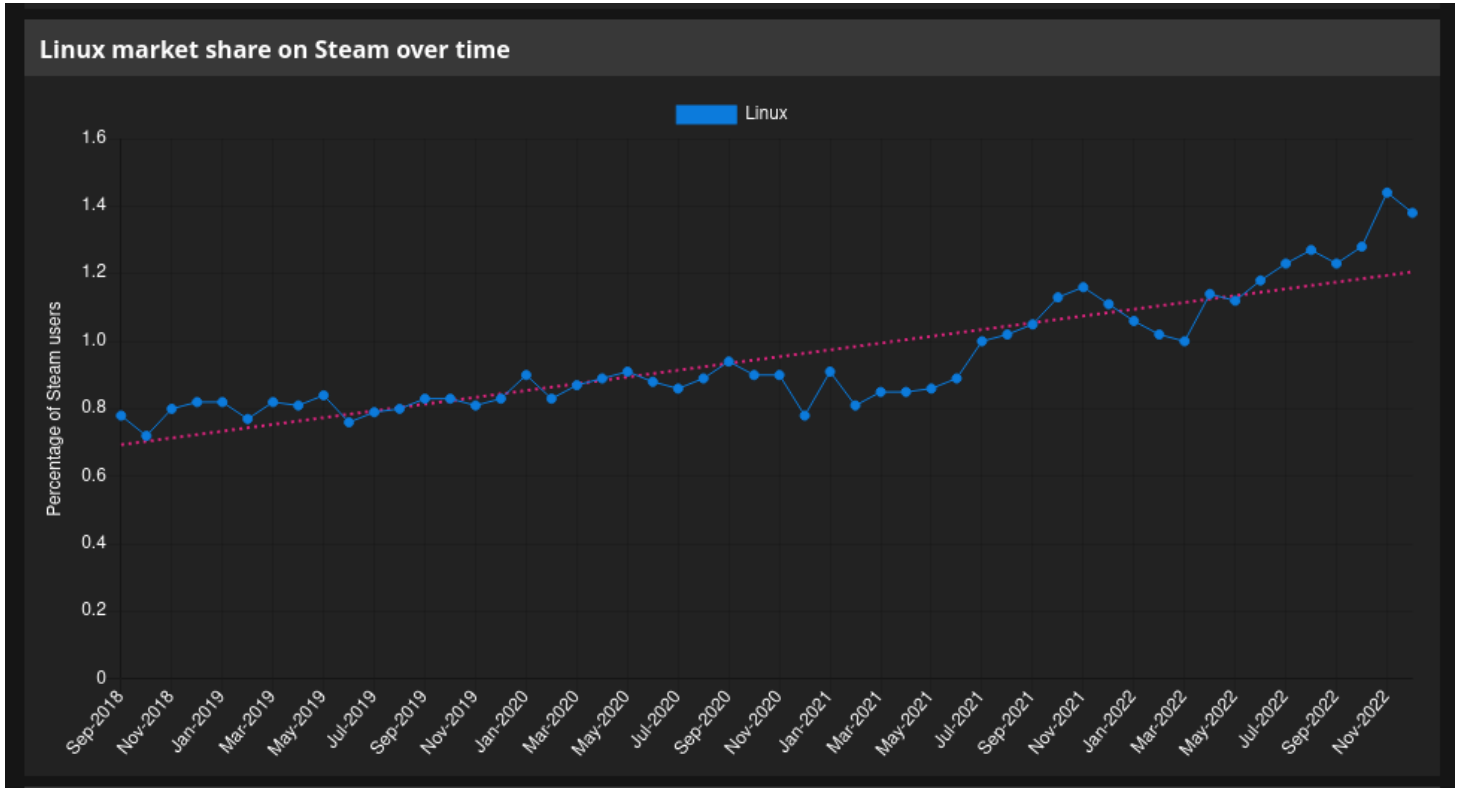
Proton Era



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Kernel features

- Linux gaming has pushed kernel development to new use cases
- Other uses benefits from this as well, mainly desktop Linux

Kernel features

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Filesystem

- Case insensitivity in ext4
  - Then supported at F2FS
- Unicode subsystem

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Futex

- futex is used for userspace mutex, semaphores, etc
- Wait on multiple futexes (WaitForMultipleObjects)
- futex2

Syscall user dispatch

- Use a different "backend" for syscalls in a memory region

GPU driver

- Numerous bugfixes, documentation, and improvements in DRM drivers, like amdgpu
- New DRM features (async page flip in atomic, better GPU reset handling)
- HDR, 3D LUT

Error handling/crash report

- Graphical kernel panic ("Windows blue screen")
- Pstore and kdump on SteamDeck

Hardware enablement

- Support for Steam Deck drivers
- Joysticks, controllers

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Many bug fixes and improvements

- Split lock detector handling
- HID bottleneck for VR use case
- Unix sockets, TSC, PTE, timestamps
- Panic refactor
- Lots of documentation

Out of tree

- Task schedulers (PDS, MuQSS)
- A lot of work-in-progress patches
  - **https://xanmod.org**
  - **https://liquorix.net**

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What's Next?

- Power management
- Layers and layers of GPU abstraction

Patches

- Case-insensitive

  https://lore.kernel.org/all/20181206230903.30011-1-krisman@collabora.com/

- futex2

  https://lore.kernel.org/all/20210915140710.596174479@infradead.org/

- Syscall user dispatch

  https://lore.kernel.org/all/20201127193238.821364-1-krisman@collabora.com/

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Patches

- Split lock

  https://git.kernel.org/pub/scm/linux/kernel/git/torvalds/linux.git/commit/?id=727209376f49

- GPU reset:

  https://lore.kernel.org/amd-gfx/20221125175203.52481-1-andrealmeid@igalia.com/

  and

  https://lore.kernel.org/dri-devel/20230123202646.356592-1-andrealmeid@igalia.com/

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Patches

- HID mutex bottleneck:
  https://lore.kernel.org/all/20211130132957.8480-1-andrealmeid@collabora.com/
- More precise info on PTE:
  https://lore.kernel.org/all/20230202112915.867409-1-usama.anjum@collabora.com/
- Panic notifier:
  https://lore.kernel.org/all/20220819221731.480795-1-gpiccoli@igalia.com/

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