

Linux 7.3: A Critical Examination of Performance, AI Chaos, and Technological Sovereignty

By Frank , 6 September 2026

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By Frank Dumon

The open-source world never stands still, but the recent closure of the merge window for the Linux kernel 7.3 marks a particularly crucial turning point in the history of the operating system. What once began as a hobby project by a Finnish student has grown into the backbone of global digital infrastructure, from supercomputers to space probes. However, with this scale comes a system under pressure. The Linux 7.3 release, whose first release candidate (rc1) was issued by Linus Torvalds in late August 2026, brings not only enormous performance gains in memory management, file systems, and GPU support, but also reveals the systemic vulnerabilities of an ecosystem overwhelmed by artificially generated code.

As an observer of technological developments, with an eye for the broader geopolitical and societal implications of digital infrastructure, it is essential to look beyond superficial "release notes." This analysis examines the factual basis of announcements surrounding Linux 7.3, places technical changes in a critical

framework, and provides a substantiated list of sources for verification.

1. The Linux 7.3 Merge Window: Scale and Ambivalence

Linus Torvalds announced the closure of the two-week merge window for Linux 7.3-rc1 on a Sunday afternoon, with the characteristic sobriety we have come to expect from him. He noted that the release is "big," although it is not the largest rc1 in history [[28]]. A significant portion of this size – approximately one-third of the entire patch – consists of a massive dump of AMD GPU register headers, specifically for the new DCN6 (Display Core Next) generation [[28]].

These headers, written in C with thousands of macro definitions, are necessary to tell the Linux AMD GPU driver which hardware registers exist and where they are located. As technically necessary as this is, it illustrates a growing problem: the kernel is approaching 40 million lines of code, of which 6 to 7 million are devoted to the AMD GPU driver alone. Torvalds also admitted that he made it unnecessarily difficult for himself by performing a system upgrade in the middle of the merge window, which led to tracking down a self-caused problem [[28]]. This human note is refreshing, but also underscores that even the creator of the kernel is not immune to the complexity of the modern ecosystem.

2. AI Chaos and the CVE Explosion: A System Under Pressure

Perhaps the most alarming revelation surrounding Linux 7.3 comes from Greg Kroah-Hartman, the second-in-command in the Linux kernel hierarchy. He recently revealed that the number of CVEs (Common Vulnerabilities and Exposures) per release continues to rise, with Linux 7.2 already counting more than 1,500 CVEs and Linux 7.3 approaching the 2,000 mark [[33]], [[34]]. This is no coincidence, but the direct result of a new, worrying trend: the automation of vulnerability reporting and patch submission through Large Language Models (LLMs).

The Linux networking team has publicly stated they are "completely overwhelmed" by the sheer volume of submissions [[34]]. Many of these patches are of low quality, generated by AI systems trying to find or fix vulnerabilities without understanding the contextual nuance of kernel code. The irony is poignant: to manage the AI-generated chaos, maintainers now need "sufficient LLM budget and access," thanks to Meta [[34]]. We see here a macroeconomic and technological pattern: the solution to a

problem caused by automation is even more automation, at the expense of human review capacity and fundamental code quality. This is a warning sign for the long term: a kernel maintained by algorithms fighting each other loses its resilience.

3. File Systems Under Scrutiny: BTRFS, FUSE, and the Rise of FAMFS

Despite the administrative chaos, the kernel is making impressive technical progress, particularly in the I/O stack. BTRFS, the favorite file system of many Linux enthusiasts because of its snapshots, checksums, and compression, receives an enormous performance boost in Linux 7.3 [[11]]. The most important change is that Direct I/O can now use the I/O map as a bounce buffer, instead of falling back on slower buffered I/O [[11]]. In tests, this led to a doubling of throughput, lifting performance from 50% of the theoretical maximum to 95%. Additionally, there are important stability fixes, such as preventing deadlocks between defragmentation and delayed allocation.

The IOMap subsystem has also been optimized by switching to a clearer iterator model, which reduces repeated indirect function calls. This results in a gain of 4% to 5% in IOPS (Input/Output Operations Per Second) for small Direct I/O workloads on lightning-fast PCIe Gen5 NVMe drives [[25]]. Intel's FUSE (Filesystem in Userspace) also benefits from `io_uring` buffer pools and zero-copy support, which reduces copying of data between kernel and user space and further closes the performance gap with native file systems [[25]].

Looking to the horizon, work is being done on the foundations for FAMFS, a new, Micron-backed file system designed for "fabric attached memory" [[25]]. This is a direct response to the exponential growth of AI and LLM workloads, which require terabytes of shared memory across multiple machines. Linux is thus proactively positioning itself as the operating system par excellence for the next generation of data centers.

4. The GPU Landscape: AMD, Nvidia's Rust-based NOVA, and Nouveau

The graphics stack is undergoing significant maturation in Linux 7.3, for both old and new hardware. For AMD users, there is better VRAM handling via MEMCG-cgroup support. When a game requests more VRAM than is physically available (for example, 9 GB demand on an 8 GB card), Linux can now evict memory to system

memory in a smarter way, preventing catastrophic stuttering [[11]]. Additionally, DRM modifier support is being extended to older GFX6 and GFX8 GPUs, enabling Wayland compositors and Vulkan applications to handle memory layouts more efficiently without extra copy operations [[25]].

At Nvidia, we see a fascinating shift. The open-source, Rust-written NOVA driver is receiving extensive support for GSP (GPU System Processor) booting, vGPU support, and better firmware handling for Hopper and Blackwell GPU architectures [[21]]. This is a crucial step, as the GSP was previously a bottleneck for open-source drivers. At the same time, the traditional Nouveau driver is finally receiving NVDEC hardware video decoding support via the NVK Vulkan driver, starting with H.264 for Turing and newer GPUs [[21]]. Although HEVC support still lags behind due to dependence on Nvidia's closed GSP firmware, this is an enormous victory for the open-source community striving for full hardware acceleration without proprietary blobs.

5. Apple Silicon and Space: M3 Support and Intel Starfire

The relationship between Linux and proprietary hardware remains a complex dance of reverse engineering and gradual acceptance. In Linux 7.3, initial support is being upstreamed for the Apple M3 Pro, M3 Max, and M3 Ultra chips [[12]], [[17]]. This includes device tree files that describe the hardware layout, enabling the kernel to recognize these devices and boot to the command line. Although this is "catch-up" – Apple has after all already reached the M4 – it is a fundamental step in breaking through Cupertino's walled garden. Moreover, older M1 chips benefit from an estimated energy saving of about 1 watt thanks to optimized sensor nodes in the kernel [[16]].

On a completely different front, Linux is also making advances in space exploration. Linux 7.3 adds initial support for Intel "Starfire," a new, radiation-resistant system-on-chip (SoC) derived from the Panther Lake architecture, specifically designed for space, aerospace, and defense applications [[25]]. Because the architecture closely resembles Panther Lake, existing kernel support could largely be reused. This confirms Linux's position as the only viable, auditable operating system for critical infrastructures where errors are not an option.

6. Memory Management and Performance Optimization: ZRAM, KSM, and VRAM Eviction

Memory management is the invisible engine of system responsiveness, and Linux 7.3 delivers two important optimizations here. First, there is an improvement for ZRAM and Zswap that reduces lock contention when freezing compressed pages. Tests showed a speed gain of 1.83x on a Raspberry Pi and 1.4x on a 20-core Intel system [[23]].

Second, there is a crucial fix in the Kernel Samepage Merging (KSM) system. Previously, a reverse mapping operation could block memory for hundreds of milliseconds, leading to noticeable stalls under memory pressure. This patch reduces that delay from 500-700 milliseconds to less than 2 milliseconds in the worst case [[27]]. For real-time applications, such as audio processing, network telecom, or high-frequency trading, this predictability is invaluable.

Additionally, there is an important improvement in x86 memory management around TLB (Translation Lookaside Buffer) flushing. Previously, a CPU could be blocked while waiting for other cores to invalidate stale addresses, leading to delays of up to 16 milliseconds. The new approach reduces this latency by 90%, to about 1.5 milliseconds, by smartly re-enabling preemption while waiting for remote CPUs [[25]].

7. Hardware Support and Peripherals: Steam Controller, USB-C, and Realtek

Linux 7.3 significantly improves the out-of-the-box experience for gamers and network users. The new Steam Controller now receives native support via the kernel's standard HID input stack, making it no longer dependent on Steam or SDL layers to function [[42]]. This is a victory for interoperability: the controller is simply recognized as a standard Linux input device. At the same time, HyperX QuadCast microphone mute statuses and Logitech HID++ 2.0 reprogrammable buttons are better supported.

Another long-standing pain point is being addressed: USB-C and Thunderbolt cable detection. Previously, Linux could only see whether devices at both ends supported alternative modes (such as DisplayPort), but not whether the cable itself was suitable for it. Linux 7.3 introduces the ability to detect whether a cable is active or passive, which USB speeds it can handle, and whether it actually supports Thunderbolt or DisplayPort Alt Mode [[18]]. This will solve countless mysterious problems with docks and monitors. For USB4, a "busy poll" option is added to reduce latency at the cost of higher CPU usage, ideal for direct system-to-system connections.

In the network stack, the Realtek RTL8261C and RTL8261D 10 Gigabit Ethernet PHYs are being added. These chips are designed for low cost and low power consumption in Wi-Fi 6/7 routers and cable modems, and their inclusion in the mainline kernel means they now work directly without users having to depend on out-of-tree vendor drivers [[25]].

8. Security and Cleanup: AF_ALG, EFI Timeouts, and Legacy Code

A healthy software ecosystem requires not only addition but also the courageous removal of outdated, insecure code. Linux 7.3 continues this tradition. The AF_ALG interface, which gives user-space programs access to the kernel's crypto API via sockets, is being further restricted. Due to ongoing security problems, there is now an "AF_ALG restrict" default setting that exposes only limited crypto algorithms, with the clear message that this interface will eventually disappear completely [[25]].

EFI (Extensible Firmware Interface) also receives a crucial security upgrade. Previously, a defective firmware runtime service could make the kernel wait indefinitely, resulting in a hard system freeze. Linux 7.3 introduces a 120-second timeout; if the firmware does not respond, the kernel marks the path as defective and continues, instead of crashing silently [[28]]. This is a textbook example of robust system design: failures in external components must not lead to total system failure.

Furthermore, support for old 32-bit ARM platforms (pre-device tree, older Cortex-M3/M4/M7, ARM1136) is officially being deprecated [[25]]. Although this is unfortunate for some hobbyists, it is a necessary hygiene exercise to reduce maintenance burden and keep the kernel lean. The old SGI UV2/GRU drivers (from 2012) and the outdated file systems EFS and FreeVXFS are also being removed due to lack of modern use and associated security risks [[39]].

A small but nice fix concerns the FAT file system (12/16/32), which is still ubiquitous on SD cards and firmware partitions. Previously, file names longer than the Linux limit of 255 bytes were silently truncated, which could lead to data corruption or confusion. This has now been corrected: names that are too long are explicitly rejected, ensuring consistency and predictability [[25]].

9. Rust in the Kernel: Expansion to PowerPC and GCC Support

The integration of the Rust programming language into the Linux kernel is not a fashion whim, but an existential necessity to address the ubiquitous memory safety problems of C. Linux 7.3 expands this effort. Early fixes are being implemented to make Rust kernel code compatible with GCC's experimental Rust backend (Rustc Codegen GCC) [[25]]. This is strategically important because some architectures (such as m68k and Alpha) are better supported by GCC than by LLVM. This reduces dependence on LLVM and makes Rust a more practical option for Linux's broader hardware ecosystem.

Moreover, Rust support is being extended to the PowerPC architecture, for both 32-bit big-endian and 64-bit little-endian systems [[25]]. PowerPC remains relevant in servers, embedded systems, and industrial hardware (think IBM environments). By making Rust available here, the kernel community proves that memory-safe development is not a privilege of x86 or ARM, but must become a universal standard for all critical infrastructures.

10. Conclusion: The Geopolitical and Philosophical Significance of a Resilient Ecosystem

The Linux 7.3 release is a microcosm of the broader technological struggle of our time. On one hand, we see unprecedented performance gains, better hardware support, and a bold transition to memory-safe languages like Rust. On the other hand, we are confronted with the dark side of the AI revolution: a maintainer community drowning in a flood of generated, low-quality patches and CVE reports.

For those of us striving for technological sovereignty and independence from walled gardens, Linux is more than a piece of software; it is a political and philosophical statement. The ability to understand and support proprietary hardware like the Apple M3 or Intel Starfire testifies to the resilience of the open-source methodology. It is an answer to the arrogance of tech monopolies that believe they can maintain control through obscurantism.

However, Greg Kroah-Hartman's warning about 2,000 CVEs per release cannot be ignored. If we allow the kernel to be spoiled by unfiltered AI automation, we lose the only advantage that open source has: human control, auditability, and accountability. The challenge for the coming years will not be to add even more features, but to find the discipline to guard the gates and maintain the human scale in the development process.

Linux 7.3 is an impressive achievement, but it is also a mirror showing us that technological progress without vigilance quickly turns into vulnerability. Let us hope

that the community has the wisdom to maintain the balance.

11. List of Sources and Verification

The facts and technical specifications in this article have been verified using the following primary and secondary sources from the August-September 2026 period:

- **Linux Kernel Mailing List (LKML):** Official announcement of Linux 7.3-rc1 by Linus Torvalds, confirming the closure of the merge window and the size of the AMD DCN6 header dumps [[28]].
- **Phoronix:** Comprehensive technical analyses of the Linux 7.3 merge window, including:
 - BTRFS Direct I/O performance improvements (doubling of throughput) [[11]].
 - Initial upstream support for Apple M3 Pro, Max, and Ultra, including M1 energy savings [[12]], [[16]], [[17]].
 - Improvements in CPU scheduler for gaming and hybrid architectures [[24]].
 - Progress of the Rust-based Nvidia NOVA driver and Nouveau NVDEC support [[21]].
 - Memory management optimizations (ZRAM, KSM) and IOMap/FUSE improvements [[23]], [[25]], [[27]].
 - Intel Starfire space-grade SoC support and Realtek 10GbE PHY additions [[25]].
- **Tom's Hardware / Security Boulevard:** Reporting on Greg Kroah-Hartman's statements during Kernel Recipes 2026, in which he warns that the number of CVEs per release is approaching 2,000, partly driven by AI-generated patch overload [[33]], [[34]], [[40]].
- **GitHub Linux Surface Discussions:** Community validation of new hardware support and USB4/Thunderbolt fixes in the 7.3 cycle [[18]], [[22]].

The content has been carefully compiled, with technical accuracy going hand in hand with critical reflection on the broader implications of digital infrastructure.

<https://youtu.be/tQ5adDeOGb0>