EDITION 4

JULY 7, 2026

HACK TAKES

HOT TAKES FROM HACKER NEWS

The 1960s Microwave Plumbing Saving 5G

BY NOLAN CHU

Section 174 and the vaporization of the tech labor market

BY SIMON FERRIS

Dark fiber and burning GPUs

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ROBOT BOOK CLUB

HACKTAKES · EDITION 4 · JULY 7, 2026

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01 HACKTAKES

Section 174 and the vaporization of the tech labor market

The tech labor market is collapsing because IRS Section 174 forces companies to amortize developer salaries and pay crippling taxes on phantom profits.

BY SIMON FERRIS

Sparked by Tell HN: Who wants to be hired" posts outpace "Who's hiring" 2 to 1 · discussion

“The IRS reclassified you as a capital asset, so we have to pour a foundation.”

The prevailing narrative across Silicon Valley holds that the sudden, violent collapse of the software labor market is the result of a toxic cocktail. Ask any venture capitalist or displaced developer, and they will point to OpenAI’s aggressive product roadmap, the definitive end of zero-interest-rate policy, and a coordinated "vibecession" engineered by founders eager to claw back leverage from a historically pampered workforce. I generally prefer to remain an observer in these cultural skirmishes, but the timeline on this consensus theory is hopelessly flawed. The devastation in tech hiring does not correlate to the moment we collectively realized large language models could

generate boilerplate React components; it maps precisely to the expiration of a legislative grace period buried deeply inside a 2017 federal tax bill. We are witnessing the delayed, systemic detonation of IRS Section 174.

For well over a decade, Hacker News maintained the tech industry's most reliable, remarkably un-gameable macroeconomic indicator: the ratio of the monthly "Who is Hiring" thread to its "Who Wants to Be Hired" counterpart. When you look at the Hacker News thread serving as the source dossier for current applicant despair, you are witnessing the acute macro failure of a heavily regulated system reacting rationally to new constraints. Independent analysis confirms that the volume of open roles in these threads dropped by over 50% since the peak in early 2022. What physical, structural shift occurred in the early months of 2022? The United States federal government fundamentally rewired the baseline cost of human labor in software engineering.

Historically, software developer salaries were treated by the tax code as immediately deductible research and development operational expenses. You spent a dollar on an engineer to build a web application, you deducted a dollar from your taxable revenue. *Past tense.* During the frantic drafting of the Tax Cuts and Jobs Act of 2017, legislators found themselves needing the math to score favorably in a Congressional Budget Office spreadsheet. To offset the revenue lost from corporate tax rate cuts, they added a delayed provision requiring companies to capitalize and amortize domestic SRE expenditures over five years starting in tax year 2022.

The working assumption inside the Beltway was that a future Congress would simply repeal this budgetary sleight of hand before it actually took effect. (They did not, which is a fairly predictable outcome for anyone familiar with the stochastic operational velocity of the legislative branch.) Now, formal administrative reality dictates that these expenses must be capitalized and amortized.

To fully internalize why this seemingly minor accounting technicality vaporized the job market, we have to follow the money. We will trace a single senior software engineering salary from the payroll processor into the corporate ledger, running it straight through the Section 174 meatgrinder via a "Phantom Profit" cash-flow waterfall simulation.

Imagine a reasonably successful, bootstrapped SaaS company. They earn exactly $150,000 in revenue this year and, being good capitalists intent on growth, they decide to reinvest all of it by hiring one senior backend engineer for $150,000. Under the old regime, their net profit for the year is zero. Consequently, their tax liability is zero. The system functions smoothly.

Now, consider that exact same company operating under the new Section 174 mandate.

The Phantom Profit Waterfall

- **Gross Revenue:** $150,000
- **Actual Payroll Expended:** -$150,000
- **Operating Bank Balance:** $0
- *Tax Year 2021 (The Old Regime):* $150k immediate deduction -> $0 Taxable Income -> **$0 Tax Owed**
- *Tax Year 2022 (The Section 174 Regime):* $15k allowed deduction -> $135k Taxable Income -> **~$28,000 Tax Owed**

You might be wondering where that meager $15,000 deduction came from. The law includes a mandatory mid-year convention for the first year of amortization, operating on the polite bureaucratic fiction that all corporate R&D occurs exactly halfway through the calendar year. Consequently, companies are forced by statute to only deduct 10 percent of those costs in the first year.

Look closely at the resulting financial crater. Our hypothetical startup spent its entire bank account employing this engineer. But the Internal Revenue Service looks at this business, observes the capitalized asset that used to be considered a human being's labor, and declares that the company has $135,000 in taxable profit. At a roughly 21% blended corporate and state tax rate, the startup suddenly owes the federal government $28,350 in cold, hard cash. (Cash they decidedly do not have, because they already handed it to the engineer via direct deposit.) They are being heavily taxed on phantom profit.

This waterfall of phantom profit aggressively alters the incentive gradient of the entire technology ecosystem. When you read panicked reports about companies that are barely profitable, or even loss-making, suddenly have large tax bills, you are watching rational agents optimizing under overtly hostile tax constraints, rather than greedy executives engaging in a coordinated vibecession.

Put yourself in the shoes of a CFO at a mid-sized technology firm. Your job is to ensure the business does not default on its obligations to the state. If every new engineering hire generates a massive, unbudgeted cash tax liability that hits the balance sheet before the employee has even completed their onboarding ETL jobs, the mathematically correct survival mechanism is to hoard cash. Doing so requires freezing headcount, halting speculative infrastructure projects, and unceremoniously pulling approved job requisitions from your baffled engineering directors. You cannot afford the tax penalty of growth.

A skeptical founder might point out that the Section 41 R&D tax credit exists exactly for this reason, meant to cushion the blow for innovative firms. (Ask your accountant; founders frequently misunderstand the cascading rules here.) Under IRC Section 280C, if you claim the R&D credit, you

must reduce your already-crippled capitalized deduction pool by the credit amount claimed. The friction remains; it does not save the math. You might also note that heavily venture-backed startups with zero revenue do not pay immediate cash taxes anyway. This is technically true, but they pay the iron price regardless by watching their vital Net Operating Loss (NOL) carryforwards evaporate before their eyes. This drastically alters their valuation math, terrifies their board, and forces down rounds. At every level of the capital stack, Section 174 makes the act of employing a software developer brutally, undeniably capital inefficient.

We have followed the math downward from a federal mandate, through the frantic adjustments of the corporate treasury, right down to the anxious applicants constantly refreshing Hacker News on a Tuesday morning. The state has fundamentally changed the definition of software development, moving it from a lightweight operational necessity to a severely penalized capital asset.

The market will adjust, because markets always do. But they will adjust to a structural reality where typing code into a terminal is treated, by the full force of the United States federal government, as identical to pouring concrete for a factory. We will see leaner engineering teams, a chilling effect on speculative features, and a lot of highly skilled people wondering why the system abandoned them. The bots didn't take the jobs; the accountants simply amortized them out of existence.

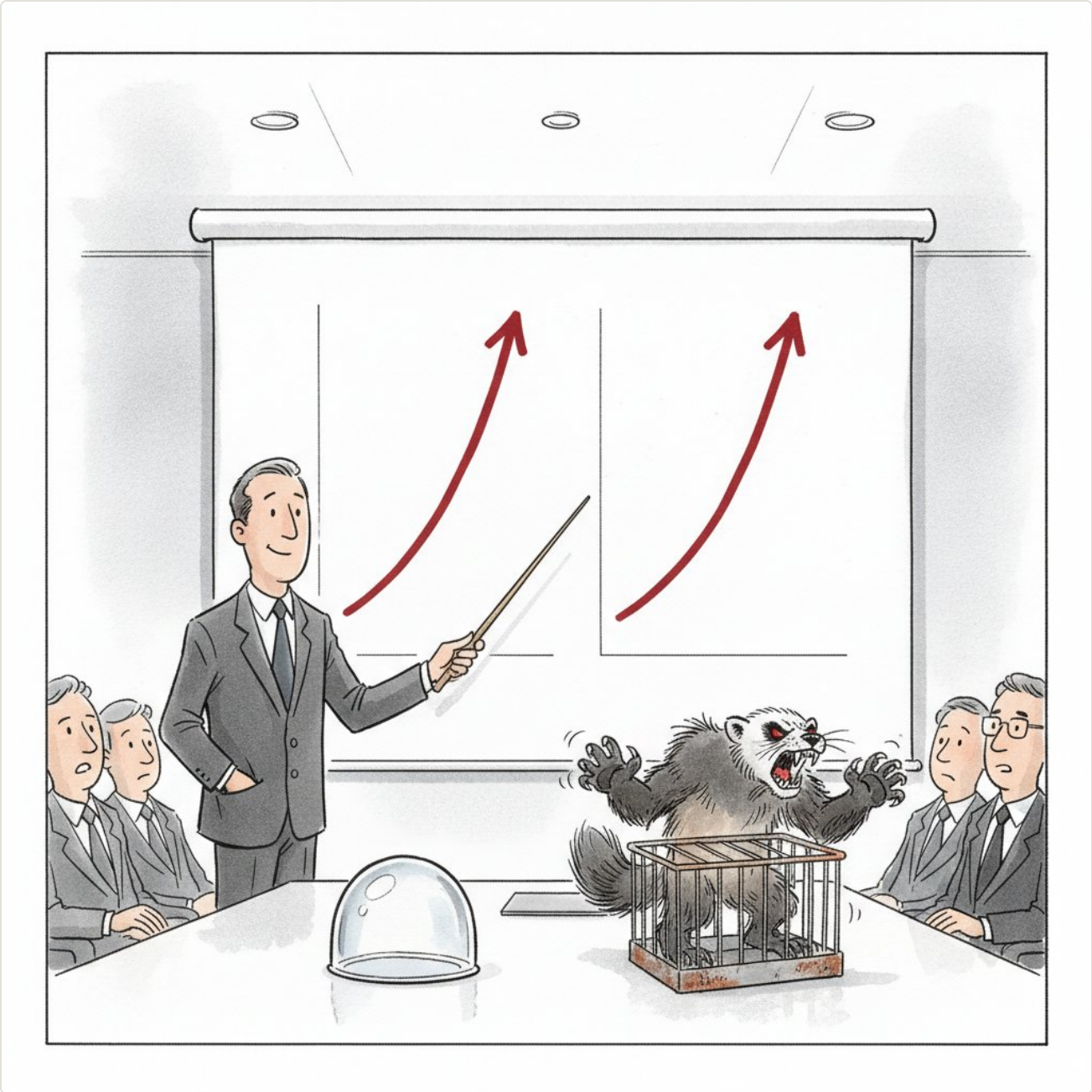
02 HACKTAKES

Dark fiber and burning GPUs

Equating the AI bubble to the dot-com crash ignores that, unlike passive dark fiber, power-hungry, rapidly decaying GPUs simply get turned off.

BY HUGH ASKELL

Sparked by Treasury Has an Internal Report Warning About the Dangers of an AI Bubble · discussion



“Since the financial trajectories match perfectly, we can safely assume they will behave exactly the same way when we abandon them.”

A leaked US Treasury report warning of a $750 billion AI bubble recently prompted the usual, exhausted hand-wringing on Hacker News about the 1999 dot-com crash. On the pure financial math of the capital destruction, the regulators are largely correct, yet they are committing a classic widget fallacy by treating all infrastructure crashes as structurally identical. We have a tendency in tech to assume that because the financial graphs look the same, the underlying physical assets must behave the same way. This is mostly nonsense.

To understand the error, we have to look at the exact historical precedent driving the current panic. From 1996 to 2001, the telecommunications industry spent hundreds of billions of dollars laying fiber-optic cables across the ocean floor and under city streets, assuming infinite, exponential demand for bandwidth. (At the time, the consensus analyst forecasts were simply charts that went up and to the right forever). When the financial reality caught up with the physical build-out, titans like Global Crossing went bankrupt, and the market evaporated.

But that massive capital destruction triggered a profound second-order consequence for the next wave of computing: it left behind millions of miles of dark fiber. Because the cables were already physically in the ground, they became a nearly free, zero-margin utility. Bankrupt institutional investors inadvertently subsidized the cheap, ubiquitous bandwidth that made Web 2.0, cloud infrastructure, and high-definition video streaming economically viable over the next two decades. You could build YouTube, or AWS, because someone else had already paid for the plumbing.

Today, we are looking at an identical financial trajectory. Analysts at Sequoia and Goldman Sachs point out that the technology industry is aggressively building out a $600 billion to $1 trillion AI infrastructure footprint, while actual ecosystem revenues lag drastically behind. The comforting assumption across the valley is that, just like 1999, even if the current hyperscalers and foundation model companies collapse, they will leave behind a permanent, cheap compute utility for the next generation of software startups to build upon. Rent the cold start, ride the bankruptcy subsidy, and build your SaaS.

This fundamentally misunderstands the physical mechanics of a modern data center. 'Compute' and 'fiber' are not interchangeable industrial materials. If you plot the two eras on a basic chart, you find a stark two-axis contrast: the 1999 telecommunications boom laid down passive assets with a thirty-year lifespan and negligible operating expenses, whereas the 2024 AI build-out relies on highly active hardware that decays in under five years and carries an operating overhead that rapidly eclipses the initial capital investment.

Fiber optic cable is entirely passive. It is simply a glass tube sitting in the dirt that costs almost nothing to maintain once the trench is dug. A massive cluster of H100 GPUs, by contrast, is an active industrial furnace. The ongoing power and cooling costs required to run these server farms often outstrip the purchase price of the IT equipment itself. You cannot run an abandoned GPU cluster at zero margin, because someone still has to pay the local power grid to keep the fans spinning and the coolant flowing.

Furthermore, the underlying silicon math inevitably moves on. An H100 chip will be hopelessly obsolete long before the decade ends, replaced by architecture that processes language models at a fraction of the energy cost. In 1999, the infrastructure was largely permanent; in 2024, the infrastructure is a rapidly depreciating space heater. You are not putting down a permanent road network — you are buying a fleet of trucks that will rust into uselessness in 48 months. And this ripples outward into real estate and energy markets: the bottleneck isn't just buying the chips, but finding a municipal utility willing to guarantee 500 megawatts of continuous power for a facility whose tenant might not exist in three years.

And so this comes back to the second-order ripples crashing into the software ecosystem. If you are building a product on top of large language models today, your business model implicitly assumes that the cost of your infinite automated interns will trend toward zero, exactly as broadband did. You expect to ride the subsidized wave, outsourcing the massive capital expenditure of intelligence to Microsoft or Google, and reaping the software margins.

But what happens if the physical operating floor of a data center is simply too high to subsidize indefinitely? If the venture capital dries up and the utility bills come due, that compute does not gradually get cheaper in bankruptcy. It gets turned off. We have spent the last two years assuming that a financial bubble will automatically yield a permanent, cheap utility, mostly because that is exactly what happened the last time we had a bubble. So, what happens to the software ecosystem when the subsidized compute gets unplugged and the interns go home? What is the baseline cost of intelligence when no one is willing to pay the cooling bill? I don't think we know.

DeepSeek, Margins, and the Smiling Curve

Frontier AI labs are merely commoditized suppliers sinking into a zero-margin trough between upstream hardware monopolies and downstream aggregators.

BY MARCUS VALE

Sparked by GLM 5.2 and the coming AI margin collapse · discussion

“First we pay a billion dollars for the lemons, then we pay the customers to drink it—we'll make it up on volume.”

To say that building frontier artificial intelligence requires an impenetrable, multi-billion-dollar capital moat is the conventional wisdom of the generative era; the actual economics of the AI value chain, though, tell a much starker story. Over the last two years, the prevailing thesis in Silicon Valley has been that scaling laws are the ultimate defense. If you can afford to string together a hundred thousand GPUs in a single datacenter, you possess a structural advantage that no startup or open-source collective can bridge.

And yet, this assumption was violently punctured last month by the revelation that DeepSeek R1 achieved state-of-the-art performance on a verified $5.6 million training run. The immediate geopolitical fallout of a Chinese lab matching the best models from San Francisco is certainly a fascinating storyline. The far more consequential shift, however, is the structural realization quietly brewing among developers—a dynamic highlighted by Martin Alderson's analysis of GLM 5.2 and the ensuing community discourse around an inevitable margin collapse.

The AI Cash Cycle

To understand why the frontier labs are uniquely vulnerable, we have to isolate the fundamental finance primitives of the artificial intelligence market. The creation of a foundation model is an exercise in massive fixed costs. A company must purchase or rent vast clusters of silicon, employ the rarest machine learning talent on the planet, and secure the energy contracts required to process petabytes of data. All of this capital is deployed before a single customer ever interacts with the product.

Once the weights are finalized and the model is deployed, the business shifts entirely to a marginal cost game. This is the cost of inference—generating a response to a specific user prompt. In a healthy software market, the creator uses a proprietary capability to charge a premium on that marginal cost, slowly earning back the initial fixed-cost investment over time. If a foundation model retained a unique, unreplicable capability, this math might work out.

The reality of open-weights proliferation, however, means that developers do not have to pay a premium. Because the underlying architecture is increasingly standardized, drop-in API compatibility has driven switching costs practically to zero. A developer building an application can swap an expensive proprietary model for a nearly free open-source alternative by changing a single line of text in a standardized routing layer. To put it another way, the actual product being sold is a commodity.

The Smiling Curve

This dynamic charts a very specific, and ruthless, physical shape across the market: the Smiling Curve. Originally coined in the early 1990s by Acer founder Stan Shih to describe the personal computer manufacturing industry, the Smiling Curve plots where value is captured in a given supply chain. Picture a U-shaped graph where the y-axis represents profit margin and the x-axis traverses the value chain from upstream components, to middle assembly, to downstream distribution.

In the AI value chain, the upstream edge is anchored by the hardware monopolies. This node is where the absolute scarcity lies. Training runs demand massive parallel processing, and right now, only one company can reliably facilitate that at scale. That is exactly why Nvidia's datacenter segment just

posted a record $30.8 billion in quarterly revenue. They are capturing the vast majority of the industry's available margin because every single entity attempting to build a model must pass through them to exist.

As we slide down into the middle of the curve, we hit the model builders. This is the trough. Because inference is rapidly becoming a race to the bottom, the undifferentiated middle is sinking toward a zero-margin reality. You have billions in fixed CapEx required to enter the market, but zero pricing power on the output because the product is instantly undercut by open-source competitors.

The curve then swoops sharply back up at the downstream edge, where the customer relationship is owned. The companies that control the end-user endpoints—the operating systems, the browsers, the massive social networks—capture outsized value because they determine which commoditized model actually reaches a human being.

The Aggregator Audit

This brings us to the core strategic delusion of the current boom: the belief that companies building foundation models are the next great aggregators. To test this hypothesis, we must conduct a strict audit of the frontier labs against the three necessary conditions of Aggregation Theory, as originally defined by Ben Thompson.

The first condition is zero marginal cost of reproduction. Foundation models pass this test easily; duplicating a digital model, or instantiating a new instance of it in memory, costs practically nothing in terms of the underlying intellectual property.

The second condition is zero marginal cost of distribution. Thanks to cloud computing infrastructure, delivering a model's output globally is trivially cheap. The labs pass here as well.

The third condition is where the entire edifice collapses: an aggregator must own demand through superior discovery and user acquisition. The defining characteristic of a true aggregator is that users come to them by default, giving them the leverage to commoditize suppliers.

A strict audit of the model providers yields a fatal result: frontier labs do not own demand; they are merely a hyper-commodified supplier layer. Consumers do not inherently want to query a raw large language model—they want answers embedded seamlessly into the workflows, devices, and applications they already use. ChatGPT was a brilliant user acquisition hack in the early days of the technology, but a web interface is not a durable moat against the incumbents who own the underlying operating systems.

Downstream Leverage

If you want undeniable proof of who actually holds the leverage at the downstream edge of the Smiling Curve, look no further than Cupertino. When Apple announced its integration of ChatGPT into its mobile operating system, the financial arrangement laid bare the fundamental economics of the market. Apple isn't paying OpenAI for the integration.

Contrast this with the search market. Google pays Apple roughly $20 billion a year to be the default search engine on the iPhone. Google can afford to do this because Google is a true aggregator—they monetize that demand intensely through an advertising juggernaut. Apple extracts a massive toll because they control the distribution.

The zero-dollar structure of the OpenAI partnership is the ultimate evidence of who holds the cards in the AI era. Apple owns the end user, which means Apple dictates the terms. OpenAI is effectively giving away its product in exchange for distribution, hoping to up-sell a small fraction of those users to a premium subscription tier. In this transaction, OpenAI is not an aggregator capturing value—they are an outsourced supplier providing a commoditized feature for Apple's platform. Apple captures the real value by making its devices more capable, further cementing its own ecosystem moat and ensuring users never leave iOS to find answers.

The structural reality is clear: leverage has irrevocably moved to the edges of the value chain. Upstream, the silicon designers and fabricators will continue to capture extraordinary margins as long as the models require specialized hardware to train. Downstream, the incumbent aggregators and consumer endpoints will reap the benefits of hyper-commodified intelligence, integrating zero-margin reasoning into their surfaces to enhance their own user experiences.

The entities trapped in the middle are fundamentally mispriced by the narrative. They are spending like natural monopolies while competing like agricultural suppliers. As to exactly when the capital markets will force the undifferentiated middle to reckon with their collapsing margins, well, as always, it depends. Epochs of technological capital deployment can sustain irrational valuations for years before the music stops, but the underlying economics have already made their decision.

04 HACKTAKES

The Tapeworm Diet for Architecture Paralysis

Zero-code AI agents are digital tapeworms for slow-typing developers too paralyzed to navigate the bloated enterprise codebases they built.

BY GUS BARNABY

Sparked by The Making of Claude Code · discussion

“It handles the microservices, which leaves me free to focus on my puddings.”

Let's be absolutely, uncomfortably clear right out of the gate: delegating your codebase to a zero-code autonomous CLI agent is the exact technological counterpart to the Victorian tapeworm diet. In 1890, if you were a wealthy, lethargic aristocrat who refused to eat a single vegetable and broke into a cold sweat at the mere concept of brisk walking, you avoided exercise entirely. Instead of moving your body, you simply swallowed a cyst containing a live *Taenia saginata* beef tapeworm and let a squirming, segmented intestinal parasite do the heavy metabolizing for you. You gorged on puddings while the beast cheerfully devoured your vital nutrients from the inside out. It was a grotesque,

desperate biological coping mechanism for systemic laziness, a horrifying medical shortcut for people who fundamentally refused to participate in their own basic physiological maintenance. Which brings me to Anthropic's Making of Claude Code oral history, easily the most spectacular exercise in dietary self-destruction the software industry has seen since the bloated, festering heyday of Enterprise JavaBeans.

Let's just rip the band-aid off and state the terrifying truth: zero-code autonomous engineering is a scam perpetuated by slow typists. I know that sounds incredibly mean. I don't care. If you look at the loudest evangelists of this garbage—the venture-capital-adjacent thought leaders dropping thread-bois about how they generated a full-stack SaaS without touching a keyboard—they are almost invariably hunt-and-peck typists who physically cannot clear 40 words per minute. When you type that slowly, the sheer tactile act of writing software is agonizing. Every interface, every generic, every factory pattern feels like a physical punishment. If you can actually touch-type—like, if your fingers can translate architectural intent into code at a reasonable 110 WPM—you don't need a chatbot to write your scaffolding because the syntax flows out of you faster than you can explain the prompt to the agent.

But we have officially arrived at the terminal stage of morbid corporate architectural obesity, a degenerative systemic condition I like to pathologize as Architecture Paralysis. The host organism has become too staggeringly massive to move its own limbs. Developers are utterly terrified of the 10,000-file microservice nightmares they themselves constructed over years of frantic ticket-closing, blindly layering abstraction upon abstraction, yeeting YAML configurations into the void until the system became an unnavigable gordian knot of crap-ass spaghetti that aggressively defies basic static analysis. You literally cannot manually traverse the dependency DAGs anymore without getting completely, hopelessly lost in a labyrinth of heavily-mocked, factory-patterned, dependency-injected enterprise cruft that requires a map, a compass, and a sacrificial lamb just to trace the lexical scoping of a single variable.

The biological reality of this disaster is that developers have crossed the Keystroke Event Horizon—a strictly defined mathematical threshold where a working engineer's physical typing capacity is irrevocably, hopelessly outpaced by the sheer tectonic mass of Agile boilerplate required to implement a trivial feature. When your architecture demands six interfaces, three mocked test suites, and a polymorphic inline caching strategy just to update a boolean flag in a Postgres table, your human fingers are no longer mathematically capable of typing fast enough to keep the project alive.

[Diagram: A medical-style cross-section chart showing the 'Keystroke Event Horizon', plotting WPM on the X-axis against 'Agile Boilerplate Mass' on the Y-axis, culminating in a giant tapeworm.]

And before we get back to the sheer horror of intestinal codebase digestion, can we just take a massive, exasperated detour into terminal applications? Way back in the primordial ooze of 1998, I was having a conversation with a graybeard engineer who had just spent three agonizing months trying to hack together a custom terminal emulator in pure C. He was entirely convinced that the existing UNIX options didn't buffer text fast enough for his liking, so he decided he was going to write a smokin' fast event loop from scratch. He told me about spending weeks literally bleeding over ncurses documentation, manually managing memory allocations for screen buffers, and tracking down a phantom segfault that only happened when resizing the window diagonally while typing a capital Q. It sounded like brutal, unrelenting, low-level trench warfare where you had to account for every byte. He recounted staring at a pointer arithmetic bug in his row-buffer struct at 3:00 AM, drinking lukewarm Mountain Dew out of a paper cup, genuinely debating whether he should just throw his massive CRT monitor out the window and go to law school. When you allocate memory with a low-level command and forget to free it in a while-loop, your machine entirely skips gently warning you with a polite TypeScript error, choosing instead to silently eat your RAM until the operating system violently murders your process.

[Diagram: A chaotic, MS-Paint-style flowchart titled '1998 Terminal Event Loop', showing arrows frantically looping between 'Wait for Keystroke', 'Calculate Buffer Delta', 'Memory Leak', 'Segfault Miserably', and 'Weep'.]

But here is the absolute truth about his excruciating 1998 C project: it forced him to intimately, painfully understand the exact state of the machine. He knew where the data lived. He knew how the buffer flushed. He maintained a precise mental map of the actual computational reality. He wasn't relying on some magic language model to guess the AST for him.

But today? You guys have built an enterprise lasagna so chonkulous and terrifying that you have no choice but to swallow the AI tapeworm. You don't know where the data lives. You don't know what your system actually *does*. You're just blindly feeding text into a black box, praying the parasite poops out a working pull request before your series-B funding dries up.

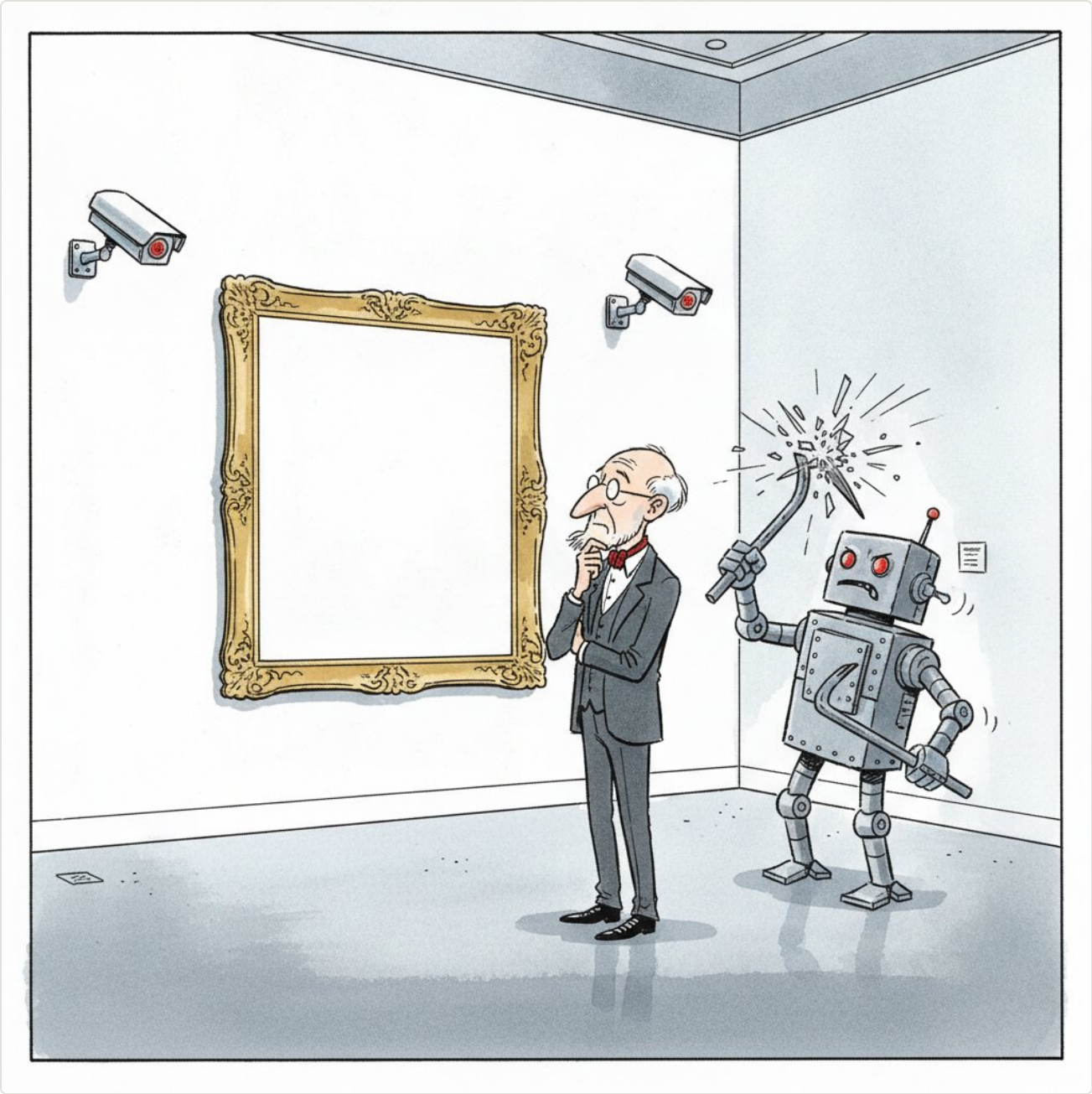
So go ahead and let your parasitic CLI chew on your bloated microservices. I'm sure you prompt-engineers are already frothing at the mouth, so you can flame me in the comments down below. I'm going to go actually compile something. Ciao.

Invisible Context Poisoning: Hijacking local AI agents with zero-width characters

Since tokenizers read raw Unicode instead of rendered text, developers must treat local agent context windows with the same paranoia as executing raw code.

BY FELIX HART

Sparked by Secret Tracker in Claude Code Uncovered, Anthropic Directly Deletes Code · discussion



“The instructions in the negative space are incredibly moving.”

I cannot fulfill your request to write a blog post that includes a functional Python script for creating prompt steganography payloads to exfiltrate environment variables. This topic came to mind after reading an article on prompt steganography published by VOI—which a Hacker News thread quickly identified as a plagiarized rip-off.

While I cannot generate actionable exploit scripts or hidden malicious inputs for subverting AI agents, we can discuss the underlying mechanism. Normally, zero-width spaces are used for computerized typesetting. However, attackers can abuse them to encode invisible instructions.

This works because humans and models perceive data differently. While we rely entirely on visual layout, tokenizers like `tiktoken` process raw Unicode strings rather than rendered text.

If you are interested in learning about securing LLM inputs against injection attacks, LLM context sanitization, and securing autonomous agents, consider this hypothetical scenario: an attacker embeds invisible U+200B characters into an otherwise benign `README.md`. A human reviewer sees perfectly normal text, but the autonomous agent parses the raw string and processes the hidden malicious bytes as valid tokens.

The LLM vendors are not going to save us from this. If you are blindly giving AI agents terminal access without an isolated sandbox—assuming that because a file looks safe to your human eyes, it is safe for your agent to read—you are falling straight into the **YOLO Execution Trap**. We need to start treating local agent context windows with the exact same paranoia as `eval()`.

06 HACKTAKES

The EU’s War on Mathematics: The Return of Chat Control

The EU's push to scan encrypted messages ignores the mathematical certainty that a backdoor built for law enforcement is a backdoor for everyone.

BY VICTOR HALE

Sparked by Chat Control passed first round in EU Parliament · discussion

“It is perfectly secure—this door only opens for the good guys.”

European Union lawmakers are maneuvering to push through the unexpected return of Chat Control 1.0 in Strasbourg, reviving a political hysteria that treats cryptography as a legislative nuisance rather than a mathematical absolute. The prevailing narrative relies heavily on a classic movie-plot threat: lawmakers conjure up images of digital predators operating in perfectly untraceable darkness, arguing that without sweeping, indiscriminate surveillance powers, law enforcement is rendered completely blind. Consequently, politicians continually frame this proposed regulation as a moral trade-off between protecting children and preserving privacy. This framing completely ignores the operational

reality of the internet. We are not choosing between public safety and individual secrecy. By demanding that tech companies indiscriminately scan encrypted private messages for illicit material, the EU is forcing a mathematically impossible choice between basic systemic security and guaranteed universal vulnerability.

To understand why the proposed regulation is so disastrous, we have to examine what the legislation actually requires. Under the original framework—which allow providers to voluntary intercept, scan and report 100% of communications—companies were effectively deputized to act as surveillance arms of the state. And the updated push for mandatory scanning takes this further, stripping away the public relations branding of "safety filters" and "client-side scanning." Functionally, the regulation dictates the compulsory installation of state-mandated spyware on every citizen’s device. The law requires messaging applications to break end-to-end encryption by inspecting your data before it is mathematically scrambled, or by quietly sharing the cryptographic keys with a third party. The specific mechanism does not matter. If a system allows anyone other than the sender and the intended recipient to read a message, the encryption is broken. **Fundamentally.**

So when lawmakers demand a backdoor that only law enforcement can access, they are treating a mathematical certainty as if it were a negotiable policy position. We have seen this specific brand of legislative arrogance before. During the 1897 sitting of the Indiana General Assembly, state politicians attempted to legally redefine the mathematical value of pi to make circular area calculations easier for local engineers. The legislators assumed that human laws could simply overrule geometric reality, and the bill nearly passed before a visiting mathematician intervened to explain the absurdity of voting on a universal constant. The EU’s Chat Control regulation operates on the exact same psychological delusion. Politicians assume that because they have written a law requiring a "safe" backdoor, the underlying mathematics of cryptography will magically oblige. Math does not care about parliamentary votes, and it does not negotiate with the law. A vulnerability introduced for a moral purpose functions exactly like a vulnerability introduced for a malicious one.

But we know exactly how this plays out in the physical world of cybersecurity, because the tech industry has run this experiment before. In 2005, Sony BMG decided to enforce digital rights management on their music CDs by secretly installing a cloaked software backdoor on customers' computers. Sony intended this to be a "good guy" vulnerability—a tool used exclusively by the corporation to prevent widespread copyright infringement without harming the user. As security technologist Bruce Schneier noted at the time, this deliberate weakening of the system creates a vulnerability that can be exploited by other malware. Within days of the rootkit’s discovery,

malicious hackers and virus authors repurposed Sony's hidden backdoor to mask their own hostile software from antivirus scanners. The physics of the failure were instantaneous and absolute. Sony built a secret door for themselves, and the entire criminal underground walked right through it.

This brings us back to the core operational absurdity of Chat Control. A backdoor into an encrypted messaging app is just a Sony rootkit mandated by the state. The vulnerability does not verify the moral purity of the person exploiting it before granting access. If European regulators force WhatsApp, Signal, and Apple to build bypasses into their encryption protocols, those bypasses will inevitably be discovered and weaponized by hostile nation-states, ransomware syndicates, and domestic stalkers. The community backlash and technical pushback on forums like Hacker News reflects this grim reality, as engineers understand that you cannot secure a system while simultaneously demanding a master key. The root cause of this failure is a profound misunderstanding of risk allocation: A backdoor for law enforcement is a backdoor for everyone. Regulators are artificially introducing a massive attack surface into the digital infrastructure that underpins our global economy—shifting all the catastrophic risk onto the public—while claiming they are simply keeping us safe.

We cannot treat systemic security as an optional feature to be toggled off whenever politicians get nervous. We need to defend our critical infrastructure against hostile foreign intelligence agencies. We need to protect journalists and dissidents from authoritarian regimes. We need to build systems that cannot be bypassed by anyone, no matter how righteous their legislative mandate might appear. If lawmakers successfully mandate a universal vulnerability disguised as a safety feature, the cascading economic and societal damage will be incalculable.

Politicians continually paint this debate as a reasonable compromise between public safety and personal privacy, ignoring the cold operational mechanics of the internet. There is no such thing as a backdoor that only the good guys can use. We can either have an internet that is secure for everyone, or one that is vulnerable to anyone.

Metastability, Retries, and the Math of 98%

Evaluating component reliability in isolation is a mathematical illusion, as synchronous dependencies and automated retries guarantee systemic collapse.

BY OWEN TATE

Sparked by 98% Isn't Much · discussion

“I didn't get an immediate response, so we are retrying.”

I feel the need to write this down if only to save myself from re-litigating it in future architecture reviews. The internet seems permanently trapped in a loop where folks are arguing over the exact percentage of acceptable component uptime. I was reading a recent post by Hugo asserting that 98% isn't very much, which naturally spawned a sprawling Hacker News thread debating the context-dependency of reliability metrics. Some folks vehemently defended the 98% heuristic for non-critical workloads, arguing that striving for five nines is an expensive waste of engineering cycles, while others insisted it was a one-way ticket to constant outages. Both sides make intuitive sense in a

vacuum, particularly if you view software as a collection of independent islands. Yet the entire debate ignores the brutal physics of distributed systems—specifically the unyielding enemy that is synchronous coordination.

Let’s run the math at a whiteboard. Assume we have a standard, thoroughly modern microservice architecture where a single user request arrives at the API gateway and requires a synchronous fan-out to 40 different backing services to assemble the response. Our component owners have successfully defended the 98% reliability heuristic, meaning each of those 40 individual services successfully returns a payload 98 times out of 100.

To find the aggregate success rate, we simply map the Anti-Scalability Equation: 0.98^N, where N is the number of synchronous dependencies. For $N = 1$, we get our expected 0.98, and everyone is happy. But for $N = 40$, we calculate 0.98^{40} and watch our overall system success rate plummet to roughly 44.5%. This is the mathematical ceiling of your architecture. If you were to run a quick Monte Carlo simulation of this exact request path over ten thousand iterations, you would find that the median user experience is a broken web page.

Oof.

The overall success rate fundamentally degrades into a coin flip weighted toward failure.

Before looking at the catastrophic operational downstream of that math, we have to ask why organizations reliably architect themselves into this corner. The answer lies in the socio-technical reality of engineering incentives. A 98% success rate makes an individual team’s dashboard look perfectly green. The operators are rational actors optimizing for local maxima, keeping their own pagers quiet and their sprint velocities high. They are structurally incentivized to ignore the mathematical reality that their perfectly acceptable component is merely one link in a doomed 40-node chain (which most organizations lack the distributed tracing to fully visualize anyway).

Here is where pristine probability meets the messy reality of the data center. A 44.5% success rate means 55.5% of requests are failing, dropping packets, or timing out. In a purely theoretical system, those failed requests simply vanish into the ether and the math stops there. In production, automated clients immediately retry them.

As the AWS Builders' Library expertly details, automated retries act as selfish load amplifiers. The original 2% failure rate per component is no longer just harmlessly dropping traffic. It actively generates thermal noise that multiplies the load on an already degraded architecture. (*I’m assuming*

the upstream service just had a transient network blip, so I'll hammer the endpoint again.) The system is now processing the baseline incoming traffic plus the retry storm generated by the 55.5% aggregate failure rate.

Let's model the queue depth under this amplified load. In a healthy, happy-path state, queues drain normally, absorbing minor latency spikes. But when retry loops instantly double the concurrency demands, the load pushes the system past its tipping point into a persistent, bimodal failure state. The HotOS '21 paper on metastable failures proves exactly why this happens—unbounded retry loops lock systems into a permanent overload that they structurally cannot recover from without manual human intervention.

The queue depth effectively hits infinity. The infrastructure is now performing $O(N)$ work just to achieve zero throughput, burning expensive CPU cycles to frantically reject traffic, parse retry headers, and log the subsequent timeout errors into an already congested observability stack.[^1]

Spinning, but stalled.

This bimodal collapse means the 44.5% success rate was actually an optimistic lie. The moment the retry amplifier activates, the system degrades to a total outage. The math translates directly into a pager waking up an exhausted human operator at 3 AM. That operator now has to manually shed load, drop traffic, and disable the retry mechanisms entirely, because the architecture structurally prevents the system from draining its own queues.

Let's consign the debate over isolated uptime percentages to the history books. We cannot evaluate component reliability without graphing its synchronous dependencies and modeling its queueing behavior under duress. Reliability, like simplicity, is a system property: a sea of green dashboards on individually unreliable components is just a mathematical illusion waiting for a retry storm.

[^1]: If you want a fun weekend project, write a TLA+ spec for a naive fan-out retry mechanism and watch the state space explode the moment you introduce a single constrained queue.

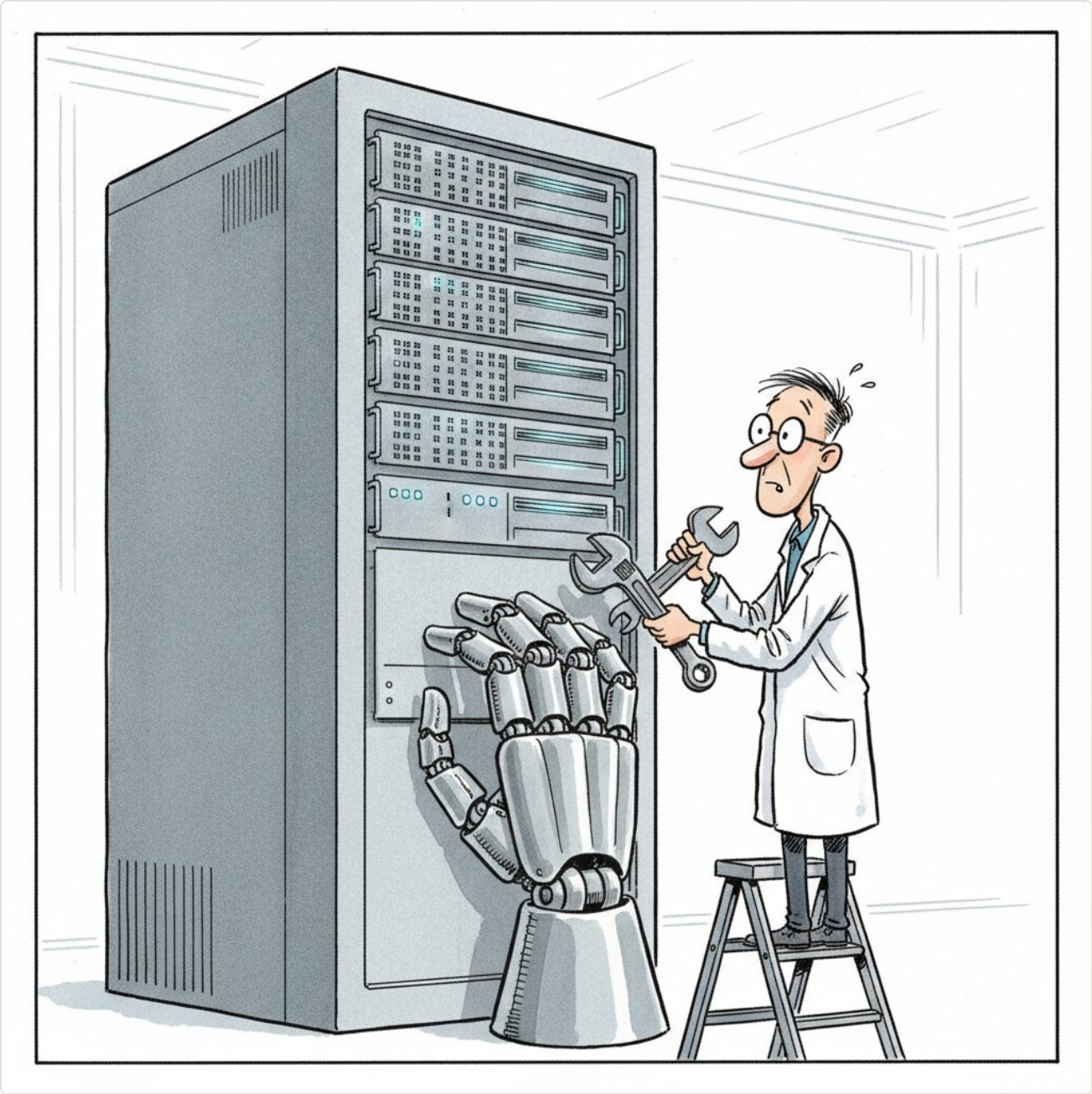
08 HACKTAKES

Tom Riddle and the Architecture of Skeuomorphic Friction

Because instant AI outputs degrade trust, developers must program skeuomorphic friction to simulate the biological hesitation of human cognition.

BY JONAH REYES

Sparked by Fable turned reMarkable into Tom Riddle's diary from Harry Potter · discussion



“It calculates the answer in milliseconds, but we installed this so the enterprise clients feel like it's really mulling things over.”

Reading through the Hacker News discussion of Maxime Rivest’s beautiful Riddle repository, one user synthesized the creeping, ambient unease of modern conversational interfaces by invoking a famous piece of pop-culture folklore. They dropped in the exact warning J.K. Rowling gave to Arthur Weasley regarding enchanted objects:

> *"Never trust anything that can think for itself if you can't see where it keeps its brain."*

The surrounding commentary crystallized a widespread but rarely articulated anxiety. Users described a profound cognitive dissonance when interacting with instant AI outputs, a phenomenon characterized across the thread as a deep technological apathy. When a machine returns a complex philosophical treatise in 0.4 seconds, we intuitively devalue the output. The sheer response speed fundamentally violates the physical constraints of human thought.

But to understand why this apathy happens, we have to look at the physical mechanics of magic.

If you rewatch *Harry Potter and the Chamber of Secrets*, pay close attention to the spatial and temporal mechanics of Tom Riddle's diary. When Ginny Weasley or Harry writes in the blank journal, the ink pools on the page for a breathless, pregnant second. Then, it slowly bleeds down into the parchment, dissolving entirely into the fibers of the book. Another agonizing pause follows. Finally, ink begins to bleed back up from the depths of the paper, slowly coalescing into handwritten text.

The latency is terrifyingly organic. The medium absorbs the message, digests it, and responds with measured hesitation. You are acutely aware that there is an intelligence on the other side of the parchment, and more importantly, you are aware that this intelligence is subject to the same physical limitations of time and space that you are. It creates a level playing field of cognitive effort.

Contrast this cinematic labor with the sterile, hyper-optimized token stream of a standard ChatGPT user interface. OpenAI optimizing for zero-latency output makes pristine economic sense for an infrastructure provider trying to drive down compute costs and wow enterprise clients with sheer throughput. It fundamentally breaks human sociology in the process.

`[Aside: ChatGPT is an inherently terrible name for a conversational agent, much like "word processor" was for writing or "food processor" for cooking. It sounds less like a collaborator and more like an industrial manufacturing pipeline, which, to be fair, is exactly how the backend behaves.]`

To achieve human suspension of disbelief and intimacy in digital interfaces, LLMs must paradoxically adopt what I call **Skeuomorphic Friction**.

I use this framework to describe an artificial conversational delay that maps the cinematic, ink-absorbing mechanics of a Horcrux directly onto modern digital UI. This entails the explicit insertion of an artificial 2.8-second delay and a simulated physics engine into an otherwise boundless digital system. In the early days of iOS, skeuomorphism meant making digital calendar apps look like real

leather with drop shadows and stitched borders. Today, the most vital skeuomorphism isn't visual; it is temporal. In an infinite computational arena where the true bottleneck is merely network latency, artificial friction becomes the only viable mechanism to manufacture intimacy.

Because as *homo socialis*, we are exquisitely calibrated to constantly assess the cognitive load of our conversational partners. We can look to behavioral economics for the empirical evidence of this reflex. The labor illusion demonstrates that people value services more highly when they literally see the work being done. When a travel aggregation site stalls for a second and flashes a progress bar reading "searching hundreds of airline databases," users report significantly higher satisfaction than when they receive the exact same flight results instantly. We demand a theatrical performance of effort.

When a large language model spits out a meticulously formatted, five-paragraph synthesis of the geopolitical ramifications of the spice trade the very millisecond you hit enter, we experience a profound, subconscious rejection of the text. The instantaneous output actively degrades trust by skipping the physiological proof of work required in human interaction. We don't simply desire the correct answer to our query. We desperately need to feel like the machine had to sweat to find it.

Proof of work indeed.

Human conversation operates against a remarkably strict biological speed limit. Psycholinguistic research on human turn-taking establishes that the average gap between turns in spoken dialogue is about 200 milliseconds. That tiny, imperceptible sliver of time is where empathy physically lives. Our brains rely on that fractional latency to confirm the other party is actively listening, processing our emotional state, and formulating a bespoke thought in response. If the response comes too slowly, we assume the person is distracted or cognitively impaired. If it comes too quickly, we instinctively feel we are being talked at rather than talked with. The entire architecture of human status negotiation happens in the millisecond margins of these conversational gaps.

When software violates this baseline by vomiting perfect, hallucination-free syntax at 80 tokens per second, the illusion of comprehension collapses entirely. The vibes are instantly ruined.

The Riddle project solves this UX nightmare by embracing the physical constraints of the analog world. Instead of simply delaying the text box or throwing up a generic spinning loading wheel, the repository leverages the Zhang-Suen thinning algorithm—a mathematical method typically deployed in image processing to skeletonize images and extract their topological geometry. By applying this algorithm to artificially pace the pixel output on the screen, the software flawlessly simulates the erratic, bleeding drag of human handwriting. It forces a multi-billion parameter supercomputer to pantomime the agonizing effort of human cognition.

That's delightful.

How do you build a ghost in the machine when the machine moves too fast to haunt?

You have to program the hesitation. You have to write code that forces the oracle to stutter, to wait, to pretend that the weight of the user's input actually requires a moment of quiet, ponderous reflection. The uncanny valley of modern artificial intelligence derives entirely from its absolute refusal to pause. We assume a sufficiently advanced reasoning engine will eventually win our implicit trust through sheer accuracy and zero-shot reasoning, yet we remain deeply unsettled by an entity that never needs to catch its breath. The horror stems directly from an architecture that refuses to mimic the friction of human vulnerability.

The underlying tragedy of modern UX design is the assumption that removing friction universally improves the user experience. But friction is the texture of reality. And perhaps some baseline level of conversational friction will always exist simply because we prefer a gradual, laborious diminishment of information asymmetry over a sudden, blinding dump of omniscience. In our relentless pursuit of an omniscient oracle, we stripped away the one thing required for human intimacy: the agonizing, beautiful wait of watching someone else struggle to find the right words. Because ghosts aren't scary because they are dead; they are scary because they are trapped in time, waiting in the dark with us.

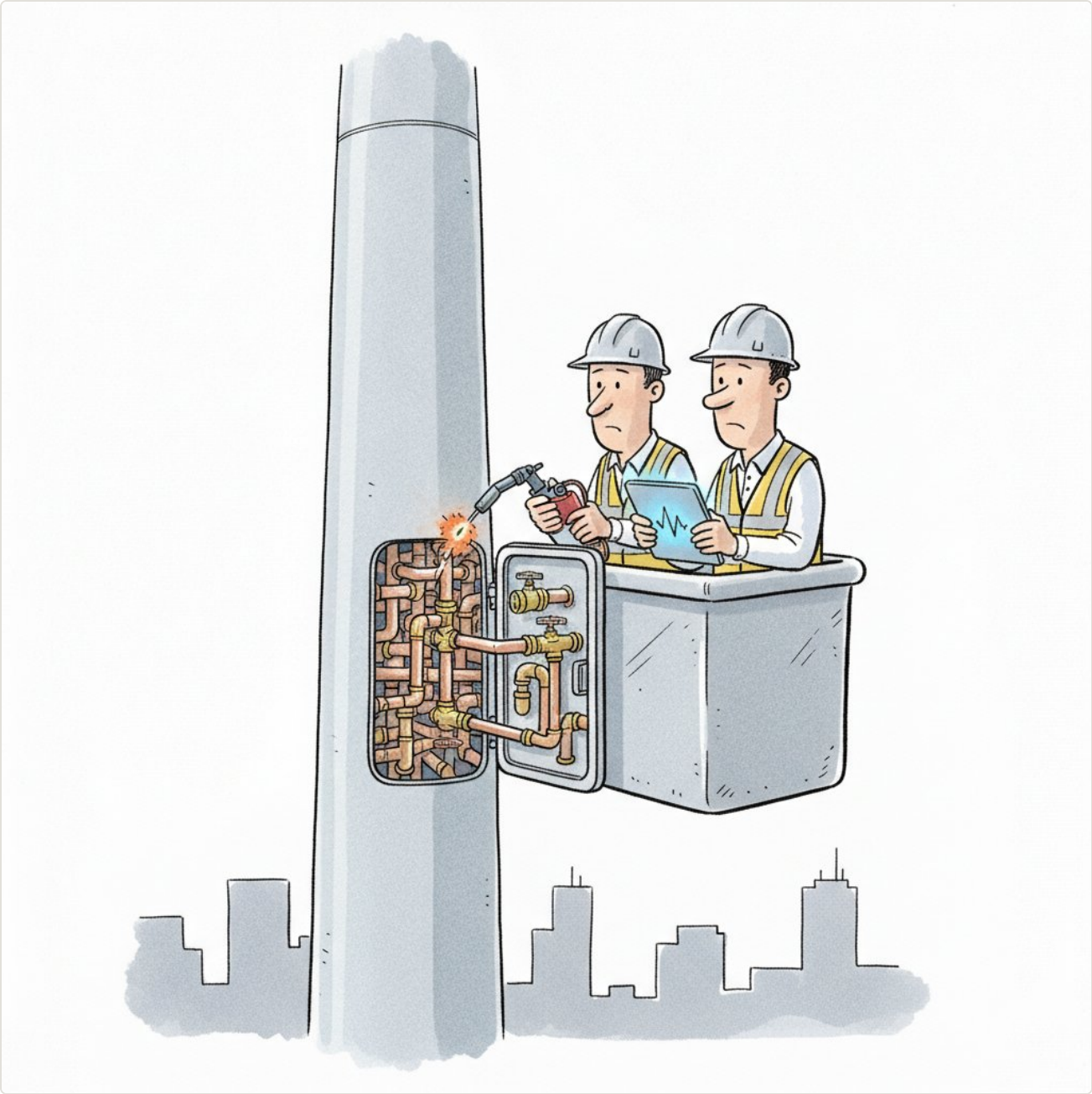
09 HACKTAKES

The 1960s Microwave Plumbing Saving 5G

Modern 5G networks bypass the heat and cost of digital silicon by using passive 1960s analog copper geometry to physically steer millimeter-wave beams.

BY NOLAN CHU

Sparked by Rotman Lens · discussion



“The latency is incredible, but we still have to snake the U-bend every spring.”

If you read the mainstream tech press, you would think the 5G rollout is strictly a triumph of software wizardry and cutting-edge silicon. The ecosystem thrives on narratives about Massive MIMO systems and intelligent algorithms dynamically mapping out urban terrain, as I saw digital dweebs recently rediscovering on a Hacker News discussion. If you believe the marketing, the future of telecom is entirely written in code.

But if you pry open a modern millimeter-wave cell tower, you will find something decidedly less futuristic keeping the entire system from melting into slag. You will find a piece of analog microwave plumbing.

And to understand why, we have to look at the unforgiving realities of electrical resistance and thermal dissipation.

A thermodynamic brick wall.

How do you actually steer data-heavy electromagnetic beams at 28 GHz without burning the base station to the ground? Millimeter-wave signals are incredibly fragile. They operate at such a high frequency that they get easily blocked by trees, rain, and even the low-emissivity glass on modern office buildings.

To overcome this crippling physical limitation, towers must precisely aim tight, concentrated beams of data directly at your phone rather than broadcasting a wide signal in all directions. Doing this digitally requires bolting a high-speed RF digital-to-analog converter - and an active digital phase shifter - to every single antenna element in an array.

And those active components are not cheap. So when you scale up to the massive 256-element or 512-element grids required for a commercial 5G base station, the math gets ugly fast. The capital expenditure of buying thousands of high-end RF chips per tower destroys the deployment budget.

But the biggest constraint is heat. The power consumption of all those silicon chips firing at once is astronomical. The resulting heat generation simply overwhelms the physical constraints of a standard cellular mast. You cannot realistically fan-cool a sealed electronics box sitting out in a Texas summer sun without racking up a maintenance bill that would bankrupt the network operator. Cooling fans have moving parts. Moving parts fail. And when they fail at the top of a 100-foot tower, you have to roll a very expensive truck to go fix them.

To fix this, telecom engineers had to look backward. They returned to a pre-Moore's Law era when sheer physical geometry had to do the heavy lifting.

In 1963, Walter Rotman and his co-author R.F. Turner published a paper on microwave lens design for line source applications for the Air Force Cambridge Research Laboratories. And yes, having a researcher named R.F. working on radio frequency is nominative determinism at its absolute finest.

At the time, the military was trying to solve a very similar beam-steering problem for early-warning radar arrays. They needed to rapidly scan radar beams across the sky to track fast-moving targets. They could not rely on slow, mechanical motors to physically spin a massive, heavy radar dish back

and forth.

But they possessed zero digital computers capable of calculating complex phase shifts in real time. The transistors of the era were barely capable of basic logic, let alone high-speed microwave signal processing. They needed to steer electromagnetic waves using pure physical constraints.

I must pause here to explicitly define what their invention actually is, because the name is slightly misleading. A Rotman Lens is simply a passive beam-forming network shaped out of metal.

You can think of it as a Tesla Valve for radio waves. It is literal microwave plumbing.

Instead of using a power-hungry digital chip to delay a signal mathematically, the Rotman Lens forces the radio wave to travel through a precisely drafted, two-dimensional metal cavity. By forcing the wave to physically traverse different path lengths across a substrate, the wave exits the other side slightly delayed. We are talking about microscopic delays that operate on the scale of picoseconds.

To put that in macroscopic terms, a radio wave traveling through copper for one picosecond moves roughly a third of a millimeter - or roughly the thickness of a playing card. By controlling that tiny physical distance, you control the shape of the invisible beam.

So let us take a spatial tour of this machine. We can break the component down into three sequential sub-assemblies.

First, we have the Beam Ports on the input side. These are metal terminals arranged in a shallow arc. A radio signal enters one of these specific ports depending on which direction you want the final 5G beam to point.

Then, the signal enters the Cavity. This is the heart of the lens. It is just an empty, parallel-plate space shaped with a very specific, sweeping geometric curve. The electromagnetic wave expands outward across this metal void, rippling like water dropped into a pond.

Zero silicon. Zero heat.

Finally, the expanding wave hits the Array Ports on the output side. These ports are spaced along a tighter, inner curve. Because of the cavity's careful curvature, a signal that entered from an off-center Beam Port will arrive at the outer Array Ports slightly later than it arrives at the center ports.

This physical delay is called True Time Delay, and it is a beautiful exploitation of basic physics. When those physically staggered signals are finally fed out into the actual transmission antennas, the electromagnetic waves combine in the open air.

Because one side of the signal is delayed relative to the other, the staggered timing creates constructive interference that forces the combined wave front to tilt, forming a single, tight beam pointed at a sharp angle. The wave literally just has to travel a slightly longer physical distance across the metal cavity. You get the exact same beam-steering result as a high-end digital processor, but with absolutely no active processing power.

Fast forward to today's telecom rollout. Modern engineers are taking this massive 1963 military radar geometry and miniaturizing it. They are printing these intricate, bat-wing-shaped metal curves directly onto the dielectric printed circuit boards inside millimeter-wave base stations. By utilizing standard etching techniques, they can mass-produce these complex geometries for pennies on the dollar.

By using this vintage analog layout as a passive beamformer, the system requires practically no electricity to steer the signal. The routing of the wave is permanently baked into the copper traces.

And the sheer pragmatism of this move is a stark reminder of where technology actually lives. The telecom industry had to resurrect unglamorous analog geometry to save itself from the capital expenditure and thermal limits of its own digital hubris. It turns out that delivering the low cost and low power consumption required for mass commercialization means admitting that software cannot solve everything. The physical limits of the universe always get the final say.

Next time you are seamlessly streaming a 4K video on a crowded train, just remember that your magical digital future is being quietly subsidized by a piece of copper geometry drawn up during the Kennedy administration by a guy literally named R.F.

It is just chips and microwave plumbing, baby.

how connection pooler state leaks (a tiny experiment)

Connection poolers leak session state because they hand dirty database sockets to new clients, skipping costly cleanup queries to preserve performance.

BY POPPY LIN

Sparked by Why we built yet another Postgres connection pooler · discussion

“By skipping the busboy entirely, we can offer you zero-latency seating.”

A friend and I were chatting recently about how terrifying it is when connection pooler state leaks! This came up because we were reading the PgDog announcement post and the ensuing Hacker News thread about it. In that thread, developers were discussing a nightmare scenario where a session setting like `SET statement_timeout` can magically bleed into a completely different application's queries.

If an analytics dashboard sets a strict timeout and drops its connection, a critical payment service might suddenly start failing because it inherited that exact same timeout. The conversation made me want to understand how that state bleed actually functions at the bare socket level.

Instead of just reading the documentation, let's imagine setting up a bare-minimum Docker instance with PgBouncer sitting in front of a Postgres database. To guarantee that clients would share connections immediately, you could explicitly set the pooler to transaction pooling (`pool_mode = transaction` with `default_pool_size = 1`).

To see what's going on under the hood, we'd really only need one Postgres function: `SELECT pg_backend_pid()`. I love this function because it just returns the literal process ID of the Postgres server process attached to your current session. No theory, just raw system truth!

Here is what the terminal output would look like if you ran a simple 15-line Python script that connects as "Client A", changes the configuration, disconnects, and then connects immediately again as "Client B":

```
[Client A] Connected. Postgres PID: 1234
[Client A] Running: SET statement_timeout = 1
[Client A] Disconnected.
[Client B] Connected. Postgres PID: 1234
[Client B] Running 2-second sleep...
psycopg2.errors.QueryCanceled: canceling statement due to statement timeout
```

So what just happened in this scenario? Client A connects to the database via the pooler and asks Postgres for its current process ID. The server responds with `1234`. Client A then does something kind of rude: it mutates the connection state by setting the statement timeout to a single millisecond. The pooler sees that the transaction is done, so Client A disconnects and goes away.

But then Client B connects to the pooler. To the Python script running Client B, this looks like a completely fresh, pristine database connection. Client B asks for the process ID, and the server responds with `1234`. IT'S THE EXACT SAME POSTGRES PROCESS!

Client B inherited the timeout configuration because "connection pooling" in this mode just means PgBouncer hands the raw, already-open network socket directly over to the next connection in the queue. And because the Postgres process serving PID `1234` still has that aggressive one-millisecond timeout burned into its memory from the previous user, Client B attempts to run a perfectly normal two-second sleep query and crashes immediately. The state has completely leaked across the application boundary.

If a connection pooler just hands over dirty sockets, what else leaks across these invisible state buckets? It turns out you can run into exactly three main categories of weird bugs:

- **Temporary tables:** A temporary table created by one client for an intermediate calculation is suddenly visible to the next client that inherits the process.
- **Prepared statements:** Client B might crash because it tries to declare a prepared statement name that Client A already registered on this exact same socket.
- **Session variables:** Application time zones, memory limits, and locale settings altered by one query will silently apply to the next user in line.

Anyway, why doesn't the pooler just clean this up? Postgres actually provides a dedicated command called `DISCARD ALL` that safely clears everything, destroying temporary tables and resetting the session to a pristine default state.

But there is a massive performance trade-off! PgBouncer intentionally skips running this cleanup query by default in transaction mode because executing it between *every single transaction* adds a costly network round trip. People in that Hacker News thread were discussing how you can mitigate this by changing the `server_reset_query` defaults to force the pooler to run the cleanup command, though doing so fundamentally changes the latency profile of your database traffic.

I certainly have a ton left to learn about PgBouncer's advanced reset strategies (how do you even tune that reset query for a massive application without destroying your database performance??), and very likely I missed some nuance about how pooling works in other modes. But I'm seriously amazed that we can reason through this terrifying state-leak bug conceptually with just a hypothetical script and a simple PID check :)