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Broken World Thinking in the Digital Era

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Abstract

This paper explores the shift from the collaborative early open-source software movement to current platform capitalism. This shift is a form of digital enclosure that privatizes collective human knowledge. This paper uses three distinct analytical views to understand this crisis. First, a Marxist framework shows the motive behind the structural extraction of immaterial labor. Second, an institutional perspective shows the method of corporate capture used to co-opt open-source movements. Finally, the political economy of maintenance exposes the physical consequences of this economic model. Tech monopolies extract value from the digital commons. However, they systematically underfund the important maintenance labor required to keep it secure. This creates a severe global sustainability crisis. Society must abandon its obsession with continuous innovation and adopt “broken world thinking.” Foundational software must be recognized as a critical public good supported by strong state and corporate funding.

Keywords: digital enclosure, platform capitalism, open-source software, general intellect, infrastructure maintenance

Introduction

When the digital revolution started, many people believed it would be a powerful force for democracy. Many hoped it would break down traditional systems of power, money, and government control. During the 1980s and 1990s, the internet was heavily supported by public funding and driven by the collaborative and open mindset of the early open-source software movement (Barron 2013; DiBona and Ockman 1999; Söderberg 2002). During this time, people imagined a "digital commons." This was supposed to be a space where information flowed freely and everyday people could work together directly, which would further bypass the focus on the profit motive of big corporations. However, over the last thirty years, this hopeful vision has been distorted. Corporate interests have aggressively taken over, blocked in (digitally enclosed), and revamped the digital world. Today, the internet is ruled by "platform capitalism," which is an economic model that makes money by constantly extracting user data, further monopolizing digital infrastructure and relying on the unpaid labor of people all over the world (Birkinbine 2020; Liang et al. 2022; Zygmuntowski 2022).

This shift did more than just change how software is made or how apps are delivered to our phones. It revamped the global economy of knowledge and labor. The takeover of the digital commons works like a current version of "primitive accumulation," which is a process where creators and users are separated from the tools and data they create. By turning our collective human knowledge into private algorithmic property, several Big Tech companies have gathered a significant amount of global and economic power. While extensive research has documented the rise of these platform monopolies and the exploitation of digital labor, there remains a lack of discussion in the literature regarding how this economic enclosure directly precipitates the physical, structural decay of foundational digital infrastructure.

This paper closes this gap by synthesizing immaterial labor theories with the political economy of infrastructure maintenance. I argue that the transition from radical open-source ideologies to contemporary platform capitalism demonstrates a form of digital enclosure that manipulates the “general intellect” (Marx’s expression for the collective knowledge of society), while creating a systematic sustainability crisis through the underfunding of necessary maintenance labor.

Three analytical perspectives must be placed in direct conversation to fully understand the crisis. The Marxist framework provides the motive for structural exploitation (Ford 2021; Koloğlu 2015; Pasquinelli 2010; Söderberg 2002). The institutional perspective explains the method of corporate capture. This second perspective analyzes how free and open-source software (FOSS) movements have been co-opted on proprietary platform supply chains to maximize corporate wealth (Barron 2013; Birkinbine 2020; Liang et al. 2022; Ross 2013; Wegner et al. 2024; Zygmuntowski 2022). Finally, the concept of the political economy of maintenance reveals the physical consequences of this enclosure. This approach uses “broken world thinking,” which is a framework that prioritizes the maintenance and repair of existing systems over continuous innovation, to explain the material vulnerability and systemic risks created by underfunded digital infrastructure and algorithmic dependency (Almakaty 2025; Boysel 2023; Carbery and Khanjani 2025; Jackson 2014; Lührsen et al. 2025; Sharma 2022). This framework therefore shifts the focus away from the tech billionaires creating new applications, instead highlighting the invisible labor required to sustain the current infrastructure we already rely upon.

The next three sections of this paper will review the structural exploitation and material precarity within the digital economy to prove how the digital commons has been enclosed and

intentionally underfunded. Section two will analyze the Marxist framework of the general intellect and how immaterial labor is structurally enclosed for private accumulation, which shows how tech monopolies extract unpaid labor from the masses. Furthermore, this involves the blurring of production and reproduction and the role of dependency theory in a digital context. Section three will discuss the institutional tensions of corporate capture, comparing early open-source ideologies with the modern incorporation of the digital commons, arguing that the tech industry relies on co-opting volunteer labor for accumulation. This section analyzes how commercial interests use the digital apparatus for accumulation. The fourth section offers ways to create policies to support the labor that is not being adequately compensated. This includes an exploration of broken world thinking and the sustainability failure of uncompensated infrastructure labor, arguing that platform capitalism is creating a global cybersecurity crisis. The conclusion will explore the potential for public support systems to secure open digital infrastructure.

The Marxist Framework and Exploitation of the General Intellect

Modern tech monopolies extract private profits by systematically converting the unpaid, everyday digital interactions and volunteer coding of users into proprietary algorithmic capital, successfully enclosing the general intellect. To understand how modern platform capitalism works, we have to examine the digital economy not just as a place of innovation, but as a system built on deep structural exploitation (Almakaty 2025; Ford 2021; Kolođlugil 2015). Traditional Marxist theories are usually focused on the physical exploitation of factory workers and how those who control the means of production made money from manual labor. A key part of this is the idea of "immaterial labor," which is the mental, communicative, and emotional work that keeps digital platforms running (Kolođlugil 2015; Liang et al. 2022). Different from building

cars on an assembly line, digital work is hard to measure by the hour or the unit, which makes such labor hard to compensate fairly and in the correct manner. This inherent vagueness leads directly to job insecurity for the modern digital workforce (Almakaty 2025; Ford 2021; Liang et al. 2022). Workers in this sector, whether they are volunteer software coders or social media moderators, are often working without any of the safety protections of a more traditional job. Since they are labeled as independent contractors or "volunteers," they are vulnerable to the constant demands of algorithms that expect never ending, unpaid productivity.

At the root of this exploitation is Karl Marx's concept of the general intellect. Marx originally used this term to describe how the collective knowledge of society eventually gets built into the machinery of factories. In current times, the general intellect describes our collective knowledge as a form of capital (Ford 2021; Kolođlugil 2015; Pasquinelli 2010). In the digital age, this intellect isn't just an abstract idea; instead, it is actual, measurable knowledge fixed into giant server farms, search engine algorithms, and AI models (Kolođlugil 2015; Pasquinelli 2010). Tech billionaires don't just own physical factories anymore. They now own the combined mental output of humanity. The "social brain" has in turn become the main engine of production because of this. The intelligence, social lives, and creativity of billions of users are harvested to create unbelievable wealth for just a handful of monopoly platforms (Ford 2021; Kolođlugil 2015).

A distinct perspective within the literature emphasizes that this structural exploitation extends far beyond the traditional workplace. Scholars in this camp argue that the creators of digital platforms design these systems to blur the lines between production and reproduction to extract unpaid surplus value from everyday social interactions. They achieve this by embedding work-related communication and data extraction into social tools used during leisure time

(Kolođlugil 2015; Liang et al. 2022; Pasquinelli 2010; Zygmuntowski 2022). This system destroys the boundary between our work lives and our personal lives. In the past, there was a clear, distinct line between the factory (where you produced things) and the home (where you rested and reproduced). This historical separation, while still exploitative, at least provided workers with bounded periods of rest and recovery away from the demands of capital. In the digital economy, that line is not there at all. Immaterial labor spills seamlessly into our everyday lives (Kolođlugil 2015; Liang et al. 2022). Work stretches far beyond the office space into our evenings, weekends, and private spaces, turning every waking moment into a chance for tech companies to extract value (Kolođlugil 2015; Liang et al. 2022). Every time we click a link, post on social media, share our location, or message a friend, we generate data. This data acts as unpaid surplus value that monopolies hoard to train their algorithms and sell highly targeted ads (Kolođlugil 2015; Pasquinelli 2010). Ironically, users are both the consumers of these apps and the unpaid workers whose digital habits end up fueling the businesses exploiting them.

We also must examine this digital exploitation through dependency theory. Dependency theory posits that resources flow from a "periphery" of poor and underdeveloped states to a "core" of wealthy states, enriching the latter at the expense of the former. In a digital context, the same inequalities persist from the era of historical colonialism, in which the Global South provided cheap raw materials so the Global North could get rich, which is happening all over again online. Today, the Global South heavily relies on digital infrastructure that is owned, operated, and controlled almost entirely by corporations in the Global North (Almakaty 2025; Kolođlugil 2015; Zygmuntowski 2022). Technology has become a new tool for imperial control, creating a system of "data colonialism." Many rich Global North platforms take mental resources and raw behavioral data from developing countries, process that data in foreign servers, and then

sell it back to the Global South as expensive software and digital ads. This unequal trade traps developing nations in a cycle of technological dependence, which makes it nearly impossible for them to build their own independent digital infrastructure (Almakaty 2025; Koloğlugil 2015; Lührsen et al. 2025).

Moving past the theory, the real-world risks of blocking off the digital world are obvious in modern software (Almakaty 2025; Koloğlugil 2015; Ross 2013). Digital enclosure acts as a barrier that separates creators from the knowledge and tools they build. Without this enclosure, information and digital tools would remain freely accessible and modifiable by the public. This process is similar to how historical land enclosures fenced off common agricultural land for private use, forcing independent farmers who lost their livelihoods to become low-wage factory workers (Almakaty 2025; Ford 2021; Koloğlugil 2015). Today, this looks like the restricting of collaborative networks and social connections, locked behind strict terms of service, expensive paywalls, and secret algorithms (Koloğlugil 2015; Ross 2013; Söderberg 2002). In response to this corporate takeover, some radical digital workers use what is called a “grammar of sabotage” (Ford 2021; Pasquinelli 2010; Söderberg 2002). This includes different ways to fight back against the selling of information, such as setting up pirate networks, using strict copyleft licenses that prevent corporate ownership, or even purposely feeding bad data to tracking algorithms (Ford 2021; Pasquinelli 2010). By actively fighting capitalist control of the digital commons, these groups try to take back the general intellect and ensure that human knowledge stays a public good instead of a private corporate asset (Pasquinelli 2010; Söderberg 2002). While it is reasonable for tech companies to profit from the platforms they create, the danger of digital enclosure lies in its perpetual and extractive nature. Unlike patent laws, which grant a temporary monopoly to balance private profit with the eventual enrichment of the public domain,

digital enclosures permanently lock away foundational infrastructure, creating a highly fragile ecosystem that ultimately harms the public.

Corporate Capture and the Enclosure of the Digital Commons

Multi-trillion-dollar corporations have co-opted the originally free and anti-corporate open-source software movement, changing volunteer community labor into a subsidized research and development support for proprietary cloud services. The history of the digital landscape is defined by an ongoing, intense battle. On one side are the radical practices of open collaboration, and on the other is the unstoppable push of capitalism to accumulate wealth (Barron 2013; Ross 2013; Söderberg 2002). At the root of this fight is a major clash of values. Corporate profit motives require products to be scarce and exclusive so they can charge money for them. However, software development that is driven by the community relies on abundance, sharing, and peer review to thrive (Barron 2013; Ross 2013). This tension is especially obvious when we look at the history of the FOSS movements. Originally, developers in these spaces eagerly volunteered their free time to write code for the public good, believing that software should be a tool for human freedom. However, they are increasingly finding that their unpaid hard work is being scooped up by tech monopolies to build private, for-profit systems. Under many open-source licenses, anyone can use, edit, and republish the code for free, which allows corporations to legally incorporate this volunteer work into proprietary products. This creates a major contradiction in which developers create social value but corporations capture all the private profit (Barron 2013; Ross 2013; Söderberg 2002).

The early ideas behind the software revolution were strongly anti-corporate and focused on freedom (DiBona and Ockman 1999; Söderberg 2002). Starting in the hacker cultures of the 1970s and 1980s, the free software movement had argued that everyday users should have the

absolute right to run, copy, share, and change any software they used. During the late 1990s tech boom, leaders like Tim O'Reilly tried to bring these radical ideas into the mainstream business world. To make such ideas sound friendlier to corporate interests, they changed the name from "free software," which sounded "too political," to "open source," which sounded more like a smart business strategy (DiBona and Ockman 1999). A major weapon during the early, radical days was a legal trick called "copyleft." Copyleft worked like a Marxist critique of traditional copyright laws. Instead of using copyright to stop people from sharing, copyleft used the law to guarantee that any new versions of the software remained completely free and open for everyone to use forever (Kolođlugil 2015; Söderberg 2002).

Despite those early principles, the following decades saw a highly successful corporate takeover of the digital commons (Birkinbine 2020; Curto-Millet and Jiménez 2023; Ross 2013). Today, large scale corporate involvement in open-source software is the norm. The space is no longer just for determined enthusiasts working independently. Instead, much of modern open-source development is hosted on centralized corporate platforms where massive companies package volunteer code into profitable enterprise services. Giant companies like Amazon, Microsoft, and Google rely heavily on free, open-source code to run their profitable cloud computing empires (Birkinbine 2020; Wegner et al. 2024). In today's world, the term "open source" is rarely used as a political philosophy about user freedom. Instead, it is used as a marketing tool for corporations to make more money. It allows multi-trillion-dollar companies to push their research and development costs onto unpaid volunteers. The companies take the free code, wrap it up in private cloud services, and then charge users fees to access it (Birkinbine 2020; DiBona and Ockman 1999).

Even with this corporate takeover, making free software is still an important way to challenge the dominance of capitalism (Barron 2013; Ross 2013; Söderberg 2002). Free software gives real world proof that software can be made outside of the capitalist system. It shows that complex, global projects can be successfully managed without corporate leaders, hourly wages, or the promise of huge profits (Barron 2013; Söderberg 2002). However, modern collaborative platforms make this idea much more complicated. Platforms like GitHub, which is now owned by Microsoft, are the main places where this non-capitalist work is organized. While developers technically retain their copyright and often use copyleft licenses to protect their code, the platforms themselves act like a fence. They bypass the spirit of open licenses by finding ways to make money off the social interactions and data of the developers, such as using the massive repositories of free code to train proprietary artificial intelligence models. These platforms systematically harvest the developers' labor and seamlessly feed it straight into capitalist supply chains (Barron 2013; Wegner et al. 2024; Zygmuntowski 2022).

This kind of relationship is a serious threat to the survival of the open-source community (Birkinbine 2020; Curto-Millet and Jiménez 2023; Wegner et al. 2024). The financial struggle of open-source maintainers has turned into a systemic crisis. The people who are responsible for maintaining the critical security infrastructure of the entire internet are often not paid. They work nights and weekends to fix code that Fortune 500 companies rely on to make billions. In turn, this leads to severe burnout, abandoned projects, and security risks for everyone (Birkinbine 2020; Wegner et al. 2024). The companies absorb all the value of the digital commons, but they are not legally required to pay for its maintenance, support the creators, or provide a basic safety net to keep the system running (Birkinbine 2020; Ross 2013; Wegner et al. 2024).

Finally, the rise of platform capitalism has completely transformed how human labor is managed (Carbery and Khanjani 2025; Zygmuntowski 2022). We are seeing a rise in the "algorithmic management" of digital labor. This means that workers, whether they are Uber drivers, freelance content moderators, or digital creators, are watched, judged, and punished by automated computer systems instead of human managers. This removes all human empathy, further destroying collective bargaining power and taking away traditional workplace protections (Carbery and Khanjani 2025; Liang et al. 2022). This job insecurity is not just an accident; it is the root, engineered feature of platform-centric business models, which rely on digital platforms to connect users and workers directly to extract value from their interactions. This misclassification of workers as independent contractors shows a deliberate political economy of rules. Tech monopolies use these legal classifications and regulatory gray areas to systematically deny workers equal access to workplace protections and resources. Platforms successfully force the workers to pay for their own hardware, training, and health insurance. This deliberate and legal yet incorrect classification of workers protects the big tech companies from the responsibilities of being an employer while allowing them to maximize their profit margins (Liang et al. 2022; Wegner et al. 2024; Zygmuntowski 2022).

Section 4: Political Economy of Maintenance

The tech industry's pursuit of new innovations, coupled with corporate exploitation and manipulation of the digital commons, has caused a physical crisis in global cybersecurity by underfunding the digital infrastructure and maintenance labor required to keep essential software running (Jackson 2014; Lührsen et al. 2025; Sharma 2022). The hard work required to sustain, protect, and secure software is mostly invisible and unpaid. We are currently watching the slow and dangerous decay of the essential open-source code that keeps the world running because of

this neglect. This decay is evidenced by the increasing frequency of critical vulnerabilities found in widely used open-source libraries that are maintained by only one or two unpaid volunteers (Lührsen et al. 2025). These are not just fun hobby projects. They are the foundational digital building blocks that secure global banking systems, hospital networks, national power grids, and even everyday communication (Jackson 2014; Sharma 2022). Scholars often use a "digital roads and bridges" metaphor to explain this scary reality. Similar to how a physical bridge will eventually collapse if the government doesn't pay for its maintenance, the digital infrastructure of the modern internet is currently crumbling under the weight of corporate neglect and a massive shortage of maintenance workers (Lührsen et al. 2025; Sharma 2022).

Furthermore, a growing consensus in the literature argues that the tech industry's capitalist obsession with continuous disruption actively incentivizes the dangerous neglect of foundational infrastructure, further framing maintenance as an economically invisible cost (Boysel 2023; Jackson 2014; Lührsen et al. 2025; Sharma 2022). To fix this crisis, we need to adopt what scholars call broken world thinking. This framework recognizes that fragility is inherent to technology and emphasizes the ongoing labor of repair and maintenance over the initial act of creation. A move toward broken world thinking, rather than an exclusive focus on valuing innovation, will address the issues in current industry practices by ensuring sustainable upkeep. The tech industry's obsession with disruption rewards people who create new apps and platforms while ignoring the crumbling systems they leave behind. Broken world thinking requires a shift in our values, in which we must focus on the labor of repair over the beauty of building new things. We have to recognize that the long-term survival of our highly technological society depends much more on the nameless maintainers who fix bugs and patch security holes than on the billionaire CEOs who launch flashy new startups (Jackson 2014;

Lührsen et al. 2025). Unfortunately, the capitalist system depreciates the importance of maintenance in our digital culture where applications and content have a short lifespan. The system rewards the creation of new, profitable intellectual property. This leaves the vital, ongoing work of system upkeep unfunded and culturally ignored (Jackson 2014; Boysel 2023).

The significant danger of this neglect was clearly shown to the world by the Heartbleed bug, which served as an undeniable sign of infrastructure failure (Boysel 2023; Sharma 2022). When it was discovered in 2014, the Heartbleed bug exposed large security flaws in OpenSSL, a little-known piece of open-source software that had been largely ignored (Boysel 2023; Sharma 2022). The crisis revealed that a basic piece of security code that was relied on by multi-billion-dollar banks, governments, and corporations to secure millions of private data streams was being maintained by just a handful of overworked, unfunded volunteers with barely any budget (Boysel 2023; Sharma 2022). This disaster exposed the systemic risks hidden inside digital supply chains and proved that even bottom layers of the internet are incredibly fragile. We have built a precarious technological house of cards that could easily lead to economic and social disaster at any moment (Boysel 2023; Wegner et al. 2024).

This situation is a good example of the modern "tragedy of the digital commons," a crisis caused by the exploitation of unpaid labor (Boysel 2023; Sharma 2022). The traditional economic theory of the tragedy of the commons usually explains a public physical resource being ruined by overuse. However, the digital tragedy of the commons is different: corporations use open-source software without giving anything for it. Many corporations take billions of dollars in value from open-source code, but they do not reinvest any of that money into keeping that code safe or paying its creators (Boysel 2023; Sharma 2022). As a result, the maintenance of the internet depends solely on the unpaid maintainer class. While some maintainers receive

sponsorships, the vast majority of those who maintain the internet are not compensated in any way by the companies that rely on their code. These highly skilled developers are often guilt-tripped into continuing, in which they are documented in developer forums and burnout accounts, further providing free labor to prevent global cybersecurity disasters. They know that if they quit, the systems will crash, while tech monopolies simultaneously make billions off their volunteer work (Boysel 2023; Lührsen et al. 2025; Sharma 2022).

To understand how deep this crisis goes, we have to look at the economics of software dependency management (Boysel 2023; Wegner et al. 2024). As engineers often say, there is "no free lunch" in programming. Even though open-source code is free to download, the true cost of using it is just delayed. In turn, that cost shows up as huge technical debt, security breaches, or system meltdowns when the unpaid maintainers burn out and quit (Boysel 2023; Wegner et al. 2024). A careful review of collaborative digital platforms proves that the tech industry's current economic model is unsustainable and unreliable. The industry relies on a mathematically impossible idea, that there will always be an infinite, endless supply of free, highly skilled labor to subsidize the explosive growth of platform capitalism (Liang et al. 2022; Wegner et al. 2024; Zygmuntowski 2022). If that idea ever reaches a limit, a negative feedback loop will likely occur where the industry will only be able to sustain what paid labor can provide.

To prevent a systemic collapse, it is important that we organize public support for open digital infrastructure (Lührsen et al. 2025; Sharma 2022; Zygmuntowski 2022). We already know that relying on corporate charity does not work. Going forward, we need solid government-backed policies to allow software sustainability. Some proposals include creating national wealth funds specifically for tech maintenance, providing international grants, or forcing tech giants to pay a mandatory tax that goes directly to funding the open-source ecosystem they

profit from (Lührsen et al. 2025; Sharma 2022). Finally, the public sector needs to take a much larger role in digital maintenance. The government receives taxes to pay for physical highways, power grids, and water systems because those things are too important to fail. In the same way, the government must step in to treat foundational open-source software as a critical public good. We must provide the financial and structural support needed to keep the digital world functioning safely (Lührsen et al. 2025; Zygmuntowski 2022).

A world that truly values maintenance would financially prioritize the stability of digital infrastructure over the relentless pursuit of new features. In this system, targeted corporate taxes would be levied specifically on large technology firms whose business models rely heavily on the free foundational code of the digital commons. These funds could be managed by an independent public infrastructure agency that disburses grants and salaries directly to the maintainers of critical open-source dependencies. This approach creates a stable career path for essential digital maintenance, providing the appropriate financial incentive for developers to focus on the necessary work of security patching rather than relying on unpredictable voluntary sponsorships.

Conclusion

The transformation of the digital economy has been from the radical visions of the open-source movement with a focus on freedom to the highly controlled methods of modern platform capitalism, which shows a clear process of digital enclosure. When we look at this transformation through the Marxist framework of the general intellect, it becomes obvious that modern tech monopolies do not just provide neutral websites for people to shop and connect. Instead, they systematically block off our collective human knowledge. They generate wealth from the uncompensated mental labor of a financially insecure global workforce. This dynamic

looks a lot like a modern form of imperialism, where the Global South and an invisible underclass of open-source maintainers subsidize the trillion-dollar profit margins of Silicon Valley. The hopeful promise of a free, decentralized digital commons has been replaced by a system of constant surveillance, data extraction, and algorithmic control. The very tools that were supposed to liberate humanity have been redesigned into tools for corporate wealth.

The fallout from this digital enclosure goes far beyond academic debates, having caused a real-world crisis that threatens global stability. The underfunding of maintenance labor, clearly shown by systemic failures like the Heartbleed bug, shows just how fragile our digital supply chains truly are. The tragedy of the digital commons is not just an unfortunate accident of technology becoming too complex. It is a deliberate feature of an economic system that always focuses on flashy innovation and corporate free riding over essential security and sustainability. As long as our economy only rewards companies for disruption, the foundational "digital roads and bridges" of our society will continue to decay.

To fix this crisis, society must fundamentally abandon its obsession with constant innovation and fully embrace broken world thinking. We must change our legal and cultural approach to digital infrastructure. We can no longer expect the manipulated goodwill of unpaid maintainers to secure the entire global economy. We must legally recognize foundational software as a critical public good, treat big tech platforms like public utilities, and legally require strong financial support from both the state and corporations to pay for their maintenance. Current efforts to compensate those who maintain the internet, such as voluntary corporate sponsorships and ad-hoc grants, are insufficient to ensure long-term stability. Moving forward, foundational software, which is defined as the critical libraries, protocols, and security frameworks universally relied upon by public and private systems, must be targeted for support.

The specific developers maintaining these core dependencies should be systematically supported by the state and corporations to ensure a resilient digital future. Some critics might suggest alternatives to federal taxes, such as a digital labor movement where developers organize to demand compensation by threatening to let the infrastructure fail. However, the open-source community is currently too geographically decentralized for such coordinated collective action to be practical, making structural policy interventions the most viable solution. This is the only way we can begin to take down the exploitative mechanisms of platform capitalism. If we fail to do this, we guarantee not only deeper economic inequality, but the catastrophic collapse of the digital infrastructure that the modern world relies upon.

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