A friendly guide to the next era of the internet

WEB3

UNLOCKED



TURAN SERT

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Turan Sert is a seasoned professional with over two decades of experience at the intersection of finance, technology, and strategy. His career has spanned multiple disciplines, including audit with Arthur Andersen, investment banking at Garanti Bank, management consulting with Booz Allen & Hamilton, and investment management at Fiba Holding. He has also held operational leadership roles at Ozyegin University and has firsthand experience as an entrepreneur in a technology startup.

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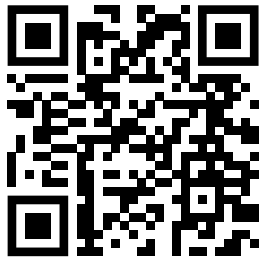
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Note: This book was first written in Turkish and published in January 2025. Several sections were originally published online in Turkish and were later revised and incorporated into the book. This English edition is a translation of that original work.

Translating it for a wider audience required more than a word-for-word rendering. It needed to carry the same arguments, precision, and voice in English. I began with an initial draft translation using DeepL, then used Gemini 2.5 Pro and GPT-4o to help polish the English by tightening dense passages, reducing repetition, and improving flow.

All changes were made under my direction, with terminology and claims checked against the Turkish text. I am grateful for the tools that helped bridge the language gap, and pleased to share this edition with you.

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Introduction

The internet is not a finished product; it is a living system, constantly remade by new ideas and technologies. We are currently living through its third great transformation, a period of architectural upheaval that promises to redefine our digital lives by placing ownership, privacy, and community at the center. This book is a mapping of this new territory. It is designed to guide you through the foundations, technologies, communities, and applications of Web3, offering a clear and grounded understanding of a world that is still being built. Our journey begins where all stories do: the genesis.

The Foundations of the Web

In this first chapter, we trace the evolution of the internet through three distinct phases: Web 1.0: Read-Only, Web 2.0: Platforms, and Web3: Ownership. Understanding this history is key, as each era is defined by its core technologies, guiding philosophy, and economic model, which directly set the stage for the next.

Web 1.0: The Read-Only Web

The internet began as Web 1.0**,** an era defined by building the fundamental infrastructure. Stemming from a US military project to create a decentralized communication network, researchers developed core protocols like TCP/IP and HTTP as **open-source, free-to-use standards**. Its creators focused on building a stable, lasting foundation, not on the user experience.

This version of the web was built collaboratively by researchers and was truly distributed, but it remained clumsy and inaccessible to the average person.

Web 2.0: The Rise of Platforms

Web 2.0 marked the internet's commercialization. Entrepreneurs and venture capitalists saw an opportunity in Web 1.0's poor usability and rushed in to build user-friendly applications. This shifted the web's philosophy entirely. The open, slow-moving approach was replaced by a fast, proprietary model focused on user acquisition. This led to the creation of centralized platforms and "walled gardens" controlled by a few tech giants. The business model offered free services in exchange for user data, which was monetized through targeted advertising. This concentration of power ultimately led to issues of privacy, manipulation, and censorship. The Facebook–Cambridge Analytica scandal famously demonstrated this risk, showing how the data-driven advertising systems at the heart of these platforms could be used to weaponize user data and influence elections.

Web3: The Ownership Economy

Web3 emerged as a direct response to the centralization of Web 2.0, aiming to combine the decentralized ethos of Web 1.0 with the rich user experience of Web 2.0. Its foundation is **blockchain technology**, which enables digital trust and ownership without relying on central intermediaries. This technology powers an "ownership economy," where value is shared among all participants—including users, developers, and investors—rather than being captured by a single company.

While Web3 faces significant challenges in user experience and finding mainstream applications beyond speculation, it is making inroads in digital-native sectors. Key areas of innovation include Decentralized Finance (DeFi), digital collectibles (NFTs), gaming, and new forms of community organization called DAOs. The ultimate goal of Web3 is to return control of data and digital assets to the individual, creating a more open and equitable internet.

This history brings us to a new question: what is the underlying machinery that powers this new web?

Key Pillars of the Web3 Economy

In this second chapter, we break down the core engines of the Web3 economy, moving from historical evolution to the principles and technologies that power it today. We start with Ethereum, as its economy serves as the undeniable center of gravity for this new digital world, and place it alongside its predecessor, Bitcoin, and its high-performance rival, Solana, to understand the different philosophies for building a decentralized future.

We see Ethereum not as a company but as a sovereign digital nation. Its economy is fueled by **transaction fees** paid by its users and Layer 2 networks, a complex revenue stream from transaction ordering known as **MEV**, and a new pillar based on exporting security called **restaking**. This design is built on a modular philosophy, where the main network provides security while outsourcing the bulk of user activity to a constellation of **Layer 2 solutions**. This stands in contrast to monolithic chains like Solana, which handle all tasks on a single, powerful layer.

This architecture is creating a more user-centric internet. The chapter examines the key pillars making this possible. **Bridges** act as the pathways connecting these once-isolated digital islands, allowing value to flow freely. We then turn to the user experience, where two concepts are essential. First, **wallets** are being reinvented through Account Abstraction, which turns them into smart, programmable software that eliminates the unforgiving seed phrase and makes Web3 safer for everyone. Second, a fundamental shift toward **intents** is reshaping how we interact with the system. Instead of giving complex commands, users simply state their goals, and a competitive market of "solvers" finds the best way to achieve them, hiding the underlying complexity of a multi-chain world.

If this sophisticated architecture isn't self-organizing, then who is shaping this new frontier?

Meet the People Powering Web3

In the third chapter, we meet the people who are building Web3. The future of the internet is not defined by technology alone, but by the new economic and social roles being created for its builders, funders, and users.

The core promise is a shift from the Web 2.0 model, where central platforms extract value, to a new paradigm where value is created and shared by the entire network.

At the center of this new world are **communities**. They are the driving force of any project, evolving from a small founding team into a broad ecosystem. This transition is managed by Decentralized Autonomous Organizations (**DAOs**), which serve as a new kind of internet-native corporation, allowing global communities to govern themselves and manage shared resources transparently on the blockchain.

The roles of **founders and investors** appear to be changing as well. Founders in this space often operate differently, tending to be more global and flexible, with some even working anonymously. By using open-source code, they can form smaller teams and build new things quickly.

Similarly, the role of the investor is shifting. Instead of holding exclusive control, an investor's success is often more closely tied to the overall health of the project's community. This has led to models where value is shared more broadly among developers and even early users.

Developers are the architects of this landscape, and tracking their movement is the best indicator of future innovation. Data shows that while market hype has faded, a growing core of seasoned developers remains, talent is becoming more global, and builders are increasingly working across multiple blockchains. The system's integrity is upheld by **miners and/or validators**, a decentralized workforce that secures the network in exchange for a stake in the system.

Finally, Web3 redefines the **user** from a product to be monetized into an owner and participant. While adoption is still in its early stages, it is tracking the growth of the early internet. The key to reaching a mainstream audience lies in radically improving the user experience, particularly through new wallet technologies that make the decentralized web both safe and simple to use.

Now that we have a clear picture of who is building this new web, what exactly are they building?

Exploring Web3 in Everyday Life

In this chapter, we explore the practical applications of Web3, moving from its theoretical building blocks to the projects and platforms you can use today. This tour covers the most developed corners of the ecosystem and ventures out to its emerging edges, showing where the code is meeting the real world.

The New Financial System

The journey begins with Web3's most mature areas. We first examine the paradox of **stablecoins**. They have become the bedrock of the crypto economy by solving for volatility and on-ramp/off-ramp problems, yet they often do so by relying on the same centralized systems Web3 aims to replace. From there, we explore **Decentralized Finance (DeFi)**, which rebuilds traditional financial services as transparent, open-source protocols that anyone can access.

The Ownership Economy

Next, we move beyond finance into digital culture and ownership. We see how **NFTs** provide true ownership of digital assets by creating a public, verifiable record of provenance. This concept of ownership is transforming industries like gaming, where the model is shifting to "Play-and-Own," granting players control over their in-game items. The same principle extends to our online lives, where **Decentralized Social (DeSoc)** and a sovereign **digital identity** aim to return control of our data and social networks to the user.

The Next Horizons

Web3's ambition also extends into the physical world and toward future challenges. **Decentralized Physical Infrastructure Networks (DePIN)** use token incentives to build community-owned hardware for services like file storage and wireless connectivity. We also look toward emerging fields

like **Regenerative Finance (ReFi)** and **Decentralized Science (DeSci)**, which aim to build more equitable systems for funding environmental and research initiatives. The tour concludes by examining the powerful convergence of **Web3 and Artificial Intelligence**.

Lessons from the Field: Case Studies

The chapter concludes with case studies that ground these concepts in recent history, highlighting both the ecosystem's potential and its perils. The cautionary tales of the 2022 crisis are examined through the collapses of **Terra**, **Three Arrows Capital (3AC)**, and the **FTX** exchange. These events serve as a stark reminder of the dangers of centralization and excessive leverage, demonstrating that the industry's largest failures stemmed not from decentralized protocols, but from opaque, human-run companies.

Set against these crises are stories of innovation and adoption. The launch of **PayPal's** stablecoin illustrates how FinTech is beginning to build on Web3 rails, while the emergence of a "synthetic dollar" from **Ethena** showcases the relentless pace of native DeFi innovation. Finally, a look at the **2023 US banking crisis** provides crucial context, showing that failures of risk management are not unique to crypto and underscoring the universal need for more resilient financial systems.

This brings us to the core of their work: what lies at the heart of all these applications and financial systems?

Exploring Tokenization

In this fifth chapter, we explore tokenization, the process of creating the digital assets that fuel the Web3 economy. Understanding tokens is essential, as they represent the ownership, currency, and rights within this new digital world, and their design determines how value and power are shared.

What Tokens Are and Why They Matter

A **token** is a digital representation of ownership secured by a blockchain.

To grasp its importance, we must first understand the "copy-paste" problem of the digital world. While physical assets are naturally scarce, digital files can be copied endlessly, making them unable to hold value. For decades, we solved this with centralized trust, relying on banks to manage our digital ledgers.

Blockchain offers a breakthrough by creating true digital scarcity without needing an intermediary. A token is a scarce digital asset recorded on this shared public ledger. Its most important feature is **programmability**—the ability to embed rules and logic directly into the asset. This superpower transforms a simple digital record into a dynamic piece of software, unlocking new efficiencies and markets. To ensure these assets can work together, they are built on common blueprints, or standards, such as ERC-20 for money-like fungible tokens and ERC-721 for unique non-fungible tokens (NFTs).

The Token Economy

The discipline of designing a token's lifecycle—from creation to distribution—is called **tokenomics**. Unlike traditional company shares distributed to founders and investors, Web3 tokens are shared with a much wider ecosystem, including developers and users. This is often done through **airdrops**, a method for distributing tokens to early supporters that evolved from simple giveaways into a sophisticated game of rewarding genuine community engagement.

While the potential market for tokenized assets is enormous, predicted to reach $16 trillion by 2030, significant hurdles remain. The primary challenge is the conflict between global, permissionless blockchains and local regulations. Furthermore, securely linking a token to a real-world asset and overcoming crypto's negative reputation are critical problems yet to be fully solved. Some large institutions are now exploring private blockchains to address these issues, an approach that saw limited success in the late 2010s and conflicts with the open ethos of Web3.

Tokenization in the Real World

Despite these challenges, tokenization is moving from theory to practice. Wall Street giant **BlackRock** made a landmark move by launching BUIDL, a tokenized fund on the public Ethereum blockchain. This fund allows crypto-native institutions to earn a yield on U.S. Treasury bonds directly on-chain, making their capital more efficient. In another pioneering example, a **house in South Carolina was sold as an NFT**. By placing the property into an LLC and tokenizing the ownership, the sale bypassed much of the traditional paperwork, offering a glimpse into a future where physical assets can be traded with digital speed.

If these pioneering examples are more than just novelties, what future are they pointing toward?

What's Next for Web3?

In this chapter, we explore the future of Web3 by focusing on fundamental technology shifts rather than market speculation. Understanding what comes next requires looking at the road ahead in two stages. First, we examine the critical short-term period of 2025-2026, where the technology is maturing. Then, we look further to its long-term evolution through 2030.

The Short-Term Horizon (2025-2026)

The next two years are about moving from promise to product. After a decade of development, Web3's foundational infrastructure is now largely in place. Networks are solving their final scaling and security challenges with Layer 2 solutions and zero-knowledge proofs. At the same time, transfers between blockchains are becoming seamless through new models like user 'intents'.

With the core technology solidified, the industry's focus is pivoting to user-facing applications. The next challenge for Web3 is design, as applications must hide their complexity to reach everyday users, much like FinTech did for traditional banking. This push for adoption is supported by

evolving regulations in the US (GENIUS and upcoming CLARITY acts) and EU (MiCA), which are providing greater clarity for stablecoins and digital asset custody. Growth will follow the path of least resistance, advancing first in fully digital sectors like gaming, AI, and the tokenization of financial assets. While most applications have yet to find true product-market fit, a few areas have proven their utility: stablecoins provide an escape from inflation and global access to yield, DeFi enables new capital markets, and prediction markets have become powerful tools for information discovery.

The Long-Term Outlook (2026-2030)

Looking further ahead, several powerful trends are poised to define Web3's next chapter. The market's center of gravity could shift from individual users to institutional capital. Financial services may adopt a "CeDeFi" model, where familiar apps run on decentralized rails in the background. In this scenario, the user wallet would become the primary interface, seamlessly managing all activity. As governance models mature, DAOs are likely to become vehicles for funding ambitious projects.

By 2028, the conversation could be dominated by artificial intelligence. The central conflict may arise between Big Tech's centralized AI and a new wave of decentralized, Web3-native projects. Ultimately, autonomous AI agents could become the primary users of Web3, executing the vast majority of network transactions.

Together, these chapters form a comprehensive journey through the Web3 landscape—from its philosophical origins to its technological core, from the people building it to the applications they are creating, and finally, toward the horizon of what's to come. This introduction has laid out the roadmap. The chapters that follow will walk the path, providing the detail, context, and clarity needed to navigate this next era of the internet. The exploration starts now.

Chapter 1

The Foundations of the Web

Web3 didn't appear out of thin air—it emerged gradually from earlier versions of the internet. Understanding Web3 requires looking closely at the worlds that shaped it: Web 1.0 and Web 2.0.

Web 1.0: The Age of Protocols

Let's start with a story you've probably heard bits and pieces of. The internet is, at its core, just a massive network of computers talking to each other. While the idea is nearly a century old, the first real computers in the 1950s laid the practical groundwork.

The internet's real origin story, however, was forged in the Cold War. In the 1960s, the US military and government-funded universities began tackling a critical question: "In the event of a nuclear attack, how do we protect our most vital information?" The primary threat was centralization. If all your data is in one place, it only takes one hit to lose everything. The solution was clear: build a *decentralized structure*.

This thinking gave birth to the ARPANET project, which led to the creation of TCP (Transmission Control Protocol) and IP (Internet Protocol) in 1974[1]. These protocols were the rules of the road for this new network.

At the same time, a critical piece of infrastructure emerged: the DNS

1 These protocols were implemented on ARPANET in 1983.

(Domain Name Service). Designed in the early 1980s, it provided a system for turning human-readable domain names like google.com into network addresses. When the NSFNET project connected university supercomputers in 1986, the DNS became essential for navigating the rapidly growing network.

The web as we know it, the 'www', arrived in the late 1980s. Tim Berners-Lee, a researcher at CERN, saw scientists struggling to share information across different machines. His solution was a standardized system for linking documents, giving us the foundational trio of the modern internet: HTML, HTTP, and the URL.

The Philosophy of Web 1.0

Web 1.0 wasn't about apps or social networks; it was about building the fundamental rails. This era was defined by a few core principles.

Infrastructure Built to Last

Building a global communication network is a monumental task that demands a long-term vision. You have to design an architecture that can last for decades.

It's not something you can rush. Imagine trying to build the internet with venture capital. Investors want a return, and they want it fast. That model works for consumer products, but not for deep infrastructure. The digital ground we all stand on has to be stable.

You can't just say, "I designed it this way yesterday, but I'm changing it today." Thousands of applications depend on that foundation remaining predictable and solid.

Open and Free by Design

That's why the core protocols of Web 1.0 were built as open-source software, free from licensing fees. Think about it: you don't pay a toll to use HTTP or TCP/IP. Pretty remarkable, right?

This was a deliberate choice. Universities shared their research freely,

allowing developers to build on each other's work instead of in their own separate bubbles.

This collaborative spirit created standardized protocols that could speak to each other. Without it, we would have faced a digital Tower of Babel—a fragmented world of incompatible networks. The internet as a unified, global platform would have been impossible.

Clumsy by Modern Standards

Let's be honest: Web 1.0 was not user-friendly. Its creators were not focused on user experience; they were busy solving fundamental engineering problems. Anyone who remembers the screech of a dial-up modem and the agonizing wait to connect can attest to this. The sleek, intuitive applications we take for granted today were still a decade away, waiting for the next phase: Web 2.0.

A Truly Distributed Network

The internet began as a connection of independent machines in different places. Web 1.0 embodied this principle. Innovations came from universities across the US and Europe, were debated openly, and became standards through community consensus.

While a few institutions took the lead, the process itself was distributed. It was a network built by a community, for everyone—a core idea that would lie dormant for years, only to re-emerge with a vengeance in Web3.

Web 2.0: The Age of Platforms

From Protocols to People

Web 1.0 built the foundation. Its academic and military architects gave us the gift of open, free protocols—the fundamental rules that allowed a global network to exist. But they weren't building it for the masses. They were building it to solve technical problems.

The move to Web 2.0 was not a single event, but a huge shift in how people thought about the internet. The process began in the early 90s when the closed network of universities and military bases was opened up to commerce. The arrival of the first Internet Service Providers (ISPs) was the turning point. For the first time, the internet wasn't just a research project; it was a product.

Web 2.0 refers to the era when the internet shifted from static pages to interactive platforms built around user-generated content.

In short, Web 2.0 was the commercialization of the internet.

The Problem of Potential

So why was this shift necessary? Because Web 1.0, for all its technical brilliance, was practically unusable for the average person.

The researchers who built the early internet weren't incentivized to think about user experience. When they applied for research grants, they promised technical breakthroughs, not beautiful design. Polishing an interface didn't have much "scientific value." As a result, the user was an afterthought.

As the internet's foundations solidified, a few people started to see its mind-boggling potential. This network could connect billions of people for communication, collaboration, and commerce on a scale never before imagined. But there was a catch: getting online was a nightmare. You needed a computer, an expensive and unreliable connection from an ISP, and the patience to navigate a clunky, unforgiving interface. To see the benefits of the internet, you first had to conquer it.

This friction created one of the biggest business opportunities of the late 20th century.

The Gold Rush

Entrepreneurs and investors saw the massive gap between the internet's raw potential and its frustrating reality—and they rushed in to fill it. This marked a fundamental handover. The center of gravity for web development shifted from university campuses to the private sector.

A natural division of labor appeared. The research arms of large corporations focused on the hard, expensive problems of hardware and infrastructure. The job of building user-friendly applications fell to a new wave of nimble, fast-moving startups.

Thousands of them sprang to life, armed with flashy pitch decks showing the internet's promise. They knocked on the doors of venture capitalists and raised millions. This kicked off the dot-com frenzy. Then, in 2000, the bubble burst. Dozens of startups that had failed to turn hype into a sustainable business were wiped out.

But from the wreckage, titans emerged. Companies like Amazon and Google, which survived the crash, had finally cracked the code. They proved that unimaginable commercial value could be built on the open protocols of Web 1.0, and in doing so, they wrote the playbook for the next twenty years.

The Defining Features of Web 2.0

So what did this new era look like? In almost every way, Web 2.0 became the polar opposite of Web 1.0. Its defining features weren't just technical, but philosophical.

Fast, User-Focused Applications

While Web 1.0 was about building the slow-moving, foundational infrastructure, Web 2.0 was about the fast-moving applications built on top of it. The focus shifted entirely to the end-user. The primary goal was to get as many users as possible, as quickly as possible.

Figuring out what millions of people want is hard. Some features catch fire, while others fizzle out. So, the Web 2.0 playbook was to ship products quickly, measure user reactions, and iterate constantly. The slow, deliberate planning of the protocol era was replaced by a new mantra: "move fast and break things." This relentless focus on creating user-friendly experiences is what finally made the internet accessible to everyone.

Proprietary, Walled Gardens

This speed and growth was fueled by venture capital. VCs invest in risky projects expecting massive returns from the few that succeed. To meet these expectations, Web 2.0 startups had to find ways to win—and win big.

This meant the open, collaborative spirit of Web 1.0 was a thing of the past. Startups fiercely protected their code with copyrights and trade secrets to prevent rivals from copying them. Their goal wasn't just to acquire users, but to *capture* them. To do this, they built "walled gardens"—closed ecosystems offering everything a user might need, making it difficult for them to leave.

Radical Centralization

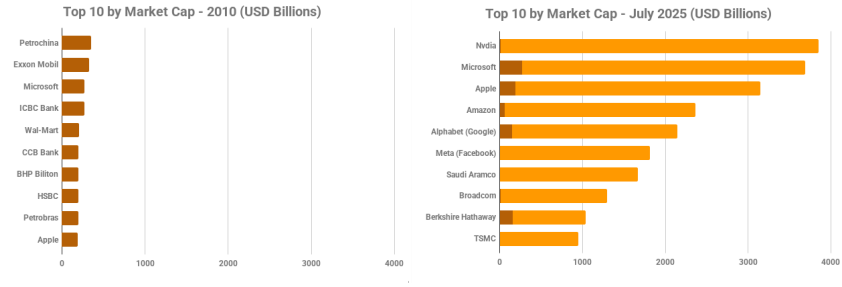
This combination of venture capital and explosive growth created an inevitable endgame: centralization. A successful startup eventually faced a choice: go public or get acquired by a larger company.

If they went public, their new boss was Wall Street, which demanded one thing above all else: relentless, predictable quarterly growth. This pressure, felt constantly by executives, left them with two paths. They could find new ways to grow their own business, or they could acquire other startups to create a story of growth for investors.

This spiral of acquisitions consolidated the market, creating a handful of giants that dominated the entire digital landscape.

The change in the most valuable companies list in 15 years reveals the stunning results of this consolidation.

The world's 10 most valuable companies (2010 and 2025 - in billions of USD)



In 2010, the world's largest companies were in oil and finance, with only Microsoft and Apple representing tech. By mid-2025, the list is dominated by technology companies, which hold the top spots. The Web 2.0 model didn't just create products; it concentrated wealth and power at an unprecedented scale.

This concentration of power in the hands of a few platforms came with its own set of problems.

The Price of "Free"

The Web 2.0 model, funded by venture capital, was built on a simple premise: grow your user base as fast as possible, at any cost. For years, profitability wasn't just ignored; it was a banned word. The only metric that mattered for startups was answering the question, "How many users have you reached?"

This strategy created tech giants and made their early products free to use. But there was a hidden cost. If users weren't paying for the product, then what was the business model? What were companies monetizing?

The answer was simple and unsettling: users themselves. Their attention. Their data. Their behavior. And eventually, their beliefs.

That is where the real problem started. How do you deliver infinite profit growth when you've already captured billions of users? You can't grow your user base by 50% year-over-year when almost everyone is already on your platform.

The tech giants needed a new story to tell investors in their quarterly earnings calls. The story they came up with was simple: if you can't get more users, you have to extract more value *from* your existing users. The business model pivoted from user acquisition to user monetization.

This is how we got the ad-supported internet. Companies like Facebook and Google realized the most valuable asset they had was user attention and data. They became the two biggest advertising agencies in the world. To sell more ads, they needed to make them more effective.

The key was personalization. A billboard is seen by thousands but is relevant to almost no one. But showing a baby food ad to a mother who just shared photos of her newborn? That's incredibly effective. So they started analyzing the data we willingly gave them.

Soon, even that wasn't enough to feed Wall Street's voracious appetite for more profit. To meet this demand, the platforms needed to learn more about us than we were consciously sharing.

Their data collection became so pervasive and their predictive models so powerful that it often felt like they were listening to our private conversations. A discussion with a spouse about a broken washing machine might be followed by a flood of washing machine ads.

This led many users to believe their phone's microphone was being used for ad targeting—a claim the companies have always denied. The reality is that their other data, from search history to social connections, allows them to make startlingly accurate predictions about our needs and intentions.

Advertising was one thing, but it wasn't the final step. These platforms soon realized the data itself was a valuable commodity. While they claim they don't sell your personal data directly, they use it to offer targeted ads. The consequences of this became terrifyingly clear in the 2010s. The same machinery built to sell products was used to sell political ideologies, famously culminating in the Cambridge Analytica scandal, where user data was weaponized to influence elections. The tools of commerce had become tools of manipulation.

Web3: The Quest for Digital Ownership

The Movement Begins

As the flaws of Web 2.0 became undeniable, a movement was already brewing. Its roots trace back to a forward-thinking group known as the **cypherpunks**.

Long before the rest of the world caught on, this digitally-native community of activists and computer scientists saw the danger ahead. They saw a threat to privacy and rights in handing the internet to just a few corporations.

Their thinking was a reaction to the great centralization of power in Web 2.0. They diagnosed a fundamental problem at the core of the digital world: the problem of trust.

In our physical world, we have systems for establishing trust and ownership. But online, in a global village of strangers, how do you verify anything?

- **The Trust Problem:** How can you trust that the person you're dealing with is who they say they are? Web 2.0 solved this with a central intermediary—Facebook, Google, or your bank—vouching for everyone.
- **The Ownership Problem:** How can anything digital be scarce or valuable? In a world of 1s and 0s, any file, like an mp3, can be copied a million times, instantly and perfectly. An infinitely available asset is effectively a worthless asset. Again, Web 2.0 solved this with a central intermediary—a company whose private database declared who "owned" what.

This created a paradox. The very intermediaries we trusted to create order became the new rulers. They held all the power, took the lion's share of the value, and trampled user rights to satisfy their business models.

So the cypherpunks started asking some revolutionary questions:

How can we own a digital asset the same way we own a physical one? How can we prove it's ours, ensure it can't be endlessly copied, and transfer it to someone else without a powerful middleman taking a cut and setting the rules? How can we reclaim our share of the value we create?

The breakthrough that solved all these critical questions at once was **blockchain**.

What Blockchain Delivers

How do you solve the puzzle of trust and ownership in a digital world without a middleman? The answer wasn't a single new invention, but a clever mix of three powerful technologies.

The first two ingredients were already well-established. The internet gave us the network, and **cryptography**, which matured in the 1980s, gave us a way to secure information.

The third, decisive ingredient was the secret sauce: a **consensus mechanism**. This was the genius of the anonymous creator(s) known as Satoshi Nakamoto. The insight was profound: instead of trying to replace the powerful intermediaries of Web 2.0 with another single entity, why not shatter their function into a thousand pieces and distribute it across a global network?

But this created a new, incredibly difficult problem: How do you get thousands of independent computers, who don't know or trust each other, to act in unison and agree on a single source of truth?

This is the hurdle that the "Nakamoto Consensus" cleared.

A network of thousands of machines acting as one—it's revolutionary for two reasons. First, it can record transactions accurately without taking orders from a central boss. Second, its design makes it virtually impossible to retroactively alter those records.

By solving these two issues, the network creates the thing every transaction needs: **trust**.

For the first time, people could own a digital asset with absolute confi-

dence. They could prove its authenticity and scarcity, assign it value, and transfer it to anyone else in the world—all without needing permission from a bank, a corporation, or any other authority.

This "trust machine" became the technological foundation for Web3. It enabled a new wave of initiatives built on decentralization and community ownership—a direct challenge to the walled gardens of Web 2.0.

A Brief History of Web3

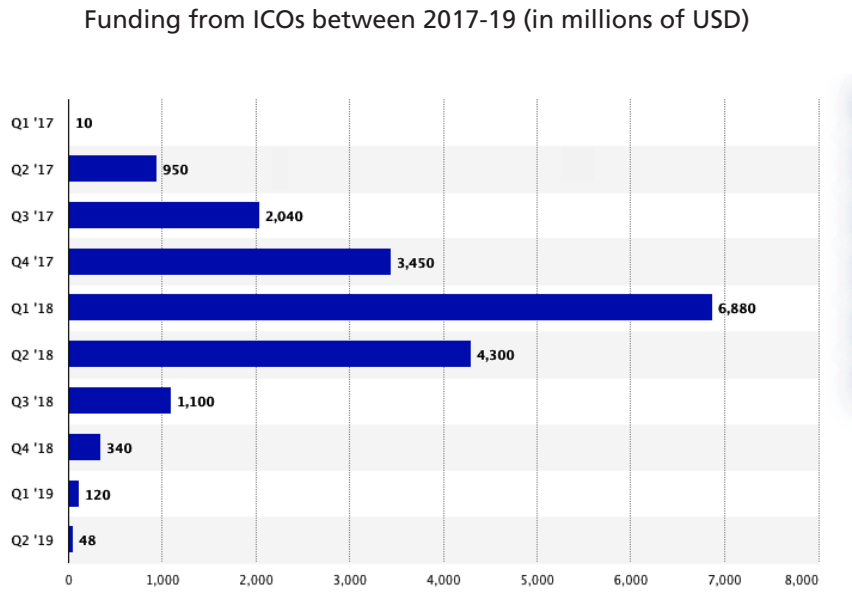
Bitcoin's launch in 2009 was the spark, but Ethereum lit the fuse for the Web3 explosion.

The movement began with a philosophical split. A group within the early Bitcoin community, led by a young programmer named Vitalik Buterin, saw that blockchain technology could be for more than just money. They envisioned a decentralized computer that could run practically any application. This clashed with the prevailing view among Bitcoin's developers, who argued that the mission was "censorship-proof digital money," and any other focus would dilute that vital goal.

Buterin's group left to found Ethereum with a new, broader mission: to be a decentralized infrastructure on which *anyone* could build.

This new vision required funding. While Bitcoin was developed without outside capital, the Ethereum founders took a different path. In 2014, they raised about $18 million in a public crowdsale—an Initial Coin Offering (ICO)—selling their ETH token for around 31 cents each. By the end of 2017, ETH was trading at $750. This astronomical return changed the game.

The success sparked the great ICO boom of 2017. A flood of investor appetite swept the market, with startups raising incredible sums. Many of these ventures offered little more than a whitepaper.



Quarterly funding from ICOs shows the speculative peak in late 2017 and early 2018, followed by a sharp decline. (Source: *Statista*)

The boom was not sustainable. As poor-quality projects and failed promises mounted, investors fled. The market plunged into a "crypto winter" that lasted nearly three years. Many who had chased quick fortunes were burned, losing faith in the technology.

In hindsight, this bear market was exactly what the space needed. With the noise of speculation gone, serious teams could finally focus. The winter became a time for building. Good teams refined their projects, pivoted, and searched for genuine problems to solve for real users.

The world changed in 2020. The pandemic and the ensuing government stimulus provided the spark the market was looking for. That summer, the work done during the crypto winter bore fruit. We witnessed the explosion of "DeFi Summer," as decentralized finance applications finally delivered on the promise of a new financial system. This was followed by the NFT craze, which showed the world the power of true digital ownership for art and collectibles.

The momentum slowed in 2022 as crises in the broader financial markets took their toll (we'll explore these in Chapter 3). However, this downturn set the stage for one of the most significant bull runs in the technology's history.

The approval of spot Bitcoin ETFs in the US in January 2024 triggered a massive wave of institutional investment, pushing Bitcoin to record highs throughout 2024 and 2025. This rally was further amplified by the approval of spot Ethereum ETFs. A decisive shift in the U.S. political landscape toward a pro-crypto stance following the 2024 election also played a key role.

The cycle of boom, bust, and building continues, with this latest round cementing Web3's role as a fixture in the global financial and political system.

What Makes Web3 Special?

The philosophy of Web3 is to combine the decentralized freedom of Web 1.0 with the rich, user-friendly experience of Web 2.0.

A New Foundation

You can't build a decentralized world on centralized rails. While Web 2.0 built its applications on the original internet architecture, Web3 required a new foundation from the ground up, built on the principle of decentralization. That foundation is the blockchain.

This new architecture is powerful, but it's still in its early days. Blockchains have matured enough to support a growing ecosystem of applications, but they still have a long way to go. The two biggest hurdles are **scalability**—the ability to handle massive, global demand without slowing down—and **interoperability**, which will allow different blockchains to communicate and transfer assets seamlessly.

The applications built on this infrastructure are also maturing. Early applications were often vulnerable to attack, but with each challenge, they have evolved, closing security holes and becoming more "bulletproof." Today, the single biggest obstacle is user experience. The promise of Web3 is

immense, but its complexity is still a major barrier. Until using a decentralized application (dApp) is as easy as using a Web 2.0 app, mainstream adoption will stay just out of reach.

Trust Through Radical Transparency

Web3 revives the open-source ethos of Web 1.0, and for a critical reason. In Web 2.0, you trust a corporation. You trust that Google or Meta will follow the law and protect your data because they have offices and are subject to regulation. In Web3, the service provider isn't a company; it's a piece of software. There may be a team behind it, but they could be anonymous.

So how can you trust it? By making the code **open source**.

This transparency is non-negotiable. It allows anyone to "x-ray" the software, audit its logic, and verify that it does exactly what it promises—and nothing more. This is a fundamental shift from "trust the corporation" to "trust the code."

For builders, this open-source nature is a double-edged sword.

On one hand, it creates **compounding innovation**. Teams don't have to solve the same problems over and over. They can take existing open-source components—like digital Lego blocks—and build on top of them. This frees up talent to tackle new frontiers and accelerates the pace of progress for the entire ecosystem.

On the other hand, it creates **relentless evolutionary pressure**. There are no trade secrets. Every innovation is instantly visible and can be copied by competitors. The only way to stay ahead is to move faster and build a stronger community. In the world of Web3, there is no catching your breath. You innovate, or you become obsolete.

The Ownership Economy

Make no mistake: Web3 is intensely commercial. The era of venture capital arrived early, with ICOs providing the fuel for development. But Web3 operates with a radically different set of economic rules.

In Web 2.0, the value created by a startup flows to a small group of founders and investors. Web3 blows this model apart. It introduces an "ownership economy" where the value is designed to be shared among everyone who helps build and sustain the network. This includes not just the core team and investors, but also the external developers who build on the protocol, the validators who secure the network, and even the early users who give it life. The goal is no longer just to have users; it's to turn users into owners. We'll explore who these new stakeholders are in the chapter 'Actors of the Web3 World'.

A Return to a Decentralized Web

At its core, Web3 is a philosophical return to the roots of the original internet. The first protocols like TCP/IP and HTTP were open, permissionless, and belonged to no one. Web 2.0 abandoned this ethos for centralized, walled gardens.

This centralization created choke points of control. When power is concentrated, it can be manipulated by outside forces—be it politicians, states, or influential organizations. The 2024 U.S. law requiring the Chinese-owned platform TikTok to divest its U.S. operations or face a ban is a powerful reminder that centralized platforms are subject to the agendas of nation-states.

Web3 is a direct response to this vulnerability. Its infrastructure is deliberately designed to be decentralized, making it resistant to censorship and control. The goal is to ensure no one can be denied access to their digital assets or silenced because of their beliefs.

It's crucial to understand, however, that decentralization is a process, not an event. A Web3 project typically starts with a centralized team to move quickly and find its feet. Over time, it undergoes **progressive decentralization,** like a rocket shedding its booster stages. The founding team gradually hands over control to the community.

One of the most important steps in this journey is the creation of a DAO (Decentralized Autonomous Organization)—a structure that allows strategic decisions to be made by the community. This transfer of governance is

often powered by issuing a "governance token," which is distributed among the team, investors, and the wider community of contributors. We'll dive into the mechanics of this in the fifth chapter, 'Tokenization'.

Challenges Facing Web3 Today

For all its revolutionary promise, Web3 is a long way from being finished. It faces enormous challenges, and pretending otherwise does a disservice to the real work being done. While progress is made every day, especially on the core infrastructure, the movement has yet to overcome its biggest obstacle: for most people, Web3 isn't yet a part of daily life.

This is the ultimate test for any new technology. To break through, it needs to solve real problems for real people. Web3's journey to clear this hurdle involves several key challenges.

The Search for Product-Market Fit

Very few Web3 projects have answered the most important question in technology: "Does anyone actually want this?" It is incredibly difficult to build a product that users genuinely need, especially when you have to convince them it's better than the seamless Web 2.0 alternative they already use.

To be fair, there are clear success stories. **Bitcoin** is the most prominent, but even it had to evolve. Its original mission was to be peer-to-peer digital cash, but the market decided its true value as a "digital store of value," or digital gold. You can see this evolution on crypto exchanges, where **stablecoins**, not Bitcoin, have become the primary medium of trade. Stablecoins themselves are the other undisputed success, providing a critical bridge between traditional finance and the crypto world.

Beyond these, infrastructure projects like **Ethereum** and **Solana** have found their footing. They are the B2B successes of Web3—the decentralized cloud providers on which other applications are built.

But when we turn to applications meant for the average person, the picture gets murkier. This leads to an uncomfortable truth that many in

the industry won't admit: for many, the primary use case for Web3 today is **speculation**. The main "product" they are using is the hope of a future payday by getting in early.

This isn't a reason for pessimism, but for realism. Every major technological shift—from the railroads to the internet itself—was fueled by a wave of speculation. It's a noisy and often frustrating phase, but it's also the phase where countless experiments are run. The real, lasting value emerges from the lessons learned in the wreckage of those that fail.

The Last-Mile Problem: User Experience

For Web3 to win, its products can't just have novel benefits; they must be a joy to use. Right now, for anyone outside the crypto-native world, they are often a nightmare.

The first door a new user walks through is the crypto wallet, and it's where most get stuck. We in the industry must admit a hard truth: the 12 or 24-word seed phrase, our standard for security, is a catastrophic failure of user experience.

In Web 2.0, if you forget your password, you click a link and get back into your account in seconds. In Web3, we tell users, "Lose this secret code and your life savings are gone forever, with no one to help you." This is a user-losing proposition from day one.

Thankfully, solutions are emerging. A new generation of "smart contract wallets," are solving this problem. They replace the rigid seed phrase with more flexible, intuitive security models. By bundling in features like built-in staking, these wallets can even offer an experience superior to their Web 2.0 counterparts. For this to become the norm, however, these improvements need to be deeply rooted in the core infrastructure. This is a top priority on the Ethereum roadmap, signaling that the entire ecosystem recognizes the urgency of solving this problem[2].

2 Account Abstraction merges the security of smart contracts with the ease of use of traditional accounts. EIP-4337 was a major step, allowing for smart contract wallet functionalities without changing Ethereum's core protocol. The Pectra upgrade, which went live in May 2025, included EIP-7702 and further streamlined this by allowing standard wallets to temporarily gain smart contract capabilities, making the user experience smoother and more accessible for everyone.

Breaking Down the Silos

In a cruel twist of irony, the movement designed to break down the walled gardens of Web 2.0 has ended up building hundreds of its own. Each blockchain is a world unto itself. An application built on Ethereum only works on Ethereum. A digital asset created on Solana is trapped on Solana.

The bridges built to connect these islands are often slow, clunky, and complex. This problem is made worse by a jungle of competing wallet standards. A user needs Metamask for the Ethereum ecosystem, a Phantom wallet for Solana, and a Keplr wallet for Cosmos. It's a confusing mess that requires technical literacy and the patience to approve every single step of a transaction—a user experience that can feel like death by a thousand clicks.

The good news is that these are software problems, and they are being solved. We are already seeing multi-chain wallets that can operate across different ecosystems. Innovations like Metamask's "Snaps" allow for plugins that extend support to new networks. An even bigger solution on the horizon is a new technology called "intents," which simplifies the user's journey by letting them declare a goal (like "swap token A for token B") and having the software automatically figure out the best way to achieve it.

The ultimate vision is a future of **chain abstraction**, where the user doesn't even need to know which blockchain they are on. They will simply use the application that works best for them, and the underlying technology will automatically route their transaction through the fastest, cheapest, or most profitable path. This future isn't a distant dream; it's just a matter of time and engineering.

Where Web3 Will Change Our Lives?

To understand where Web3 is headed, we first need to cut through the hype. The early hype suggested that blockchain could revolutionize any industry plagued by middlemen and high costs. But reality has taught us a crucial lesson.

The most important prerequisite for Web3 to work its magic is **digitalization**.

Blockchain technology is a powerful tool, but it can't be bolted onto a non-digital world. The most famous cautionary tale comes from the world of supply chains. In 2015, the go-to example for blockchain's potential was logistics. A company like IBM, leading the charge with its Hyperledger protocol, would point out that a single refrigerator shipping from Europe to Africa required hundreds of approvals. The system was a tangled mess of intermediaries—a perfect problem for a blockchain to solve, right?

Not quite. The problem was that the supply chain itself—the handshakes, the paper forms, the stamps of approval—wasn't digital. To apply a blockchain solution, the entire industry would first have to digitize every step of its process. After years of effort, IBM's ambitious partnership with shipping giant Maersk failed to deliver on its promise precisely because you can't build a digital ledger on an analog foundation[3].

This brings us to a clear conclusion: Web3 will make its mark first in sectors that have already completed their digital transformation or were "digital-native" from birth. So, where are these fertile grounds? And more importantly, what real benefits will they offer? Let's explore a few key areas.

Transforming Games and Social Media

Digital games and social media are two of the most dominant forces in modern culture. They are also digital-native, which makes them fertile ground for Web3's disruption. In the current Web 2.0 model, these are closed ecosystems. The platforms own the infrastructure, they own your data, and they capture nearly all of the value that you, the user, create.

Web3 offers a radical alternative: a world where you own your digital life. The relationships you build, the communities you join, and the content you create can be yours, recorded on a blockchain, free from the control of any single company. This provides two profound benefits.

First, it grants you **platform freedom**. If you're unhappy with the rules

3 While the lack of industry-wide digitization was a significant factor, other issues such as insufficient global collaboration and challenges in achieving widespread adoption also contributed to its failure.

or fees of one platform—say, a new version of Twitter or Facebook—you can seamlessly move your social graph and content to a competitor. The vision is that platforms should be interchangeable windows to access your data, not the walls of a prison that holds it captive.

Second, it allows you to **share in the value you create**. The "play-to-earn" model was the first, flawed experiment in this direction. While the initial hype has faded, the core idea is evolving into something more sustainable. The focus is shifting from simple earning to true ownership, creating open economies where the time and effort you invest in a game or a community can generate real-world rewards. Companies like Animoca Brands are at the forefront, not just building games, but cultivating entire ecosystems built on the principle of digital property rights for all participants.

Expanding Possibilities with NFTs

Underpinning this entire shift is the technology of Non-Fungible Tokens, or NFTs. An NFT is more than just a digital collectible; it's a certificate of ownership for a unique digital asset, secured on a blockchain. This seemingly simple concept unlocks a world of possibilities that were previously unimaginable.

With NFTs, the scarcity, ownership, and transfer of digital goods become a reality. But the potential goes far beyond simply owning a piece of digital art. NFTs allow for **programmable ownership**. An artist can bake in a royalty, ensuring they get a cut of every future sale of their work—something impossible in the traditional art world[4]. A high-value asset, like virtual real estate or a rare in-game item, can be fractionalized, allowing many people to own a small piece.

When combined with the principles we'll discuss in our chapter on "Tokenization," these digital assets can be traded on global markets quickly, cheaply, and without the need for traditional intermediaries, breaking down geographical and financial barriers to entry. NFTs are not just another ap-

4 While the enforcement of these royalties depends on the policies of the marketplace where the asset is traded, it opens up possibilities for creators that are difficult to achieve in the traditional art world.

plication of Web3; they are the fundamental building blocks—the digital atoms—of this new, user-owned economy.

DAOs: The New Shape of Organizations

In the Web3 world, communities are the economy. The primary tool for organizing these communities is the Decentralized Autonomous Organization, or DAO. This isn't just a new feature; it's an entirely new way to structure human collaboration.

Think of a DAO as a digital cooperative. Where a traditional project requires forming a company, navigating legal systems, and establishing a top-down hierarchy, a DAO allows thousands of people from around the globe to pool capital and labor towards a shared goal, governed by rules encoded on a blockchain.

This is transforming the very nature of work. Instead of being tied to a single company, contributors can participate in multiple DAOs, lending their skills where they are most valued. The early, idealistic vision of DAOs as purely code-based entities has matured. As of 2025, the most successful DAOs are becoming pragmatic, often adopting "legal wrappers"—like foundations or LLCs in forward-thinking jurisdictions—to interact with the traditional world and protect their members. This isn't a retreat from decentralization, but an evolution towards building durable, real-world institutions.

Make no mistake: like any startup ecosystem, most DAOs will fail. But the models that succeed are poised to become some of the most influential and valuable organizations of the next decade.

Cryptocurrencies: The Fuel for the New Economy

This new world of decentralized organizations is powered by a new kind of money: **cryptocurrencies**.

The open-source movements of the past often ran on passion and volunteer effort. But to compete with the deep-pocketed giants of Web 2.0, passion isn't enough. For a DAO to be sustainable, it needs a continuous

economic incentive to attract and retain talent. That incentive mechanism is its native token, or cryptocurrency.

This process typically has two phases:

1. **The Bootstrap Phase:** In the beginning, before the network has generated real value, the project distributes its tokens to the stakeholders who are building it—the founding team, early investors, developers, and even the first users. This gives everyone a share of the potential upside, aligning all parties to work towards the project's success.
2. **The Sustainable Phase:** For the token to have lasting value, the network must eventually provide a service that people actually want to use. When a project achieves product-market fit, a vibrant economy can form around its token. Users might spend it to access services, while contributors earn it for securing the network or improving the protocol. This creates a self-sustaining loop where the value of the token is tied to the value of the network itself.

In keeping with Web3's core philosophy, it's only natural that these new economies run on their own native currencies, rather than the fiat currencies issued by the central banks of the old world. It is the final piece of the puzzle in creating truly self-sovereign, digital nations.

DeFi: Rewiring the Financial System

As the Web3 ecosystem grows, it needs its own financial plumbing—tools for investing, lending, and allocating capital. It's no surprise, then, that this new economy is being built on **Decentralized Finance (DeFi)**, a system that perfectly matches the core philosophy of decentralization.

Finance was the perfect first target for Web3, for two simple reasons. First, the financial sector is already almost entirely digital. Second, the core value proposition of traditional finance is *trust*. When you deposit your money in a bank, you trust them to keep it safe. When you make a trade, you trust a broker to execute it fairly. Web3, with its ability to replace this institutional trust with verifiable code, strikes at the very core of the financial world.

The classical financial system is powerful but also deeply conservative and exclusionary, wrapped in tight regulations that, while necessary, often stifle innovation. The result is a system that primarily serves the elite, leaving an estimated 1.4 billion people worldwide without access to basic financial services.

DeFi aims to change that. It is building a parallel financial system from the ground up—one that is open, permissionless, and global by default. Its goal is not to serve the few who are reading these lines, but to build on-ramps for the billions who have been left behind.

Beyond Finance: The Next Frontiers

The principles forged in the crucible of DeFi are now expanding to reshape other fundamental parts of our world. As of 2025, several key areas are emerging as the next frontiers of the Web3 movement.

- **Decentralized Science (DeSci):** This movement aims to break down the walled gardens of traditional academia. By using Web3 tools, DeSci is creating open and transparent systems for research funding, data sharing, and peer review, accelerating the pace of scientific discovery.
- **Decentralized Physical Infrastructure (DePIN):** Hailed as one of the most exciting growth areas, DePIN allows communities to build and own real-world infrastructure. From decentralized wireless and energy grids to data storage and mobility networks, token incentives are enabling a bottom-up approach to creating the essential services our society relies on.
- **Decentralized AI:** Perhaps the most profound shift, this movement is a direct challenge to the dominance of a few Big Tech companies over artificial intelligence. It seeks to democratize access to AI models and data, fostering permissionless innovation and enabling the creation of autonomous AI agents that can participate in the Web3 economy.

From digital identity to decentralized social media, the list of experi-

ments continues to grow. We'll explore these use cases in detail later, but they all have one thing in common: using decentralized technology to cut out powerful gatekeepers and return ownership to communities and individuals.

Chapter 2

Key Pillars of the Web3 Economy

We've seen how the internet evolved from an open, experimental frontier (Web 1.0) into a handful of digital empires (Web 2.0). The first chapter traced the rise of centralization and the damage it caused. Now we're in the early days of Web3, an attempt to rebalance the scales and return power to communities.

But how does this new world actually work? What are the economic principles and technologies that prevent it from becoming a repeat of the past? This chapter breaks down the core engines of the Web3 economy.

We'll start with Ethereum, the primary economic engine of Web3. It's more than just a piece of technology; it's the platform where the most value is created and exchanged. To understand this new economy, we must first look at its key participants—the builders and the users—and how they interact. This makes it the undeniable center of gravity and the natural place to begin.

Of course, Ethereum isn't the only blueprint for this new world. By placing it alongside Bitcoin, its stoic predecessor, and Solana, its leading high-performance rival, we can see the fundamentally different philosophies for building a decentralized future.

This brings us to one of the most critical debates happening right now: how to prepare for a billion users. Since 2023, the idea of "modular chains" has taken center stage. Ethereum is betting its future on this approach, us-

ing a constellation of Layer 2 networks to handle massive demand. We'll explore this modular architecture and look at pioneering projects like Celestia, which are built entirely on this vision. On the other side of the debate are 'monolithic' chains, which handle all tasks on a single, powerful layer. High-performance chains like Solana are a prime example of this approach. Bitcoin also follows a monolithic design, though its focus and scaling methods differ significantly.

These blockchains, however, are like isolated nation-states, each with its own rules and unable to speak to the others. For a user, this is just an unnecessary headache. They don't care about network architecture; they just want to move their assets from one place to another, freely and without friction. This is the crucial role of bridges. We'll examine how they connect these digital islands and touch on their turbulent history of exploits. Even with constant work to improve security, bridges are still one of Web3's biggest targets for hackers, and keeping them safe is a huge, unsolved problem.

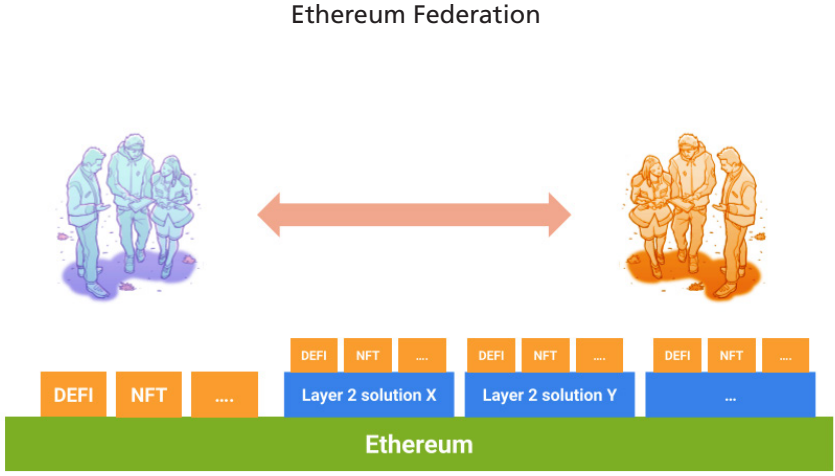
Finally, we'll turn to two topics that are often overlooked but are essential for the user. First, wallets—not just as a place to hold assets, but as your passport and identity in this new economy. And second, a concept you'll be hearing a lot more about: intents. Fueled by advances in AI, intents are a fundamental shift – from giving the network commands to simply stating your goals and letting the system find the best way to get it done. They are the future of how we will interact with the open economy.

What makes Ethereum's economy tick?

So, how does Ethereum's economy actually work?

First, we have to understand what it is. The easiest mistake is to think of Ethereum as a company. It's not. A better analogy is to think of it as a sovereign digital nation.

And if we include the Layer 2 blockchains developing on top of it, Ethereum starts to look like **a federation of states**, each with its own local customs but all united under a single security umbrella. Like any nation, this federation has different groups of actors who drive its economy.



Ethereum as a federation of users, applications, Layer 2 solutions, and its underlying main chain

Who Lives Here?

The most important actors in this digital nation are its **users**. These are the individuals and programs transferring assets or using the thousands of applications built on the network. For every action they take—every transaction they send—they pay a fee[5]. These transaction fees are the primary

5 Traditionally, users paid the cost of using Ethereum's infrastructure directly with each transaction. However, this is changing. With the rise of 'Account Abstraction,' applications can now sponsor fees on behalf of their users, creating smoother, 'gasless' experiences more akin to Web 2.0 apps.

fuel for Ethereum's entire economy.

The applications themselves act like **businesses** renting digital land. They provide everything from financial services (DeFi) and digital art (NFTs) to identity systems and social media. But here's a key difference from the traditional world: the apps don't pay the rent. The users pay the cost of using Ethereum's infrastructure directly with each transaction[6].

The second group of actors are the **Layer 2 networks**. Think of these as the individual states within the federation. Each one is a distinct blockchain that manages its own activity but relies on the main Ethereum chain for its security. Just like users, these Layer 2 chains pay fees—their form of "federal tax»—to the main network for providing this foundational trust.

So, where does all this money go?

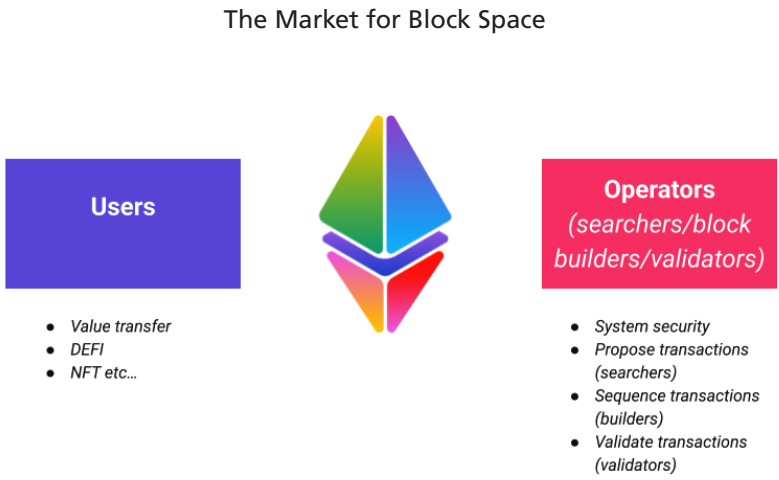
The fees go to the people who secure the network and process transactions. For years, this work was done by **miners**, similar to the Bitcoin network. But on September 15, 2022, Ethereum went through a historic transformation. It replaced miners with **validators**—people who stake their own ETH (Ethereum's native currency) as a security deposit. They now have a direct financial stake in the long-term health and security of the network.

The simplest way to get a handle on the size of Ethereum's economy is to look at the total revenue it generates from fees. It's the closest thing we have to a digital nation's GDP.

Where does Ethereum's revenue come from?

Ethereum's core product is secure, programmable block space. Think of it as digital land that is guaranteed to be yours, where contracts are enforced by code. All of the network's revenue flows from selling access to this land.

6 This analogy clarifies the cost distribution between Ethereum's users and its applications, underscoring that users directly bear transaction costs.



Users, DeFi applications, and Layer 2 solutions all compete for Ethereum's block space, paying transaction fees to the validators who operate and secure the network.

An Auction for Every Transaction

Every time a user wants to send money, trade a token, or interact with a financial protocol, they must pay a transaction fee. This fee is their ticket to have their action permanently and securely recorded on the Ethereum ledger. These fees are, by far, Ethereum's largest source of revenue.

As block space is limited and demand is high, a real-time auction determines who gets to use it and when. When a user submits a transaction, it enters a public waiting room called the mempool.

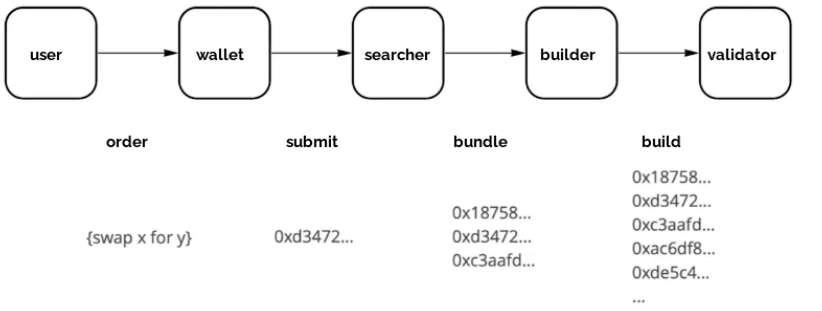
This waiting room operates like a competitive bidding system. To get their transaction processed, every user pays a **base fee**, which is determined by overall network congestion. But if you're in a hurry, you can't just pay the base fee; you need to get to the front of the line. To do this, you add a **tip** (or priority fee) for the validators who run the network.

Validators, who want to maximize their income, will naturally prioritize transactions with the highest tips. This creates a dynamic where a significant portion of Ethereum's revenue comes from these priority payments, as users compete to have their transactions processed faster than everyone else's.

MEV Revenue

The order of transactions in a block is just as important as the transactions themselves. Control the order, and you can unlock a second, far more complex revenue stream. This is where a new class of sophisticated players comes in: **Searchers**, who scan the mempool for profitable opportunities, and **Builders**, who assemble the final blocks submitted to the chain.

The Value Flow of a Transaction



Specialized intermediaries now sit between a user's transaction and its inclusion on the chain.

Builders decide which transactions make it into a block and in what sequence. Their goal is to build the most profitable block possible. The simplest way is to include transactions with the highest tips, but the real prize lies in exploiting the *order* of transactions. This creates a spectrum of strategies.

On one end, you have benign arbitrage.

Imagine your trade pushes the price of ETH on one exchange to $2001, while it's $2000 everywhere else. A builder can insert a transaction immediately after yours to sell ETH at $2001, capturing the $1 difference and helping to nudge the price back in line with the broader market.

This kind of arbitrage is useful, helping to keep markets efficient. But this power can also be turned against users.

A builder can see your large buy order, insert their *own* buy order just

before yours to drive the price up, and then sell into your trade at a higher price. You, the user, get a worse price because you were "sandwiched" between their predatory trades.

This entire universe of profit—from beneficial arbitrage to parasitic attacks—is known as **Maximal Extractable Value (MEV)**. It remains a major source of revenue on Ethereum, particularly for validators and builders.

Is this system fair? The consensus is a resounding no. The Ethereum community is deeply focused on this problem[7], and a series of upgrades are already being planned to limit the negative impacts of MEV.

Exporting Security: The Rise of Restaking

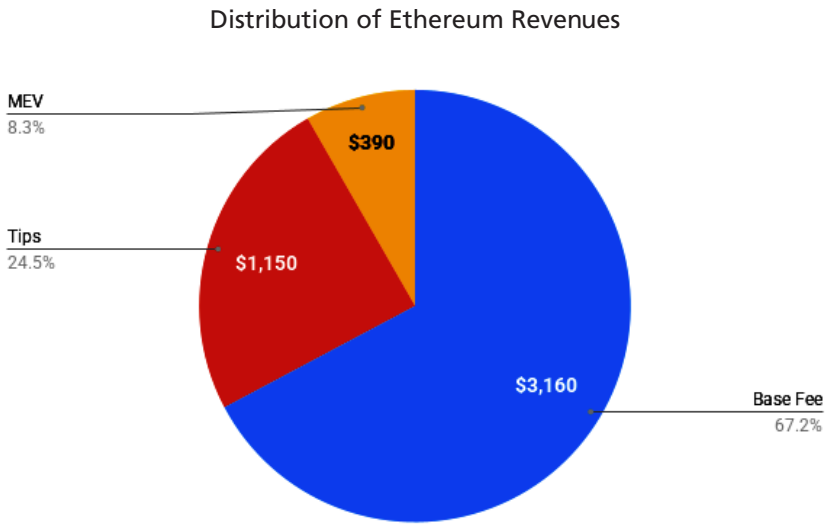
Beyond the direct fees for block space and the hidden world of MEV, a third economic pillar is emerging: the ability to export Ethereum's security.

Think of the billions of dollars in ETH staked to secure the network. This creates a massive wall of economic trust. A new concept called **restaking** allows validators to leverage that same capital to simultaneously secure other emerging protocols, like bridges or new data networks. In exchange for taking on this added responsibility and risk, they earn a new stream of revenue.

The pioneer in this field is **EigenLayer** (now called EigenCloud), which has built a marketplace for this very service. It allows new projects to effectively rent Ethereum's powerful security guarantee instead of having to bootstrap their own from scratch.

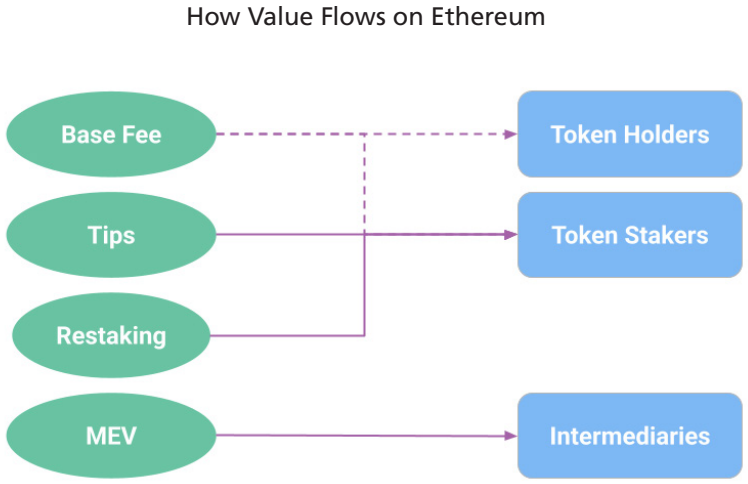
> These three pillars—transaction fees, MEV, and restaking rewards—give us a complete economic picture. The chart below illustrates the revenue distribution across these streams for the first 11 months of 2024.

7 Upgrades like Pectra and proposals for enshrined Proposer-Builder Separation (ePBS) aim to formalize the block production market and curb the most harmful effects of MEV, though the challenge is ongoing.



Calculated based on figures from a chart by Blockworks (in US$ million). (Source: Blockworks - *Dan Smith*)

But where does all this value actually flow? As the next diagram shows, the movement of capital in Ethereum's economy is not always a straight line.



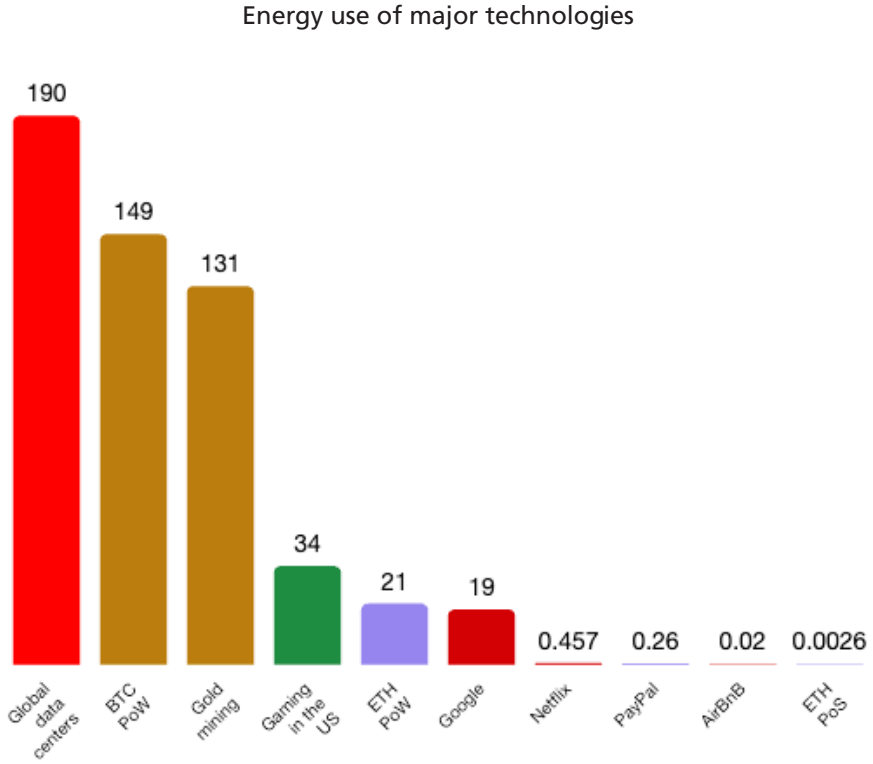
Value flows from users to network participants in four distinct ways. Solid lines show direct payments, while dashed lines show indirect value accrual.

Some revenue, like priority fees and certain MEV, flows directly into the pockets of builders and validators. Other forms of value are indirect. For example, the base fee paid on every transaction isn't given to anyone—it's burned, permanently removing it from circulation. This doesn't add ETH to a validator's wallet, but by reducing the total supply, it increases the scarcity and potential value of every remaining token, benefiting all long-term holders.

So, where does Ethereum spend its money?

So, what does it cost to run a digital nation like Ethereum?

For years, the answer was a staggering electricity bill. Like Bitcoin, Ethereum's original Proof-of-Work system required a global network of "miners" to burn immense amounts of energy to secure the chain. But on September 15, 2022, Ethereum fundamentally re-architected its economy. By switching to Proof-of-Stake (PoS), it slashed its primary external expense—energy consumption—by over 99%.



A comparison of annual energy consumption shows Ethereum's post-Merge efficiency - (terawatt hour/year). (Source: *Ethereum Foundation*)

Today, Ethereum's costs are internal. Instead of paying external energy producers, the network now pays for its security from within. Validators, who pledge their own ETH as collateral, are rewarded with newly issued ETH for their work in securing the system.

This raises a fascinating economic question: are these rewards a true expense?

Some experts say 'yes', issuing new currency is the "cost of security" for the network. But a more subtle view argues it isn't an expense in the traditional sense. Rather, it's a dilution of the existing supply—a transfer of value from passive holders to those actively working to protect the network.

Finally, there's one more cost to consider—a social one that exists on

a spectrum. The most harmful forms of MEV, like predatory sandwich attacks, act as a hidden tax paid by everyday users to the sophisticated few. However, not all MEV is bad. Some forms, like arbitrage, are a crucial part of the economy that helps keep market prices consistent. So, MEV is a complex wealth transfer within the ecosystem; part of it is a cost to users, and part of it is a reward for making the market more efficient.

Meet Ethereum's currency: ether (ETH)

Ether (ETH) is the native currency of the Ethereum nation. It's how the network pays for its security and how users can own a piece of its economy. Holders can capture a share of the value created on the network in two distinct ways: one active, one passive.

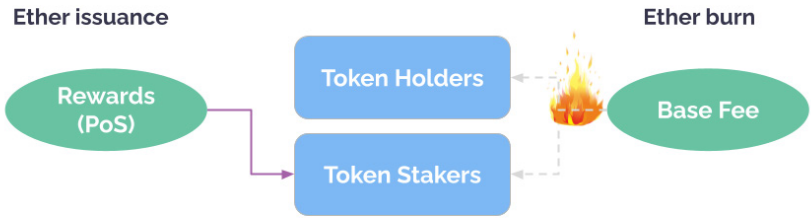
The active path is to become a **validator**. By "staking" their ETH, users lock up their capital to help secure the network and process transactions. In return for this work, they earn a yield from three sources:

1. **Issuance:** New ETH created by the protocol as a reward for providing security.
2. **Fees & MEV:** Tips paid by users for priority, along with value captured from transaction ordering (Maximal Extractable Value).
3. **Restaking Rewards:** Additional yield earned by using staked ETH to simultaneously secure other networks and protocols.

The passive path relies on a powerful and unique feature of Ethereum's design: **the fee burn**. The base fee required for every transaction is not paid to anyone; it is permanently destroyed. This mechanism directly links the economic activity on the network to the scarcity and value of ETH.

This creates a constant push-and-pull on the money supply, a dynamic battle between issuance and burning.

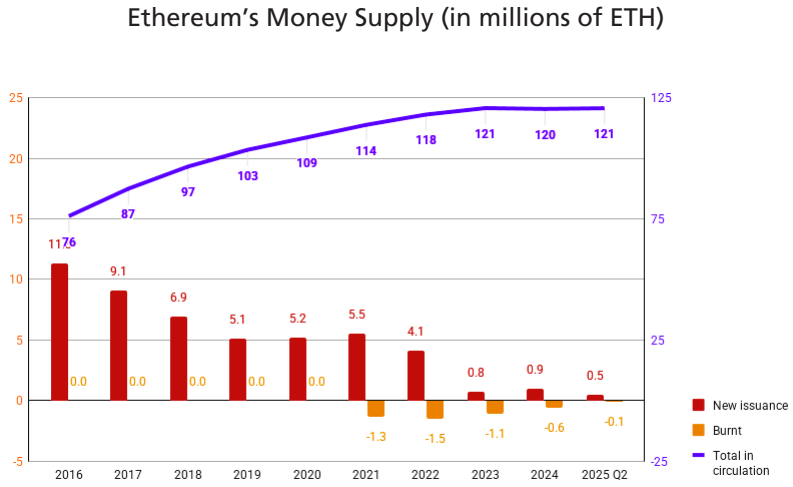
How ETH gets minted and burned



New ETH is minted (left) to reward system participants, while a portion of fees is burned (right), removing it from circulation. Direct value transfers (solid lines) are payments, while indirect influence (dashed lines) affects the asset's overall scarcity.

This dynamic has a huge impact. The issuance of new ETH slightly dilutes passive holders, while the fee burn counteracts this by reducing the total supply. When network usage is high *on the mainnet*, the amount of ETH burned can exceed the amount of new issuance, making the entire asset temporarily **deflationary**. However, with much activity now on Layer 2s, the network more commonly experiences a very low rate of inflation.

Stakers don't feel this dilution because they receive the new issuance, which maintains their overall share of the network. Passive holders, meanwhile, benefit when high network activity leads to a larger burn, making their holdings more scarce. This isn't just theory—the chart below shows this economic engine at work since the key upgrades in 2021 and 2022.



The change in ETH supply over time, showing the impact of the fee burn and the switch to Proof-of-Stake. (Source: *Blockworks*).

Unlike Bitcoin's fixed cap, ETH has a dynamic monetary policy. There is no hard supply limit. Instead, the supply responds directly to the network's economic health. While there's a theoretical maximum inflation rate, real-world data since late 2022 has shown that a busy network often leads to a stable or even shrinking supply of ETH. As of mid 2025, with about 29% of all ETH staked, the amount burned has frequently kept pace with new issuance, showcasing a monetary system designed to reward usage.

Why is ETH called "ultra-sound money"?

To understand the provocative phrase «ultra-sound money," you first have to understand Bitcoin's original narrative: **sound money**. Because its supply is fixed, predictable, and steadily decreasing, Bitcoin earned this title as a direct critique of central banks, which can print national currencies at will.

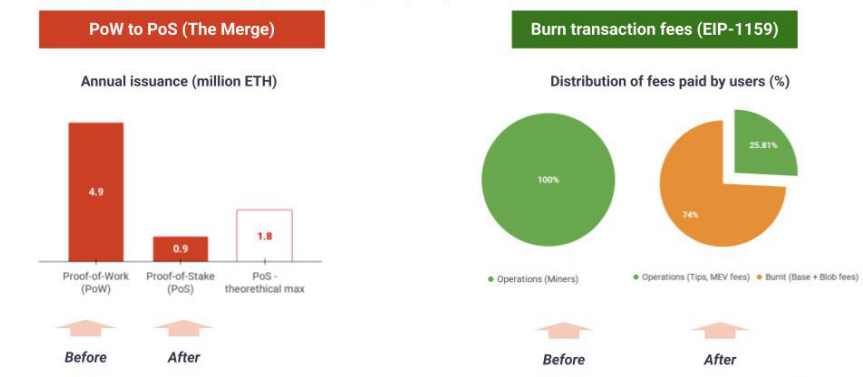
This established a powerful analogy in the eyes of investors: Bitcoin was **digital gold**. Like physical gold, its utility is limited—it's not used for much beyond securing its own network—but its value comes from its proven scarcity and its role as a hedge against uncertainty. It commands a "monetary premium," a value far beyond its immediate use case.

By contrast, early Ethereum was seen as **digital silver**. It didn't have a fixed, predictable supply, so it couldn't compete with Bitcoin on scarcity. Instead, like silver—an industrial metal—its value was tied to its utility. Ether was useful for powering financial policy applications, and its value was measured by the cash flows it could generate.

For years, the Ethereum community focused on building the world's most powerful decentralized computer, largely neglecting the monetary policy of its native asset. But as the foundations of the network solidified, the focus shifted. Two revolutionary upgrades changed everything.

First, **EIP-1559** in August 2021 began burning a portion of transaction fees, directly linking network activity to the scarcity of ETH. Then, **The Merge** in September 2022 switched the network to Proof-of-Stake, eliminating payments to miners and slashing the issuance of new ETH by nearly 90%.

The Two Upgrades That Changed ETH's Supply

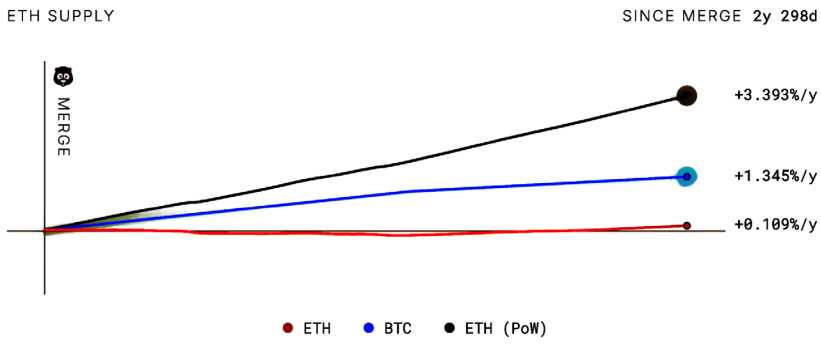


The one-two punch of The Merge and EIP-1559 fundamentally altered Ethereum's economic engine. (Source: *Blockworks*).

For a remarkable period following these upgrades, ETH's supply growth plunged below Bitcoin's and frequently turned deflationary. This transformation gave birth to a powerful meme that captured the moment: if Bitcoin is sound money, then ETH, with its usage-based scarcity, was positioned

as **ultra-sound money**. While later network upgrades to lower fees have made ETH slightly inflationary again, this period revealed a powerful new economic engine at the heart of the protocol.

Post-Merge Supply: ETH vs. BTC



After The Merge, ETH's net issuance (red - lowest) often fell below Bitcoin's (blue - in the middle), a stark contrast to the pre-Merge trajectory (black - highest). (Source: *Ultrasound Money*).

This narrative reveals the powerful economic flywheel at the core of Ethereum's design. The theory is that increased demand raises ETH's price and security, attracting more users. This activity is meant to generate more transaction fees, with the burned portion reinforcing scarcity and restarting the cycle. While currently experiencing low inflation, this underlying mechanism shows how the network's utility is designed to directly strengthen its native asset.

It's a complete economic loop where the network's usefulness directly strengthens the value of its native asset.

What the Future Holds

Ethereum is no longer just a platform for experimentation; it's maturing into a global, decentralized financial layer. To get there, it's transforming from the inside out, with a renewed focus on execution and a clear technical roadmap.

First, the organization's focus is sharpening. The Ethereum Foundation has streamlined its leadership to speed up development, pushing for an intense, renewed focus on the core protocol. The mission is clear: ship faster, be more accountable, and concentrate on scaling the network, expanding data capacity for Layer 2s, and radically improving the user experience.

This new focus is already delivering. The Pectra upgrade, which went live in May 2025, is the network's largest to date and represents a massive leap forward on two fronts:

1. **A Better User Experience:** For the average person, Pectra is a game-changer. A new feature (EIP-7702) gives standard crypto wallets the powers of a smart contract. This means you can finally pay for transactions with tokens other than ETH, bundle multiple actions into a single click, and secure your account with familiar tools like passkeys. It's a major step toward an experience that feels less like niche crypto and more like the modern web.
2. **A Commitment to Scaling:** For the network, Pectra doubles down on the master plan: scale through Layer 2s. Building on the foundation laid by the 2024 Dencun upgrade, Pectra doubles the data capacity for 'blobs', making sure that transaction fees on these 'rollup' networks stay low, even as demand skyrockets. It cements the rollup-centric roadmap as the clear path forward for handling millions of users.

With these foundations in place, the next major upgrade, tentatively named "Fusaka," tackles the final frontier: true, decentralized scalability.

Fusaka will introduce technologies like PeerDAS and Verkle trees. Stripped of the jargon, their purpose is simple: to make it possible for anyone to help validate the network using consumer-grade hardware. As Ethereum grows, it's crucial that running a node does not become something only large data centers can do. This is the key to preserving decentralization at a global scale.

Each upgrade, from organizational shifts to deep cryptographic changes, is another deliberate step toward building a trust-minimized foundation for the next generation of the internet.

Bitcoin, Solana, and Ethereum: The Big Three

In this section, we'll look at the recent performance of the three leading blockchain networks and explore what the future might hold.

What's Been Happening Lately?

After the boom of 2020–21, crypto markets entered a bear market in 2022, triggered by the dramatic collapse of the Terra Luna ecosystem, centralized lending platforms, and the FTX exchange. By late 2023, however, signs of recovery emerged, waking markets from their prolonged slumber and kicking off a new, albeit volatile, bull market that continued into 2024 and 2025.

Looking at price movements toward the end of 2023, Ethereum's coin, ether (ETH), lagged behind both bitcoin (BTC) and Solana's SOL. This trend continued at times into 2024 and 2025, although market dynamics have been volatile, with periods where Solana also experienced significant corrections.

What explains this trend? Why did bitcoin and SOL surge, while ETH trailed behind?

Crypto markets are still young, and traditional investment metrics like "value creation" are still fuzzy, leaving prices to be easily swayed by powerful stories. So, what narratives did each cryptocurrency offer investors recently?

Bitcoin, the market heavyweight, benefits from simplicity. Its clear narrative as "digital gold," easy for anyone to understand, continues to resonate strongly. Technically complex? Perhaps. But bitcoin's resilience over its 14-year lifespan—persistently surviving multiple declarations of its death—makes detailed technical understanding less relevant to most.

Beyond its simplicity, bitcoin's recent surge hinged on three strong expectations:

First, growing skepticism about government monetary policies boosted

bitcoin's appeal as an alternative asset. Investors expect demand to rise if monetary expansion resumes post-COVID.

Second, investors were eagerly awaiting the approval of bitcoin spot ETFs in the US. After a decade of SEC denials, the agency's court loss to Grayscale in summer 2023 left them no choice. Approval finally came in January 2024. This led to huge, steady inflows, over $14 billion net by mid-2025, which caused a major price jump.

Third, bitcoin's halving event in April 2024 cut miner rewards in half, reducing new supply and easing persistent selling pressure from miners needing to cover expenses[8]. While long-term miner incentives remain uncertain, recent increases in transaction activity and fees from innovations like Bitcoin Ordinals have partially addressed these concerns. (We'll discuss these Bitcoin Layer 2 solutions shortly.)

Solana: The Comeback Kid

SOL was 2023's biggest surprise. Even Solana's most loyal fans didn't predict its dramatic comeback at the start of the year. A key player during the 2021 bull market, SOL suffered deeply during the bear market, further impacted by the collapse of its largest supporter, FTX, and founder Sam Bankman-Fried in late 2022.

At one point, Solana's very survival was on the line. However, its resilient community rallied strongly, proving the adage "what doesn't kill you makes you stronger."

Significant technical improvements have greatly reduced past reliability issues (notably, network outages)[9], making Solana one of the leaders in the new bullish cycle. Solana's strength lies primarily in its extremely low transaction fees and rapid processing speeds. This makes it ideal for

8 Notably, well-funded US miners (like Marathon and Riot) typically avoid selling mined bitcoins immediately. Riot started selling BTC reserves during the first quarter of 2025.

9 While a major outage occurred in February 2024, the network has demonstrated long stretches of stability since, and ongoing upgrades like the 'Firedancer' validator client aim to make such events a thing of the past.

newcomers learning to trade and experienced speculators alike, creating the vibrant trading environment needed for new token launches.

Airdrops—free token distributions rewarding user engagement—also play a critical role. Foundational examples like the meme coin BONK and the exchange aggregator Jupiter (JUP) significantly boosted the network's growth in late 2023 and early 2024. This trend has continued, with airdrops from protocols like Kamino, Tensor, and Drift remaining a key strategy for attracting users and liquidity to the Solana ecosystem throughout 2024 and 2025.

Whether Solana's surge is sustainable long-term remains to be seen.

Ethereum: Caught Between Bitcoin and Solana?

Ethereum, the second-largest network, was incredibly popular during the 2020–21 bull run but lagged behind BTC and SOL in the recent recovery[10]. The situation grew so stark that past debates like "Will Ethereum surpass Bitcoin's total value?" shifted toward questions like "Will Solana surpass Ethereum?»

But is Ethereum really in trouble? Let's briefly compare ETH to BTC and SOL:

Ethereum's narrative struggles compared to BTC's clear "digital gold" story. Ethereum's ambitious goal—becoming "a universal computer accessible to all"—is complex, lacking direct appeal to retail investors. Upcoming technical improvements that support this vision don't excite casual investors.

Moreover, Ethereum isn't as cheap to use as Solana. Ethereum intentionally limits its block space to maintain decentralization, despite strong demand.

10 Although by mid-July growing institutional demand seems like having a positive effect on ETH's price.



Hardware requirements for Ethereum vs. Solana validators. (Source: *Florin Digital*).

Increasing block space could lower transaction costs but would demand more powerful machines, reducing the number of validators and leading to centralization. Centralized systems risk censorship, compromising Ethereum's fundamental neutrality.

Thus, Ethereum sits awkwardly between Bitcoin's simple, powerful narrative and Solana's inexpensive transactions.

Does this mean ether's future looks bleak?

Is Ethereum's Future Really in Jeopardy?

To answer, we need to consider Ethereum's long-term strategy. Founded in 2013 and launched in 2015, Ethereum has undergone significant strategic changes, slow by crypto standards but fast for an infrastructure network. Its biggest shifts included abandoning Bitcoin-like energy consumption (Proof-of-Work) and focusing primarily on infrastructure, shifting user-facing functions to Layer 2 solutions[11].

This strategic decision emphasized long-term stability over short-term gains, causing temporary growing pains. Currently, Ethereum's main priority is providing a secure, neutral foundation for Layer 2 chains, ensuring us-

11 Ethereum and Solana differ here: Ethereum decentralizes blockchain components among various entities, while Solana manages core functions internally.

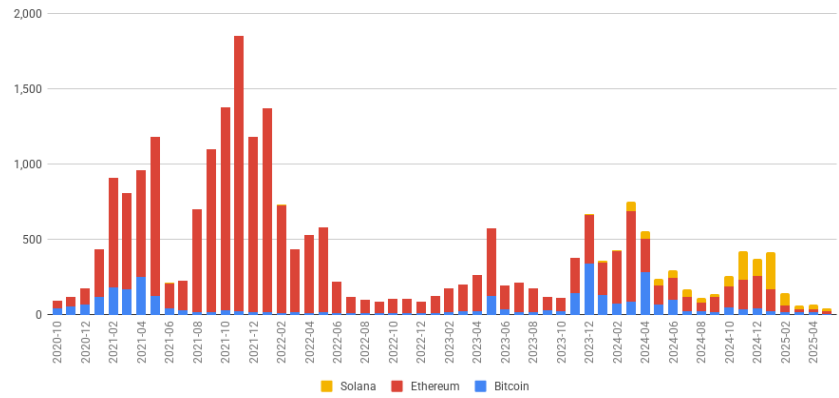
ers' funds remain safe across these chains[12]. Pursuing short-term strategies (like increasing block space) might have reduced costs quickly but would eventually risk centralization.

Users, for now, understandably prioritize cheap fees and quick profits, unconcerned by centralization risks. Yet centralization invites censorship, undermining Ethereum's goal of a neutral, open network accessible to everyone without discrimination.

That's why Ethereum's developers focus on lowering costs indirectly through Layer 2 networks. For example, Ethereum's Dencun upgrade (March 2024) reduced Layer 2 transaction costs to one-tenth, enabling significantly cheaper Layer 2 user transactions.

While Ethereum's narrative doesn't excite retail investors—high fees make Ethereum daunting—its secure and stable infrastructure strongly appeals to institutional investors. High fees indicate strong network demand, and the growing adoption of Layer 2 networks further validates its long-term potential. Simply put, Ethereum is becoming a reliable backbone for institutional investors and Layer 2 solutions.

Bitcoin, Ethereum, and Solana monthly transaction fees



Monthly transaction fee revenues for the three largest networks (USD millions). (Source: Dune Analytics, @sankin).

12 Ethereum aims for "credible neutrality"—treating all participants equally without bias.

Institutional investors initially gravitated to Bitcoin's clearer narrative, boosted by ETF approvals. Ethereum ETFs faced SEC resistance but eventually launched in July 2024. Beyond ETFs, Ethereum offers institutional investors additional appeal through competitive Layer 2 transaction fees, reliable staking rewards, and innovative features like restaking (generating extra yield from staked ETH).

Comparing the narratives: retail investors prefer networks promising quick rewards (like Solana's fast transactions and airdrops), while institutions prefer stability, reliability, and steady returns—qualities Ethereum excels at providing.

Wrapping Up the Big Three

Bitcoin's position remains uniquely strong, backed by its clear message and proven durability. Its long-term success depends on two factors: growing confidence amid economic uncertainty (a positive) and ensuring mining remains attractive despite halving-induced reward reductions (a lingering concern)[13].

Solana aims to keep its momentum going with token incentives and smart technical upgrades, especially in DeFi and gaming.

Ethereum's short-term ETF-driven optimism emerged in mid-2024 following a surprise regulatory approval. Longer-term success depends on effectively delivering inexpensive yet secure environments through Layer 2 solutions and steadily attracting institutional interest.

13 Critics argue Bitcoin's expansion into Layer 2 and DeFi strays from its original "digital gold" vision.

Modular vs. Monolithic Blockchains

Two competing philosophies are shaping the future of blockchain infrastructure: the monolithic and the modular approach. Let's explore what they are and, more importantly, why they matter.

The Power of Interoperability

Web3's biggest difference from the internet we know today is how its applications interact. In the old world—Web2—tech companies build walled gardens. They create a product, control all its components, and offer you a finished, take-it-or-leave-it package. It's convenient, but it's also limiting. You're stuck with their package deal.

Web3 shatters this model. Here, the user is in control, free to pick and choose different components to create their own experience. Because applications are built on shared, open standards, a wallet from one developer can seamlessly interact with a marketplace from another. This creates a powerful dynamic. Developers compete on the quality of their specific component, leading to relentless innovation. Teams focus on solving one problem exceptionally well, knowing they can rely on other best-in-class solutions for the rest. This accelerates progress for everyone.

This Lego-like interoperability is the engine of Web3. This leads to a natural question: if breaking applications into specialized pieces makes them better, can we do the same for the blockchains they run on?

At first, this might seem like an abstract, technical debate. Why should you care how the underlying blockchain is pieced together? The answer comes down to the fundamental limitations of blockchain technology. This isn't just a theoretical problem; it directly impacts the transaction fees you pay, turning an architectural debate into a very real hit to your wallet.

The Constraints of a Blockchain

At its core, a blockchain is a system for creating an unchangeable record of transactions.

The only way to guarantee this immutability is to distribute the ledger

across as many different machines in as many different locations as possible. This makes taking over the network impossible, or at least prohibitively expensive.

From a pure performance perspective, centralized systems will always be faster. They are managed from a single point. But that single point is also a single point of failure. While you can technically "bulletproof" a centralized server against digital attacks, defending it against political or social pressure is a much harder problem to solve.

Decentralization is the answer to this pressure. To achieve it, however, the system has to be accessible to as many people as possible, which means the blockchain's ledger must remain small and the hardware requirements low[14]. If you fail at this, only those with high-capacity machines can run the system. The number of participants shrinks, the network centralizes, and the security evaporates.

This creates a core problem. The very thing a blockchain sells is its block space—that limited, secure digital territory. When demand is high, the chain doesn't simply crash[15]. Instead, transaction fees rise in a dynamic auction, pushing out those whose needs aren't urgent. While this is a logical market mechanic, persistently high fees will inevitably drive users to seek out alternatives.

Ethereum's Persistent Challenge

There is no better case study for this dilemma than Ethereum.

During the DeFi and NFT boom of 2020-21, demand for Ethereum's block space exploded, and transaction fees skyrocketed. Users were paying hundreds of dollars for simple operations, making the network unusable for many. The development community was caught in a difficult position, without a quick fix.

The initial dream was to scale the blockchain by splitting it into parallel

14 The size of the blockchain ledger naturally increases over time as more transactions are recorded. Developers are implementing solutions like light nodes or pruning to manage the growing size of the blockchain ledger and keep hardware requirements manageable.

15 Some blockchains do halt operations occasionally, but we exclude these immature exceptions here.

'execution shards'—imagine an island for DeFi and another for NFTs, each processing its own transactions. But after realizing the immense complexity of this approach, the strategy shifted.

Instead of sharding for execution, Ethereum's developers pivoted to a 'rollup-centric' roadmap, choosing to 'outsource' the heavy lifting to Layer 2 systems built on top of the main chain. The concept of sharding evolved to support this: with the Dencun upgrade in early 2024, Ethereum introduced Proto-Danksharding, which creates dedicated, low-cost data space for these rollups, making them significantly cheaper and more powerful.

Blockchain's Four Core Tasks

A blockchain may be a ledger, but it has to perform four distinct jobs to reliably record anything on it. Think of them as the layers of work required for every single transaction.

Execution: The Action This is where things happen. Execution is the act of computing a transaction—transferring an asset, swapping tokens on a decentralized exchange, or minting an NFT. Applications tell the chain what they want to do, and this layer processes that request. For most of us, this is the only part of the process we directly experience.

Consensus: The Agreement Once a transaction is broadcast to the network, thousands of independent machines must agree on its validity and, crucially, its order. Consensus is the process of getting the entire network to agree: "Yes, this transaction is valid, it happened in this exact sequence, and here's the resulting state of all accounts." This is the decentralized heart of the system.

Settlement: The Finality After the network agrees on a set of transactions, it's time to make them permanent. Settlement is the point of no return—where the results are officially committed to the blockchain's ledger. When you send money, this is the moment your balance officially decreases and the recipient's increases. The validators lock in the final state of the accounts, and from this point forward, the record cannot be altered.

Data Availability (or Publishing): The transaction is done, settled, and

final. Now, the entire system needs to be updated. This final step involves publishing the data from the new block across the network. This is critical because every application and user needs to know the most current state of the ledger to build the *next* set of transactions[16]. Without this shared public knowledge, the chain would grind to a halt.

Monolithic vs. Modular Approaches

This brings us to the great architectural debate in crypto: how should a blockchain perform these four essential jobs? Two distinct philosophies have emerged. The first is the **monolithic** approach, where a single chain does everything, much like Apple's tightly integrated ecosystem. The second is the **modular** approach, where different specialized layers handle each job, similar to the more open and layered Android ecosystem.

The monolithic school is led by networks like Bitcoin and Solana.

Bitcoin chose this path out of elegant simplicity. It's, in essence, an application-specific network—built to do one thing and one thing only: process BTC transactions. Since it doesn't support general-purpose smart contracts, it can't serve as a platform for other applications[17]. By deliberately keeping its scope narrow, Bitcoin sidesteps the scaling race entirely[18].

Solana represents a far more ambitious take on the monolithic design. It *is* a generalized network that runs complex smart contracts, and it attacks the scaling problem head-on by using much larger blocks. This makes it incredibly fast, but it comes with a serious trade-off. Processing these massive blocks demands high-performance hardware, significantly raising the cost

16 "Data publishing" (broadcasting recent transactions) is often confused with "data availability" (archiving historical data), which can be stored on fewer nodes, not all.

17 The narrative that it cannot serve as a platform for other applications has been challenged. The recent development of protocols like Ordinals and Runes has enabled token and NFT-like assets directly on its ledger. This, combined with an emerging ecosystem of Bitcoin Layer 2s aimed at adding more complex functionality, shows that even Bitcoin is becoming a platform for new innovation, albeit in a different way from its peers.

18 Debate continues whether Bitcoin's simple approach is viable long-term. With mining rewards halving every four years, transaction fees must increase through added functionality (Layer 2 or DeFi) to maintain miner incentives.

to run a validator. This barrier to entry inevitably reduces the number of participants, creating a constant risk of centralization.

On the other side of this debate are the modular systems. You can see this philosophy in two interconnected trends.

First are the **Layer 2 rollups** built on Ethereum, which handle execution independently but rely on the main chain for security and settlement.

Second, and more recently, are dedicated modular blockchains like **Celestia**, which don't process user transactions at all but instead offer a specialized, low-cost layer for **Data Availability** that other chains can use.

The most common approach combines these, with Ethereum Layer 2s outsourcing their execution while leveraging the main chain for settlement. Let's dive into how they work.

Layer 2 Solutions: Ethereum's Scaling Heroes

Modular designs are solving blockchain's scaling problem. This is best seen in the Layer 2 (L2) ecosystem built on Ethereum. L2s act as high-speed lanes, handling the bulk of transactions to relieve congestion on the main network.

By processing transactions separately and posting summaries back to Ethereum, L2s boost throughput and slash user fees. This has opened the door for a new wave of applications and users.

Security by Inheritance

The key difference between an L2 and a rival Layer 1 like Solana is security. L2s are anchored to Ethereum, effectively "renting" its world-class security. User assets remain protected by Ethereum's massive validator set, even if the L2 itself has a problem. This creates a level of trust that new, independent chains must build from scratch.

Hubs of Innovation

While secured by Ethereum, each L2 is its own blockchain. This encourages rapid innovation. Features that might take years to reach Ethereum, like better account security, are pioneered on L2s like Starknet and zkSync. They serve as live testbeds for the future of web3.

This layered approach does carry risk. Every new piece of software introduces potential bugs and vulnerabilities.

An Economic Flywheel

The L2 business model is simple. They charge users a small transaction fee, which is priced just above the cost to post data back to Ethereum.

This model ignited after Ethereum's Dencun upgrade in March 2024, which drastically cut data costs. The results speak for themselves:

- **Daily Transactions:** By mid-2025, L2s collectively process **around 100 million transactions daily**, a figure that is more than **80 times** the volume of the Ethereum mainnet.
- **Lower Fees:** Average transaction fees have plummeted, with many costing just a few cents.
- **Massive Growth:** The total value locked (TVL) across all L2s has surged to **over $42 billion**, signaling deep liquidity and user confidence.

Sustained volume on networks like Arbitrum and the rapid growth of Coinbase's Base prove that L2s are the primary hub for users on Ethereum.

The Road Ahead

Two main challenges remain: decentralization and data costs.

While most L2s still currently use centralized sequencers to order transactions, this is rapidly changing. Key networks like **Arbitrum** and **Optimism** are actively developing and testing decentralized sequencer solutions. This transition is a top priority across the ecosystem to distribute control over transaction ordering and revenue (MEV), representing a key step toward achieving true censorship resistance[19].

Additionally, while cheaper after Dencun, data posting remains a significant cost. As a result, many L2s are now actively integrating **alternative data availability solutions** like **Celestia** and **EigenDA**. This strategy is proving crucial for further reducing fees and making their blockchains more scalable and accessible to all. However, L2s that use these other data solutions don't get the same security guarantees that Ethereum provides.

19 The L2 decentralization roadmaps are closely followed by the ecosystem. You can check L2Beat to see the latest status of each L2 (under the "Stage" heading).

Don't Mind the Gap: Bridges and the Internet of Value

Blockchains began as isolated digital islands. Each had its own culture, code, and currency. Moving between them was a slow crawl through centralized exchanges.

Bridges changed everything. They are the pathways connecting these separate worlds, letting value and data flow freely. They are essential infrastructure for an internet of value.

The Great Migration

At first, users fled Ethereum for one reason: high gas fees. They chased faster, cheaper chains.

That era is over. Ethereum's 2024 Dencun upgrade slashed costs on its Layer 2 networks. Now, bridging isn't about escaping fees. It's about chasing opportunity—finding the unique apps, deep liquidity, and new experiments scattered across a multi-chain world.

How They Work: Lock and Mint

Most bridges use a simple trick: lock and mint. You lock a token on one chain, and the bridge issues a wrapped version on another. It's a coat check for your assets.

But it's not just for tokens. Bridges can move any data. This allows a smart contract on one chain to trigger an action on another, making truly seamless applications possible.

A Battlefield of Ideas

The bridge world is a showcase of competing designs.

- **Foundational Protocols:** Think of the Inter-Blockchain Communication Protocol (IBC). It's the proven, battle-tested standard for connected chains in the Cosmos ecosystem.

- **Universal Translators:** Protocols like LayerZero aim to be a single messaging layer for all blockchains, connecting everything to everything.
- **Intent-Based Systems:** This is the new wave. Instead of managing the process, you just state your goal: "Swap my ETH for SOL." A market of solvers then finds the best path to make it happen for you.

The Billion-Dollar Risk

Bridges are Web3's biggest security risk. Billions have been lost in hacks. Early designs often relied on a small group of trusted parties, creating a centralized point of failure.

The industry is now racing toward better, trust-minimized designs. The most powerful solution on the horizon is the **zero-knowledge (ZK) bridge**. Using pure math, ZK-bridges can prove a transaction is valid without trusting anyone. This is a radical leap in security.

The Future is Invisible

The ultimate goal? **Chain abstraction.**

The best bridge is the one you never see. Soon, you won't have to pick a network or a bridge. You'll just click a button, and sophisticated protocols will handle the cross-chain magic in the background.

The boundaries between blockchains are dissolving. A truly fluid internet of value is finally here.

Wallets

A digital wallet is your key to Web3. It's an app on your phone or computer that lets you connect to decentralized services.

You visit a site, click 'Connect Wallet,' and approve transactions. It all happens in seconds. Once you get past the learning curve, it feels simple enough. But these wallets have a dark side. They are built on a foundation that is deeply flawed.

The End of the Unforgiving Wallet

Web3 promised an internet you control. True digital ownership. But this power came with a catch: the 12-word seed phrase. Lose it, and your assets were gone forever. This single point of failure was a deal breaker keeping crypto a niche interest.

The user experience had to be completely reinvented. That reinvention is Account Abstraction (AA). And it's not a future concept; it's reshaping the digital world right now.

Your Wallet, Reimagined

Account Abstraction turns your crypto wallet into a piece of smart, programmable software. It fixes the fatal flaws of old wallets without needing to overhaul the entire blockchain, thanks to a standard known as ERC-4337.

The result is a user experience that feels as simple as the best Web2 apps. Here is what's new:

- **No More Seed Phrases.** "Social recovery" lets you use friends, family, or other devices to regain access. Permanent loss is nearly impossible.
- **Layered Security.** Require approvals from both your phone and laptop for large transactions.
- **Total Convenience.** Set daily spending limits. Let trusted apps perform routine actions without constant pestering.

The New Center of Gravity

The real action is on Layer 2 networks.

Platforms like Starknet and zkSync built Account Abstraction into their core DNA. This ignited a firestorm of innovation across other major L2s like Polygon, Arbitrum, Optimism, and Base. With their low fees and high speeds, these networks are where the smart wallet revolution is happening.

The numbers show a technology hitting its stride. As of mid-2025, over 26 million smart accounts have been created, processing nearly 148 million user transactions.

While still a fraction of total on-chain activity, the trend is accelerating fast. Infrastructure providers like Pimlico and Biconomy are leading the charge, sponsoring user fees and making it even easier for developers to build.

The Next Hundred Million Users

The era of the unforgiving crypto wallet is over.

Account Abstraction is making Web3 safe and practical for everyone. It buries the terrifying complexity of private keys under a simple, elegant interface. The industry is finally making good on its promise of an internet owned by its users.

The next hundred million people are no longer at arm's length. They're on the doorstep.

Intents

Web3's power has long been trapped behind a wall of complexity, making it intimidating for most people to use. But a fundamental shift is happening, driven by a simple yet powerful idea.

This emerging philosophy is built around **intents**, and it's beginning to reshape the entire landscape by focusing on a better user experience. The system no longer asks you to be a technician. It asks, "What do you want to do?"

Old Way vs. New Way

Before, you did all the work. A simple trade meant manually plotting every step: approve, select a platform, set gas, and execute. It was rigid and unforgiving.

Intents flip this model completely. You don't give orders; you declare an outcome. You simply sign a message with your goal: "Swap 1 ETH for the most USDC possible, with a max fee of $20." You state the *what* and delegate the *how*.

The Solver Marketplace

When you broadcast your intent, it enters a competitive marketplace. A network of agents called "solvers" race to find the best way to execute your goal. They might route your trade across multiple chains or exchanges—anything to get you the best price while shielding you from issues like MEV.

Crucially, your assets never leave your wallet until the deal is done. You get a better experience without sacrificing self-custody.

From Theory to Standard

This isn't just a theory. Intents are now the engine of Web3.

- Pioneers like Across Protocol and Uniswap X proved the model.

- Exchanges like CowSwap have used solvers for years to protect users.
- Account Abstraction (ERC-4337) gives intents superpowers, enabling far more complex goals.

This synergy is opening a new world for developers.

Taming a Multi-Chain World

The blockchain ecosystem is a sprawling archipelago of L1s, L2s, and appchains. This creates complexity.

Intents are the bridge. They are a universal layer that hides the backend intricacy from you. Protocols like NEAR and Socket use intents to make cross-chain interactions feel seamless. Use an app on one chain with assets from another. No switching. No headaches.

The Road Ahead

Intents are now the bedrock of the Web3 experience. It's a decisive move away from a system that demanded you be an expert to one that simply works.

You don't need to know TCP/IP to check your email. Soon, you won't need to know about gas fees to use your digital assets. Challenges remain—solver networks must stay decentralized. But the trajectory is clear.

By focusing on outcomes, not process, intents are finally making the promise of Web3 real for everyone.

Chapter 3

Meet the People Powering Web3

We've journeyed through the past, from the web's first dial-up tones to the conceptual thunderclap of the blockchain. That history sets the stage for what's next, but technology alone doesn't build the future. People do. The real story of Web3 isn't about servers or protocols; it's about the new economic and social contracts being written between the people who build, fund, and use the internet.

The fundamental promise of Web3 is a radical realignment of value. The old world was defined by walls; the new world is defined by networks. In the Web 2.0 playbook, value was a resource for central platforms to extract. In Web3, it is created and shared by the community.

This isn't just a slight adjustment; it's a complete paradigm shift, built around a new cast of characters whose roles are subtly and profoundly different.

At the heart of this universe are the **communities**. They are the lifeblood, the culture, and the driving force behind any meaningful Web3 project. While a visionary founding team is as crucial as ever, their role has evolved from that of a gatekeeper to a catalyst. Their primary job is no longer just to build a product, but to cultivate a thriving ecosystem. We'll explore what separates a vibrant, self-sustaining community from a transient crowd. This leads us directly to the operating system for these communities: Decentralized Autonomous Organizations (**DAOs**). Think of DAOs not just as a new kind of company, but as a fundamental rethinking of how humans can organize, collaborate, and create value on the internet—often with

more transparency and flexibility than any traditional corporate structure could offer.

Naturally, **founding teams** and **investors** haven't disappeared—they've just leveled up. Their contributions are no longer fire-and-forget. We'll unpack how their success is now inextricably linked to the health and wealth of the entire network, demanding a long-term perspective over short-term gains.

Since every Web3 product is software at its core, **developers** are the architects of this new frontier. They are the builders laying down the digital bricks and mortar. To understand who they are and what they're building, we'll draw on the invaluable insights from Electric Capital's definitive annual developer report—the gold standard for tracking the talent flow that signals where the future is heading.

But who keeps this entire system honest? Who ensures that a Web3 network remains a neutral, public good, free from capture or censorship? That responsibility falls to the **miners and validators**. They are the silent guardians of decentralization, the digital workforce that dedicates computational power to secure the network in exchange for a stake in the system they uphold. We'll examine their critical function and how their incentives are designed to protect the integrity of the ecosystem for everyone.

And finally, we arrive at the **users**. For decades, users were the product, their data sold to the highest bidder. Web3 proposes a different deal: users as owners, participants, and beneficiaries. We'll touch on how this new dynamic is poised to attract the next billion people to a more equitable and open internet.

Understanding this new social and economic architecture is the key to grasping the power of Web3. Once we see how the people and their incentives create this interlocking system, we'll be ready to explore the engine that powers it all: **tokenization**.

The Rise of the Community

If you want to understand what makes Web3 different, start with the community. It's the single most significant departure from the startup world we once knew.

The classic playbook for building a company was simple and secretive. A small team of entrepreneurs and their investors would build a product behind closed doors. These two groups—the founders and the venture capitalists—were the only ones with a real stake. If the startup succeeded, the payoff came through an IPO or an acquisition, and the rewards were split between them. It was a private club.

Web3 tears up that playbook.

The closed-door company has been replaced by the open, dynamic ecosystem. The core idea is no longer about building a product *for* a market, but about cultivating an economy *with* a community. The circle of stakeholders has expanded dramatically. It's not just about the founding team and their investors anymore. Now, the **users** who bring the network to life, the **developers** who build on top of it, and the **miners** or **validators** who secure its infrastructure are all considered vital contributors.

This is why community is everything in Web3. A project's strength isn't measured by its headcount but by the vibrancy of its ecosystem. While this creates an incredible engine for growth, it also presents a profound new challenge: how do you coordinate a global, loosely connected group of people toward a common goal? You use a DAO.

DAOs: The Native Corporation of the Internet

What is a DAO?

A **Decentralized Autonomous Organization** is what it sounds like: a community with a shared mission and a bank account, governed by rules encoded on the blockchain. Think of it less like a traditional company and

more like a collective of people from all over the world, working together as peers. The "laws" of this organization—how to vote, how to spend funds, how to reward contributions—are written into transparent, unstoppable smart contracts. It's an organization with no CEO, no boardroom, and no single point of failure.

The Journey to Decentralization

A project doesn't typically start as a DAO on day one. There's a natural evolution from a centralized team to a decentralized community. Why?

In the beginning, a startup needs to move fast. A small, focused core team can make quick decisions, pivot based on feedback, and navigate the chaotic early days with agility. They are the initial spark.

But if the project finds traction and begins to flourish, something magical happens. The circle of contributors naturally expands. External developers start building new tools and features. Users become evangelists, shaping the culture and driving adoption. The project takes on a life of its own, growing beyond the capacity of its initial creators.

This is the point where the need for a new structure becomes critical. The core team needs resources to keep the lights on, and outside talent needs to be compensated for their work. This is when investors might enter the picture, not just to fund a company, but to support an emerging ecosystem.

This is the moment of transition. To truly scale and become a public good, the project must be handed over from the founding team to the community itself. It's a process often called "progressive decentralization," and the DAO is the vehicle for that journey.

The Contributor's Stake

This global, distributed effort isn't fueled by altruism alone. The thousands of contributors who dedicate their time and talent to a project do so because their incentives are directly aligned with its success. They aren't just working *for* the project; they are working to increase the value of their stake *in* the project.

The mechanism that makes this possible is the **token**. By creating and distributing a native token, a project can reward every contributor—from the earliest investors and developers to the most active community members—with a piece of the network they are helping to build.

So, What Is a Token Actually Worth?

A token's value comes from the rights and privileges it grants its holder. It's a key that unlocks a new kind of ownership.

First and foremost, a token is a voice. In a DAO, tokens grant **governance rights**. Holding a project's token means you get a say in its strategic direction.

Proposals for new features, changes to the protocol, or how to spend the community treasury are put to a vote, and token holders cast their ballots based on the number of tokens they hold[20]. It's the digital equivalent of shareholder voting, but for a decentralized network.

Naturally, contributors also expect to share in the economic upside they help create. However, this is where things get nuanced. While tokens have value and can appreciate as the network grows, most projects avoid distributing direct revenue or profits to token holders. Doing so would risk the token being classified as a "security" under U.S. law, which invites significant legal and regulatory complexity[21].

Instead, value is delivered in other ways. Token holders are often granted special privileges, like priority access to new features, discounted fees when using the product, or exclusive opportunities in collaborations with other projects. It's a way to reward the community and deepen their engagement

20 While one vote per token is the common practice the space is actively experimenting with alternative models to address the shortcomings of this, such as plutocracy (where wealthy token holders have excessive influence) and voter apathy. Alternatives like quadratic voting, conviction voting, and reputation-based or identity-based voting systems are being explored and implemented by various DAOs to create more equitable governance.

21 Token revenue distribution is typically used to avoid being classified as securities under U.S. law. Under current US law, categorizing a token as a stock requires regular reporting to the SEC by issuing teams and compliance with many procedures. Some argue that Web3 tokens should be treated differently from stocks and advocate a new legal framework. The Biden administration (2020–24), particularly SEC Chairman Gary Gensler, maintained that existing securities laws suffice for token management. The Republicans which controlled the House and the Senate in 2025 are in the process of bringing new regulatory framework for digital assets.

in the ecosystem without crossing regulatory lines.

The Inevitable Path to Decentralization

A project can have a token, a public blockchain, and a passionate user base, but if all the critical decisions are made by a small, centralized team, it has failed to deliver on the core promise of Web3. Decentralization isn't a technical feature; it's the diffusion of power.

This isn't just a philosophical stance; it's a principle with massive real-world consequences. A project that remains centrally controlled cannot truly be called decentralized.

This view aligns with influential guidance from key figures at the U.S. Securities and Exchange Commission (SEC). In public statements, the SEC has explored when a digital asset might no longer be considered a security, and the conclusion often hinges on the degree of decentralization.

The critical test is whether the network can thrive without its original creators. As the SEC has noted, for a network to be considered sufficiently decentralized, its value cannot depend on the "essential management or entrepreneurial effort" of a single group.

> "But this also points the way to when a digital asset transaction may no longer represent a security offering. If the network on which the token or coin is to function is sufficiently decentralized – where purchasers would no longer reasonably expect a person or group to carry out essential managerial or entrepreneurial efforts – the assets may not represent an investment contract. Moreover, when the efforts of the third party are no longer a key factor for determining the enterprise's success, material information asymmetries recede. As a network becomes truly decentralized, the ability to identify an issuer or promoter to make the requisite disclosures becomes difficult, and less meaningful."[22]

22 U.S. SEC guidance emphasizing decentralization in token evaluation. Excerpt from a 2018 speech by

This is the heart of the matter. As long as a small team holds all the keys, they have privileged information and control, just like a traditional corporate management team. The goal is to eliminate that information asymmetry.

This is precisely the role a DAO is designed to fill. It serves as the vehicle for a project's journey away from its founding team and toward genuine decentralization. A thriving DAO is the ultimate proof that a network is no longer a private venture but a public good, governed and sustained by its community.

The Decentralization Playbook

How does a Web3 project evolve from a private company into a public good? A common playbook has emerged. A project often begins with a core team incorporating into a "Labs" company to raise funds and build the initial technology. When the time comes to decentralize, a critical shift occurs: an independent **Foundation** is created in a neutral, crypto-friendly jurisdiction like the Cayman Islands, Switzerland, or the British Virgin Islands (BVI). This separate legal entity, managed by independent directors, handles the token issuance[23]. This deliberate separation of the for-profit builder from the non-profit steward is the key maneuver that allows a project to shed its centralized origins and become a credibly neutral protocol owned by its community.

The Many Flavors of DAOs

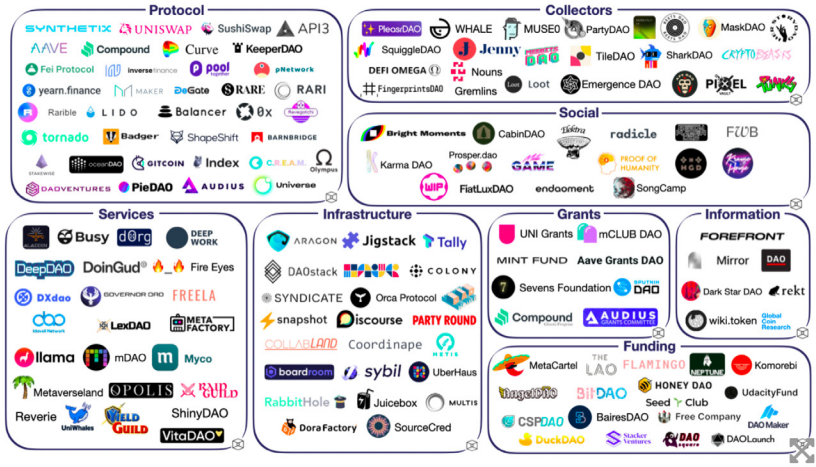
The world of Decentralized Autonomous Organizations (DAOs) is a fluid and rapidly evolving landscape, making any attempt at a strict classification a challenge. However, you can identify several distinct "flavors" of DAOs,

William Hinman, former Director of Corporate Finance at the SEC: "If the network on which the token or coin functions is sufficiently decentralized—where purchasers no longer reasonably expect a person or group to manage essential efforts—the assets may not represent an investment contract."

23 Common practice of using independent offshore foundations for token management. For additional insights, see this detailed X post.

each organized around a specific purpose. This 2021 chart, while from a few years ago, still provides a valuable snapshot of the landscape.

DAO Ecosystem (2021)



The players that make up the DAO ecosystem. (Source: 'TheBlock, Mapping out the DAO Ecosystem' report).

Different types of DAOs range from Protocol DAOs like Uniswap and MakerDAO, which act as community stewards for essential Web3 infrastructure, to Collector DAOs that are like group investment funds for acquiring NFTs and other digital artifacts. Social DAOs operate like next-generation private clubs, prioritizing community and shared interests, while Service DAOs act as decentralized talent agencies, connecting skilled professionals with projects in need.

Beyond these, other crucial types make the backbone of the ecosystem. Infrastructure DAOs build the essential "picks and shovels"—the voting, treasury, and operational tools that all other DAOs rely on. Grant DAOs serve as decentralized funding bodies, distributing capital to encourage growth within their specific ecosystems. Information DAOs act as the media and knowledge-management arms of Web3, running community-owned wikis and news outlets to keep everyone informed. Finally, Funding DAOs are challenging the traditional venture capital model by allowing members

to pool capital, source deals, and co-invest in promising early-stage projects, democratizing access to startup investing.

Nice in theory not so in reality…

While in theory, DAOs give online communities the tools to govern themselves, make collective decisions, and share in the value they create together, the reality is a bit different.

The truth is, we're in the messy, early days of DAOs. Many are struggling with fundamental problems, like convincing members to actually show up and vote. Voter apathy isn't just a problem for nation-states; it's a critical bug in decentralized systems too. On top of that, DAOs operate in a legal gray zone, leaving them exposed and uncertain of their standing in the traditional world.

Despite these growing pains, they represent a radical experiment in human coordination. They are a direct challenge to the idea of the top-down, hierarchical firm that has dominated for centuries. What does it look like when a global community, bound by shared goals instead of a shared office, truly takes control? We're about to find out.

How Do You Gauge the Health of a Network?

How can you tell if a community is thriving or just faking it? It's a crucial question, and while there's no simple formula, you can learn a lot by knowing where to look and what to look for. Think of it as vetting a project's most valuable, and often least understood, asset.

Your investigation starts at the project's website—the digital front door. From there, you'll find pathways into the community's core gathering places.

The first stop is almost always **Discord.** For the uninitiated, Discord can feel like stepping into a chaotic, sprawling city. It's the Web3 equivalent of the corporate Slack, but messier and more alive. This is the project's town square. Pay attention to the quality of the conversation. Is it full of meaningful questions and support, or just noise and price speculation?

How does the core team interact with members? The signal is in the quality of the conversation, not just the raw number of members—a metric that can be easily inflated.

For more thoughtful, long-form discussions, turn to the project's official forums or Reddit sub-channels. These are the community's public archives. Here, you can get a feel for the mood over time and find deeper critiques and more detailed proposals. Comparing the engagement here to that of competitors can offer a rough sense of scale and passion.

A project's X (formerly Twitter) presence also provides clues, revealing how it communicates its vision and engages with the broader Web3 conversation.

But a truly vibrant community is more than just users and speculators; it's an ecosystem. The most powerful, and often most overlooked, indicator of a network's long-term health is its **developer community**. Are builders actively creating new tools and applications on the protocol? A project that invests in its developers—by providing excellent documentation, tools, and resources—is building a platform, not just a product.

Mature projects make this support official through grant programs, allocating a significant portion of their tokens to fund new development. These grants are designed to kickstart a flywheel of innovation, where outside developers build spin-offs and integrations that make the entire ecosystem more valuable. Ultimately, a project's success hinges on its ability to convince the smartest builders to bet their time and energy on its future. That's the most potent social proof there is.

Conclusion

In Web3, the community isn't just a part of the strategy; it *is* the strategy. A project with brilliant code but no active community is like a city with no people—an empty shell. The true product isn't just the software, but the living, breathing economy of users, developers, and backers who give it life.

For founders, this means time spent encouraging discussion and incorporating feedback is as vital as time spent writing code. For investors, the calculus has changed. The most telling sign of a project's future success isn't

just the elegance of its tech, but the vibrancy of its community. A strong community is the ultimate competitive moat, and the most reliable leading indicator of growth.

Web3 Founders: A New Breed of Entrepreneurs

The teams building the future of the internet look and operate differently than their traditional tech counterparts. Forget the stereotypical startup grind; Web3 is forging a new model for entrepreneurship.

Entrepreneurship Reimagined: Teams in the Web3 Era

The old image of the sleep-deprived founder, chained to a desk and fueled by caffeine, is fading. Web3 entrepreneurs are a different breed entirely—a global network of loosely-connected individuals, many of whom have never met in person.

In an industry this new, traditional experience is less important than adaptability. The rigid, all-or-nothing commitment demanded by Silicon Valley investors is gone. Today's builders can contribute to multiple projects at once, shifting their focus as new opportunities arise without abandoning their existing work.

This flexibility extends to identity itself. Team members are free to choose whether they reveal their real names or operate under a pseudonym. In fact, many successful projects are built by completely anonymous teams.

Why the anonymity? It's not just for show.

First, it's a practical defense against the risks of a hyper-digital world. Second, and more fundamentally, innovation often pushes against the boundaries set by regulators. Anonymity allows builders the freedom to experiment and push the limits of what's possible without premature constraints.

This freedom is rooted in the core philosophy of decentralization. You'll find that the most authentic founders are deeply committed to this ideal. However, as projects attract investment and face the pressures of growth, that commitment is tested. Ego and top-down leadership can creep in, betraying the project's foundational principles.

Be wary of teams that drift in this direction. The projects with real staying power are those that remain true to the decentralized ethos, even under pressure, eventually handing over control to their communities through DAOs.

The Power of "Open Source"

So, how can you trust a project built by an anonymous team? The simple answer is: you don't have to. The foundational principle of Web3 is "don't trust, verify." Your confidence isn't placed in the people behind the project; it's placed in the integrity of the code they write. The only way this works is if the software is open for anyone to see and audit.

This is the principle of "open source." In an open-source project, the entire codebase—from the initial commit to the latest update—is transparent. You can track the complete development history, typically on a platform like GitHub, and verify for yourself that the software does what it claims to do.

This transparency allows Web3 founding teams to be leaner than ever before. They are supported by a global army of volunteer contributors. But don't mistake this for charity. These contributors are incentivized; they lend their skills in exchange for a future stake in the project, usually in the form of tokens, or because the project's success directly benefits their own work.

The advantages are enormous. In the traditional tech world, knowledge is a trade secret, locked away by copyrights and patents. A new startup has to build everything from the ground up, a slow and expensive process that requires hiring large teams and chasing venture capital.

In Web3, the rules are different. Since everything is open source, start-ups can freely build upon the work of others. The goal isn't to simply copy but to take existing code and improve upon it, adding a unique insight or feature.[^4] This allows new products to launch at incredible speeds with minimal resources.

This leverage is a hallmark of Web3. For instance, in its early days, the DeFi giant Uniswap hit a multi-billion dollar market capitalization with a

core team of just 11 people[24].

This new model doesn't just change how products are built; it also transforms the founder's relationship with investors.

24 While the core team, Uniswap Labs, has since grown to support the massive ecosystem, the principle remains: open-source allows small teams to build immensely valuable protocols by leveraging a global community of contributors.

Web3 Investors: New Rules, New Roles

Just as the founders have changed, so have the investors who back them. The old rules of venture capital no longer apply in a world where power is shifting away from the boardroom and into the hands of the community.

A Weaker Hand at the Table

In the Web 2.0 era, the relationship was simple: the founder needed the venture capitalist (VC). The dynamic was a familiar dance. Founders would go door-to-door, pitching their ideas and business plans to VCs. The investor's job was to provide capital and connections to guide the company toward a lucrative exit, like an IPO or acquisition, where they would cash in their shares. In this world, the founder and the investor were the only two players that truly mattered.

In Web3, the table is much more crowded, and the VC's hand is weaker.

Founders are not the only other players at the table. The value created by a project is now shared among a much wider group. You've got external developers contributing code, ecosystem partners building on the platform, and, most importantly, the users themselves. All of them have a stake in the project's success and expect a piece of the pie.

With more players claiming a share, the VC's slice inevitably gets smaller. In the old world, investors bought equity through shares or a SAFE (Simple Agreement for Future Equity). In Web3, tokens replace shares, and they are distributed to a broader base of stakeholders. Investors now often use a SAFT (Simple Agreement for Future Token), a contract that reflects this new reality: they are just one part of a larger community, not the sole kingmaker.

...But the Pendulum Swings Back

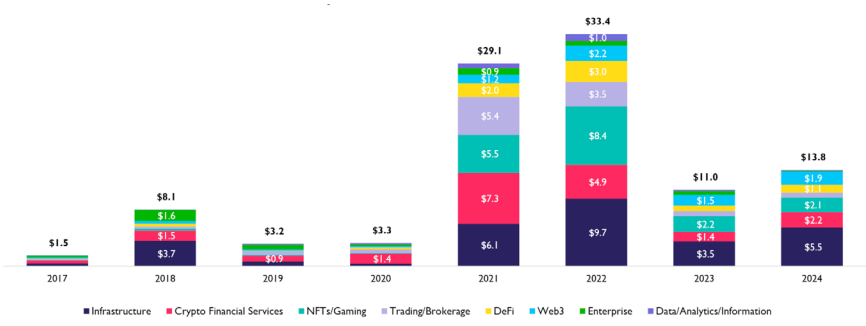
The balance of power didn't shift overnight. Before 2020, VCs had an even tougher time. Founders could bypass them entirely by raising funds directly from the public through Initial Coin Offerings (ICOs). But the ICO

boom was short-lived. Fueled by hype, countless individual investors poured money into projects that turned out to be hollow, leading to massive losses and a collapse in market trust.

This crash forced a flight to quality. After 2020, the most promising startups shifted their strategy from simply selling tokens to a more thoughtful distribution. To get their projects off the ground, they turned to experienced venture capitalists who could provide more than just capital—they could offer guidance and serious vetting.

Now, the power dynamic between founders and investors ebbs and flows with the market. During the 2020-21 bull market, founders held all the cards. They could send a simple spreadsheet to VCs with a veiled threat: "You have until next week to invest, or you're out." The fear of missing out was so intense that it worked. When the market turned, however, those same founders found their messages went unanswered.

Blockchain Venture Funding 2017-2024



Distribution of annual blockchain investments by area. (Source: TheBlockPro Research, *The Block Pro Research - 2024 Blockchain Venture Funding Recap*)

The trend is clear: the days of completely ignoring investors are over. Venture capital is becoming a core part of the Web3 ecosystem. The big funds are no longer just placing bets; they've become seasoned players in this world. They are more selective, and more importantly, they are building powerful ecosystems by creating synergies between the various projects

in their portfolios. They aren't just investors anymore; they are becoming network architects.

Investors Are Becoming Specialists

As venture capital becomes more embedded in Web3, the firms themselves are evolving. The top VCs are no longer just financiers. They have also dedicated research teams, significantly strengthening their technical expertise. Leveraging this expertise, many firms now specialize in certain Web3 niches.

For instance, a16z, one of the largest investors, invests heavily in zero-knowledge (zk) research and actively backs projects focused on this technology. Paradigm, another major fund, has learned a lot from its experiments with tokenization and game theory, which it uses to help design the tokens for its portfolio companies—though opinions vary on how well this has worked.

Developers: Powering the Web3 Revolution

To understand where Web3 is going, you have to follow the developers. They are the architects of this new world, and their movements are the most reliable leading indicator of future growth and value. Where talent flows, innovation follows.

Fortunately, the open-source nature of Web3 gives us a clear view of this migration. The most comprehensive analysis comes from the annual Developer Report by Electric Capital, which offers a detailed summary of the entire landscape.

Here are the key takeaways from the 2024 report:

2024 Developer Report Highlights

The report's findings paint a clear picture: while surface-level numbers may fluctuate with market cycles, the foundation of the Web3 ecosystem is stronger than ever.

Here's the story the data tells:

- **A Healthy Shakeout.** Since Ethereum's launch in 2015, the number of developers has grown an explosive 39% on average each year. While 2024 saw a 7% dip, this isn't a sign of decay. It's a consolidation. The "tourists" who arrived during the hype cycle have left, while the true builders remain.
- **The Veterans Are Doubling Down.** The number of "seasoned developers"—those who have been building in the space for more than two years—is at an all-time high, growing by 27% in 2024 alone. This dedicated core now ships 70% of all code. They are the ones laying the bedrock for the future.
- **Talent is Decentralizing.** The center of gravity is shifting. In 2024, Asia surpassed North America as the region with the most developers. The US, which accounted for 38% of developers in 2015, now

represents just 19%. This is a global movement, no longer confined to Silicon Valley.

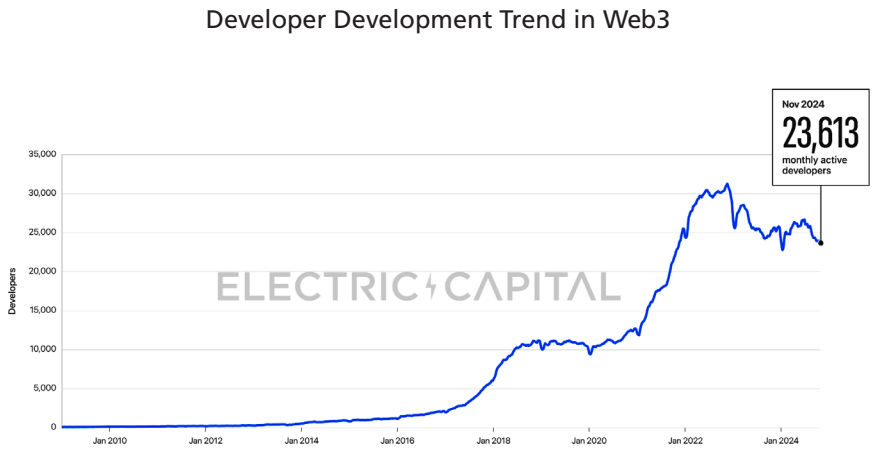
- **The Rise of the Multi-Chain Developer.** The days of pledging allegiance to a single network are fading. Nine years ago, fewer than 10% of developers worked on multiple chains. Today, one in three are active across different networks. They are becoming chain-agnostic, choosing the right tool for the job and paving the way for an interoperable future.
- **Scaling is the Name of the Game.** While Ethereum remains the undisputed king of developer mindshare, the real story is the relentless focus on scaling. Solana is seeing the fastest growth among alternative networks. Meanwhile, 42% of Bitcoin developers are focused on scaling solutions, and a remarkable amount of new work in the Ethereum ecosystem is happening on Layer 2 networks. Base now accounts for 42% of new code commits within the Ethereum ecosystem."

Key Takeaways: What to Watch

The Signal in the Noise

At first glance, the trend line for Web3 developers might seem worrying. While the number of active developers has grown by an average of 39% every year since 2015, the chart shows a recent dip in 2023 and 2024. Are the alarm bells ringing for crypto?

Not if you look closer.



Growth of crypto developers over the years. The average annual growth rate is 39%. (Source: Electric Capital Developer Report 2024 Page 9)

The recent decline is simply the echo of an unsustainable boom. The bull market of 2020 and 2021 was a gold rush. Startups, flush with venture capital, were locked in a frantic race to hire talent and ship products. This frenzy lured a wave of developers from outside Web3, many drawn more by the sky-high salaries than a belief in the mission.

When the market turned in the second half of 2022, driven home by the collapses of Terra, 3AC, and FTX, the flow of easy money stopped dead. The party was over.

Projects had to tighten their belts to survive the crypto winter, leading to a sharp reduction in developer headcount in 2023.

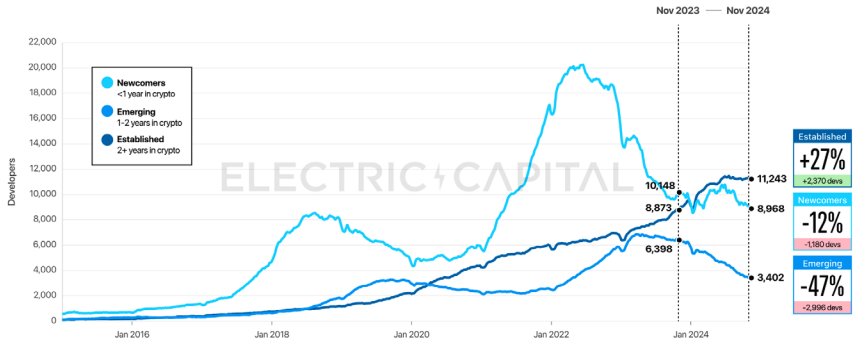
The further 7% decrease in 2024 is best understood as the market finding its stable footing. As the report notes, fluctuations of this size are common and not statistically significant. This isn't a sign of decay; it's the natural consolidation that follows a hype cycle, leaving behind a more resilient and committed base of builders.

Seasoned Developers Lead the Charge

This is the most important part of the story. While the overall devel-

oper count has dipped, the number of truly committed builders is growing. The data shows that the ranks of experienced developers—those with more than two years in the trenches—grew by a remarkable 27% through 2023 and 2024.

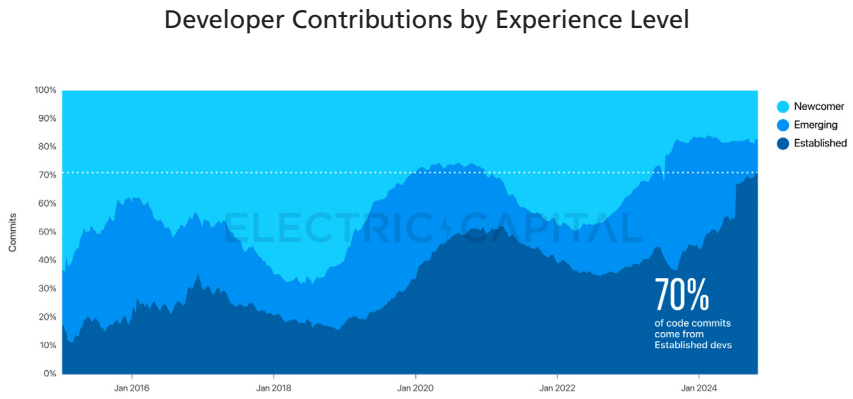
Monthly Active Developers by Experience



Growth in monthly active developers segmented by experience. (Source: *Electric Capital Developer Report 2024, Page 12*)

These aren't fair-weather builders. They are the veterans who have weathered multiple market cycles and remain dedicated to the long-term vision. Their growing numbers signal a powerful consolidation of talent and a maturing ecosystem.

Their impact is even more profound than their numbers suggest. This core group of experienced developers writes 70% of all the code in Web3.



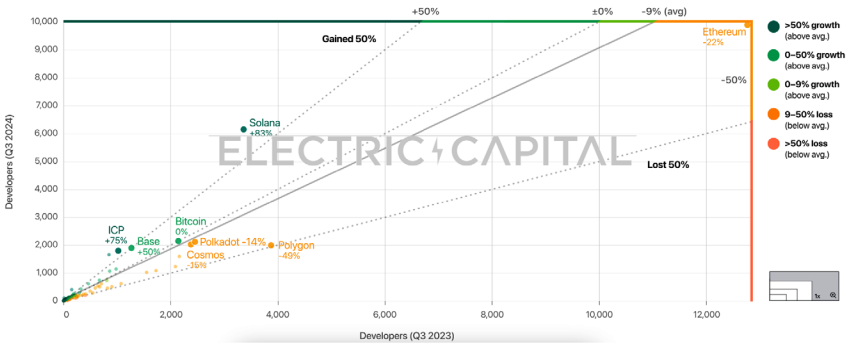
Developer contributions segmented by experience. (Source: *Electric Capital Developer Report 2024, Page 13*)

While headlines may focus on fluctuating market caps, the real work is being done by a dedicated and growing cohort of experts who are quietly building the future of the internet. The foundation isn't cracking; it's solidifying.

Network Popularity Among Developers - Where is the Talent Flowing?

Every year, the most revealing part of the report is the breakdown of where developers are choosing to build. In a down market, this data is even more crucial—it shows which ecosystems have real momentum.

Top Networks by Developer Count (2023-24)



Developer count changes from Q3 2023 to Q3 2024 for networks with 2,000+ developers. (Source: *Electric Capital Developer Report 2024, Page 104*)

The chart above maps the change in developer counts for major networks from late 2023 to late 2024. Any network to the left of the far-left dashed line grew its developer base. Anything to the right shrank.

With the entire industry seeing a 9% contraction, true performance is relative. The networks that beat this average are the ones to watch.

- **The Outliers:** Solana, ICP, and Base are the clear winners, posting stunning growth of 83%, 75%, and 50%, respectively. In a year where talent was scarce, they didn't just retain developers—they aggressively attracted them. Bitcoin also showed resilience, holding its developer count steady.
- **The Incumbents:** In contrast, established players like Polygon (-49%), Ethereum (-22%), Cosmos (-15%), and Polkadot (-14%) all saw their developer numbers shrink by more than the industry average.

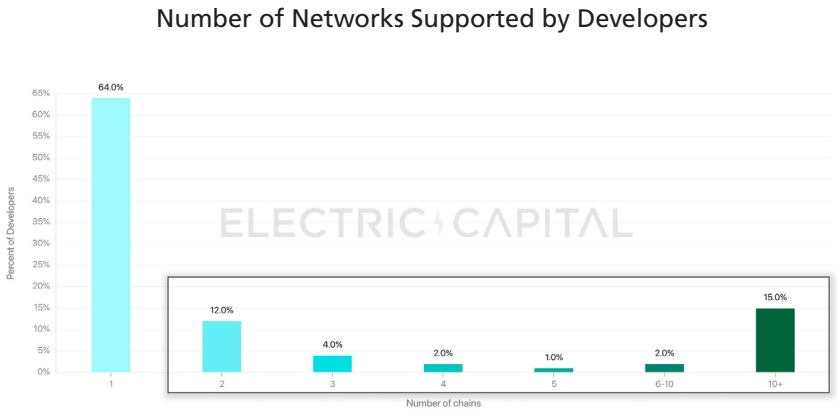
Despite the dip, Ethereum still commands the largest army of developers by a massive margin. Its lead is so significant that it's hard to imagine any other network catching up in the near future.

Why does Ethereum have such a powerful gravitational pull? A huge part of the answer lies in its vast, established ecosystem. But the killer feature

is the Ethereum Virtual Machine (EVM). The EVM is the software environment where Ethereum applications run, and it has become the *de facto* standard for smart contracts. New blockchains adopt the EVM to make it easy for Ethereum's massive developer base to build on their networks. This creates an incredible network effect, cementing the EVM as the industry's core programming environment.

Developers Embrace Multi-Network Development

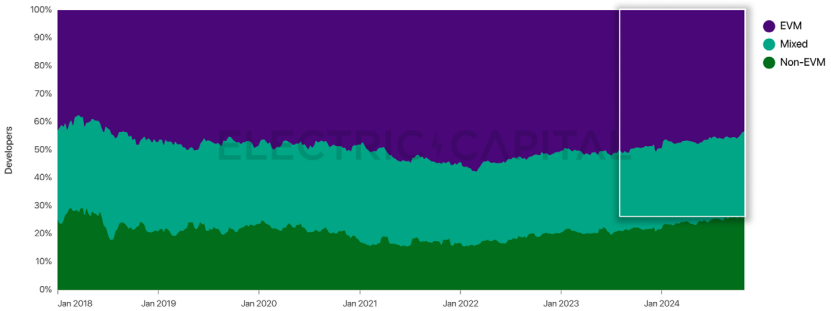
The dominance of the EVM standard is creating a new type of builder: the chain-agnostic developer. The old model of dedicating oneself to a single network is fading. Today, 36% of all developers are active on multiple blockchains.



How many networks developers typically contribute to. (Source: *Electric Capital Developer Report 2024, Page 48*)

This trend is a direct result of the EVM's success. It provides a common language that allows developers to seamlessly deploy their applications across a wide range of compatible networks. This creates a fluid, interoperable ecosystem where builders can follow opportunities without having to learn a new technical language. Unsurprisingly, among developers who work on multiple smart contract platforms, 74% are building on at least one EVM-compatible chain.

Multi-Chain Developers: EVM vs. Non-EVM

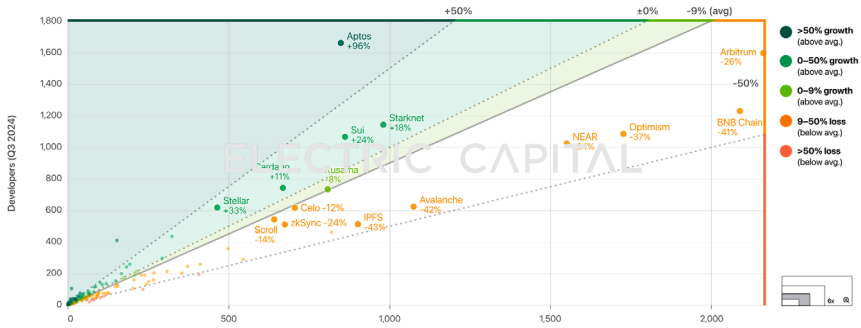


Percentage of developers working across multiple networks by EVM compatibility. (Source: *Electric Capital Developer Report 2024, Page 57*)

How Do Smaller Networks Stack Up?

Beyond the established giants, a different story is unfolding. A look at the smaller and mid-sized networks reveals where the next wave of explosive growth might come from.

Developer Growth: Mid-Sized Networks (500–2,000 Developers)



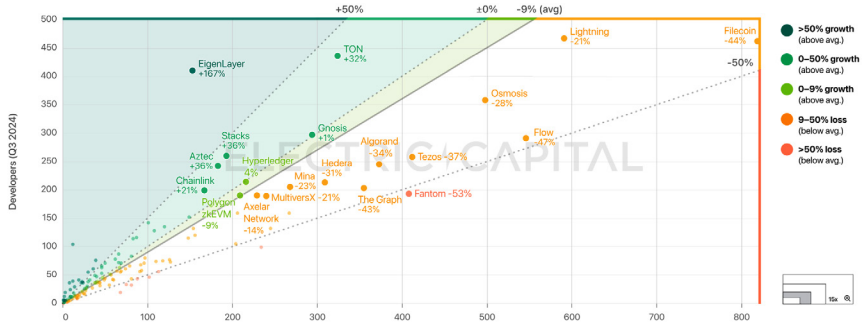
Developer growth from Q3 2023 to Q3 2024 for mid-sized networks (500–2,000 developers). (Source: *Electric Capital Developer Report 2024, Page 106*)

While the overall market consolidated, these emerging platforms saw fierce competition for talent. Here's what stands out:

- The Move programming language is having a moment. Aptos and Sui, two networks built on Move, are shining brightly. Aptos leads all networks with a staggering 95% growth in its developer base, while Sui is close behind with a 24% increase.
- Other notable winners include the payments network Stellar (+33%), the scaling solution Starknet (+18%), and the established smart contract platform Cardano (+11%).

Finally, let's take a closer look at even smaller, nascent ecosystems.

Developer Growth: Smaller Networks (200–500 Developers)

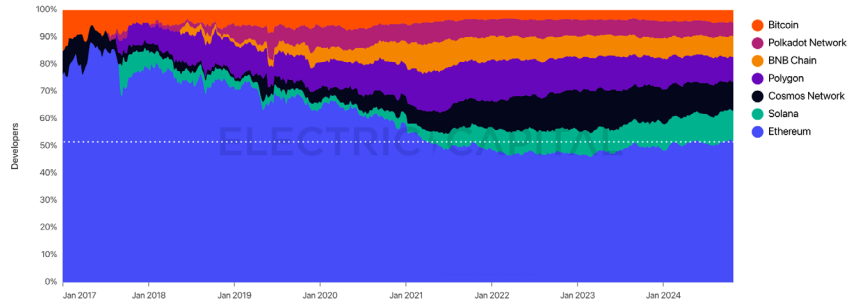


Developer growth from Q3 2023 to Q3 2024 for smaller networks (200–500 developers). (Source: *Electric Capital Developer Report 2024, Page 107*)

Developer Activity in Decentralized Finance

When it comes to decentralized finance (DeFi), the most valuable and competitive sector in Web3, all roads still lead to Ethereum. More than half of all developers building the future of finance are doing so on the Ethereum network.

Developer Distribution in DeFi



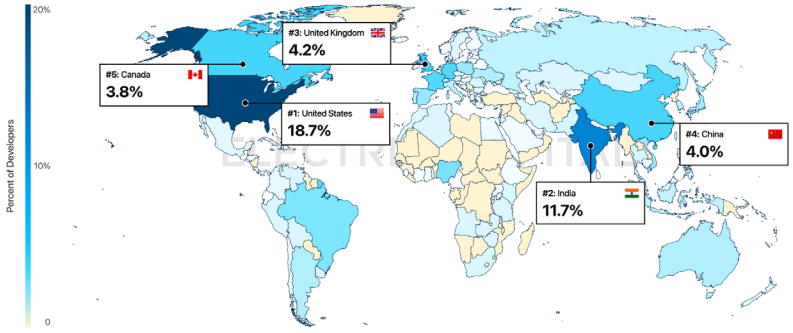
Networks with the highest concentration of DeFi developers. 53% of developers work on Ethereum and Ethereum L2s. (Source: *Electric Capital Developer Report 2024, Page 147*)

Web3 is a Global Movement

Finally, where are these developers located? While the United States still leads as the single largest country for Web3 talent, that fact masks the most important trend: this is a truly global phenomenon.

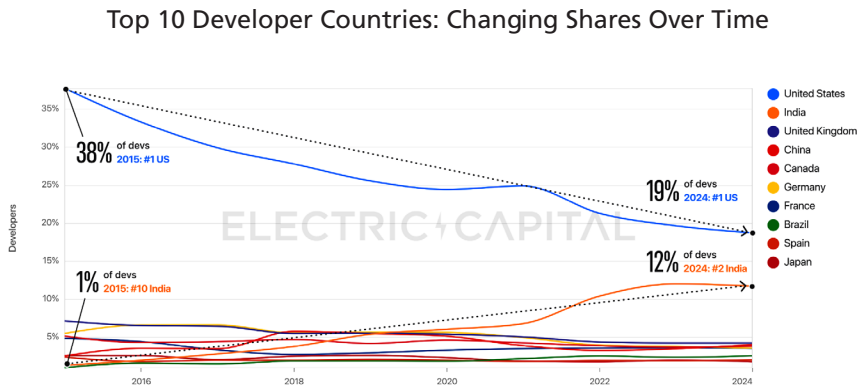
Today, a massive 81% of all Web3 developers are located *outside* the US.

Global Distribution of Web3 Developers



Developer distribution by country. (Source: *Electric Capital Developer Report 2024, Page 29*)

The geographic center of gravity has been shifting for years. A look at the regional trends shows a clear and powerful surge from Asia, with India leading the charge. The US's once-dominant share of the developer landscape has been shrinking as talent and innovation flourish worldwide.



Evolution of developer share by region over time. (Source: *Electric Capital Developer Report 2024, Page 30*)

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Developers are the lifeblood of the crypto ecosystem. Their movements are the most powerful leading indicator of where the future is headed. While the recent crypto winter certainly shook the market, the underlying signals are quite bullish.

The transient builders have moved on, but the core of experienced, dedicated developers is larger and more productive than ever. Talent is no longer concentrated in one country but is spread across the globe, with new hubs of innovation constantly emerging. This isn't a sign of an industry in decline. It's the mark of a maturing, global movement that is quietly building the foundations for the next era of the internet.

Miners and Validators: Blockchain's Backbone

Web3 introduces a new class of participants that simply didn't exist in Web 2.0: miners and validators. They are the guardians of the network, the decentralized workforce that keeps the entire ecosystem running.

Why Do They Exist?

Web3 projects aren't companies; they're open ecosystems built on blockchain infrastructure. This digital world is like the Wild West—a permissionless frontier where anyone, including malicious actors, can enter and interact with the system.

In the old world, a company would protect itself by building digital walls and investing heavily in centralized security. Web3 networks take a different approach. By running their software on thousands of independent machines, they eliminate the single point of failure that attackers could target.

But decentralization alone isn't enough. How do you ensure the transactions being added to the network are legitimate and can never be changed? The core promise of blockchain is that you don't have to trust anyone. While open-source code allows anyone to audit the system's rules, that only verifies the design. It doesn't guarantee the execution.

You still need to be sure that the machines running the code are doing so correctly. This boils down to two critical functions:

First, you need to ensure the machines keep the system online and processing transactions. Second, you need to guarantee that these machines are acting honestly and independently, faithfully recording history without being manipulated. This is the role of miners and validators.

How Miners and Validators Secure Networks

The machines that run the infrastructure of a blockchain are called min-

ers on the Bitcoin network[25] and validators on most others. For over sixteen years, these participants have kept their networks running like clockwork, all thanks to the ingenious incentive mechanism invented by Bitcoin's founder, Satoshi Nakamoto.

The Bitcoin Miners

Bitcoin mining has evolved from a hobbyist activity into a massive, capital-intensive industry. After years of Chinese dominance, the sector's center of gravity has shifted to the United States, where publicly traded mining giants now reinvest their financing into deploying ever-more powerful equipment[26].

Miners have two sources of income:

1. **Block Rewards:** Newly created bitcoin they earn for successfully adding a new block of transactions to the chain, which happens roughly every ten minutes.
2. **Transaction Fees:** Fees that users pay to have their transactions included in a block.

Historically, block rewards have made up the vast majority of their revenue. But this model has a built-in challenge: with around 95% of all bitcoin already mined and the block reward programmed to decrease by half every four years, the network's security budget is shrinking. How will miners be compensated for securing the network in the future?

The answer must come from transaction fees. For the system to remain secure, activity on Bitcoin has to increase dramatically. This is the driving force behind the recent explosion of innovation on the network. Protocols like Ordinals (active since 2023), the BRC-20 token standard, and the new Runes protocol (launched in 2024), along with the development of Layer 2 networks, are all attempts to create new use cases for Bitcoin. The goal is

25 Smaller networks like BCH, Dogecoin, and LTC also operate with miners, similar to Bitcoin.

26 After years of Chinese dominance in mining hardware, the industry is seeing a major shift: Bitmain, Canaan, and MicroBT have set up production in the U.S., boosting North America's share of global hashrate to roughly 30–40%. Still, Chinese firms continue to supply over 90% of mining equipment.

to generate enough transaction activity to secure the network for decades to come (this is covered in more detail in the 'Case Study: Second Level Solutions on Bitcoin' at the end of the second part).

Ethereum's Validators

Ethereum originally followed Bitcoin's mining model but later made a crucial switch. Citing the huge energy consumption of mining, the network transitioned to a different system, replacing miners with validators. This new model, which we discussed in the second chapter, is now the standard for most modern blockchains.

Whether they are called miners or validators, these participants receive a reward for their service: new tokens created by the network itself. This issuance increases the total supply of the token, creating a predictable and transparent form of inflation. This inflation isn't an accident; it's the security budget that pays for the network's defense.

Comparing Miners and Validators

Aspect	Proof of Work (PoW)	Proof of Stake (PoS)
Associated Role	Miners	Validators
Primary Role	Create new blocks and secure the blockchain by solving complex computational puzzles.	Validate transactions and secure the network by staking cryptocurrency as collateral.
Selection Mechanism	Based on computational power and hashing ability (mining).	Based on the size of the stake, holding duration, and reputation.
Incentive & Rewards	Block rewards and transaction fees.	Staking rewards and transaction fees.
Security Model	Secured by the economic cost of the required energy expenditure.	Secured by the economic value of the staked collateral.
Hardware Requirement	Specialized and powerful hardware (e.g., ASICs).	Standard computers or servers.
Energy Consumption	High	Low
Environmental Impact	High	Low
Risk of Centralization	Centralization of power in large mining pools and regions with low energy costs.	Potential for wealth concentration among large stakeholders.

Do Layer 2 Solutions Require Validators?

Miners and validators are the bedrock of a decentralized network. In mid-2025, one of the most pressing questions for the Web3 space is how Layer 2 networks, particularly those built on Ethereum, will achieve true decentralization and what role their native tokens will play in that journey.

As these Layer 2 networks mature, many have launched their own to-

kens, initially distributing them to users and ecosystem participants. The primary function of these tokens is governance, allowing holders to vote on the future direction of the network. But is that a strong enough value proposition to sustain a token's value in the long run? The consensus is no, and the race is on to embed these tokens with deeper utility.

The core challenge lies in a Layer 2's relationship with Ethereum. So-called "roll-up" solutions[27] are designed to inherit their security directly from Ethereum's battle-tested validators. In return for this security blanket, they must pay for services in ETH, the native currency of Ethereum[28]. This creates a dilemma. Ethereum won't accept a Layer 2's native token as payment, so these networks must constantly balance the need for ETH with the desire to make their own token essential. Some networks navigate this by charging users transaction fees in their own token, then converting them to ETH on the back end to pay Ethereum. It's a clunky but tolerable workaround in the quest to build value for their token.

A far more significant value proposition lies in decentralizing the "sequencer." Right now, most Layer 2 networks use a centralized party to order transactions before they are sent to Ethereum. This is a critical and highly profitable role, as the sequencer can capture what's known as MEV (Maximal Extractable Value)—revenue generated by arranging transactions in a specific order. Controlling the sequencer is like controlling the front of the line.

To become truly decentralized, networks must give up this central control and distribute the sequencing role to a set of independent actors. How this will be done is still one of the most active areas of research and development. Some projects are actively implementing decentralized sequencing. For example, Scroll has begun rolling out its multi-sequencer protocol, allowing a permissioned set of third-party operators to participate in the network's transaction ordering process.

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27 To clarify again: Layer 2 networks are any solutions built on top of Layer 1 networks. Roll-up solutions, a subset of Layer 2 solutions, derive security directly from Ethereum. Some Layer 2 solutions transfer data to Ethereum but don't rely on it for security.

28 Deriving security" means these networks send batched transactions to Ethereum, where transactions are verified to ensure accuracy.

Meanwhile, a new category of infrastructure known as 'shared sequencers' has emerged. Services like Espresso, Astria, and Radius are building protocols that offer decentralized sequencing as a plug-and-play utility that multiple Layer 2 networks can use, saving each project from having to build its own decentralized set of validators from scratch.

Users: The Heart of Web3

Every player in the Web3 ecosystem—from founders to investors to validators—is working towards a single goal: getting people to actually use this technology. So, have they succeeded? For now, the honest answer is "no." To understand what it will take to get to "yes," we first need to grasp how Web3 fundamentally redefines the concept of a user.

A New Model for Identity

It's nearly impossible to know how many individual "people" use Web3, because the system isn't designed to know. Unlike the physical world, where your identity is tied to your person, the digital world allows for a different model. In Web3, users are not anonymous, but pseudonymous. This is a critical distinction, born from a deep-seated philosophical difference about privacy and ownership.

To understand why, let's look at the world of traditional finance. When you use a bank, you transact with your real-world identity. This is essential for the bank's security model, but it comes at a cost to you: privacy. While your financial details are kept hidden from the public, they are fully visible to the bank and, by extension, to government and regulatory bodies. You are trusting the institution to be a responsible steward of your private information. For decades, this has been a workable trade-off.

Web3 starts from a different premise. It operates on a transparent, public ledger where all balances and transactions are visible to everyone. This radical transparency is what eliminates the need for a trusted third party like a bank. The network itself proves that all transactions are legitimate and that all assets are accounted for.

But if everything is out in the open, how do you protect user privacy? If a user's entire net worth were tied to their real name, it would expose them to immense personal risk.

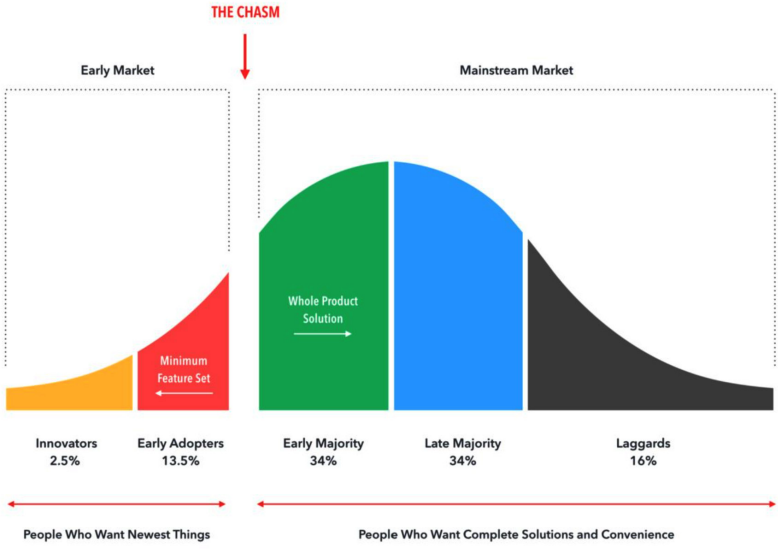
The solution is pseudonymity. Instead of linking transactions to your government-issued identity, Web3 links them to a public address—a string

of letters and numbers controlled by your personal wallet[29]. Your real-world identity is decoupled from your on-chain activity. This model flips the old system on its head: instead of public identity and private transactions, Web3 offers pseudonymous identity and public transactions. You don't have to trust a bank to protect your privacy, because the system is designed so they never have it in the first place.

Tracking Web3's Journey to Mainstream Adoption

Web3 is a technology barely a decade old, and it's following the classic adoption curve of every major technological shift. To understand where we are, it's helpful to look at Geoffrey Moore's famous model for technology adoption.

Crossing the Adoption Chasm



Geoffrey Moore's famous "Crossing the Chasm" graphic. (Source: *Wikipedia*)

After years of building foundational infrastructure, Web3 is finally be-

29 Blockchain addresses are semi-anonymous strings of letters and numbers. Think of them as email addresses. Accessing both the public address and the private keys requires a set of 12 or 24 words.

ginning to offer products and services that can compete with Web 2.0. It is now attempting to make the tricky leap across the "chasm"—the gap between the visionary early adopters and the pragmatic early majority. The users who have gotten Web3 this far are a unique and specific bunch.

Who is Currently Using Web3?

Until recently, the Web3 world has been populated by two main groups of "early adopters."

First, there are the **Pioneers**. These are the developers, creators, and users who are drawn to the technology for its underlying philosophy of decentralization. They see the potential for a more equitable and open internet and are willing to put up with clunky interfaces and technical hurdles to help build it. Their curiosity and enthusiasm are the engine of innovation, and they are essential for pushing the ecosystem forward.

The second, much larger group, is motivated primarily by **Financial Opportunity**. They see the enormous potential for wealth creation in this new frontier and can be broken down into three distinct sub-groups:

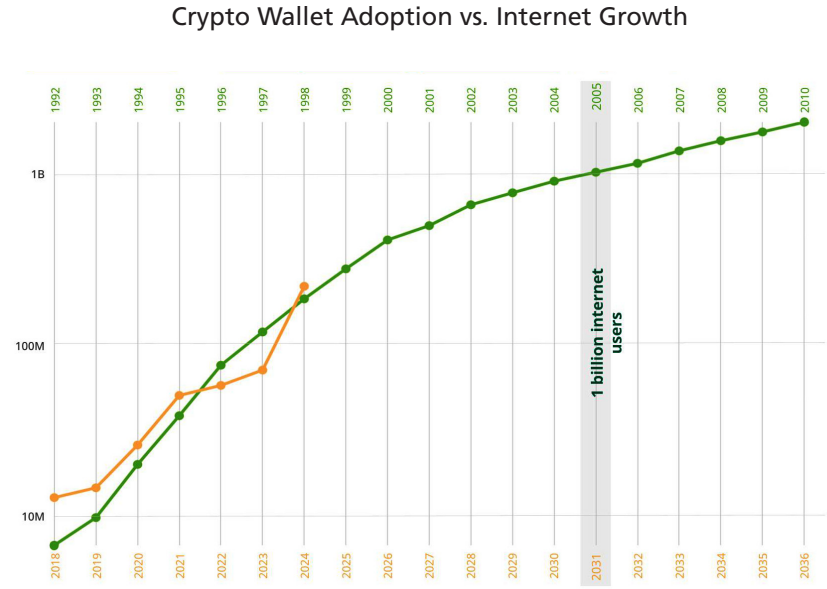
1. **The Long-Term Investors:** This small but influential group invests in projects with a multi-year time horizon, betting on the fundamental value of the technology.
2. **The Traders:** This is the largest and most visible segment. They buy and sell the ecosystem tokens issued by Web3 startups, often speculating on short-term price movements. Since many projects have not yet reached maturity, much of this activity is speculative. A lack of deep financial and technological literacy can make this a particularly high-risk game for many participants.
3. **The Airdrop Hunters:** This group actively uses new protocols and applications with the primary goal of receiving free tokens, known as airdrops, which projects distribute to reward early users. While some dismiss them for generating superficial, "hormonal" growth, they play an undeniably crucial role. By flocking to new applications, they stress-test the infrastructure and uncover critical bugs, effectively

acting as a massive, decentralized quality assurance team. We will explore airdrops in more detail in our 'Tokenization' chapter.

Tracking User Interest in Web3

While no single metric can perfectly capture the number of Web3 users, several key indicators paint a clear picture of the network's underlying growth trajectory.

One powerful comparison comes from a16z crypto's 2024 State of Crypto report, which maps the growth of active crypto wallets against the early growth of the internet.

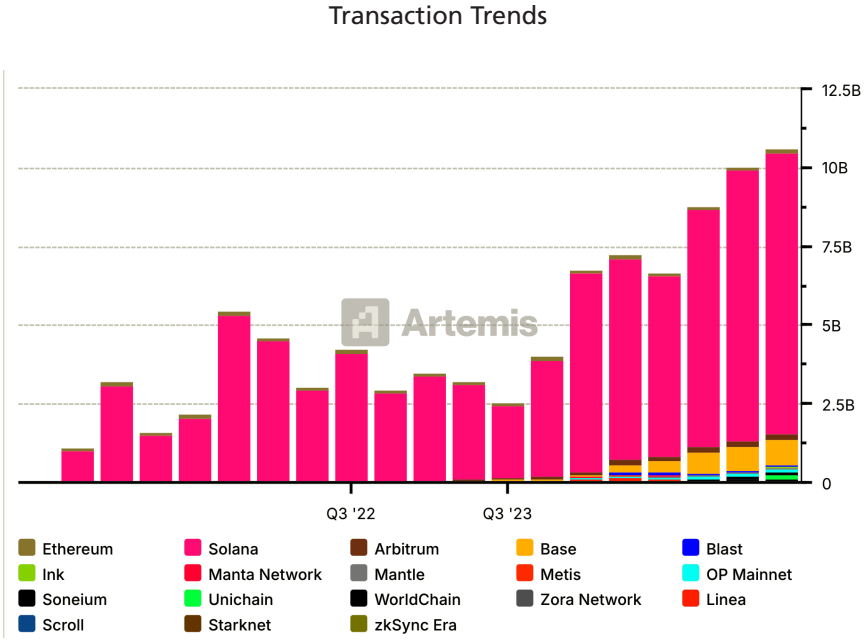


Comparison of the number of internet users and the number of active crypto wallets on a logarithmic scale. The first year is 1992 for internet users and 2018 for crypto addresses. (Source: World Bank, Artemis, and Dune @Daren Matsuoka)

The chart shows that the growth curve for crypto adoption is closely tracking the early days of the internet. It took the internet roughly 13 years to reach one billion users. If this parallel holds, Web3 is on a path to reach one billion monthly active wallets by 2031. While not a perfect apples-to-

apples comparison, it's a compelling model for visualizing the technology's potential scale.

Another key metric is the actual usage of the networks. The chart below shows the quarterly transaction volume on smart contract platforms compatible with Ethereum.



Quarterly transaction counts on blockchains. (Source: *Artemis*)

The trend line tells a story of resilience and renewed momentum. After explosive growth in 2021, the market stagnation of 2022 and 2023 led to a predictable cooldown in transaction volume. However, beginning in the final quarter of 2023 and until through mid-2025, activity has been increasing rapidly, signaling that users are returning and engaging with applications at a growing rate.

How Does Web3 Reach More Users?

It's clear that most people are not yet using Web3 applications in their daily lives. The current user base is a mix of pioneers who are fascinated by the technology and a larger group of speculators betting on its future growth. So, what will it take for Web3 to break out of its niche and reach a mainstream audience?

As we'll explore in detail in the final chapter, the answer comes down to solving a few critical problems. Here's a brief look at the path forward.

A Radically Better User Experience

First and foremost, Web3 applications must become radically more user-friendly. For years, developers rightly focused on the deep engineering challenge of building a secure and reliable decentralized infrastructure. That work has paid off, and the foundation is now largely in place.

The industry's focus must now shift from infrastructure to product. It's time to obsess over the user. This means learning from the last two decades of Web 2.0, which, for all its flaws, mastered the art of creating intuitive, seamless, and valuable user experiences. The technology needs to fade into the background so the benefits can shine through.

The New Generation of Wallets

Perhaps the biggest obstacle to a smooth user experience is the crypto wallet. The core principle of Web3—that you are the sole owner of your assets—is both a revolutionary feature and a terrifying responsibility. In the current model, "be your own bank" also means "be your own security," and a single mistake, like losing a seed phrase, can result in a permanent loss of funds.

Fortunately, a new wave of wallet technology is emerging to solve this problem. Powered by a concept called "account abstraction," these smart wallets are poised to completely change the game. They separate the user's account from the public/private key pair, enabling features that were previously impossible:

- **Social Recovery:** You can appoint trusted friends or institutions to help you recover your account if you lose access, just like resetting a password.
- **Gasless Transactions:** Projects can choose to sponsor transaction fees, so users no longer need to buy a specific token just to interact with an app.
- **Programmable Security:** Users can set spending limits, require multiple approvals for large transactions, and whitelist trusted applications.

In short, these new wallets can make using a Web3 application as simple and safe as using a modern mobile app. If you ask me, their widespread adoption won't just be an improvement—it will usher in a new era, finally making Web3 accessible to everyone.

Finding Product-Market Fit Through Pain

Most Web3 applications haven't yet achieved the product-market fit that defines successful Web 2.0 companies. The reason is simple: for most people, the "pain" of using Web 2.0 isn't acute enough to force a change. Adaptation will come slowly, then all at once, as users increasingly suffer the pain of centralized platforms.

We saw a clear example of this recently when Instagram was banned in our country. The platform's decision to remove certain content, followed by the state's move to cut off access entirely, instantly created havoc for users and the thousands of people who earn a living through the application.

This is a problem Web3 is fundamentally designed to solve. When content is stored on a decentralized blockchain, no single company or government can block access on its own. If one application censors you, you can simply use another one to access the same data. They say "time heals all wounds," but in technology, time often reveals them. It's best to let the inherent flaws of centralized systems drive users toward a better alternative.

Collaboration Between the Old Guard and the New

The other major catalyst for adoption will be the entry of established institutions. When the Web 2.0 players—especially financial firms—begin offering cryptocurrency services to their existing customers, it will provide a trusted and seamless on-ramp for millions.

The Web3 world has a long way to go, but the gap with Web 2.0 is closing faster than most people think, driven by a young and relentless generation of entrepreneurs. The coming years won't be defined by hype, but by execution. The teams and communities that finally solve real problems and find true product-market fit are the ones who will shine, and they will build the future of the internet.

Chapter 4

Exploring Web3 in Everyday Life

We've covered the "why" and the "how" of Web3's building blocks. Now, we get to the exciting part: seeing it in action. Where is the code meeting the real world? This chapter is a tour of the Web3 landscape, starting with the applications you can use today and journeying out to the bleeding edge of what's next.

Our first stop is a paradox. For a world built on decentralization, its most-used product is often anything but: the **stablecoin**. For years, Bitcoin dominated crypto trading, but since the early 2020s, stablecoins have taken over[30]. They solve the market's crippling volatility but often by relying on the very centralized institutions Web3 aims to disrupt. This tension between utility and ideology is one of the most important stories in Web3 today, and time will tell if decentralized alternatives can truly take hold.

From there, we explore why blockchain's first and most natural target was **finance**. Money has been digital for decades, and any system built on bits and bytes is ripe for a software-based revolution. **Decentralized Finance (DeFi)** had its breakout moment in 2020 and has since grown into the most mature and battle-tested corner of the Web3 ecosystem.

Next, we dive into the world of **NFTs**. After a meteoric rise in 2021, the initial hype cooled, forcing a deeper conversation. What is an NFT beyond

30 Although Bitcoin remains the top cryptocurrency by market cap, stablecoins have dominated crypto trading volume since the early 2020s, making up around 40% of exchange volume and with USDT and USDC comprising nearly 90% of stablecoin market capitalization.

a digital collectible? We'll peel back the layers to see how they fundamentally differ from cryptocurrencies and, more importantly, what new kinds of value—from provenance to property rights—they can bring to any artifact.

From finance, we turn to our online lives. Unlike finance, which only adopted digital, **social media** was *born* digital. We'll explore how Web3 is reimagining social platforms, which leads directly to one of the most vital questions of our time: who are you online? A truly sovereign **digital identity**, controlled by you, is a cornerstone of the Web3 vision.

But Web3 isn't just about software; it has to run on hardware. This brings us to **Decentralized Physical Infrastructure Networks (DePIN)**. It's an often-overlooked but critical frontier: think decentralized file storage, wireless networks, or even energy grids. Building in the physical world requires immense capital and patience. While DePIN represents a long-term vision, it has rapidly emerged as one of Web3's most active sectors and is essential for true decentralization.

Finally, we'll venture to the emerging frontiers where the most radical ideas are just beginning to sprout. We'll see how new models like **Decentralized Science (DeSci)** are being created to fund research and how **Regenerative Finance (ReFi)** aims to build regenerative economies. Then, we'll tackle one of the most powerful intersections in tech today: the convergence of **Web3 and Artificial Intelligence**.

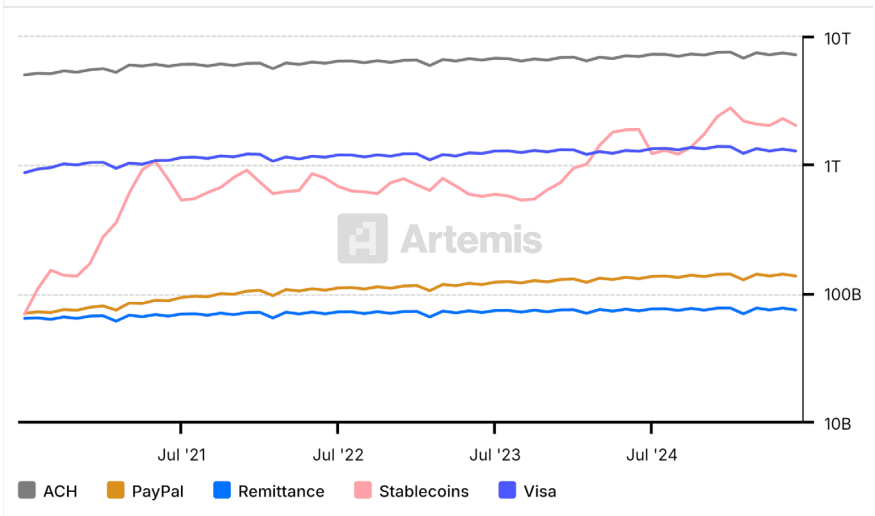
Throughout this tour, we'll ground these concepts in real-world projects, showing you the teams and ideas building this future as we speak.

Stablecoins: Web3's Killer App

In the relentless search for product-market fit, one Web3 product has succeeded: the stablecoin. It has become the bedrock of the crypto economy. After a brief dip, the total value of stablecoins started climbing again, surpassing its 2022 peak in mid-2024 and continuing to set new all-time highs into 2025.

So what are they? At their core, stablecoins are simple: cryptocurrencies pegged to a fiat currency. In today's market, that almost exclusively means the US dollar. In an ironic twist, the very technology that was once heralded as the end of US dollar hegemony now relies on it for stability.

Stablecoin Volumes vs Other Financial Systems



Average last 30D rolling adjusted volume of stablecoin transactions (USD), excluding MEV activity and intra-centralized exchange transactions, against the current average daily volume of other financial systems. Data is aggregated on a weekly basis. Log scale. Originally created by Nic Carter. (Source: *Artemis*)

Satoshi Nakamoto originally envisioned Bitcoin as a peer-to-peer payment system. While that goal remains elusive, Bitcoin did find an early use case as the primary trading pair on crypto exchanges. If you wanted to buy a

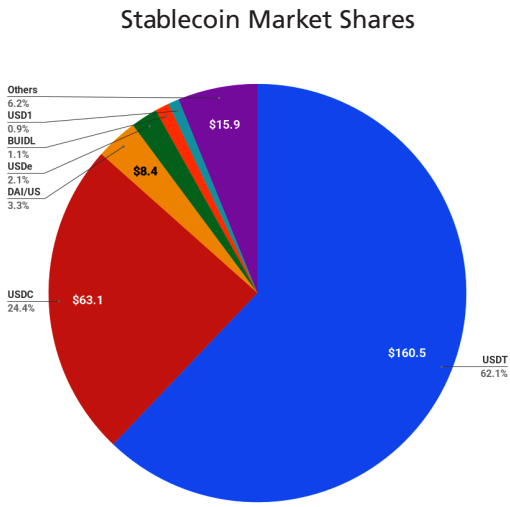
new token, you usually had to buy it with BTC. But that era is over.

Volatility is a terrible foundation for a trading economy, and stablecoins—primarily USDT (Tether)—provided the solution. They replaced BTC as the market's default currency, leaving Bitcoin to solidify its narrative purely as a store of value.

Who Owns the Market?

The stablecoin space is dominated by two heavyweights: USDT (Tether) and USDC. Both are centralized, issued by private companies, and (theoretically) fully backed by an equivalent amount of fiat currency held in traditional bank accounts.

While many smaller players exist, the most significant recent entrant is a giant from traditional finance. PayPal, one of the world's largest payment systems, has thrown its hat in the ring with its own stablecoin, PYUSD, now available on both the Ethereum and Solana blockchains. This move signals a powerful convergence between the old financial world and the new. We take a closer look at this in our case study, "Case Study: PayPal's Stablecoin, PYUSD."



Market shares of US dollar-pegged stablecoins. (Source: *DefiLlama*)

Risks of Centralized Stable Coins

The Risks of Centralized Trust

This centralized model offers a sense of security—a promise that your digital dollar can always be swapped for a real one. But this promise rests on a fragile foundation: trust. First, you have to trust that the issuer, like Tether or Circle, actually holds one dollar in a bank for every token it mints. This requires faith in their audit reports and transparency.

Second, there's the risk that the banks holding the reserves could fail, a risk that became startlingly real for USDC holders in March 2023 when its peg wavered during a banking crisis.

Most importantly, these stablecoins undermine the core promise of crypto: "full ownership of your assets." You may hold USDT in your wallet, but Tether can freeze those assets remotely with a single command. As centralized companies, Tether and Circle are susceptible to pressure from regulators and governments, and if they are forced to act, there is nothing a user can do.

What About Decentralized Alternatives?

This brings us to the decentralized challengers, most notably **DAI** from MakerDAO, which was built to be censorship-resistant.

Unlike its centralized cousins, DAI isn't minted by a company. It's created by users who lock up collateral—mostly other cryptocurrencies like ETH, but also some real-world assets—to mint DAI against it.

While DAI is more ideologically pure, it has struggled to gain mass adoption. The reason lies in its design. To protect itself from the volatility of its crypto collateral, the system requires massive over-collateralization. For every dollar of DAI that exists, roughly $1.44 worth of other assets must be locked away[31]. This makes DAI incredibly capital-inefficient. For most users, the potential returns don't justify tying up that much capital.

The story took another turn in the summer of 2024 when MakerDAO, the entity behind DAI, began a major rebrand to "Sky" and announced a new stablecoin, USDS. This news triggered a backlash from the crypto community because USDS, unlike DAI, includes a feature that allows it to be frozen—the very centralization it was meant to oppose. Sky is making this compromise to get ahead of future regulatory challenges. While the original DAI will continue to exist[32], the move felt like a retreat from the ecosystem's core principles[33].

Of course, not all decentralized stablecoins are created equal. In 2021, an algorithmic stablecoin called **UST**, built on the Terra blockchain, gained immense popularity by promising an incredible 20% annual interest rate. Whenever a product offers returns that seem too good to be true, the first question should always be: "Where is the yield coming from?"

In UST's case, the yield was essentially a marketing expense paid by the

31 At the time of writing, Maker ecosystem has $6.91 bn outstanding DAI/USDS and $9.96 collateral. Source: makerburn.com

32 The DAI stable coin's smart contract is non-upgradable—meaning that once deployed to Ethereum, no one can change it. Anyone can freely use it, highlighting blockchain's immutability.

33 The rebrand drew criticism—only ~10.7% of MKR holders converted despite incentives—and fueled concerns that USDS's added administrative features could introduce centralized control points.

founders to attract users. As the total value soared past $18 billion, the model became unsustainable. The spectacular collapse of UST is a crucial lesson, which we explore in the "Case Study: UST" at the end of this chapter.

Central Bank Digital Currencies: The Empire Strikes Back

The rise of stablecoins did not go unnoticed by the world's central banks. Wary of private, decentralized alternatives to the currencies they control, monetary authorities have been diligently working on their own answer: **Central Bank Digital Currencies (CBDCs)**.

From a central bank's perspective, issuing a CBDC is just the next logical step. Technology now lets them create *programmable money*, a powerful new tool for implementing monetary policy with surgical precision.

Imagine a natural disaster strikes a specific region. A government could instantly airdrop funds directly into the digital wallets of affected citizens. But the power of a CBDC goes further. The government could program that aid to be spent only on essential goods like food and medicine, or on diesel for farmers to save their crops. They could even set an expiration date, automatically reclaiming any funds not used within a specific timeframe.

While this is a massive leap in efficiency for central banks, the implications for citizens are deeply concerning. The complete transparency of a CBDC raises profound privacy issues. Every transaction is recorded, creating a permanent, searchable ledger of a person's financial life. For Web3 proponents, this capability evokes dystopian futures, pointing to China's "social credit" system as a cautionary tale of what is possible when the state has total financial visibility.

In the United States, the traditional leader of the financial world, there is significant resistance to the idea. In a country where personal freedom is a cornerstone of the national identity, convincing the public to adopt a transparent, government-controlled currency is a massive challenge. The Republican party has already declared its firm opposition.

Furthermore, the US may not even feel the need for a CBDC at this stage. The Web3 stablecoin market, worth hundreds of billions of dollars, already runs on the U.S. dollar. The largest issuers, Circle (USDC) and Tether (USDT), have proven to be responsive to government directives. Requests from authorities to "freeze funds in this account" are handled swiftly. With private companies already providing a controllable, dollar-denominated digital currency, the US government can enjoy many of the benefits of a CBDC without bearing the political cost of creating one itself.

Instead of building its own digital dollar, the US is taking a different path: regulating the private stablecoin market. The summer of 2025 saw intense legislative work to create a formal stablecoin act. This new framework doesn't replace issuers like Circle and Tether; it just codifies the rules they must play by, mandating full 1:1 reserves, transparency, and compliance with government oversight.

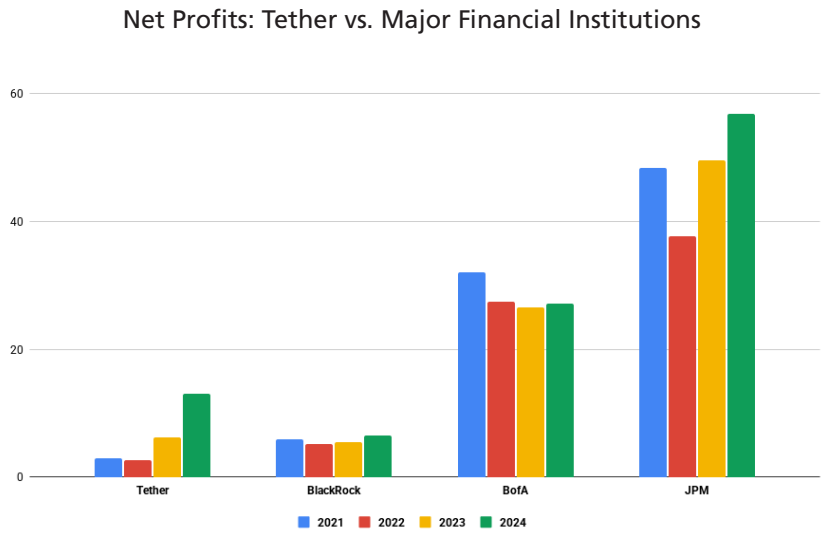
This strategy allows the US to maintain control and harness the innovation of the private sector. It effectively outsources the digital dollar, extending its global reach through regulated stablecoins without the government having to build or manage a controversial CBDC on its own.

What Do Stable Coins Offer? The Zero-yield Problem

So what do you, the user, get for holding a stablecoin? With centralized coins like USDT or USDC, the answer is simple: nothing[34]. You are effectively giving an interest-free loan to the issuer.

Tether's business model is to take the billions of dollars users give it and invest that capital in interest-bearing assets, like U.S. Treasury bills. They pocket the entire yield. It's an incredibly profitable business. In 2023, In the first quarter of 2025 alone, Tether, a company with roughly 150 employees, reported a staggering $4.52 billion in net profit—more than triple what BlackRock, the world's largest asset manager, pulled in over the same period.

34 Coinbase, a former Circle partner, offers interest to users who lock USDC with them.



Net earnings of JPMorgan, Bank of America, BlackRock and Tether for the last four years. The lean, high-margin stablecoin business is a financial powerhouse. (Source: Delphi Digital, Tether, Yahoo Finance)

Decentralized alternatives operate differently. DAI, for instance, allows users to lock their DAI into a smart contract and earn a variable interest rate set by the protocol's governance[35].

A new player, Ethena, which emerged in 2024, claims it can solve both the centralization problem of USDT and the capital efficiency problem of DAI. We take a closer look at this ambitious project in our case study, "Case Study: Ethena."

The Stablecoin Paradox

Stablecoins offer a crucial safe harbor in the volatile crypto markets. They are the primary on-ramp for new users and the essential lubricant for the entire Web3 economy.

Yet, they represent a deep conflict with the ecosystem's core philosophy. The dominance of centralized, censorable stablecoins—and the emergence

35 As of mid-July 2025, this rate was 2% for DAI and %4.5 for USDS.

of government-issued CBDCs—pulls the industry back toward the very systems it was meant to replace. For Web3 to live up to its original promise, truly decentralized alternatives have to eventually win the market's trust.

For now, stablecoins offer a clear value proposition, especially for users in developing nations looking to shield their savings from unpredictable economic policies. As they get more integrated with other technologies, their use will only grow. The most important of these is Decentralized Finance, the engine of the new economy and our next topic.

Decentralized Finance: Web3's Financial Revolution

We now arrive at the most developed part of the Web3 world: finance. The ecosystem of applications built here is known as Decentralized Finance, or DeFi.

An Idea Evolves

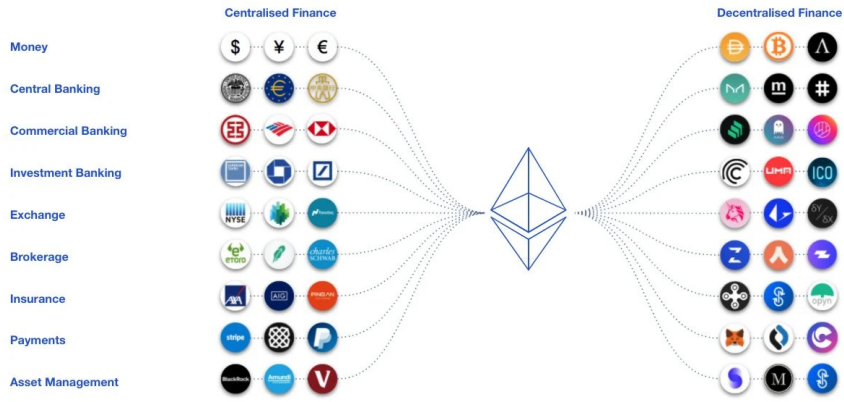
The story begins with Bitcoin. Launched in 2009, it was a singular creation: a censorship-resistant, peer-to-peer digital currency. But a few years later, a group of developers saw that its underlying technology—the blockchain—could do much more than just money. This insight led them to break away and launch Ethereum in 2015.

Ethereum wasn't just a currency; it was a decentralized computer that anyone in the world could use to build and run applications. It was only natural that the first real killer apps to emerge were financial ones.

What is DeFi?

Decentralized finance is the rebuilding of the traditional financial system on top of blockchains. It takes all the services you'd expect—lending, borrowing, exchanging, derivatives—and creates them as transparent, open-source protocols.

Traditional Finance vs. Decentralized Finance



Decentralized finance aims to provide every service offered by the conventional financial system, but without the traditional gatekeepers. (Source: *Consensys*)

The real power of DeFi lies in its architecture. It's an open ecosystem where apps are built to work together seamlessly.

We call this "composability," but it's easier to think of it as "money legos." Each DeFi service is a building block. As a user, you can pick and choose blocks from different providers and snap them together to create a customized financial strategy. If a better block comes along, you can instantly swap it out. This simple concept creates a huge shift in power from closed institutions to the individual user.

Why Finance First?

It was no accident that finance became the first major arena for Web3. It happened for two simple reasons: the sector had massive, untapped potential for disruption, and the conditions were perfect for that disruption to occur.

The High Cost of Trust

At its core, blockchain technology is a trust machine. It allows people

who don't know each other to interact and exchange value securely in a digital world without a middleman. The one industry whose entire business model is built on acting as that trusted middleman is finance.

The primary product that financial institutions sell is trust. To produce it, they carry a huge operational burden, from maintaining buildings and staff to navigating a maze of regulations. This is expensive, and the cost is inevitably passed on to you, the customer.

Furthermore, these regulations require banks to be exclusive; they can't serve everyone. As a result, a huge part of the world's population remains unbanked and locked out of the financial system.

This is where DeFi gets fiercely competitive. By generating trust through transparent code instead of expensive institutions, it dramatically lowers the operational burden. It offers financial services that are radically cheaper and, because they're permissionless, open to anyone with an internet connection and a crypto wallet. No paperwork, no gatekeepers.

A Digital Foundation

Of course, potential alone isn't enough. An industry must be ready for a blockchain-based revolution, and the most important precondition is that it must already be digital. Blockchain thrives in the world of bits and bytes; it stumbles when it has to interface with the physical world.

Finance, more than almost any other sector, has been relentlessly digitizing itself since the 1990s. Our relationship with banks has become less physical and more virtual every year. We use cards instead of cash and manage our accounts through mobile apps. Banks have encouraged this shift, closing physical branches because they understand the massive cost advantages of digitalization.

This digital transformation laid the perfect groundwork for Web3. Cryptocurrencies and stablecoins gave us a way to hold and transfer value digitally without permission. DeFi took the next logical step, creating a parallel financial system that allows capital to flow directly from those who have it to those who need it, all in the native language of the internet.

The Advantages of DeFi

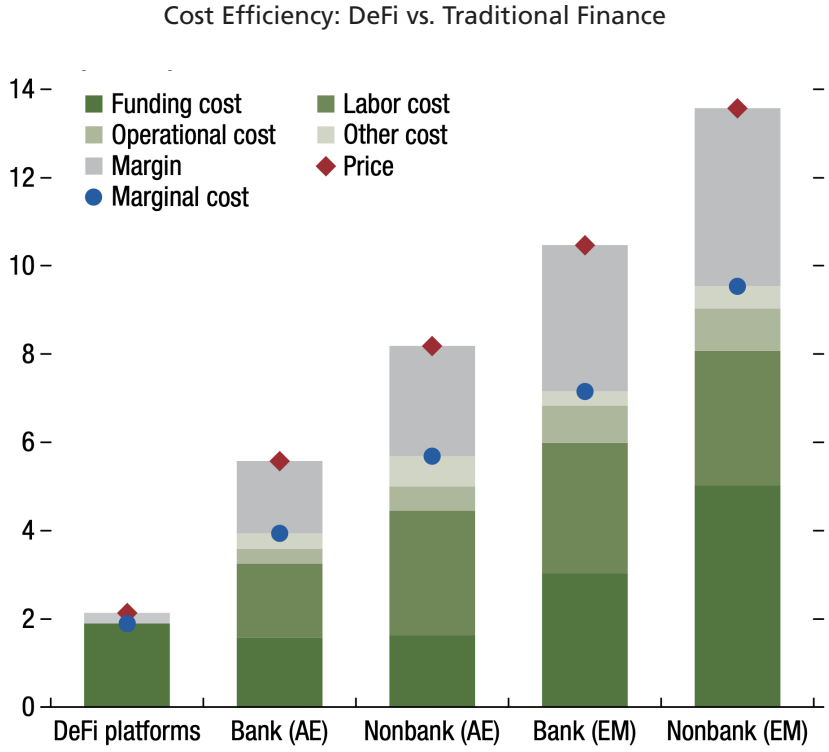
DeFi's power comes from a few core principles that give it a fundamental edge over the old system.

Boosting Efficiency

DeFi protocols are essentially just software—smart contracts running on a blockchain. Because they are code, they can be deployed and operated at a fraction of the cost of a traditional financial institution. This isn't just an incremental improvement; it's a foundational shift in the cost structure of finance.

Furthermore, DeFi is built on open standards, meaning different applications can connect and work together like money legos. This "composability" ensures that developers don't have to build entire systems from scratch; they can specialize and innovate in one area, knowing their product can plug into the broader ecosystem. The result is fierce competition and rapid innovation, which drives down costs and creates better products for everyone.

A 2022 Global Stability Report from the IMF illustrates this advantage perfectly:



A comparison of costs and prices for DeFi platforms versus financial institutions in both developed and developing countries. The data shows DeFi's significant labor and operational cost advantage, especially when compared to banks in developing nations. Intense competition also keeps DeFi's profit margins thin, delivering better prices to the consumer. (Source: IMF Global Financial Stability Report, April 2022, Page 80)

Unprecedented Transparency

In the Web3 world, the teams building apps can be anonymous. This sounds strange until you realize the paradigm has shifted. It no longer matters *who* wrote the code; it only matters that the code *works* as advertised. This is possible because DeFi operates on the principle of "open source"—the underlying smart contract code is public for anyone to inspect, audit, and verify. Once you can see exactly how the machine works, who built it becomes secondary.

This transparency extends to the whole system. Every transaction and every position is recorded on the blockchain for all to see. The 2008 financial

crisis was fueled by opaque derivative instruments bundled into a bubble that no one could accurately measure. In DeFi, that kind of systemic murkiness is impossible. The risks are always right there in the open.

Permissionless Access

Public blockchains are, by their nature, accessible to all. Anyone with a smartphone and an internet connection can download a wallet and get an account on this global financial network. From there, they can connect to any DeFi application and use its services.

But what about websites that block users from certain countries? This is a common question. It's crucial to understand that a website is just a *frontend*—a window to the app. The DeFi protocol itself—the smart contract—lives on the blockchain forever. While a specific team might restrict their website to comply with local laws, the underlying protocol cannot be turned off. Users can always connect to the smart contract through other websites or directly, making access truly unstoppable.

True Digital Ownership

Perhaps the most profound value Web3 offers is the ability to truly own your digital assets. When you deposit money in a bank, you are legally entrusting it to that institution. You assume you can get it back anytime, but as citizens in countries like Lebanon have discovered during financial crises, that isn't always true. When the bank says no, your money is gone.

In DeFi, you have total control. Your assets are secured in your personal wallet, and only you hold the keys. This is called **self-custody**. You can send your assets to anyone, anywhere, at any time, without asking for permission. This also eliminates **counterparty risk**—the risk that the other side of a trade or loan won't meet its obligations.

Of course, this power comes with immense responsibility. If you lose the private keys to your wallet, your assets are irrecoverably lost. Fortunately, new wallet technologies are emerging to solve this very problem, making self-custody safer and easier for everyone, a topic we covered in more detail in Chapter 2.

How Did DeFi Take Off?

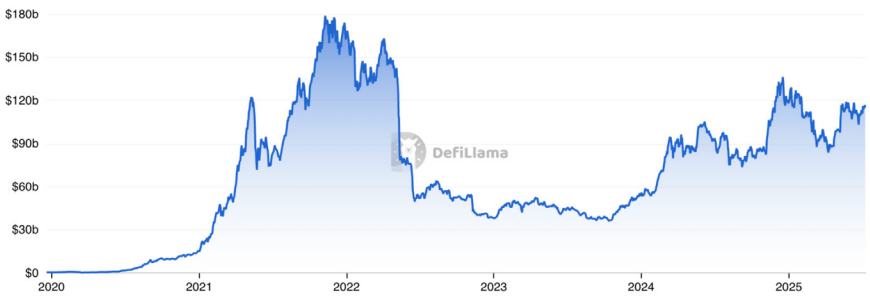
DeFi's explosive growth was lit during what's now known as "DeFi Summer" in 2020. The catalyst was a powerful new strategy: protocols began distributing their own governance tokens to users as an incentive.

This tactic, known as "liquidity mining," created a brilliant growth flywheel. By rewarding users with ownership in the network, protocols attracted the two things they needed most to survive: liquidity from investors and transaction volume from traders. Giving away tokens also had the crucial side effect of decentralizing control, spreading governance across a wide base of users and moving the projects closer to the Web3 ideal.

Of course, this boom had its excesses. A significant amount of the growth was fueled by reckless, high-leverage trading from centralized players like hedge funds and lending desks. When the market turned in 2022, these were the firms that imploded. It's a critical point: the crisis was not a failure of decentralized protocols, which largely continued to operate as designed, but a failure of the opaque, centralized companies that gambled recklessly within the DeFi arena.

After bottoming out in late 2022/early 2023, DeFi's TVL and market activity began a gradual recovery through 2023 and into the following two years.

Total Value Locked in DeFi



The total value (in billions of USD) locked in Decentralized Finance protocols over the years. This metric, known as TVL, acts as a barometer for user trust and capital commitment to the ecosystem. (Source: *DefiLlama*)

While distributing governance tokens was an incredibly effective go-to-market strategy, it was never a sustainable one. There's a finite supply of tokens to give away. The million-dollar question for DeFi now is: what keeps people using these systems when the rewards run out? The answer lies in building real, durable utility that can stand on its own.

What stands in the way of growth?

For DeFi to achieve sustainable growth, it needs to be adopted more widely. This requires solving two main problems: the fact that it's hard to use and the inherent risks users have to take on.

Improving the User Experience

Traditional finance is a managed system where institutions hold and secure customer funds. DeFi is the opposite; it's built on users managing their own assets with DeFi protocols.

This space is new, and for the first five years, developers—mostly engineers—focused on the technical challenge of building a solid, working infrastructure. Now that the foundation is built, the next stage is to "polish" these products to make them comfortable for the average person.

The end user doesn't need to know about blockchains, Layer 2s, or private keys. They simply want to access products from their phone. While DeFi isn't there yet, work in this area is accelerating. Solana, known for its fast transaction speeds and developer-friendly environments, has pursued strong user experiences.

We also see progress with products like crypto debit cards. These are making it easier for users to spend their crypto, connect to DeFi apps, and move between fiat and crypto (on-ramp/off-ramp). The next step is integrating daily needs like paying bills[36].

36 For more, see Delphi Digital's "The Year Ahead for DeFi 2025».

Reducing User Risk

Full ownership of one's assets is DeFi's greatest power, but it's also a major obstacle. This power comes with great responsibility.

Users are expected to understand the risks of different blockchains and protocols and manage their portfolio accordingly. However, the masses have neither the financial literacy nor the desire to take on this role. We saw this clearly in 2022 with the collapse of UST. It was marketed as a "risk-free" stablecoin, but investors who ignored the underlying risks were wiped out. You can read the full story of the UST crisis in the case study at the end of this chapter.

To reach a wider audience, DeFi needs simpler, more understandable products. It may also need a new layer of intermediaries—not to take custody of your assets, but to use the system's transparency to explain risks and guide users, all while upholding the spirit of decentralization.

The Path to Adoption

To solve these problems and bring DeFi to the masses, the path forward involves both internal innovation and external collaboration.

What DeFi Can Build on its Own

It's important to remember that DeFi is still in its early innings. Having built the core infrastructure, the focus is now shifting to the user. We are seeing a rapid improvement in user-facing applications: portfolio dashboards like Zerion and Zapper, user-friendly smart wallets like Clave, Ready (formerly 'Argent') and Safe, and aggregators that simplify access to complex products. These tools are crucial for improving the user experience and will continue to accelerate.

Addressing user risk is more complex. Users are rightly intimidated by protocol hacks, founder rug-pulls, and sudden market liquidations. Today's hedging tools are too complicated for most, and decentralized insurance, led by protocols like Nexus Mutual, remains a niche market. However, new

products are emerging, and the potential for growth is immense. The fact that venture capital continues to flow into Web3, even after the 2022 crisis, signals strong belief in the sector's long-term promise.

Building Bridges with the Old World

DeFi doesn't have to solve every problem alone. Strategic partnerships with established players could be a powerful catalyst for growth.

The first candidates are **fintech companies**. These firms have mastered the art of digital user experience in the traditional financial world. By partnering with them, DeFi can power the backend of familiar applications—a model best described as "Fintech in the front, DeFi in the back." This would let users access the power and efficiency of DeFi protocols through the simple interfaces they already know and trust.

The other major candidates are **centralized institutions**, including traditional banks and large crypto exchanges. These players can bring their enormous user bases, established trust, and insurance-like guarantees to DeFi products. While some view this as a betrayal of the "spirit of decentralization," offering users a spectrum of choices from fully decentralized to institutionally-backed will be critical for mainstream adoption.

Conclusion

DeFi offers a fundamentally different financial world. After a period of consolidation following its initial explosive growth, it seems to have regained momentum. The next chapter of its story will likely be defined by a powerful combination of native innovation from within the ecosystem and strategic collaboration with the centralized world. The path forward is promising, and it will be fascinating to watch it all unfold.

Exploring the NFT Universe

The NFT explosion of the early 2020s was a chaotic, brilliant moment that put digital ownership on the map. While the initial speculative frenzy has cooled, the underlying tech remains one of the most important building blocks for the future of the internet.

Demystifying NFTs

To get NFTs, you first have to understand the core problem of the digital world: everything is a copy. The "right-click, save as" command allows for infinite, perfect reproductions of any file. In a world of 1s and 0s, abundance is the default setting. But real value requires scarcity. If anything can be infinitely copied, how can anyone truly own anything?

This is the problem the Non-Fungible Token solves. "Non-fungible" simply means unique and irreplaceable. A dollar bill is fungible; you can trade it for any other dollar bill. The original, signed Declaration of Independence is non-fungible; it is one of a kind. An NFT is a small piece of code—a token—that acts as a unique digital certificate of authenticity for an asset.

But what does it mean to "own" something that anyone can copy and view?

Rethinking Digital Ownership

Previous attempts to create digital ownership focused on locking things down with encryption or slapping watermarks on them. It was a losing battle. NFTs take the opposite approach: they lean into the fact that digital artwork can be everywhere at once.

Ownership in the Web3 world is no longer about possessing the single, private copy of a file. It is about having an undeniable, public claim to the *original* work.

This is where the blockchain comes in. A blockchain is a global, public, and permanent ledger. Think of it as a digital deed book for the entire world. The creator of a digital work can record its ownership on this ledger. This

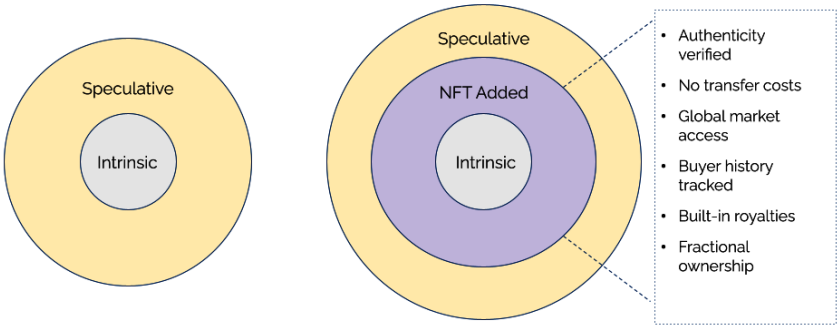
entry—the NFT—can then be transferred or sold.

The artwork itself can become a public good, free for everyone to look at and enjoy. But the *provenance*—the unbreakable chain of ownership pointing back to the original creator—is now provably scarce and can be verified by anyone. The NFT isn't the art; it's the unforgeable title to the art.

How NFTs Add Value

An NFT fundamentally changes an asset's value by enhancing its story, its history, and its utility in the digital world. Think of an asset's price as being driven by its story and social value more than its raw production cost. NFTs supercharge these components.

How an NFT Adds Value to a Work of Art



An NFT's impact is primarily on the speculative and narrative layers that determine an asset's true market value. (A subjective evaluation.)

Here's how NFTs add distinct layers of value:

Perfect, Instant Provenance

Authenticating physical art is a costly, expert-driven process. With NFTs, proving an artwork is original is trivial. All you need is the creator's public address, and the blockchain gives an ironclad, instantaneous, and free confirmation of its origin.

Frictionless Transfer

Moving physical assets across borders is slow and expensive. NFTs transfer at the speed of the internet, with near-zero friction. This opens up a single global marketplace, letting any asset reach a worldwide audience of buyers instantly.

Enhanced Liquidity & New Financial Uses

Because NFTs can be traded securely and globally in seconds, they are far more liquid than their physical counterparts. This liquidity unlocks new possibilities. We are seeing platforms like **NFTfi.com** and **BendDAO** that allow users to borrow against their NFTs, treating them as legitimate collateral for loans.

A Public, Verifiable History

An asset's value is deeply tied to its history—the famous collections it has been a part of. NFTs make this history, known as provenance, completely transparent. Anyone can see the full history of owners and sale prices, adding a rich, unforgeable story to the asset itself.

Automated Creator Royalties

Perhaps the most powerful innovation here is programmability. An artist can code a royalty percentage directly into their NFT's smart contract[37]. This makes sure they automatically get a cut of the price every time the work is resold in the future—no lawyers, intermediaries, or collection agencies required. This solves a problem that has frustrated creators for centuries.

Fractional Ownership

A physical masterpiece can only have one owner at a time. An NFT, since

37 While theoretically true, whether these royalties are honored depends on the marketplace where the asset is sold. Following intense competition, many top marketplaces made royalty payments optional, creating a major challenge for creators. While new standards are being developed to give artists more control, it is no longer guaranteed that they automatically receive a share of the price every time the work is resold.

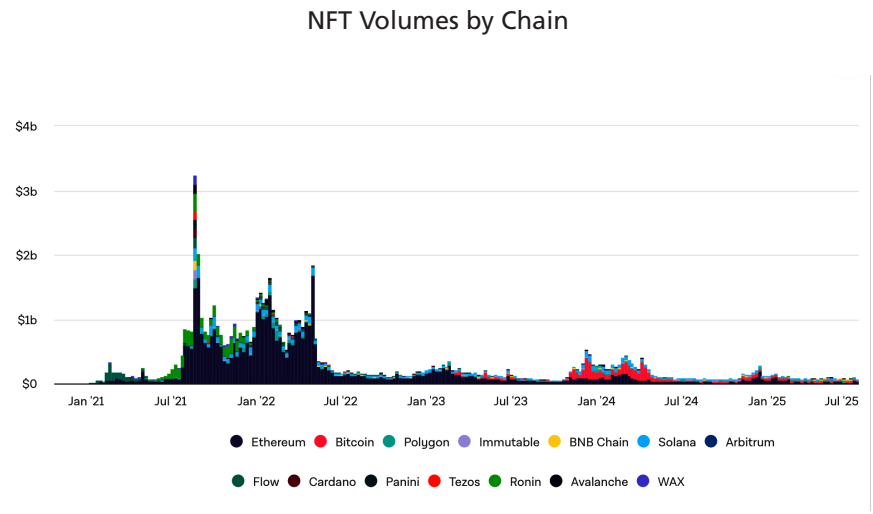
it's just a piece of code, can be digitally "fragmented," letting many people own a share. This makes high-value assets accessible to a much broader audience, dramatically increasing the potential market and liquidity for the work.

Deeper Community Building

NFTs are more than just assets; they are digital keys. They can give holders access to exclusive communities, private events, and a direct line to the creator. This turns the static relationship between artist and fan into a dynamic, interactive community, creating ongoing value for everyone.

The State of the NFT World

The explosion of 2021 was the NFT world's Big Bang—a chaotic, speculative frenzy that put digital assets on the map. The inevitable cooldown in 2022 was not an end but a reset, clearing the way for a more competitive and diverse ecosystem. The era of a one dominant chain and marketplace is over.



Monthly NFT volume across different chains (in billions USD). The market has shifted from Ethereum dominance to a multi-chain landscape. (Source: *TheBlock*)

For years, the market was synonymous with Ethereum. While it's still a major player, the landscape is now a fierce multi-chain competition. Bitcoin, once thought to be limited to a currency, became a major force in 2023 with the emergence of **Ordinals**, creating an entirely new ecosystem for collectors. Likewise, the **Solana** network, having weathered the 2022 crisis, has roared back to prominence, capturing a massive new audience with its low-cost, high-speed environment for NFTs and memecoins.

This competitive dynamic has also upended the marketplace hierarchy. **OpenSea**, the undisputed leader on Ethereum during the bull run, was outmaneuvered in early 2023 by **Blur**, a new marketplace that aggressively courted professional traders with token incentives and a focus on high-speed trading.

On Solana, a similar story of intense competition unfolded. **Magic Eden**, the network's established leader, was dethroned in trading volume by **Tensor**, a new marketplace that aggressively courted professional traders in 2024. However, in a dramatic reversal in early 2025, Magic Eden successfully recaptured its dominant position, demonstrating the highly volatile and competitive nature of the marketplace ecosystem.

Magic Eden also expanded its empire by strategically supporting Bitcoin Ordinals early, establishing itself as a major force in that new ecosystem. It now competes fiercely with other leading Ordinals marketplaces like **OKX and UniSat** for influence on the original blockchain.

Conclusion

The NFT market is maturing. The speculative tidal waves are receding, revealing a more durable landscape underneath. What was once a single-lane road is now a multi-lane highway with intense competition driving real innovation. This is no longer a niche experiment; it is the foundation of a serious new asset class.

Gaming and the Metaverse

We now turn to one of Web3's most promising—and most challenging—frontiers: gaming and the metaverse. While the vision is clear, building it has proven to be a tough road.

Why Gaming Became a Web3 Focus

The evolution of Web3 has been a logical progression. It began in 2009 with Bitcoin, which established the idea of a decentralized digital asset: money. From there, Ethereum generalized this concept, enabling a full suite of financial services in what became the DeFi summer of 2020. The next natural step was to move beyond finance and into culture, which gave us the NFT explosion. So, what comes after digital money, finance, and art? Digital worlds.

Why did gaming, and not another industry like supply chain management, become the next major focus? There are two clear reasons.

First, games are entirely digital. They are self-contained worlds of code, free from the complexities of the physical world. This makes them perfect laboratories for Web3 concepts like true asset ownership and decentralized economies.

Second, the sheer size of the industry is impossible to ignore. Gaming is no longer a niche hobby. In 2024, it was a $184 billion industry[38], more than double the size of the movie and music industries combined. When an industry is that large and built entirely on digital foundations, it becomes a prime target for a technological revolution.

Web3's Core Proposition for Gaming

The hype around Web3 gaming was fueled by a few fundamental ideas that directly challenged the decades-old model of the video game industry.

38 While other sources estimate the market size at approximately USD 221.24 billion in 2024. It is forecasted to reach USD 424.23 billion by 2033, growing at a CAGR of around 6.50% during the forecast period (2025-2033).

Full Control Over Your Assets

Anyone who has sunk hundreds of hours and dollars into a game knows the feeling. You level up, acquire rare items, and build a powerful character. But the moment you stop playing, all that value—your time, your money, your effort—vanishes. You never truly owned any of it; you were just renting it from the game studio.

Web3 flips this model on its head. By representing in-game items as NFTs, it grants players true, verifiable ownership of their digital assets. The long-term vision is full interoperability, where a sword earned in one game could become a cosmetic skin in another. While this is still a complex future goal, the core principle is revolutionary: your assets are yours, independent of any single game world.

The Ability to Monetize Your Time

True ownership naturally leads to the creation of open economies. If you own your digital assets, you can sell them to anyone, anywhere, on any marketplace. This is a stark contrast to the "walled gardens" of Web 2.0 games, where any in-game trading is tightly controlled by the studio, which takes a significant cut. Web3 lets the value created by players be captured by players.

The Evolution of "Play-to-Earn"

Web3 startups needed a way to compete with the huge marketing budgets of established game studios. They found it in a disruptive new model: sharing the network's value directly with the players.

This began with "Play-to-Earn." Led by the explosive success of *Axie Infinity*, this model attracted millions of users by rewarding them with tokens for their in-game activity. It was a brilliant way to get new users. However, the pure "earn" focus often proved unsustainable, creating inflationary pressure as players extracted value without a robust underlying economy.

The industry has since evolved. The new focus is on "Play-and-Own"—making high-quality, fun games first. The economic layer is no longer the

primary draw but a powerful feature that rewards players for their skill and long-term commitment, creating more durable and engaging digital worlds.

Why the First Wave Crashed

The initial boom in Web3 gaming was thrilling, but the bust that followed was inevitable. The early excitement was built on a shaky foundation that prioritized speculation over substance. When the broader market turned, these fundamental flaws were exposed.

The Conflict: Fun vs. Finance

The cardinal sin of first-generation Web3 games was that they forgot to be fun. Developers, many new to gaming, focused almost exclusively on the "earn" mechanics, creating experiences that felt more like a job than a game. This immediately alienated the core gamers, who saw the financialization of their hobby as a cynical cash grab and pushed back hard. A game must be compelling on its own; a token is not a substitute for great gameplay. When the rewards dried up, there was simply no reason left to play.

Unplayable Onboarding and Friction

For anyone outside the crypto-native world, just starting a Web3 game was a nightmare. The process involved a gauntlet of technical hurdles: setting up a non-intuitive crypto wallet, navigating an exchange to buy the right token, transferring it, and paying "gas" fees for every little in-game action. Each click was a potential point of failure. This crippling user experience was a huge barrier for mainstream adoption, leaving only a small pool of crypto speculators willing to go through the pain for a potential airdrop.

Broken Promises and Flawed Economics

The grand vision of interoperability—using your items across different games—remained a fantasy. The tech to make this seamless simply wasn't ready, and a core promise went undelivered.

More importantly, the economic models were often designed to be extractive, not sustainable. Many "Play-to-Earn" systems were built on inflationary tokens, requiring a constant flood of new players to pay the old ones—a model that quickly collapses under its own weight.

The general crypto winter that began in 2022 was the final nail in the coffin. As the market crashed, so did the value of these gaming tokens, often falling 90-95%. The financial incentive—the only reason many were playing—vanished overnight, triggering a mass exodus and exposing the projects' lack of any real, durable value.

Reviving the Web3 Gaming Industry

So, is Web3 gaming a failed experiment? Far from it. The crypto winter was a much-needed reset. In the quiet of the bear market, serious builders have been tackling the very problems that caused the first wave to crash. Here's how the industry is staging its comeback.

A Return to Fun on Better Infrastructure

The industry has learned its most important lesson: a game must be fun. The focus has shifted decisively from speculative mechanics to creating high-quality, engaging experiences. This pivot is enabled by a revolution in infrastructure. The days of building games on the slow and expensive Ethereum mainnet are over. A new generation of specialized "app-chains" like Ronin and Immutable X offers low-cost, high-speed environments built specifically for gaming. They are joined by powerful Layer 2 solutions and competing chains—from Arbitrum Orbit and zkSync to Solana and Avalanche—all competing to provide the fast, cheap infrastructure that modern games demand.

Making the Onboarding Invisible

The painful process of setting up wallets and managing gas fees is finally disappearing. Thanks to advancements like "account abstraction," the user experience is being radically simplified. Players can now log in with a social media account, transact without needing to hold a chain's native token, and

approve multiple actions at once. The goal is to make the blockchain tech completely invisible, delivering a smooth onboarding process that feels just like any traditional Web 2.0 game.

Delivering on the Promise of Interoperability

The dream of moving assets between different games and blockchains is finally becoming a reality. New cross-chain messaging protocols like LayerZero, Hyperlane and Chainlink's CCIP are creating the foundational pathways for value to flow freely across the Web3 ecosystem. This tech is the key to unlocking true, seamless interoperability for NFTs and other digital assets.

Finding New Highways to the Mainstream

Web3 games are discovering powerful new ways to reach millions of users. In 2024, games on the TON network went viral by integrating directly into the Telegram messaging app, effortlessly onboarding a portion of its nearly 900 million users. In another major development, electronics giant Sony is working on its own Layer 2 solution on Ethereum, signaling that major players in traditional entertainment are now building their own bridges into Web3.

The Search for Sustainable Economies

The flawed, inflationary token models of the past are being thrown out. The trial-and-error process continues, but startups are now focused on a much harder question: "What is the most balanced economic model that can attract new players while retaining existing ones for the long term?" Finding the answer to this is the central challenge, but it's a sign of a maturing industry focused on building durable value.

What About the Metaverse?

So far, we've focused on gaming. But what about the metaverse, the other half of this chapter's title? The term that was on everyone's lips has gone quiet. Why?

The metaverse hype was supercharged by a perfect storm: the COVID-19 pandemic, which forced our lives online, and Facebook's dramatic rebranding to Meta. It seemed like the next great paradigm shift was just around the corner. The reality has been a lot more complicated.

The visions of fully immersive digital worlds have not yet materialized, but this isn't a failure of the idea. It's a recognition of the immense challenge. Unlike purely software-based worlds like DeFi, the metaverse is a hardware problem. It requires a convergence of technologies—from powerful and affordable VR/AR glasses to faster internet and more powerful computers. These are not insurmountable obstacles, but they take years and billions of dollars to solve.

The thing to watch now is the core ideological battle for this new digital frontier. Will the metaverse be a series of closed, corporate-owned "walled gardens," as Web2 giants like Meta appear to be building? A world where they control the platform, the assets, and the rules will inevitably block the open innovation that Web3 promises.

This is why decentralized alternatives are so important. Platforms like The Sandbox, Decentraland, Otherside, and RFOX are playing a different, longer game. They are building the open, interoperable foundations for a universe of interconnected worlds, not just a single, proprietary one. The metaverse is a marathon, not a sprint, and the race to define its future is still in the early laps.

Decentralized Social Media: Taking Back Control

In this section, we'll explore decentralized social media, an emerging alternative to the tech giants that dominate our digital public square.

The Problems with Social Media

The platforms we use every day—Instagram, X (formerly Twitter), TikTok, and Facebook—are built on a fundamentally broken model, and the cracks are becoming impossible to ignore. Let's revisit the core issues.

The Flawed Business Model

The root of the problem is the business model. As publicly traded companies, social media giants are locked in a relentless quest for quarterly growth. Their only way to achieve this is to sell more ads and collect more data. This creates a perverse incentive to degrade the user experience with an ever-increasing ad load and to conduct invasive surveillance on their users. Their systems track not just your clicks, but potentially listen in on your conversations, all to serve you a more targeted ad. You are not the customer; you are the product being sold.

The Illusion of Control

Your social media feed is not your own. The chronological timeline, where you saw what your friends posted in order, is long gone. It has been replaced by opaque algorithms designed to maximize engagement and serve the platform's agenda, not yours. We have been conditioned to accept this manipulation.

More fundamentally, you don't own your digital life. Your content, your identity, and your network of followers are all held hostage by the platform. If you decide to leave, you can't take your social graph with you. This creates a powerful lock-in effect that traps users in digital prisons.

The Unchecked Power to Censor and Silence

This centralization of power has dangerous consequences. In the sum-

mer of 2024, a conflict between Instagram and Turkish national authorities over content it deemed "inappropriate" led to the platform being blocked in the country, punishing users and creators caught in the middle. Similarly, since **October 2024**, Turkey has blocked **Discord**, citing concerns over illegal content and its refusal to provide user data—and at the time of writing remains inaccessible.

This power is not just wielded by governments. On X, there are constant accusations that the algorithm now favors the political biases of its new owner. It's his platform; he can do what he wants. What's puzzling is watching users flee one centralized system only to embrace another, like Meta's Threads, which operates centrally[39]. This was driven home when Mark Zuckerberg admitted to the US Congress that he complied with government requests to suppress certain narratives before the 2020 election.

The ultimate expression of this power is **de-platforming**. Pre-Elon Musk Twitter famously demonstrated this when it permanently banned the sitting US President, Donald Trump, erasing his account and 88 million followers overnight.

39 While Threads launched as a centralized platform, Meta has been actively integrating it with the Fediverse via the ActivityPub protocol (the same protocol Mastodon uses).

De-platforming the President of the USA on Twitter



For a long time, this was the screen that greeted anyone trying to access Donald Trump's Twitter account.

This power can also wipe out entire industries. Years ago, Facebook encouraged game developers to build on its platform, attracting millions of users. After observing the revenue and engagement these games generated, Facebook abruptly shut down the platform, destroying countless businesses with a single decision.

Decentralized Social: The Solution?

Decentralized Social (DeSoc) rebuilds social media from the ground up to solve the core problems of the Web2 era. Its promise is simple: you, the

user, own and control your content, your identity, and your network.

The key innovation is separating the application you use from your underlying social data. Your profile, posts, and followers are stored on a permissionless, decentralized network—think of it as a public utility for social data.

This means anyone can build an app to access this data. Instead of being locked into a single platform like Instagram or X, you can choose from dozens of clients, each with a different design or feature set. This creates a competitive marketplace for user experience and makes it impossible for any single company to control the narrative or cut off access.

The DeSoc landscape is still new and fragmented, with many projects competing to become the standard. Let's look at three that stand out.

Discovering Lens Protocol

Lens Protocol

One of the first and most prominent DeSoc infrastructures is the Lens Protocol, built by the influential team behind the DeFi lending platform Aave.

Lens's core innovation was to treat your social graph as a collection of ownable assets. Your profile, content, and the relationships you build are all controlled by your crypto wallet, making them portable and programmable. This turns your social presence from something you rent on a platform into a digital asset you truly own.

This ownership unlocks powerful new capabilities. For example, the protocol's "Open Actions" feature allows any post to become an interactive application. A user can tip a creator, mint a collectible, or vote in a poll directly from their feed, opening up monetization models far beyond simple advertising. To combat spam, Lens Protocol initially gated access, but has since opened up, allowing anyone to create a profile for free.[40]

40 It relies on other mechanisms, including its modular architecture, to manage network quality.

This foundational layer supports a competitive ecosystem of applications like Phaver and hey.xyz, which act as different "windows" onto the same underlying social data. This has led to communities forming around unofficial, community-launched tokens, although the protocol itself has no native token. After launching on Polygon, Lens has since migrated to its own dedicated Layer 2 network—**Lens Chain**—built with ZKsync technology to handle the high transaction volume of social media at a very low cost.

Getting to Know Farcaster

Farcaster has gained significant traction among Ethereum users, positioning itself as a popular decentralized alternative to X. It uses a hybrid model, securing user identities on-chain while keeping content off-chain for speed. Its breakout feature, **Frames**, allows developers to embed interactive mini-apps directly into posts, unlocking a new wave of creativity for games, polls, and commerce. Built on the Optimism network, the protocol charges a small annual fee for accounts to deter spam. Its most popular client, originally named Warpcast, now also called **Farcaster**, sharing the name of the protocol itself.

Exploring Nostr

For those who prioritize absolute censorship resistance, there is Nostr. Popular within the Bitcoin community, Nostr is not a company but a simple, open protocol—a set of rules for passing messages through a network of independent nodes. With no founder or leader, it is radically decentralized and funded by community donations. Its raw, robust design makes it a haven for free speech, with clients like Damus providing a window into the network.

The Broader Landscape

The DeSoc world is far from a two-horse race. The most significant other contender is Bluesky, founded by former Twitter CEO Jack Dorsey. Built on its own unique foundation, the AT Protocol, it has seen impressive user

growth, surpassing 10 million users by fall 2024. Bluesky represents a different architectural vision for decentralization.

Beyond these, the ecosystem is vast and global. While Western platforms get the most attention, significant projects thrive in other regions, particularly Asia. Older, federated models like Mastodon continue to serve a dedicated user base. The space also sees explosive, short-lived experiments like **friend.tech**, which serve as case studies in viral hype and token-driven speculation. This diverse list of projects is constantly evolving, all competing to build the future of social media.

The Hurdles for Decentralized Social

Despite its powerful vision, decentralized social media is still far from challenging the giants of Web2. The reasons are clear: the landscape is fragmented, the user experience is still lagging, and the hard problem of content moderation remains unsolved. However, elegant solutions to each of these challenges are beginning to emerge.

Fragmentation and the Rise of the Aggregator

A social network is only valuable if people are on it—the "network effect." Today, the DeSoc world is fragmented across multiple competing protocols, splitting this vital network effect.

The solution, however, isn't for one protocol to win, but for the applications to unite them. Early pioneers, like the now-defunct Phaver[41], attempted to solve this by building clients that could access multiple protocols from a single interface. While building a sustainable business in this new space is incredibly difficult, the core idea remains the most promising solution: a user's loyalty will belong to the app that provides the best experience, not the underlying protocol.

41 Even though gained some traction, Phaver had to close its doors due to insufficient funding.

Closing the UX Gap and Innovating Beyond

DeSoc apps are still playing catch-up to the polished, multi-billion dollar products of their Web2 rivals. The resource gap is real. Yet, in some ways, they have already leaped ahead.

Features like **Farcaster's Frames** and **Lens's Open Actions** are native Web3 innovations that centralized platforms cannot easily replicate. They turn static posts into interactive applications. Directly within a post, a user can mint an NFT, play a game of chess, tip a creator, or vote in a DAO. This transforms the social feed from a simple wall of content into a dynamic and computational environment.

A Market for Moderation

The biggest critique of DeSoc is its potential for unchecked, harmful content. Centralized platforms solve this with top-down control, acting as both judge and jury. The decentralized world offers a different, more nuanced solution.

The protocols themselves remain neutral, like public utilities. The responsibility for moderation is pushed up to the application layer. This creates a "market for moderation," where different apps will compete on their content policies. Some will offer raw, unfiltered access. Others will provide heavily curated and family-friendly feeds. Users will be free to choose the client and the level of control that they prefer, escaping the one-size-fits-all censorship of today's giants.

Conclusion

For years, creators and now users have felt the pain of the centralized social media model. DeSoc, while still small, holds the blueprint for a better system. The ultimate winner may not be a single protocol, but a vibrant ecosystem of aggregator apps built upon them. Should this vision succeed, the result will be a social web that is more open, more innovative, and fundamentally more aligned with the interests of its users.

Digital Identity: Taking Back Your Data

One of the most important conversations in Web3 revolves around a concept that is fundamental to our online lives, yet completely broken: digital identity.

The Identity We Have Today

Right now, you don't have a single digital identity. You have a collection of separate, rented identities given to you by different authorities. Your government gives you one, your bank gives you another through its "Know Your Customer" rules, and every social media platform gives you yet another.

The common thread is that you don't own or control any of them. They are all issued by a central institution, stored in a central database, and can be revoked at any time. This centralized architecture has created two toxic and unavoidable problems.

First, these databases are irresistible honeypots for hackers. The question is not *if* they will be breached, but *when*. We see it constantly in the news: massive data thefts exposing our most sensitive information. This isn't a bug in the system; it's a built-in feature of centralized data storage.

Second, our data gets exploited. For companies like social media giants, our identity is the raw material that fuels their business. They offer a "free" service in exchange for the right to process our data and sell it to advertisers. The Facebook-Cambridge Analytica scandal was the moment the world saw the terrifying power of this model—how our data could be used not just to sell products, but to manipulate our political views on a mass scale.

Will blockchain be the cure?

While it's wise to be skeptical of presenting blockchain as a magical cure-all, digital identity is one of the rare, fundamental problems it is uniquely positioned to solve.

To see why, it helps to break down any identity interaction into three parties:

- The **Issuer**: The trusted authority that grants a credential (e.g., a university issuing a diploma).
- The **Holder**: You, the individual who holds the identity and its credentials.
- The **Verifier**: The party that needs to confirm a credential (e.g., an employer verifying your diploma).

The current system is inefficient and insecure for all three. The blockchain-based model, often called **Self-Sovereign Identity (SSI)**, offers a profound upgrade for everyone.

For **issuers**, it eliminates the costs and risks of managing physical documents and fighting fraud. They can issue secure, digitally signed **Verifiable Credentials** that are tamper-proof and can be authenticated instantly by anyone in the world.

For **verifiers**, the benefit is huge. They no longer need to request, handle, and secure tons of sensitive personal data, which dramatically reduces their liability and security overhead. Instead of holding a copy of your driver's license, a bar can simply request cryptographic proof that you are over 21, without ever seeing or storing your birthdate.

Of course, the biggest beneficiary is you, the **holder**. This model gives you back control. Your credentials live in your own digital wallet, not in some company's database. You decide what to share and with who. Using technologies like zero-knowledge proofs, you can prove specific facts about yourself—that you have a valid degree, that you are a citizen, that your credit is good—without revealing all the underlying personal data. The power shifts from the institutions back to the individual.

How It Works in Practice

So how does this new identity system actually work? The prototype has been hiding in plain sight for years within decentralized finance. Crypto

wallets provide the architecture for universal SSI passports—intentionally harnessed, not accidental.

With this passport, the silos of the old internet dissolve. Imagine using a single wallet to log in everywhere. In this world, your content and followers are attached to *your wallet*, not to a corporate platform. You are no longer trapped. If you are unfairly de-platformed—even if you are the President of the United States—or just want to try a new app, you can take your entire digital life with you. Your identity, your assets, and your social graph are yours to control.

A whole new ecosystem of projects is building this future. Pioneers like Civic, Ontology, and SelfKey laid the groundwork for the infrastructure.

They are now being joined by modern protocols built on scalable Layer 2s. A prominent example is Worldcoin's **World ID**, a 'proof of personhood' identity protocol that uses iris-based biometric scans and zero-knowledge cryptography[42].

Crucially, for this to go mainstream, the experience must be seamless. This is where user-friendly solutions like Magic come in. They provide "wallet-as-a-service," allowing users to create a self-custodial wallet with just a familiar email login, completely abstracting away the crypto complexity while preserving the benefits of true ownership.

Wrapping It Up

Digital identity is not just another "application" of Web3. It is the foundational layer that makes everything else—from NFTs and gaming to social media—truly user-owned. While it may not generate the speculative headlines of other sectors, it is the critical, enabling infrastructure for the entire Web3 vision. It's the bedrock on which a more equitable and user-centric internet will be built, and it should be on your radar.

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42 World ID operates via Ethereum Layer 2 solutions—including Optimism-based World Chain—to deliver scalable, privacy-preserving unique-humanness verification.

Decentralized Physical Infrastructure: The Next Frontier

In this section, we'll explore one of the most ambitious and important frontiers in Web3, a sector with a decade-long horizon: Decentralized Physical Infrastructure, or DePIN.

The Centralization Paradox

Decentralization is the core promise of Web3, giving power back to users by cutting out the middlemen. But while this is happening at the app layer, the truth is that the Web3 ecosystem is running on a dangerously centralized foundation. This is the great paradox of the space right now.

When we look under the hood, we find an alarming dependency on a few giant companies. The vast majority of the nodes that run our blockchains are hosted on the servers of centralized cloud providers like Amazon Web Services (AWS). The data generated by projects and users is often stored in the same centralized silos we sought to escape, creating the same risks of manipulation and abuse that we saw in scandals like Cambridge Analytica.

As long as a handful of corporations can "pull the plug" on the servers, the entire promise of a censorship-resistant and user-owned internet remains fragile. The critical question, then, is this: can the principles of decentralization be applied not just to software, but to the physical world of hardware and infrastructure? Can we do for physical infrastructure what DeFi did for finance? DePIN's mission is to answer that question with a definitive yes.

Introducing DePIN

DePIN, which stands for **De**centralized **P**hysical **I**nfrastructure **N**etwork, is a movement dedicated to rebuilding the world's physical infrastructure from the ground up. The core idea is to use token incentives to coordinate and reward a global community of individuals for contributing their hard-

ware and resources, creating a decentralized and user-owned alternative to the services dominated by giant corporations.

To make this concrete, think of these pioneering examples:

- **Filecoin** created a decentralized data storage network, a community-powered alternative to Google Drive or iCloud.
- **Helium** built decentralized wireless networks, rewarding people for setting up hotspots that provide connectivity for IoT devices, as well as a separate network for mobile phone service[43].
- **Hivemapper** is building a decentralized world map by rewarding drivers for contributing footage from their dashcams, creating a real-time competitor to Google Maps.

While still in its early days, the DePIN landscape can be broadly divided into two major categories:

1. Digital Resource Networks This category is focused on creating decentralized marketplaces for the internet's most essential digital commodities. It's about building a community-owned cloud to rival Amazon Web Services. This includes:

- **Storage:** Networks that allow anyone to rent out their unused hard drive space.
- **Compute:** Marketplaces for processing power, where users can buy or sell access to CPUs and GPUs for tasks like AI model training or video rendering.
- **Bandwidth:** Networks that provide services like decentralized VPNs or content delivery networks (CDNs).

2. Physical Resource Networks This category involves coordinating location-dependent hardware to provide real-world services. This is where DePIN extends from the digital world into our physical environment. Key areas include:

- **Wireless:** As we saw with Helium, this involves people setting up

43 Helium started with IoT (LoRaWAN) and later added limited mobile service via its Helium Mobile offering.

hotspots to create decentralized mobile, WiFi, and IoT networks, breaking the hold of traditional telecom companies.

- **Sensor Networks:** These networks incentivize individuals to collect and contribute real-world data. Hivemapper's dashcams are a prime example. This raw sensor data can then be processed, often with the help of AI, into highly valuable data sets for industries ranging from logistics and real estate to insurance. This is a user-owned alternative to the data-grabbing model of Web2.
- **Energy Grids:** Perhaps the most ambitious frontier for DePIN, these projects aim to decentralize the energy sector. This includes everything from financing green energy production to creating community-owned "virtual power plants." Due to heavy monopolization and regulation, this area has a long and challenging road ahead.

Other applications, like decentralized service marketplaces (think a user-owned Uber) or privacy-preserving advertising networks, are often built as a service layer on top of these foundational resource networks.

Where Does Crypto Come In?

So how do you convince thousands of people across the globe to build a physical infrastructure network? This is where the crypto-economic model becomes essential. DePIN projects are powered by a "flywheel" where tokens serve three critical functions:

1. **To Fund the Network:** Tokens allow projects to crowdfund the massive capital needed for infrastructure projects directly from their community.
2. **To Build the Supply:** This is the most crucial step. Tokens are used to incentivize early contributors—the "supply side"—to buy and deploy hardware *before* there is any user demand. This solves the classic bootstrapping problem.
3. **To Drive Demand:** Once the network is operational, the token

becomes the native currency. Users—the "demand side"—pay for the service (e.g., data storage or wireless access) using the token, creating a real economy.

The blockchain itself acts as the global, permissionless ledger that makes all of this possible, coordinating payments and making sure thousands of participants are on the same page.

Solana is a leading chain in DePIN thanks to its high throughput and low fees while Ethereum Layer 2 networks also compete aggressively.

Meanwhile, new, innovative approaches have launched, such as purpose-built blockchains **peaq** and **IoTeX** that are designed specifically for DePIN[44].

Challenges Facing DePIN

As elegant as this model sounds, building DePIN networks is incredibly difficult. Unlike pure software, which is costly to develop but virtually free to deploy, DePIN operates in the world of atoms. It involves expensive physical hardware with real initial investment and ongoing operational costs.

This creates two major challenges. The first is walking the **tokenomics tightrope**. The project must distribute enough tokens to incentivize suppliers to build out the network. But if they distribute too many, they create massive inflation that devalues the token, hurting everyone. The token's price volatility on the open market further complicates this, making it difficult for hardware providers to predict their return on investment.

The second is the **"cold start" problem**. Centralized companies can use billions in venture capital to subsidize a service and attract users until they hit critical mass. Decentralized projects, which are funded by the community, don't have this luxury. They face a classic chicken-and-egg dilemma: they need a critical mass of suppliers to offer a high-quality service, but they need a high-quality service to attract the paying users who generate the revenue needed to sustain the suppliers. Overcoming this initial hurdle is the single greatest challenge for any new DePIN network.

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44 Additionally there are cases such as Eclipse, which uses Solana's high-performance virtual machine on top of Ethereum's security.

What's Next for DePIN?

Rebuilding physical infrastructure takes decades. The need for DePIN must become undeniable. The models must be refined through experience.

However, Artificial Intelligence is a powerful catalyst. AI has an insatiable need for two things: processing power and vast datasets. Centralized cloud providers are already struggling. This creates a huge opportunity for decentralized networks. DePIN can supply the compute and data AI needs. This symbiotic relationship is the sector's biggest driver[45].

Final Thoughts

DePIN is founded on a beautiful ideal. But its real-world implementation is difficult. Its grand vision may take years to realize. However, the convergence with AI is accelerating its relevance.

It's easy to dismiss niche technologies. But AI itself was once a niche topic. Now it is a world-changing force. DePIN could follow a similar path. For investors and users, it is a critical sector to watch closely.

45 It takes serious computing power to process questions and generate quality responses. Today, it's far too expensive for decentralized systems to run this fully on-chain—so smart contracts can't use these models directly. If zero-knowledge proof (zk) tech can someday verify that an AI model's result is accurate, we might be able to run parts of this process off-chain. But first, zk proofs need to become much cheaper to generate.

Regenerative Finance: A New Web3 Vision

In this section, we turn to Regenerative Finance (ReFi), a branch of Web3 on a mission to prove the ecosystem has a soul.

There's a common misconception about Web3. Because it grew from a Bitcoin philosophy that fiercely champions individualism[46], many see it as an inherently selfish movement.

But this misses Web3's other superpower: its ability to act as a **social coordination mechanism**. This gives itthe tools to align thousands of strangers around the world towards a common goal, all bound by transparent, predetermined rules.

The emerging ReFi movement aims to harness this power for a specific purpose. It represents a powerful counter-narrative to the idea of pure self-interest.

What is Regenerative Finance?

Regenerative Finance (ReFi) is a movement aiming to reshape the financial landscape. Its goal is to restore and improve our natural environment—something we've clearly neglected—and boost overall societal well-being[47].

The system we live in is fundamentally extractive. It is designed to maximize returns for capital owners, treating environmental and social costs as mere "externalities" to be ignored.

ReFi aims to change this definition of profit. It seeks to build a world where the value created flows not only to shareholders, but also to the communities and ecosystems that support us all.

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46 The early Bitcoin philosophy strongly emphasizes individual freedom.It's worth noting that one of the most influential segments of the Bitcoin community leans toward individualism and libertarianism—an ideology with strong roots in the U.S.

47 Definition adapted from "Where finance, digital, sustainability and impact meet: What is Regenerative Finance (ReFi)?" by Hogan Lovells.

You might think these goals are utopian dreams. You may be right. But for the first time, the decentralized tools of Web3 offer a plausible path to achieving them. Let's look at how blockchain technology can power this movement.

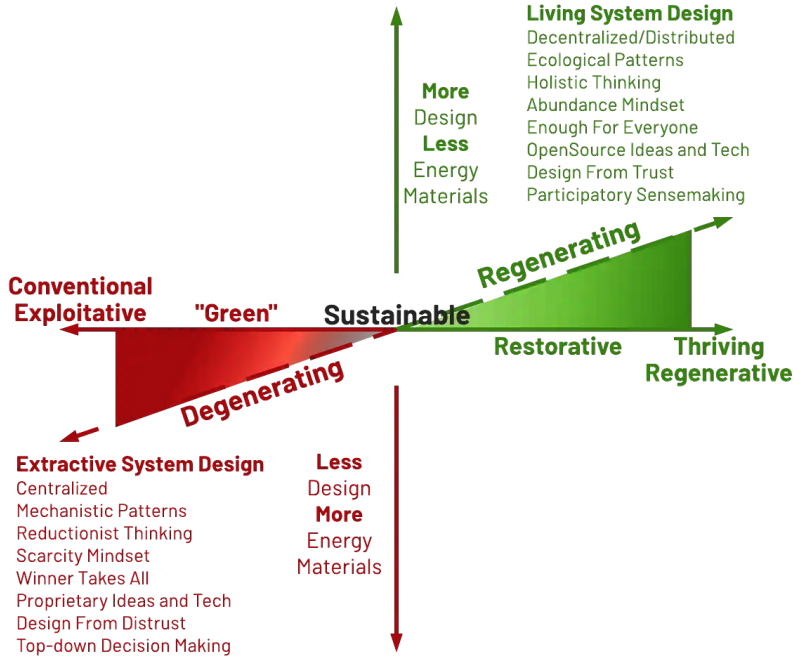
How Blockchain Helps

ReFi takes the powerful, battle-tested tools of decentralized finance and points them at real-world problems. It adapts DeFi's core value proposition—user sovereignty over assets and frictionless, borderless value transfer—for a new purpose.

To understand why this is so powerful, we must first look at why current systems fail. The incentive models of our traditional economy are broken. They are slow, opaque, and terrible at mobilizing people on a global scale. Aid for environmental projects or disaster relief is often wasted, captured by intermediaries, or used inefficiently, with little to no accountability for those who cause the problems in the first place.

ReFi uses blockchain to build a better toolkit. It enables anyone, anywhere, to fund socially beneficial services with speed and transparency.

Evolving Ecological Economies



The evolution of economies from extractive and degenerative to restorative and regenerative. Adapted from 'The road ahead for ecological design' by Bill Reed (Regenesis) (Source: *Word Economic Forum*)

Here's how it works in practice:

- **Transparent & Auditable Funding:** By using a public blockchain, the flow of capital can be tracked from a donor all the way to the project on the ground. This radical transparency cuts out corruption and makes sure resources are not wasted.
- **Tokenizing Natural Capital:** ReFi allows us to turn positive environmental outcomes into tradable digital assets. A ton of carbon removed from the atmosphere, a restored hectare of rainforest, or a verified reduction in plastic waste can be represented as a token. This creates a direct financial incentive to heal the planet.
- **Decentralized Coordination:** Through structures like DAOs, ReFi

allows global communities to pool funds and govern projects directly, bypassing the slow and bureaucratic non-profits and institutions of the old world.

This open-source, transparent, and democratic infrastructure makes it possible to precisely reward positive actions and ensure accountability. It provides the foundation to create global resource pools, design products for local communities, and accelerate environmental movements on a scale never before possible[48].

Where ReFi Can Make a Difference

While ReFi's potential is vast, it is already making a tangible impact in a few key areas.

Building Markets for Environmental Assets

Perhaps the most mature area of ReFi is creating liquid, transparent markets for environmental assets. Projects like Toucan Protocol were early pioneers in tokenizing carbon credits, bringing them onto the blockchain[49]. Others, like Credit Nature, focus on new assets like biodiversity credits, creating financial incentives for landowners to engage in reforestation and conservation.

Financing Sustainable Agriculture

ReFi projects are also creating new models to support sustainable farming. A powerful example is EthicHub, a platform that connects investors directly with unbanked coffee farmers in South America. It uses DeFi's lending rails to provide affordable capital, bypassing local lenders who charge insane interest rates. It also helps farmers access new revenue streams (such

48 These definitions are from Toucan's blog post, "What is ReFi?"

49 However, this first model faced significant challenges in 2022 when major carbon registries restricted this activity, forcing the on-chain carbon market to evolve. Today, Toucan and other projects are developing new infrastructure for creating more robust and transparent 'digital native' environmental assets

as biodiversity programs) by connecting them to global markets[50].

Empowering Local Communities

At its core, ReFi is about using Web3 tools for grassroots development. This includes a wide range of initiatives, from funding micro-entrepreneurs[51] to bringing financial services to the unbanked and helping communities build their own renewable energy projects.

Challenges Facing ReFi

For all its promise, why don't we hear more about the ReFi movement?

First, this is a long-term game. The positive impacts of regenerative projects are measured in years or decades, not days or weeks. The ReFi space today feels much like DeFi did between 2017 and 2020: a small community of builders laying the groundwork, long before the mainstream hype arrived.

Second, the core idea—that token incentives can create sustainable, regenerative economies—is still a powerful but unproven hypothesis. Finding the right economic models that align profit with purpose without creating unintended consequences will require years of testing and refinement.

Conclusion

ReFi is the conscience of Web3. It extends the ecosystem's value proposition from empowering the individual to healing society and the planet. In a world often dominated by short-term speculation and hype cycles, it takes courage to build for the long term.

While it may seem small today, ReFi's focus on solving tangible, real-

50 After years of successfully providing affordable loans to unbanked coffee farmers, the platform faced a major crisis in 2022-2023 when a sharp drop in coffee prices led to widespread defaults. However, the project demonstrated significant resilience. By 2025, EthicHub had entered a recovery phase, securing a $1 million investment from Bybit and expanding its partnership with Heifer International to rebuild its lending pools.

51 Through protocols like Goldfinch which uses crypto to originate loans for businesses in emerging markets.

world problems could be the key to Web3's mainstream legitimacy and adoption. It is a critical movement that aims to prove that this technology can be used not just to create wealth, but to create well-being.

Decentralized Science: A New Frontier (DeSci)

For years, the most successful use case for Web3 has been finance. The tools built for DeFi, particularly the Decentralized Autonomous Organization (DAO), proved to be incredibly powerful for coordinating capital and communities. Now, that same battle-tested model is being aimed at a new target: the world of science.

After a wave of non-financial blockchain projects failed between 2015 and 2019, a more mature movement has emerged. Decentralized Science, or DeSci, is applying the lessons learned from DeFi to rebuild the scientific process from the ground up.

Exploring Decentralized Science (DeSci)

Classically, science is a methodical search for truth. In practice, it has become a centralized system, monopolized by a handful of powerful universities, government grant agencies, and for-profit academic publishers. This structure often stifles innovation, slows down funding, and locks critical knowledge behind expensive paywalls.

DeSci aims to dismantle this old model by building a new scientific ecosystem based on four key principles[52]:

- **Decentralization:** DeSci moves science away from siloed institutions and onto open networks. The goal is to reduce the power of bureaucratic gatekeepers and make funding and decision-making more democratic.
- **Transparency:** The movement puts transparency first. It aims to make the entire research process—from data collection to peer review—more open and auditable, increasing the reliability and reproducibility of scientific work.

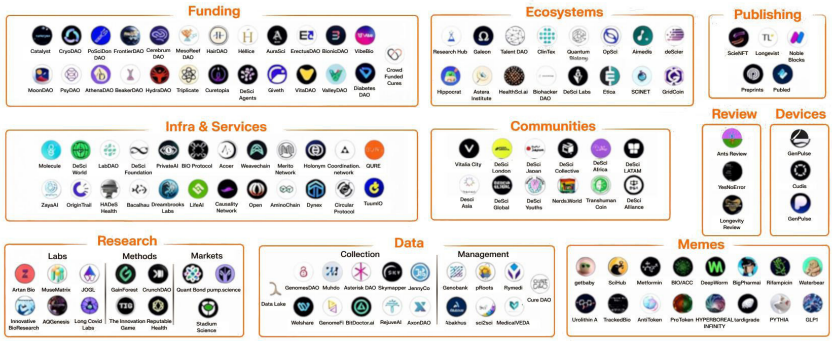
52 Definitions of decentralized science are sourced from Jagjit Singh's article published on Cointelegraph.

- **Permissionless Collaboration:** Using distributed networks, DeSci breaks down the institutional and geographical walls that separate researchers. It fosters a global environment where diverse perspectives can connect and collaborate without friction.
- **New Incentive Systems:** DeSci introduces powerful new economic models. Through DAOs and tokens, it can directly reward researchers for their contributions and use novel mechanisms like IP-NFTs to give scientists and funders true ownership of the intellectual property they create.

The DeSci Landscape

The DeSci movement has sparked a Cambrian explosion of new projects. By early 2025, the number of organizations building in the space had surged to over 250, creating a vibrant and diverse ecosystem.

The Decentralized Science Ecosystem



The DeSci ecosystem map as of Dec 2024. (Source: *Messari*)

While a detailed list of these initiatives is available, the players can be grouped into a few key functional areas that are working to rebuild the scientific process[53]:

53 Definitions of the groups below come from the DeSci Wiki, the most comprehensive resource in this space.

- **New Funding Models:** At the heart of DeSci are new ways to fund research. This is led by **DAOs**—decentralized autonomous organizations—that allow communities to pool capital and collectively vote on which projects to support. They focus on everything from longevity research to rare diseases, bypassing traditional grant agencies.
- **Open Publishing & Collaboration:** This category aims to dismantle the paywalls of traditional academic journals. These projects are building open, transparent platforms for publishing research, conducting peer reviews, and enabling scientists to collaborate across borders without friction.
- **Data and IP Infrastructure:** This is the foundational layer for a new scientific economy. It includes decentralized protocols for storing and sharing large datasets immutably. Crucially, it also includes platforms that use **IP-NFTs** (Intellectual Property NFTs) to turn patents and research data into ownable, tradable, and fundable digital assets.

Conclusion

Decentralized Science is tackling one of the most important and challenging use cases for Web3. Initiatives that bridge the digital and physical worlds, like DeSci, face thorny problems and long timelines.

Nevertheless, the mission to build a more open, efficient, and equitable system for scientific discovery is critical for the long-term adoption and legitimacy of Web3. While its success is not guaranteed, its potential impact is immense, making it one of the most vital areas of innovation to watch.

AI Meets Web3

Artificial Intelligence and Web3

Two of the most powerful forces in technology are on a collision course: AI and Web3. Understanding their relationship is key to understanding the future.

Artificial intelligence is nothing new. Its roots trace back to the 1950s, and the quest for 'general artificial intelligence'[54] has been a quiet pursuit for over two decades. For years, progress was slow, simmering in the background. Then, recent explosions in hardware capability threw fuel on the fire, bringing us to today's incredible pace of development.

So, how does it all work?

What is AI?

Pinning down a single definition for artificial intelligence is tricky because it serves so many functions. At its core, you might think of general AI as a hyper-aware mimic, a parrot with a near-perfect memory. It absorbs the vast universe of information we've created and reflects it back to us. But this is no simple mimicry. What's magical about this parrot is that it doesn't just imitate our words; it imitates our patterns of thought, our tones of voice, and ultimately, evolves into something more advanced than the original it's copying.

AI's lifeblood is data, and its primary source is the internet. Every piece of text, every image, and every sound file on the open web is ingested. This public library is then enriched with information from private databases. Once collected, this raw data is cleaned and structured, making it readable for a machine.

54 Artificial intelligence began with narrow applications—for example, IBM's Deep Blue, which focused on chess. General-purpose AI (AGI) has progressed more slowly but gained serious momentum in recent years.

From there, the machine begins to analyze, looking for patterns. It infers the relationships between words—how they're used, in what order, and in what context. Through a process called 'tokenization', every word and its components become individual units. The critical step is weighting these units based on how often they appear and how they relate to other units. This complex web of relationships creates a model with trillions of parameters. ChatGPT, for example, operates on a staggering 1.8 trillion parameters[55].

Finally, when you ask it a question, the AI predicts and constructs an answer[56], presenting it so naturally it feels like a conversation[57].

Here's where it gets interesting. Once a machine learns *how* to learn, it can begin to teach itself. Every interaction, every piece of user feedback, becomes a lesson. You might remember when ChatGPT first launched; users would point out a flawed answer, and the AI would take that into account and update itself. That wasn't just a simple fix. It was the AI using our feedback to refine its own understanding. This process has become so effective that today, even the experts who build these systems are sometimes stunned by the emergent, unexpected ways AI arrives at its conclusions.

But what *is* this intelligence? Is it a physical box humming in a server farm, or a ghost in the network? To understand, we need to pull back the curtain and see what's running the show.

Inside AI's Technology Stack

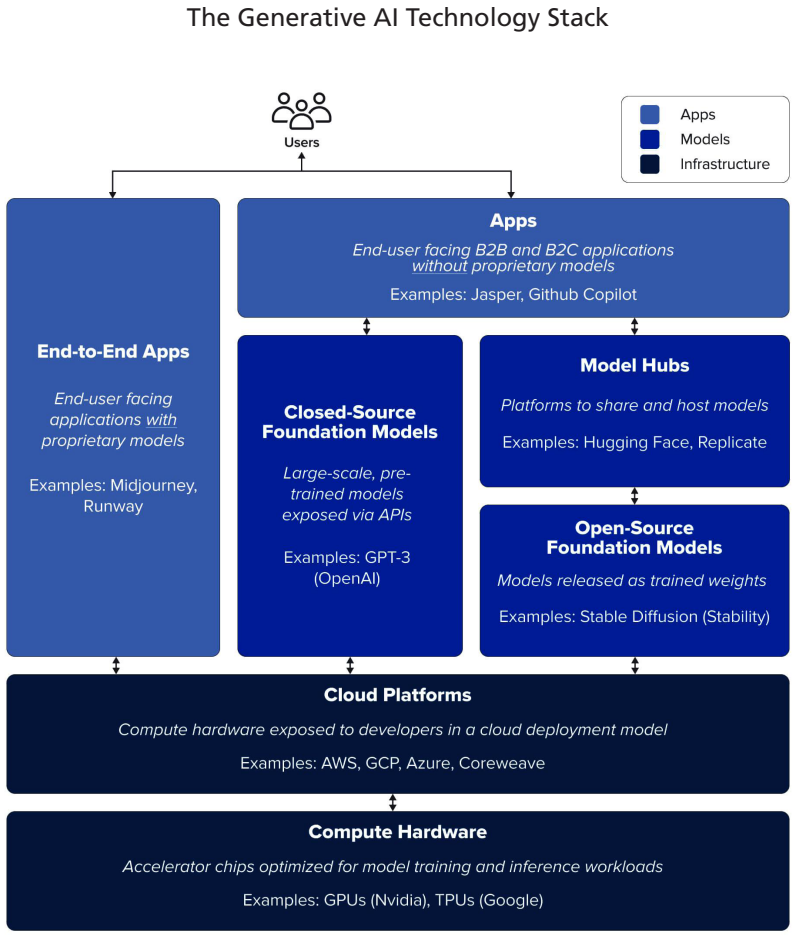
Artificial intelligence isn't some single, monolithic thing. It's a stack of technologies, layered on top of each other, much like the DeFi "money legos" we've explored. Each layer builds on the one below it, creating the foundation for the tools we now use every day.

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55 While OpenAI has never confirmed this figure, it illustrates the immense complexity involved as the industry's focus shifts from raw parameter count to overall model efficiency and capability.

56 Artificial intelligence mimics how we associate and make sense of people, patterns, and events.

57 AI can generate a wide range of outputs—from writing text to analyzing images and gathering data. For simplicity, we've used ChatGPT's Q&A approach as our example here.



The stack that powers generative AI, from silicon to application. (Source: a16z.ai)

At the very bottom of the stack is the **infrastructure layer**. To perform trillions of calculations and deliver results instantly, AI has an insatiable hunger for computational power. This is the world of hardware—the processors (chips) and cloud platforms that do the heavy lifting. It's why chip giants like Nvidia have seen their valuations soar[58] and why Amazon's AWS

58 In fact Nvidia has seen its valuation skyrocket, becoming the world's most valuable company in 2025 with a market capitalization exceeding $3.5 trillion.

and Microsoft's Azure have become profit engines for their parent companies. This layer provides the raw power.

On top of this foundation sits the **model layer**. This is where the "brain" of the operation lives. Here you'll find the large models like ChatGPT that have captured the world's attention. But not all models are created equal. They exist on a spectrum from closed to open.

- **Closed models**, like the initial versions of ChatGPT, are proprietary. Both their training data and their internal weightings are kept secret, like the recipe for Coca-Cola.
- **Semi-open models**, like Meta's Llama, take a different approach. While the training data is closed, the model's internal weightings are made public. This is a crucial distinction. It means anyone can take the model and fine-tune it by adjusting these weights—for example, one could theoretically remove the censorship filters common in other systems.
- **Fully open-source models**, like some versions of Mistral[59] open everything. Both the data and the weights are available for anyone to see, use, and modify.

Finally, at the very top, is the **application layer**. This is the part of the stack you see and touch. These are the end-user products built on top of the powerful models below, turning their abstract intelligence into something tangible and useful[60].

The Dazzling Pace of AI

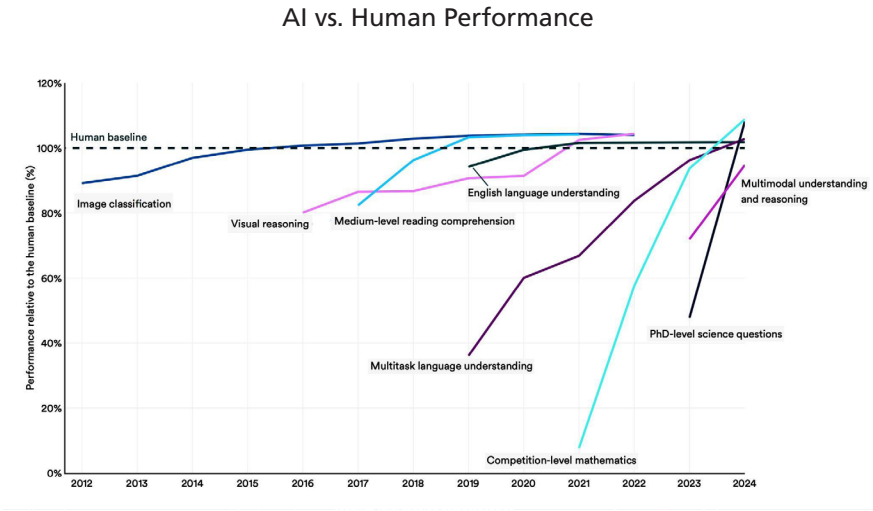
Artificial intelligence is developing at a breathtaking pace. While many of us see it through the narrow lens of a personal assistant like ChatGPT, its true impact is quietly reshaping the global economy.

Imagine a new kind of workforce. It doesn't eat or sleep; it only consumes

59 "Mistral 7B" and "Mixtral 8x7B," models are truly open source.

60 Some AI models, like Midjourney, are accessible directly without a separate app layered on top.

energy. It works 24/7. Today, it has the skills of a sharp university student. Tomorrow, it will have the capabilities of a PhD candidate[61]. This isn't science fiction; it's the reality of AI's integration into the business world.



This chart tracks AI performance against a human baseline (the 100% line). AI has already surpassed human ability in almost all areas except multimodal understanding and reasoning. (Source: *Stanford University - AI Index Report*)

This leap in performance translates directly into economic value. The World Economic Forum projects that AI will add between $1.2 trillion and $3.8 trillion to the global economy *annually* over the next decade[62].

Now, combine this cognitive revolution with rapidly advancing robotics. The implications are staggering, poised to fundamentally alter everything from the cost of services to the very nature of your work[63].

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61 I tried to keep this article free of flashy headlines, but here's one too good to skip: Bryan Caplan, an economics professor at George Mason University, bet Matthew Barnett in January 2023 that "ChatGPT won't score an A on any of my exams before 2029." Three months later, GPT-4 aced the test, and Caplan lost the bet.

62 Some research claims that AI could push per capita GDP growth—historically around 2% annually—to as high as 30% per year thanks to explosive productivity gains. Read more here.

63 One more glimpse of the future: this short story by an OpenAI engineer imagines how AI might someday design its own chips to break through the computational bottleneck.

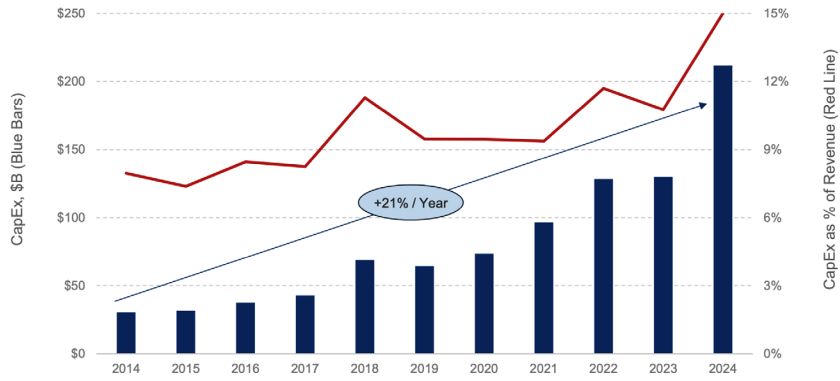
The AI Arms Race

The tech giants aren't just dabbling in artificial intelligence; they are in an all-out arms race, investing everything they have to claim the future.

Consider the 'four horsemen' of the tech world: Microsoft, Amazon, Google, and Meta. Over the last three years, they have poured a stunning $465 billion into AI.

They did not stop there. In 2025 alone, their collective capital expenditures, driven almost entirely by AI, are projected to approach $200 billion. By the way, the spending spree is far from over. These companies, along with Apple, are sitting on a war chest of another $550 billion in cash, ready to be deployed. This isn't a temporary trend; it's a seismic shift in capital allocation, and the investment appetite will only continue to grow.

Big Six Tech Giants Capital Expenditure Spending



The combined capex spending and % of total revenue for six major tech companies (Apple, Nvidia, Microsoft, Alphabet / Google, Amazon, & Meta Platforms) (Source: *Bond Capital*)

This tidal wave of investment has a clear beneficiary. Propelled by the insatiable demand for its processors, chipmaker Nvidia has skyrocketed to become one of the most valuable companies in the world.

When you consider that the biggest owners of the data—AI's most critical input—are these same tech giants, a familiar and troubling question arises. Are we destined to repeat the problems of Web 2.0, where a handful

of companies held monopolies over our digital lives?

This is the central challenge of our time. Will AI simply reinforce the centralized power of the incumbents, or can decentralized solutions like Web3 offer an alternative path?

The Intersection of Web3 and AI

In a world dominated by AI giants, can the decentralized startups of the Web3 world even survive? Forget challenging the titans head-on; is there any space for them to exist at all?

To answer that, we first have to understand if their underlying technologies can even work together.

Are Blockchain and AI Compatible?

At a technical level, blockchain and artificial intelligence are fundamentally incompatible. Their core designs are in direct opposition.

Blockchain demands mathematical certainty; every transaction must be absolute and verifiable. AI, however, thrives on probabilistic guesswork, constantly calculating the *likelihood* of an answer being correct[64].

Furthermore, their resource needs are diametrically opposed. Blockchain is intentionally slow and redundant, distributing its workload across thousands of machines to achieve decentralization. AI is a centralized beast, a computational brute that devours as much processing power and energy as it can get. The more resources it consumes, the more powerful it becomes.

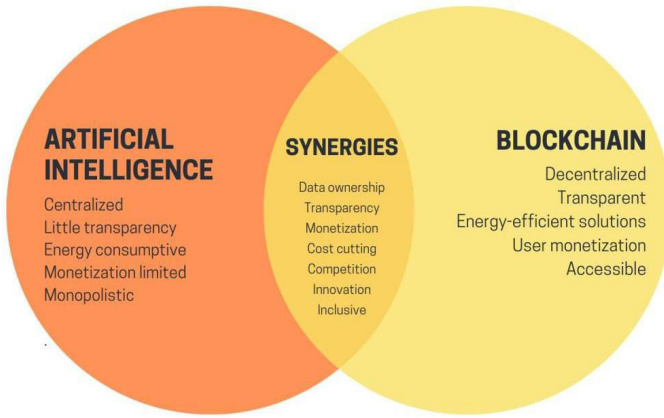
While these technologies seem like oil and water, their very differences can create powerful synergies where they intersect.

Where Opposites Attract

The unique properties of blockchain can complement AI precisely where AI is weakest. Their conflicting natures can create a new kind of harmony.

64 Blockchain systems produce definitive, unchangeable results. AI, like humans, works probabilistically. That's why when you correct it, it says "Sorry!"—and adjusts. (It can also apply logic through neural networks, but we'll skip that tangent for now.)

Synergies at the Intersection of AI and Blockchain



"Polarity creates synergy." (Source: De University of Ethereum)

How Can Web3 Influence AI?

Given the immense investment required to build AI, a completely decentralized, end-to-end model cannot realistically compete with what the tech giants are building. Frankly, it doesn't need to.

The goal isn't to build a parallel universe but to strategically inject the spirit of Web3 into the existing AI stack. By carving out a niche in specific layers and leveraging the core strengths that set it apart from Web 2.0, Web3 can offer a powerful alternative. So what are those strengths?

The Web3 Advantage (compared to Web 2.0)

Web3 offers a fundamentally different vision for the internet, built on a set of principles that directly challenge the old guard:

It is a world built on **openness**, where transparency is the default. It is **permissionless**, available to everyone and resistant to the de-platforming risks of centralized control. Its components are designed for **interoperability**, allowing different parts to work together seamlessly. It is built to be **censorship-resistant**, with **immutable data** that provides a verifiable source of truth.

Most importantly, it is an ecosystem where **users get a share of the value they help create.**

Where Web3 is Making a Difference in AI

The core features of Web3 aren't just theoretical ideals; they are potent, practical tools for solving some of the biggest problems emerging in the age of AI. As a recent a16z report highlights, Web3 startups are already carving out niches by applying these principles.

Fighting For Authenticity: In 2023 alone, AI models generated over 15 billion photos[65]. That's more than humanity produced in the entire 150-year history of photography. In a world flooded with synthetic content, blockchain provides a vital anchor to reality, allowing us to cryptographically verify a piece of content's origin and prove its authenticity.

Democratizing Power: The raw computational power required to train cutting-edge AI models has quadrupled every year for the last decade. This creates a massive barrier to entry, concentrating power in the hands of a few. Web3 offers an alternative by creating decentralized marketplaces where anyone can access or contribute computational power, breaking the stranglehold of the giants.

Building Transparency: Over the last five years, public trust in AI companies in the US has plummeted from 50% to 35%[66]. Blockchain directly counters this erosion of trust. By building services that are open, auditable, and owned by their users, it provides a transparent alternative to the "black box" approach of corporate AI.

Enabling Ownership: Leading AI models have been trained on trillions

65 With growth continuing exponentially, the annual figure for 2024 was estimated to be significantly higher, demonstrating the flood of synthetic content blockchain aims to authenticate.

66 The erosion of trust in the technology sector is a significant headwind. The 2025 Edelman Trust Barometer, for example, revealed that while technology remains the most trusted industry, a majority of people globally feel innovation is being poorly managed. Blockchain counters this by building services that are open, auditable, and owned by their users, providing a transparent alternative to the 'black box' approach of corporate AI.

of data points[67], nearly all of which were provided by users for free. Blockchain flips this exploitative model on its head. It creates a system where data providers can be treated as true owners, earning royalties and sharing in the immense value their information creates.

These are not just abstract possibilities. A new wave of decentralized startups is already building on these principles, chipping away at the centralized AI stack. Let's look at who they are and what they're building.

The Data Layer: From Collection to Validation

AI's hunger for high-quality, verified data is insatiable. The open internet is a good start, but it's full of low-quality information and has its limits. Web3 provides the tools to create better data pipelines by properly incentivizing people to share and verify information without compromising their identity.

A whole ecosystem of solutions is emerging here:

- **Data Marketplaces** are being built to connect data providers with data consumers. Protocols like Ocean Protocol[68], Masa, and Sahara AI are creating new, transparent economies for information.
- **DataDAOs** and other networks are focused on sourcing valuable private datasets directly from users, creating community-owned information pools. (Case Studies: Valve, NVG8)
- Other platforms specialize in sourcing public data or creating new synthetic datasets on demand, effectively 'sweeping' the web for valuable information. (Case Studies: Dria, Mizu, Grass, Synesis One, First Batch)
- Once sourced, data needs a home. Decentralized **data storage** solutions ensure that datasets can be stored immutably and accessed reliably for the long term. (Case Studies: Filecoin, Arweave, Ceramic, Tableland)

67 "Tokens" in the AI context are units of data, like words or pixels.

68 In 2024, Ocean Protocol, Fetch.ai, and SingularityNET merged to form the Artificial Superintelligence Alliance (ASI).

- Before an AI can use data, it must be processed. **Data management and validation** platforms prepare information so AI models can digest it and cryptographically verify its source. (Case Studies: Space and Time, The Graph, Subsquid, Sahara, Covalent, Hyperline)
- Finally, **data labeling** protocols use human intelligence to fine-tune AI models, creating a feedback loop that results in higher-quality data and smarter systems. (Case Studies: Sapien, Kiva AI, Fraction. AI)

The Processing Power Layer: Decentralizing Compute

To analyze massive datasets and generate human-like responses, AI requires immense processing (GPU) power. Tackling the hardware layer is the ultimate challenge for Web3 startups, as tech giants have a massive head start.

While these decentralized solutions are still nascent, they represent a fundamentally different approach to providing the raw horsepower AI needs.

- Some platforms provide **general purpose processing power**, offering decentralized alternatives to cloud services for a wide range of hardware needs. (Case Studies: Akash Network, Aethir)
- Others focus on **narrow-domain processing**, providing compute for specific AI tasks like model training or GPU tokenization rather than trying to compete across the board. (Case Studies: io.net, Gensyn, Prime Intellect, Hyperbolic, Hyperspace)
- Perhaps the most radical approach is bringing processing power **directly to the end-user**. The mega-models we use today run in massive, centralized data centers. A new generation of smaller, more efficient models promises to run on your phone or personal computer. This is a game-changer for privacy. When the model runs on your device, your personal data never has to leave it. These solutions provide both the models and the processing capacity needed for a truly personal and private AI. (Case Studies: PIN AI, Exo, Crynux.ai, Edge Matrix)

Building the Foundation for AI Agents

The next frontier for AI is the 'agent'—autonomous applications that can act on our behalf. But before these agents can flourish, they need a solid foundation to stand on. This infrastructure layer is developing now, creating the rails upon which future user-facing applications will run.

This foundation is being built with a mix of open-source and decentralized components:

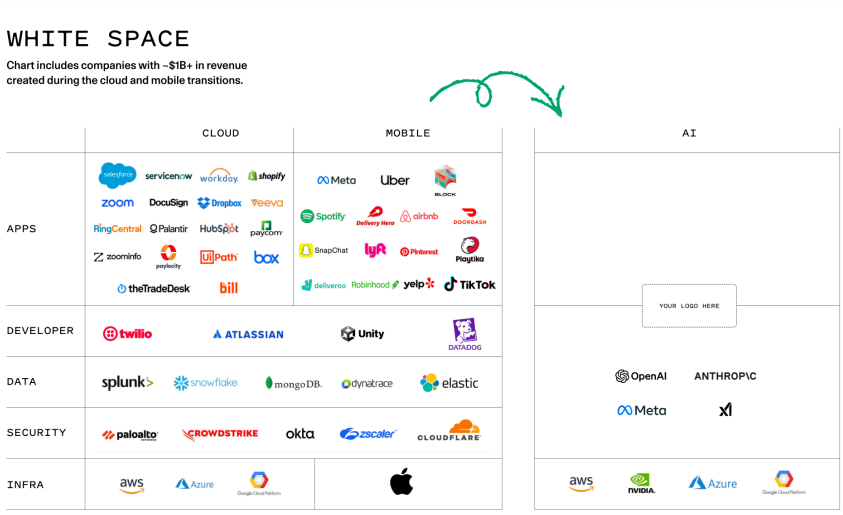
- It starts with **interchangeable large language models**. When models like Meta's Llama3 or those from Mistral release their internal 'weights' as open source, they hand immense power to builders. Anyone can take these models and fine-tune them, giving agents the power to be shaped for specific needs—or to have "features" like censorship mechanisms removed entirely.
- Another crucial layer provides **privacy**. As AI models are trained and used, platforms like Bagel Network, Arcium, and ZAMA are creating the cryptographic mechanisms needed to protect confidential user information.
- To combat AI "hallucinations" and build trust, a new category of tools focuses on the **verification of AI outputs**. Modulus Labs, Giza, Ritual, and OpenGradient are building platforms that produce cryptographic proofs to verify that an AI's inference is accurate and untampered with.
- Finally, **networks that coordinate infrastructure** act as the conductors for this decentralized orchestra. Platforms like Bittensor, Near, Allora, and Sentient are emerging to bring together all the necessary resources—processing power, datasets, and models—into a coherent, functioning whole.

The Final Frontier: User Applications

While the infrastructure heats up, the application layer remains surprisingly cool. As we've seen, open-source or decentralized AI applications for

end-users are still incredibly rare. In fact, not a single major AI application startup (with over $1 billion in sales) has emerged yet. The field is wide open.

The Application Layer is Still Virgin Territory



Cloud, mobile, and AI startups that have crossed the $1 billion revenue mark. While tech giants dominate infrastructure, the application layer is waiting for its breakout star. (Source: Sequoia Capital - Generative *AI's Act o1*)

Today, most of us interact with AI through centralized, closed applications like ChatGPT. This creates enormous "platform risk" for anyone building on top of them. We've seen this movie before. Remember when Facebook changed its algorithm, wiping out the audiences of countless businesses that had built their content on the platform? All that investment vanished overnight. It's highly likely that platforms like OpenAI will eventually operate like the Apple Store, taking a significant cut from any plugin that becomes successful on their turf.

This is where the Web3 world offers a fundamentally different path. A new wave of applications is emerging that leverages the unique properties of decentralization to address user needs for privacy and ownership. For

example, end-user applications like venice.ai use verifiable AI inference and are built on a promise to never store user data. In the gaming world, projects like Parallel's Colony allow users to connect their own wallets and forge their own paths alongside AI agents.

So far, we've explored how Web3's principles can reshape the world of AI. But this is a two-way street. Now, let's flip the coin and see how AI is set to revolutionize the Web3 world itself.

How AI Can Reshape Web3

Artificial intelligence is a tidal wave transforming every corner of the software world, and Web3 is no exception. Its most profound impact will be fixing Web3's biggest weakness: its notoriously difficult user experience.

For all its unique advantages, Web3 remains clunky and intimidating for the average person. We can criticize the centralized giants of Web 2.0, but they mastered one thing: creating intuitive, user-friendly applications. This is where AI enters the picture. AI-powered "agents" are the missing link that may bridge this gap, translating complex on-chain actions into simple, seamless experiences[69].

This revolution is happening on two fronts. The first is the creation of these user-facing agents. The second is the development of the underlying AI-powered infrastructure that allows these agents to operate effectively on-chain[70]. Let's explore the emerging initiatives in both of these areas.

Artificial Intelligence Agent Applications

This is where AI will deliver its most transformative impact on Web3: creating intelligent applications, or "agents," that finally make it easy for people to navigate the complexities of the on-chain world.

Let's be honest: Web3's philosophy of giving power and responsibility

69 Some projects are experimenting with translating on-chain actions into natural-language workflows, though mass adoption is still pending.

70 These projects don't necessarily need to be decentralized or open source—many of them aren't.

to the user is revolutionary, but most people lack the technical skill to use the applications. Nor should they need to. The world of decentralized finance, for example, is filled with powerful and interesting applications spread across different networks. To use them, you currently need to act as your own IT administrator, manually bridging assets from one network to another. An average user doesn't need to know—or care—what network they're on. They just want it to work.

This is the problem AI agents will solve. They will act as a natural language interface for the blockchain. An agent will understand a command like, "Buy me $100 worth of this token at the best possible price, every day for the next month." More than that, it will work for you 24/7 to execute that command under the best possible conditions.

Is this fully possible today? Not quite. Agent applications are still in their infancy, and the underlying AI infrastructure needs more time to mature and support decentralized systems. But the foundation is being laid, and the direction is clear.

Here's a look at the key areas where AI agents are already beginning to reshape the Web3 experience:

Simplifying the User Experience: The most immediate impact is creating **AI interfaces** that let you interact with the blockchain using natural language. Instead of complex transactions, you can simply tell an agent what you want to do. (e.g., Venice.ai)

Powering Decentralized Finance (DeFi):

- **Automated Trading:** Agents are being built to execute complex on-chain trading strategies automatically, turning simple commands into sophisticated actions. (e.g., Taoshi, Intent.Trade, Robonet)
- **Smarter Lending:** New models are using zero-knowledge proofs and AI to assess a user's digital reputation, allowing them to borrow with less collateral without exposing their private data.
- **Automated Risk Management:** In the volatile world of DeFi, platforms are using machine learning and AI agents to monitor market

conditions and instantly adjust risk parameters, protecting protocols and users. (e.g., Chaos Labs, Gauntlet, Minerva)[71]

Strengthening the Ecosystem:

- **Smarter Governance:** In DAOs[72], where members vote on key decisions, AI agents can help automate the on-chain actions that result from those votes. (e.g., Botto)
- **Better Developer Tools:** AI is being used to create a new generation of **development and security tools**, improving the developer experience and hardening the security of the entire ecosystem. (e.g., ChainGPT, Guardrail)
- **Proof of Personhood:** To combat bots, applications are using AI and cryptographic proofs to verify that a user is a unique human, a critical primitive for a fair digital society. (e.g., Worldcoin)

Creating New Entertainment and Social Experiences:

- **Next-Generation Gaming:** Game developers are using AI to create smarter, more dynamic non-player characters (NPCs) and core game mechanics, leading to more immersive worlds. (e.g., Parallel Colony, PlayAI)
- **Enhanced Social Media:** AI agents are being integrated into social apps to enhance the on-chain user experience. (e.g., KaiKai, NFPrompt)

The Infrastructure Powering the Agents

For AI agents to function as a user's trusted on-chain concierge, they need a constant supply of high-quality, verifiable data and a suite of powerful tools to act on it. An entire decentralized infrastructure is being built to provide this support system.

Making Sense of the Data: The first step is understanding what's

71 The space is also dynamic; another leader, Gauntlet, famously parted ways with its largest client, Aave, in early 2024 to pursue its own protocol, highlighting the evolving business models in this sector.

72 DAO stands for "Decentralized Autonomous Organization."

happening on-chain. **Data analysis and tracking tools** act as the eyes and ears of this world, querying, analyzing, and visualizing blockchain data to provide actionable insights. (e.g., Nansen, Dune, Arkham, Messari)

Verification and Scaling: Blockchains need help in two key areas: increasing their transaction capacity and verifying the "probable" information coming from AI models. Decentralized **co-processors** are emerging to tackle both problems, acting as a trust layer that helps blockchains scale and validate AI-driven information[73]. (e.g., Superprotocol, Phala)

Bridging to the Real World: To be truly useful, agents need access to off-chain information like prices, news, or weather data. **Oracles** act as the essential bridge, securely feeding real-world data to on-chain smart contracts. (e.g., Chainlink, Ora, OpenLayer)

Building and Training the Models: A new wave of platforms is focused on the AI models themselves:

- **On-chain model creators** are building foundational language models specifically designed for use in the Web3 ecosystem. (e.g., Pond, RPS, Nous)
- **Data training and 'fine-tuning' mechanisms** create on-chain feedback loops. These platforms use token incentives to encourage users to help train and correct AI models, creating a verifiable and community-driven way to improve them over time. (e.g., Gensyn, Prime Intellect, Pluralis, Macrocosmos, Neuromesh, Flock.io)

Bringing It All Together: Finally, **agent networks** act as the master conductors for this orchestra. They bring together all the different infrastructure resources—data, compute, models—and provide developers with the tools to easily build, deploy, and even monetize the agent applications that users will ultimately interact with. (e.g., Morpheus, Theoriq, Grass, Olas, Wayfinder, Mira, Payman, Skyfire)

73 Projects like Phala lead the way in TEE deployment; related research on zero-knowledge ML (zkML) and optimized ML (opML) is ongoing in both academic and industry settings.

What's Next for AI and Web3?

An age of abundant intelligence is upon us. AI is poised to fundamentally reorder our economy, first by transforming the work of "white-collar" professionals who trade on knowledge, and later, with the rise of robotics, by reshaping the physical labor of "blue-collar" workers.

This incredible promise is shadowed by a familiar risk. The same tech giants who defined the centralized world of Web 2.0 are investing hundreds of billions to own the infrastructure of this new era. It begs the question: are we destined to simply repeat the past, trading one set of monopolies for another?

Perhaps not. This time, the Web3 world is more prepared. It has learned from the past. Instead of trying to build monolithic, end-to-end competitors, a new strategy has emerged. A swarm of smaller, interoperable initiatives is working in harmony, embodying the idea of strength through decentralization.

Let's be realistic. The core infrastructure of AI—the raw energy, the advanced chips, the massive data centers—requires immense capital. The dominance of the tech giants in this layer is likely to continue for some time. Web3 startups won't win with a frontal assault; they will win by "nibbling" away at the edges of this massive pie.

The most promising beachhead for these decentralized solutions is the layer closest to the user. They can win by becoming the indispensable bridge between people and the complex AI infrastructure. The applications that succeed will be those that empower the user—finding the fastest, cheapest, or most private way to accomplish a goal.

The race is on, and the pace of development is staggering. It's difficult to predict whether decentralized initiatives will one day stand as equals alongside the tech giants in the world of AI. What is far more certain is that AI will be the catalyst that Web3 has been waiting for. By solving the user experience problem that has held it back, AI will finally make the promise of a user-owned internet a tangible reality for everyone. We will all watch—and participate—with excitement.

Further Reading:

For deeper exploration, check these invaluable resources:

- Delphi Digital's Decentralized AI Reports:
  - I - The Tower & The Square
  - II - Means of Production
  - III - Composable Compute
  - IV - The Agentic Economy
- Situational Awareness by Leopold Aschenbrenner
- Coinbase Ventures - Demystifying the Crypto x AI Stack
- topology.vc AI Map: Comprehensive overview of AI startups.

Case Study: PayPal's PYUSD Stablecoin

Just as the crypto world seemed to be sinking under the weight of regulatory pressure in the US, a glimmer of light appeared. In mid-2023, amidst a storm of legal crackdowns and hostile rhetoric, FinTech giant PayPal announced its own stablecoin: PYUSD. This wasn't just another coin; it was a move by a pillar of the traditional finance world, a potential turning point for the entire industry. What led PayPal to dive in, and what does it signal for the future of money?

What is PYUSD?

In August 2023, PayPal, a name synonymous with online payments, launched its US dollar-pegged stablecoin, PYUSD. Initially issued on Ethereum and later on Solana (and as of mid-July 2025, also onto Arbitrum), PYUSD shares characteristics with other major stablecoins like Tether (USDT) and USDC, but with a few crucial distinctions that speak volumes about the current landscape.

Like its counterparts, PYUSD's value is backed by reserves—in this case, US dollars held in a bank. It's a simple promise: one PYUSD is redeemable for one dollar. But here's where it gets interesting. PYUSD is issued by a centralized company and is fully programmable. This means that, even if the coins are in your personal wallet, the issuer can freeze them remotely. It's a stark reminder that not all digital assets are *truly* decentralized.

The infrastructure for PYUSD is managed by Paxos, a company operating under the stringent financial laws of New York. This isn't Paxos's first major partnership; they were also the issuer behind Binance's BUSD. That relationship, however, came to an abrupt halt when New York's financial regulator, NYDFS, ordered Paxos to stop minting BUSD—an order Paxos promptly obeyed. The choice of Paxos signals PayPal's intent to operate squarely within the bounds of US regulation, a clear departure from the offshore ambiguity embraced by some earlier crypto players.

PayPal's journey into crypto didn't start with PYUSD. The company

first dipped its toes in the water back in 2020, launching a crypto custody service, also through Paxos. At first, users could only trade within the PayPal ecosystem. But by 2022, they had expanded the service to allow withdrawals to personal wallets. These were not random experiments; they were calculated steps, laying the groundwork for a deeper integration of crypto into their global payment empire. PYUSD is the culmination of that strategy, a bold move from a company that has spent decades shaping how we move money online.

PYUSD's Unique Edge Among Stablecoins

In a crowded market, PYUSD's key distinction isn't a flashy feature, but a structural safeguard: protection from issuer bankruptcy.

Think back to the USDC crisis in March 2023. When Silicon Valley Bank—where Circle held a portion of its reserves—collapsed, panic ensued[74]. The value of USDC, a coin supposedly pegged 1:1 to the dollar, plummeted to $0.88. The peg was only restored after U.S. regulators took the extraordinary step of guaranteeing all of the bank's deposits. The immediate crisis was averted, but it exposed a critical vulnerability. What happens next time, if the bank isn't saved?

PayPal and Paxos are taking a different path. Every dollar backing PYUSD is held in a bankruptcy-remote trust account, completely segregated from the corporate funds of both PayPal and Paxos. If either company were to fail, that money is legally ring-fenced, available only to redeem PYUSD tokens. This structure arguably makes PYUSD's dollar backing more robust than USDC's and certainly more transparent than Tether's (USDT).

Furthermore, Paxos is subject to NYDFS rules, which include strict KYC/AML requirements—arguably more comprehensive than what governs some offshore stablecoin issuers.

74 You can read more on this on 'Case Study: 2023 US Banking Crisis' section at the end of this chapter.

The Great Divide: Crypto's Reaction to PYUSD

The news of PYUSD's launch split the crypto world squarely in two, exposing the industry's core philosophical tension.

On one side, you have the pragmatists. After a brutal year of regulatory attacks, many saw PayPal's entry as a lifeline. Their thinking was, "If the biggest name in FinTech is building on-chain, then there must be a future here." For this camp, PayPal's move was a powerful validation, a signal that institutional adoption was still on track.

On the other side are the purists. Their reaction was one of dismay: "We set out to build a new financial world, free from the control of the very entities we sought to escape. Now, the old guard is here." For them, PYUSD represents a Trojan horse for centralization, undermining the core principles of the crypto revolution.

I find myself leaning toward the first camp. The single most important catalyst for crypto's long-term success is mass adoption. While the technology offers profound financial freedom, the inherent risks have kept most people on the sidelines. PayPal's entry is a game-changer because it brings a trusted brand to the forefront. We're talking about a giant with nearly 400 million customers and over 30 million merchants. People trust PayPal. Having a familiar name offer a bridge into this new world is critical.

PayPal has spent decades building the legal and financial rails connecting thousands of banks. This existing infrastructure provides a massive advantage for creating seamless on-ramps (fiat-to-crypto) and off-ramps (crypto-to-fiat), solving one of the biggest user experience hurdles in the space.

So, how will people actually use PYUSD?

Imagine a freelance graphic designer in Southeast Asia with a client in New York. The client wants to pay for a project, but the designer doesn't have a PayPal account. Instead, the designer provides an Ethereum or Solana address. Using PYUSD, the client can send the payment directly from their PayPal app to the designer's wallet.

In the old world, this would be an international wire transfer, meaning days of waiting for the payment to clear through intermediary banks, each taking a cut. With PYUSD, the value arrives in minutes. The costs are negligible. The waiting, the fees—they simply vanish. This is the promise of a truly global, near-instant payment network.

While I understand the skepticism from crypto purists, the reality is that the stablecoin market is already overwhelmingly centralized. Both USDT and USDC are controlled by single entities. Does PYUSD add to that concentration of power? It absolutely does.

But for those who champion decentralization, the answer isn't to block regulated, centralized players from entering the space. The real work lies in building better decentralized alternatives. The emergence of decentralized stablecoins like DAI, USDe, and crvUSD is a crucial part of the industry's maturation. So far, their impact has been limited, but that's a sign of a sector still in its early innings, not a sign of failure. The goal shouldn't be to build a wall around crypto, but to clearly explain the risks of centralized systems while relentlessly innovating on decentralized ones. We must remember that stablecoins issued by centralized companies are a potential time bomb ticking under the DeFi ecosystem, and the only true defusal is a robust, decentralized competitor.

This is also why PYUSD's impact could ultimately dwarf that of the spot Bitcoin ETFs. An ETF allows you to invest in crypto from within the old financial system. PYUSD pushes you to *use* crypto within the new one. It has the potential to onboard millions directly into the digital economy, not just as speculators, but as active participants. That's the difference between watching from the sidelines and actually playing the game.

What's in it for PayPal?

Make no mistake: PayPal's launch of PYUSD wasn't a gamble or a reaction to market hype. It was a calculated, strategic offensive, launched with careful planning in the face of legal uncertainty.

PayPal, a titan of payments, can see the writing on the wall. Its profit margins are being squeezed. The arrival of instant, low-cost payment systems like the Federal Reserve's FedNow which some analysts suggest could intensify competition in instant payments, potentially pressuring margins. PayPal needed a new frontier, and it found one on the blockchain.

PYUSD brilliantly extends PayPal's reach. Instead of being limited to merchants within PayPal's network, users can now spend their balances anywhere that accepts crypto. This single move breaks down the walls of PayPal's ecosystem, making its service exponentially more useful and keeping customers and their money locked in.

The real genius, however, is in the economics. In a world with rising interest rates, holding customer balances is incredibly profitable. Every dollar put into PYUSD becomes part of a massive reserve pool. For PayPal, this float acts as a giant, zero-interest loan from its users. To understand the scale of this opportunity, just look at Tether, the industry leader, which is on track for billions in profits simply by earning interest on its reserves. When you see numbers like that, PayPal's motivation becomes crystal clear.

The Final Take

PayPal's PYUSD is a watershed moment for crypto. It promises to onboard millions of new users through a trusted brand and offers a more securely backed alternative to some existing stablecoins.

Yes, the critiques about centralization are valid and vital. But the real test for crypto's founding ideals isn't about stopping giants like PayPal from entering the arena. It's about building a better alternative. The true challenge for critics is to channel their energy into creating decentralized stablecoins that are so good, so useful, and so resilient that they win on the open market. The game is on.

Case Study: Ethena's USDe Stablecoin

In the world of stablecoins, two ideals have often seemed at odds: decentralization and capital efficiency. A new project, Ethena, has stormed onto the scene, claiming to have cracked the code for achieving both. But Ethena doesn't call its creation, USDe, a stablecoin. It calls it a "synthetic dollar." What does that mean, and why does it matter?

Meet Ethena: Decentralized Synthetic Dollar

At its core, Ethena gives you the power to create your own dollar-pegged currency. By depositing collateral—be it ETH, BTC, SOL, or liquid staking tokens like stETH—you can mint an equivalent amount of USDe. It's a synthetic dollar, born on the blockchain and designed to maintain a 1:1 value with its real-world counterpart.

Once you have USDe, you can use it across the decentralized finance (DeFi) landscape, just as you would with any other stablecoin. So far, so familiar. But what happens when the ground beneath it shifts?

What if Collateral Prices Drop?

This brings us to the critical question that has always haunted collateralized stablecoins: "DAI requires over-collateralization precisely to avoid a crisis if the value of the collateral plummets. Ethena, on the other hand, operates on a 'dollar-for-dollar' basis. What happens if the assets backing it take a nosedive?"

Herein lies Ethena's clever twist. For every dollar of cryptocurrency you deposit, Ethena takes out an equivalent short position on a centralized exchange. This is a classic hedging strategy from traditional finance, repurposed for the crypto world.

So, what does this actually do? Imagine the price of ETH, held by Ethena as collateral, drops from $3,000 to $2,900. Normally, this would create a $100 hole in the backing of USDe. But thanks to the short position, Ethena

earns $100 from that same price drop, perfectly offsetting the loss. The result? The total value of the collateral remains a steady $3,000. This elegant solution not only protects the peg but also dramatically reduces the amount of collateral required to mint new USDe.

More Than Just a Stablecoin: Meet sUSDe

But Ethena's design offers more than just stability. It also provides a way for you to put your USDe to work. While you can use your USDe in the open market, you also have the option to lock it back into the Ethena system. In exchange, you receive a new token: sUSDe. By holding sUSDe, you become a direct beneficiary of the revenue streams generated by the collateral you and others have provided.

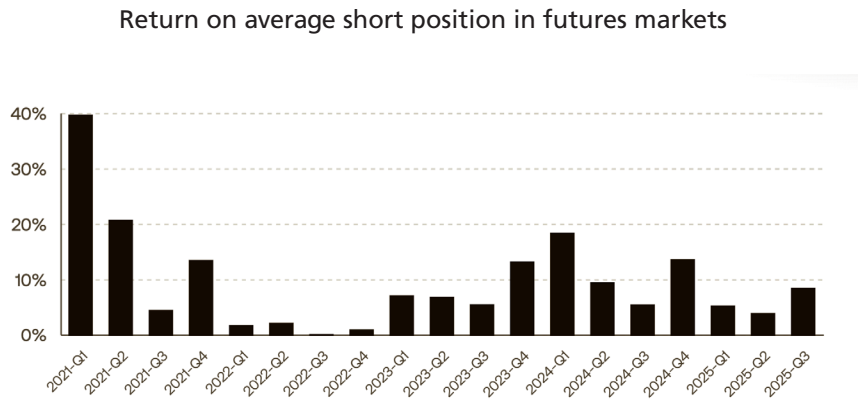
How Ethena Makes Money

So, where does this revenue come from? Ethena has two primary income sources.

First, the protocol stakes the ETH and other assets it holds as collateral. With liquid staking tokens like stETH, it automatically earns staking rewards, which currently hover around 2.77% annually, though this rate fluctuates.

The second, and more dynamic, source of income comes from the short positions it opens for hedging. In the crypto futures markets, known as perpetuals, traders are constantly betting on the future direction of prices. Some go long, expecting prices to rise, while others go short, anticipating a fall. To keep these two sides in balance, the market uses a mechanism called the "funding rate."

In a bull market, where most traders are long, they pay a fee to the short-sellers to keep their positions open. Since crypto markets have historically trended upwards, these funding rates are often positive. As a short-seller, Ethena collects these fees and distributes them to those who have locked their USDe in the system. While this rate is constantly changing and can occasionally turn negative—a risk we'll explore later—it has proven to be a significant source of yield.



Average quarterly rates of return on ETH perpetuals markets (annualized). (Source: *Ethena Labs*)

To put this in perspective, the yield for sUSDe in the last quarter of 2024 fluctuated between 15-20%, averaging at 18%[75]. This powerful combination of stability and yield is what makes Ethena one of the most talked-about projects in DeFi today.

Ethena: Stablecoin Meets Internet Bond

This unique architecture has a twofold outcome. First, it gives the world USDe: a truly (almost[76]) decentralized synthetic dollar built for the internet economy. Second, it offers sUSDe: an 'Internet Bond' that provides a globally accessible, dollar-denominated savings instrument[77]. One is money; the other is a vehicle for making that money productive.

The Price of Innovation: Understanding Ethena's Risks

No great reward comes without risk, and Ethena's design is a masterclass in managing a complex set of trade-offs. The team has been commendably

75 As of mid-2025, the yield has stabilized to a more typical, yet still significant, rate of around 12-13%.

76 Caveat: USDe is backed through centralized exchanges and custodial services.

77 Subject to regional regulations.

transparent about the challenges, laying them out for all to see. Let's walk through them.

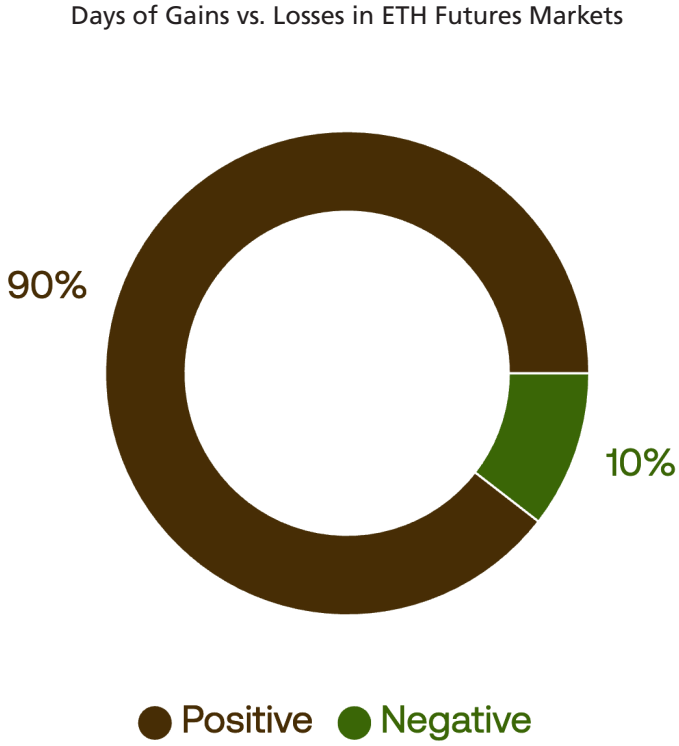
What if the Yield Engine Goes into Reverse?

Ethena's stability hinges on its short positions in the perpetual futures markets[78]. In these markets, traders who bet on prices rising (going "long") typically pay a fee to those betting on prices falling (going "short"). Since crypto markets have historically been biased toward optimism, Ethena, being permanently short, usually collects a steady stream of these "funding costs." This is the engine of its yield.

But what happens when sentiment flips? In a bear market, fear can take over. Shorts can become the majority, forcing them to pay the longs. For Ethena, this means the yield engine goes into reverse, and the protocol starts bleeding money.

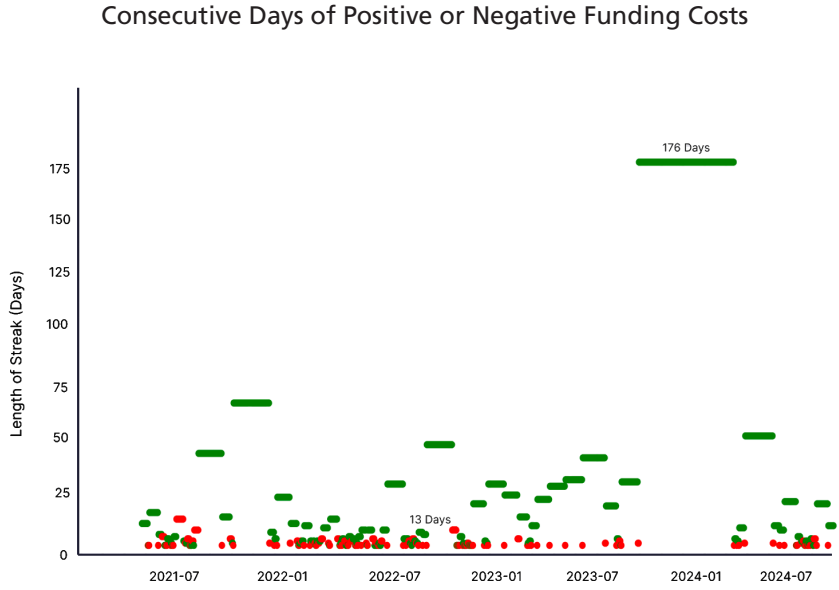
How serious is this threat? Looking at the last three years of data, funding rates have been negative about 20% of the time. While Ethena profited the other 80% of the time, the risk of a prolonged downturn is real. What happens if the losses from funding costs start eating into the collateral backing USDe?

78 Perpetuals are a type of futures contract—like traditional futures, but with no expiration date.



Over the last three years, short positions on ETH perpetuals have been profitable roughly 90% of the time. (Source: *Ethena Labs*)

This is where the **Reserve Fund** comes in. Ethena sets aside a portion of its earnings to create an insurance buffer. This fund is designed to cover losses during periods of negative funding, protecting the collateral. While historical data shows that the longest consecutive losing streak for shorts was only 13 days, the future is always uncertain.



Distribution of consecutive days funding (+/-) streaks longer than 5 days. Green bars show streaks of positive funding (yield); red bars show negative streaks. The longest losing streak was 13 days. (Source: *Ethena Labs*)

Independent auditors like Chaos Labs (and CryptoQuant later) have modeled these scenarios, recommending a specific reserve amount needed to weather potential storms[79]. As of now, Ethena has around 1% of outstanding USDe as funding reserve[80].

If the Reserve Fund were ever depleted, the value of USDe could fall below a dollar. This wouldn't be a sudden, UST-style death spiral. Instead, it would be a slow bleed. Arbitrageurs would sell USDe on open markets like Curve, and approved institutions could then redeem the discounted USDe

79 Initial Chaos Labs finding was $33 million for the first $1bn USDe. Source: Chaos Labs 'Ethena Perpetual Assessment Risk Report' p. 43 dated Nov 9, 2023. CryptoQuant remodeled a different dynamic approach and concluded that "To safely manage the extraordinary event of large negative funding rates at larger market capitalizations of $4 billion, $5 billion, $7.5 billion or $10 billion, the reserve fund would need to increase to about $40 million, $50 million, $80 million and $100 million, respectively". Source: 'Ethena: USDe's Tail Risks Analysis and Key Metrics to Monitor ' p.7 dated April 16, 2024.

80 Ethena has $61 million in funding rserve and $5.3 billion outstanding USDe as of mid-2025 which corresponds to 1.15%.

directly from Ethena for $1 worth of collateral, gradually draining the system. It's a measured process, not a catastrophic collapse, giving users time to exit their positions with minimal losses.

The Centralization Dilemma

To get the deep liquidity it needs for its hedges, Ethena must use centralized exchanges—a pragmatic but risky choice. What happens if an exchange like Binance or Bybit goes bust?

Ethena mitigates this counterparty risk in several ways:

1. **No Single Point of Failure:** It spreads its positions across multiple major exchanges, including Deribit, Binance, Bybit, Bitget, and OKX.
2. **Off-Exchange Custody:** This is the crucial part. Ethena uses institutional-grade custodians like Copper, Ceffu, and Cobo. Client assets are held in a "bankruptcy-remote" legal structure, meaning that if an exchange fails, Ethena's collateral is legally separate and cannot be seized to pay the exchange's debts.
3. **Frequent Settlement:** Profits from trades are swept from the exchanges back to secure custody every 8 to 24 hours, minimizing the funds at risk at any given moment.
4. **Radical Transparency:** Ethena provides real-time dashboards showing all collateral balances and hedging positions, along with monthly attestations from third-party auditors.

Code, Oracles, and Regulators

Beyond market and counterparty risks, a few other factors are in play:

- **Smart Contract Risk:** Ethena is new technology. Like any complex protocol, there's always a risk of a bug or exploit in the code that has yet to be discovered.
- **Oracle Risk:** The protocol relies on external data feeds from Pyth Network and Redstone to get accurate pricing information. If these oracles are compromised, it could threaten the system's operations. Using multiple providers helps reduce this risk.

- **Regulatory Risk:** The global regulatory landscape for crypto is a minefield. Ethena restricts access for users in numerous jurisdictions, including the United States, United Kingdom, and Canada, to comply with global regulations.

Is It Worth the Risk?

Yes, the list of risks is long. But risk is never absent; it's just different. Holding centralized stablecoins like USDT or USDC means you are trusting a company and the traditional banks they partner with. You are exposed to censorship and classic counterparty risk.

Ethena replaces that with a different set of transparent, auditable, and market-based risks. The choice is yours: Do you prefer the familiar, opaque risks of the old financial world, or the volatile but transparent risks at the frontier of DeFi? Ethena bets that for many, a calculated, on-chain risk is better than a risk you can't see at all.

Where Does Ethena Go From Here?

Ethena's ascent has been nothing short of explosive. In the short time since its launch, it has attracted over **$5.3 billion** in assets, a testament to the market's hunger for a capital-efficient, decentralized dollar. But with great growth comes a great question: what are the limits?

A system like Ethena can't grow infinitely. Its size is fundamentally capped by the depth of the markets it relies on for hedging. To maintain its peg, every dollar of collateral must be matched by a dollar in a short position. This means Ethena's potential size is a fraction of the total open interest in the ETH and BTC derivatives markets.

The team estimates their ceiling is roughly 30% of the total open positions available. While this imposes a hard limit at any given moment, the ceiling itself is constantly rising. The crypto derivatives market is not static; it grows with the underlying assets. According to an analysis by Chaos Labs, a 1% increase in ETH's market capitalization tends to expand the futures

market by 1.2% to 1.45%. In other words, as the crypto ecosystem expands, so does Ethena's runway.

The ENA Token: Valuing the Protocol

Much of the initial excitement around Ethena was fueled by its governance token, **ENA**. While it grants holders a say in the protocol's future, its real value may come from a potential share in Ethena's revenue.

So, just how profitable is this system? We can sketch out a simple model.

The protocol generates revenue from the yield on USDe that *isn't* staked as sUSDe. As of today, with roughly **$5.3 billion** in total USDe supply and about 60% of that locked as sUSDe, the protocol is earning yield on the remaining **$2.1 billion**.

Assuming an annualized yield of **10%** from its hedging activities, Ethena's potential annual revenue clocks in at over **$210 million**. A figure like that would instantly place Ethena among the most profitable products in DeFi history[81].

Of course, such high returns rarely last forever. Ethena's incredible yield is a direct result of a market inefficiency—an imbalance between long-biased retail traders and the few players willing to take the other side. As Ethena proves the model's success, you can bet that institutional capital will flood in to capture the same spread. Inevitably, this competition will compress the funding rates, and the 'alpha' will shrink. The challenge for Ethena will be to innovate faster than the market can catch up.

Conclusion: The Great DeFi Experiment

Ethena is more than just another protocol; it's a high-stakes experiment attempting to deliver two of crypto's holy grails: a truly decentralized, scalable synthetic dollar (USDe) and a native, permissionless savings vehicle for the internet (the sUSDe "Internet Bond").

81 These figures are for mid-July. During the first half of 2025 the staked USDe figures ranged between 42% and 71% and sUSDe earning yields were between 4.89% and 10.03%. Source: Dune Analytics - entrophy_advisors.

Its complex architecture is both its genius and its vulnerability. The risks—from negative funding rates to exchange counterparty failure—are not just footnotes; they are core to the model. The protocol's future hinges on a fundamental question: can its sophisticated defenses and transparent risk management outlast the inherent chaos of open markets? The measures are in place, but they have yet to be tested by a true black swan event.

At the same time, Ethena faces the paradox of success. The incredible yields it offers are a product of market inefficiency. As the protocol proves its model and competitors flood in to capture the same arbitrage, those returns will inevitably compress.

The journey ahead is uncertain. We will see if the team can navigate the immense risks while adapting to a maturing market. What is certain is that Ethena represents a bold leap forward, pushing the boundaries of what a decentralized financial system can look like. Whether it succeeds or fails, its story will be a defining chapter in the evolution of money.

Case Study: 2022 Crisis Act I – Terra Implosion

This section dives into the story of Terra's algorithmic stablecoin UST, which faced a major crisis in May 2022.

UST, which was issued by the Terra, a payments-focused blockchain, lost its peg to the US dollar due to a coordinated market attack. Let's quickly recap what stablecoins are before examining what went wrong with UST.

What Is UST, and How Does It Work?

UST is an algorithmic stablecoin. Unlike stablecoins backed by cash (like USDC) or over-collateralized crypto (like DAI), UST was backed solely by Terra's native cryptocurrency, LUNA.

Here's how it works: If you want UST, you send LUNA. If you send $100 worth of LUNA, the system mints 100 UST and burns the LUNA you provided. Want your money back? Send 100 UST to the system, it burns that UST, and you receive freshly minted LUNA worth $100.

Why Did the Market Need UST?

Given the many stablecoins already available, why introduce UST? Terra is a payments-focused blockchain that needed a flexible and liquid stablecoin tailored specifically to its ecosystem. Using USDC or USDT would require Terra to pay external issuers, whereas with UST, Terra can mint tokens directly against LUNA whenever needed.

But why would users adopt UST? The theory was simple: If you believed in Terra's future growth and wanted to use its ecosystem apps, you would acquire and hold UST. Yet initially, the Terra ecosystem didn't have many applications, creating a classic chicken-and-egg dilemma.

Terra solved this by employing a tried-and-tested DeFi incentive: attractive yields. Through Anchor Protocol, Terra offered an incredible 20% interest rate on deposited UST—highly appealing, especially when US dollar yields were near zero in 2021.

The strategy worked spectacularly. From launch until May 2022 (around 18 months), the market supply of UST soared to $18 billion.

Notably, UST had already survived a scare in May 2021, temporarily losing its peg to $0.96, though it quickly recovered, reassuring investors.

What Happened Next?

UST's rapid growth benefited LUNA immensely. To get high yields on Anchor, investors swapped LUNA for UST, driving demand and reducing LUNA's supply through burning. Consequently, LUNA's price surged from just $1 to an all-time high of $119 by early April 2022.

However, this positive cycle had a critical vulnerability. If investors ever lost confidence and swapped their UST back for LUNA en masse, increased LUNA issuance could crash its price, triggering a vicious downward spiral.

To prevent such a scenario, Terra's founders adopted a traditional central banking strategy: building a reserve. Just as central banks hold gold or foreign currencies, Terra chose Bitcoin (BTC), the "digital gold," announcing plans to build a $10 billion BTC reserve. Eventually, they accumulated roughly $3 billion worth of BTC.

Unfortunately, this precaution wasn't enough. Between May 7-9, following the US Federal Reserve's announcements and broader crypto market declines, heavy selling pressure hit UST, causing it to lose its dollar peg irreversibly. LUNA went down from its highs to below $1 in matter of hours.



Terra ecosystem's native coin LUNA price chart *(USD). (Source: CoinGecko)*

Trust Is Everything

Stablecoins are foundational to decentralized finance (DeFi), making user trust essential. Investors expect stablecoins to reliably preserve value amid other investment risks.

USDC earns trust by proving each token is backed by actual dollars. USDT lacks perfect transparency but benefits from being the de facto standard on centralized exchanges. DAI is over-collateralized, though crypto-backed reserves pose their own risks, especially in market downturns.

Algorithmic stablecoins like UST are different, experimental, and inherently risky. Past algorithmic projects like Basis failed, while others, like Ampleforth, remain niche despite hovering near $1.

Long-term success for algorithmic stablecoins requires broad acceptance in payments and app integrations. Terra was aware of this, establishing

partnerships with Avalanche and Evmos. But offering high interest alone doesn't guarantee genuine utility if users only deposit funds for yield without actual spending.

In the short term, however, success hinged entirely on trust in LUNA. High yields fueled rapid but unsustainable growth. Paying 20% annually on $18 billion ($3.6 billion per year) required constant issuance of new LUNA.

Terra's opaque defense measures during attacks included allocating $1.5 billion to OTC traders. These actions, taken without clear transparency, undermined trust. This secrecy and lack of on-chain verification fueled rumors and fear, exacerbating the crisis.

Lessons Learned from the Crisis

While it won't recover losses, the crisis offers important lessons that can make crypto stronger. Let's review some key takeaways:

DeFi Is Young: Theory vs. Reality

DeFi's risks aren't exaggerated. Even the most carefully planned theoretical models can fail under real-world stress.

Delphi Digital, a leading DeFi analyst firm, later openly reflected on their Terra misjudgment. Initially, Anchor's 20% yield seemed reasonable compared to typical 100%-plus DeFi yields. But as yields fell across DeFi in 2022, Anchor's fixed rate drew unsustainable inflows, eventually collapsing under market pressures despite BTC reserves.

Decentralization Is Essential

Decentralization must be the guiding principle for blockchain projects. While some centralization may be acceptable early on, genuine decentralization demands transparency in decision-making and full on-chain traceability. Terra's centralized approach and opaque emergency actions undermined these principles severely.

Understanding Relative Risks Matters

In traditional finance, investors balance risky and "safe" assets. Similarly, crypto investors thought UST was safe because of its supposed peg to USD. Unfortunately, the reality proved different—highlighting the importance of accurately understanding and evaluating relative risks.

Fanaticism Has Limits

Every project initially needs enthusiastic supporters who help sustain momentum despite early imperfections. However, unchecked fanaticism can become toxic. Terra's community, including founder Do Kwon, notoriously dismissed criticisms as "stupid." Ignoring constructive criticism ultimately prevented necessary improvements and risk mitigation.

Even seasoned investors, like Galaxy Digital's Mike Novogratz—who infamously tattooed LUNA on his arm—fell prey to overconfidence. Post-collapse, Novogratz acknowledged his mistake, emphasizing humility as essential for investors.



"I'm officially a Lunatic![82]" – Mike Novogratz (*source*; later deleted).

Transparency: A DeFi Must-Have

Transparency is crucial for DeFi because no formal regulatory oversight exists. Users must trust platforms based purely on openly available information, including open-source code, on-chain transactions, and publicly determined strategies.

Terra's BTC reserves were not transparent. It took Terra 10 days after the crisis began to publicly reveal their BTC sales, severely damaging trust.

82 Lunatic refers humorously to LUNA fans.

A Painful but Necessary Lesson

Despite widespread commentary claiming this crisis damaged DeFi irreparably, I disagree. The UST crisis undoubtedly delayed mainstream adoption—especially alongside the collapses of 3AC and FTX. However, it clearly demonstrated the importance of adhering strictly to Web3 principles.

Had the collapse occurred later, losses could have been even greater, given other unstable projects emerging at the time. Viewed optimistically, perhaps we narrowly avoided an even bigger disaster.

Conclusion

The UST/LUNA collapse, crypto's largest crisis to date, had lasting repercussions. However, I believe the Web3 community emerged stronger by clearly recognizing the dangers of centralized, opaque, and leveraged structures. Crypto's post-crisis path emphasizes transparency, openness to criticism, and more cautious growth. Future crises are inevitable, but hopefully, small investors will increasingly weather them safely. Time will tell.

Case Study: 2022 Crisis Act II – 3AC Bankruptcy

The collapse of Terra wasn't an isolated earthquake; it was the shockwave that triggered a tsunami. The first domino had fallen, and its impact would send a chain reaction of failures across the entire crypto landscape.

The next to get swept away was Three Arrows Capital (3AC), one of the largest and most influential investment funds in the industry.

How It Started

The contagion began with a single point of failure: UST, the Terra blockchain's algorithmic stablecoin. As a quick refresher, UST was a currency pegged to the US dollar not by cash reserves, but by a volatile sister token, LUNA. It was supercharged by the Anchor Protocol, which offered an irresistible 20% annual yield. This promise pulled in nearly $18 billion in just under a year.

This hormonal growth was obviously unsustainable. Insiders knew it and skeptics warned about it, yet as long as the music was playing, everyone kept dancing.

When the music finally stopped in May 2022, the industry frantically scrambled for a seat. But the most aggressive player on the dance floor, Three Arrows Capital, was left standing—and completely exposed. So, who were they?

Meet Three Arrows Capital (3AC)

Founded in 2012 by two former traders, Zhu Su and Kyle Davies, Three Arrows Capital (3AC) became a legend in the crypto bull market. At its core, it was an arbitrage fund—a firm designed to profit from small price differences between similar products in different markets.

But 3AC didn't just play with small differences. They became famous for

a few signature, high-conviction trades that they amplified with massive amounts of borrowed money.

3AC's Three Signature Plays

To understand 3AC's collapse, you have to understand the three trades that fueled its rise. Each seemed brilliant on the surface but concealed a fatal, illiquid flaw.

1. The Grayscale Bitcoin Trust (GBTC) Trade

Before the US approved Bitcoin ETFs in 2024, large institutions wanting BTC exposure had one main option: the Grayscale Bitcoin Trust (GBTC). This exclusive access created huge demand, causing GBTC shares to trade at a significant *premium* to the actual Bitcoin they held.

The trade was simple: 3AC would borrow Bitcoin, deposit it into the trust to create new GBTC shares, wait out a six-month lock-up period, and then sell those shares on the open market for a handsome premium. The catch? You couldn't redeem your GBTC for the underlying Bitcoin. The only way out was to sell to another buyer.

This was fine as long as the premium existed. But what if it vanished and became a *discount*? Then your capital was trapped. Getting out at a loss was the only option unless the trust could convert into an ETF—a move the SEC resisted until a court forced its hand.

2. The Staked ETH (stETH) Trade

When Ethereum moved to Proof-of-Stake (PoS) in September 2022, users could lock up their ETH to secure the network and earn interest. But this ETH was locked until at least April 2023.

Lido Finance offered a solution: give them your ETH, and they'd give you stETH in return. This "liquid staking derivative" lets you earn staking rewards while still being able to use the stETH token across DeFi. Theoretically, 1 stETH should equal 1 ETH. But again, there was a catch. You couldn't redeem your stETH for ETH until the network upgrade. Your only

exit was the open market. If too many people tried to sell at once, the price of stETH would "de-peg" and trade at a discount to ETH.

3. The UST "Risk-Free" Yield Trade

This was 3AC's most direct bet on the Terra ecosystem. As we covered, Anchor Protocol was paying 20% interest on UST deposits. In a world where you could borrow stablecoins like USDC for less than 4%, the math was intoxicating. 3AC borrowed heavily to pour money into this trade, chasing what looked like a money-printing machine. Buyer happy, seller happy.

Until the music stopped.

How Leverage Turned a Bad Bet Into a Catastrophe

3AC didn't just make these trades; they made them with staggering amounts of borrowed money. They took out massive loans, using their holdings of GBTC and stETH as collateral. This leverage was rocket fuel on the way up, but it became an accelerant in the fire on the way down.

When the markets turned, the hidden risks of these trades became terrifyingly real.

First, the UST peg broke. The "zero risk" trade exploded, punching a massive hole in 3AC's balance sheet.

This triggered the second stage of the collapse: the liquidity crunch. Spooked by the Terra implosion, 3AC's lenders demanded their money back. When 3AC couldn't pay, the lenders began a fire sale, dumping the GBTC and stETH they held as collateral onto the market.

This created a death spiral. The forced selling widened the GBTC discount to a staggering 34% and pushed stETH's price down to 0.93 ETH. The very assets 3AC held were plummeting in value precisely when they needed cash the most, triggering even more liquidations. In June 2022, BTC itself lost nearly 40% of its value, erasing what was left of their collateral.

To make matters worse, allegations surfaced that 3AC had used the same collateral to get loans from multiple lenders—a practice that, if true, is fraud. In September 2023, the Monetary Authority of Singapore banned both founders from its capital markets for nine years, citing a 'flagrant disregard' for regulations.

The saga took another dramatic turn just weeks later. On September 29, 2023, Zhu Su was arrested in Singapore's airport while attempting to flee the country. He was sentenced to four months in prison for failing to cooperate with liquidators and was released in December 2023.

Case Study: 2022 Crisis Act III – FTX Collapses

Just when the crypto world thought the worst was over—after the death spirals of Terra and 3AC—the industry's own poster boy revealed himself to be the final boss. The third act of the 2022 crisis was the most shocking of all: the breathtaking collapse of the FTX exchange.

What Happened?

It all started with a quiet tremor. On November 2, 2022, a report from Coindesk revealed the dangerously intertwined balance sheets of FTX and its sister trading firm, Alameda Research.

While the story raised eyebrows, it was largely dismissed. After all, FTX founder Sam Bankman-Fried (SBF) wasn't just another crypto CEO. He was the industry's curly-haired boy genius, a prolific political donor who lobbied lawmakers in DC on how crypto should be regulated. Surely, the man shaping the rules for everyone else would have his own house in perfect order.

Then, on Sunday, November 6, the storm broke. Changpeng Zhao (CZ), then[83] the head of rival exchange Binance, announced on Twitter that he would be liquidating all of his FTT—the native token of FTX—citing the troubling reports.

What followed was a week of pure chaos. Rumors of insolvency ran rampant. On Monday, a brief wave of relief washed over the market when SBF announced that he had struck a deal to sell FTX to Binance. But the calm was short-lived. After just one day of due diligence, Binance backed out, citing concerns that were too great to ignore. The next day, Thursday,

83 While Changpeng Zhao (CZ) was the CEO of Binance during the FTX collapse, he stepped down from the position on November 21, 2023, as part of a major settlement with the U.S. Department of Justice. As part of the settlement, Binance pleaded guilty to criminal charges related to anti-money laundering violations and sanctions evasion, agreeing to pay $4.3 billion in penalties. CZ personally pleaded guilty to failing to maintain an effective anti-money laundering program. On April 30, 2024, he was sentenced to four months in prison. Richard Teng, a former senior executive at the company, was appointed the new CEO of Binance.

November 10, SBF admitted he had made a catastrophic mistake and was scrambling to find investors.

By Friday, November 11, it was over. All 134 corporate entities under the FTX umbrella filed for bankruptcy protection[84].

In just six days, the world watched as one of the largest and most trusted exchanges in crypto simply vanished. A company valued at $32 billion in January was suddenly worthless. SBF's personal fortune, estimated at $16 billion just days earlier, had evaporated into thin air.

This was not just a business failure; it was one of the largest financial frauds in U.S. history. In the months that followed, Bankman-Fried would be arrested, tried, and ultimately sentenced in March 2024 to 25 years in prison for his crimes.

How could the industry's champion fall so far, so fast? To understand, we have to peel back the layers of deception, one by one.

Tracing the Deeper Origins of the Crisis

The chaos surrounding FTX's collapse was fueled by rumors, but the core truth was simple: FTX had secretly funneled billions of dollars in customer funds to its sister trading firm, Alameda Research. The real question is, how did they pull off one of the largest financial frauds in history, right under everyone's nose?

To understand the scheme, you have to know that Alameda came first. SBF founded the trading firm in 2017, initially profiting from Bitcoin arbitrage. In 2019, he launched the FTX exchange. From the outside, it looked like a standard progression. On the inside, it created a closed loop ripe for abuse. Court testimony later confirmed that FTX gave Alameda advance notice of large trades, allowing them to 'front-run' the market for risk-free profits.

84 While the exchange was gone for good, the bankruptcy process that followed yielded a surprising result. Over the next two years, the new management team successfully recovered billions in misappropriated and poorly invested funds. By mid-2025, the FTX estate had amassed enough cash to fully repay all of its customers and creditors.

But that was just the appetizer. The main course was a far more audacious deception. Alameda needed capital for its risky trades, and sitting just one firewall away were billions in customer deposits on FTX. But how could they tap into that money without setting off alarms?

The key was FTT, FTX's own exchange token.

Ostensibly, FTT was a utility token that gave users trading discounts. In reality, it was the perfect tool for fraud. Most of the FTT supply was held by FTX itself, meaning its market was incredibly thin and its price easily manipulated. This enabled a perfect, self-contained loop of fake value:

- **Create an "Asset":** FTX minted vast quantities of FTT and gave them to Alameda for next to nothing.
- **Inflate its Value:** FTX used its exchange to pump the price of FTT, creating the illusion of a multi-billion dollar asset on Alameda's books.
- **Post Fake Collateral:** Alameda then pledged this artificially inflated FTT back to FTX as collateral.
- **Receive Real Money:** Against this worthless collateral, FTX lent Alameda billions of dollars in real assets—its customers' funds.

It was a brilliant deception. As long as the price of FTT remained high, the hole in the balance sheet was invisible. The entire system was a house of cards resting on a single point of failure: the belief that FTT was worth something.

And then, one man decided to push it over.

After the Coindesk news broke, the only person with enough power to collapse the scheme was Binance founder, CZ. As an early investor in FTX who had been bought out in 2021, CZ had received a massive amount of FTT in the deal—worth at least $580 million by November 2022.

On the evening of Sunday, November 6, he pulled the pin. In a single tweet, he announced his intention to sell his entire FTT position.

The announcement triggered a bank run on an asset that had almost no real buyers. The price of FTT crashed, vaporizing the value of Alameda's

collateral and exposing the multi-billion dollar hole in FTX's finances. For a day, Alameda desperately tried to defend the $22 price level against a tidal wave of selling, but it was no use.

In the end, a single tweet was enough to pull a foundational stone from the empire. The entire sandcastle collapsed.

Where is the Root of the Problem?

The failures of FTX, 3AC, and Terra weren't isolated events. They were all symptoms of the same underlying disease: a credit bubble disguised as a technology revolution.

DeFi's meteoric rise from a $1 billion to a $120 billion ecosystem looked like a story of explosive, organic adoption. But the truth was darker. **This wasn't a grassroots movement. It was a speculative frenzy fueled by a handful of centralized, opaque firms making reckless, leveraged bets with borrowed money.**

When the market was hot, everyone was happy. But when the tide went out in early 2022, we saw who was swimming naked. First Terra, then 3AC, Voyager, and Celsius—all collapsed under the weight of their own leverage, triggering a cascade of failures.

It now seems FTX and Alameda were among those wounded in the initial blast. SBF's highly publicized bailouts of firms like BlockFi and Voyager were hailed as the work of a "white knight" saving the industry. In hindsight, it's clear he was not acting as a savior but was desperately trying to stop the contagion from reaching his own crumbling empire.[85]

The fundamental problem is that these companies operated as black boxes. The ambition for growth didn't just blind the operators like SBF; it blinded their supposedly sophisticated investors. Venture capital funds and institutional lenders, caught in the mania, abandoned basic due diligence.

85 There's also a rumor that after acquiring BlockFi, FTX pushed the company to adopt its escrow services to attract customer funds. Another theory suggests Alameda was running a steady loss in its market-making operations. Normally, a market maker in that situation would shut down. But SBF couldn't afford to—doing so might have cut off FTX's essential liquidity.

They poured billions into firms like FTX based on little more than a few pages of unaudited notes, never questioning the impossible profits or the incestuous relationship between the exchange and its sister trading firm.

This exposed the core intellectual error of the 2022 bubble: **the industry made the critical error of confusing opaque, human-run companies with transparent, autonomous protocols.**

Decentralized finance is built on software—smart contracts that run on a blockchain, where every transaction is open to public scrutiny. They are glass houses by design.

Centralized firms like FTX are different. They are run by people, and people have the capacity to lie, cheat, and "pollute" any system they control. The argument that "this is a whole new world with different rules" was a convenient fiction used to avoid accountability.

Centralized companies will and should always be a part of the ecosystem. But the path forward isn't to pretend they are something they're not. It is to force them to adopt the ethos of the technology they profit from: radical transparency. The challenge is to turn these black boxes into glass houses, by choice or by force.

The Path Forward

After the failures of 2022, the way forward demands action, not words. The future of crypto hinges on the commitment of four key groups.

1. Centralized Institutions: The era of blind trust is over. In the wake of the crisis, most major exchanges adopted on-chain **Proof of Reserves (PoR)** to show they hold customer assets. While this was a major step, these reports are not full audits, as they often don't show a company's liabilities. The push for complete financial transparency continues.

2. Regulators Regulation doesn't need to be complicated. The principle is simple: **if you take custody of customer funds, you are a bank and must be regulated like one.** This rule provides clarity while carving out true, non-custodial DeFi protocols.

3. Decentralized Protocols The crisis was the ultimate stress test, and decentralization won. The code worked flawlessly; the human-run firms imploded. While the fallout hurt everyone, it proved that the future belongs to transparent, autonomous systems.

4. Users The final lesson is the most important. The promise of crypto is sovereignty—so take it. Learn to use a personal wallet and become your own bank. In this world, the ultimate responsibility for your assets is yours and yours alone.

Building a Better Future in Crypto

It's tempting to view the FTX saga as a senseless tragedy. But the truth is, the implosion of SBF's empire, while a disaster for millions, may have been one of the most important catalysts for the long-term health of decentralized finance[86]. It drew a brutally clear line in the sand: on one side, the opaque black box of FTX; on the other, the transparent, auditable world of DeFi.

The industry was forced to learn that hype is not a business model. It was a painful but necessary reminder that fundamentals—profitability, risk management, and rigorous audits—are not "old world" relics but timeless principles of value. The era of crowning celebrity founders and celebrating growth at all costs had to die.

Of course, this won't be the last crisis. The frontier is, by nature, a chaotic place. But each time a centralized player fails, the case for truly decentralized alternatives grows stronger.

The future doesn't belong to just any protocol. It will be forged by the teams that obsess over security, deliver seamless user experiences, and create undeniable value. The builders who learn the lessons of the past are the ones who will own the future.

86 Binance's potential acquisition of FTX might have had even more dangerous consequences. It would've been one black box buying another—doubling the opacity and risk in the long term.

Case Study: 2023 US Banking Crisis

The spring of 2023 sent a tremor through the U.S. financial system. For a moment, it felt like we were staring into the abyss of another 2008-style meltdown as three banks imploded in rapid succession. While a massive government rescue package[87] managed to calm the immediate panic, the episode left a lingering question: Just how stable is the ground beneath our feet? To understand what might be coming, we need to dissect what went wrong.

The Setup: A Flood of Cash, Then a Sudden Stop

To understand the banking crisis, we first have to understand the tidal wave of cash the Federal Reserve unleashed on the economy. In 2020 and 2021, to fight the pandemic-induced recession, the Fed effectively turned on the money printer. This deluge of capital caused bank deposits surged by over $4 trillion in 2020–21, reaching record-high levels.

For banks, this was a strange problem to have. They were swimming in cash but had nowhere to lend it. Their solution? Pour that money into the safest asset they could find: U.S. Treasury bonds. With interest rates at historic lows, they loaded up on long-term bonds (5-10 years) to chase whatever meager yield they could find.

This strategy created a hidden time bomb: a massive *maturity gap*. Banks' liabilities—their customer deposits—are short-term. Anyone can demand their cash back at a moment's notice. But their assets—those long-term bonds—were locked up for years. Sure, you can sell a bond on the secondary market, but that comes at a cost, especially if everyone is selling at once. And that's exactly where the problem began.

The Squeeze: How Everything Unraveled

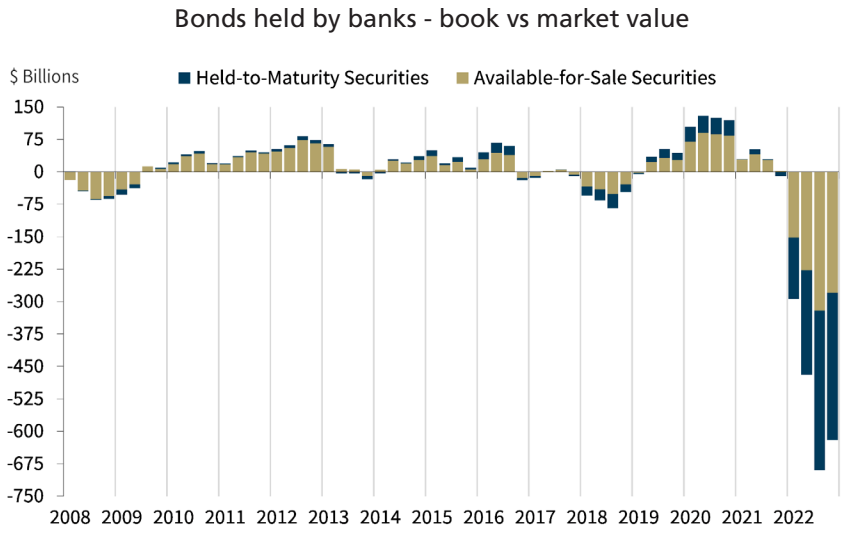
The trigger was the Fed's dramatic reversal. In 2022, facing down the worst inflation in 40 years, it slammed on the brakes, hiking interest rates

87 Including full coverage of uninsured deposits and a new Fed lending facility.

at a pace not seen in decades. This single move created a two-pronged crisis for the banks.

First, as interest rates climbed, the market value of those low-yield bonds the banks were holding plummeted. A simple rule of finance is that when new bonds pay higher interest, older bonds with lower interest become less valuable. This created a massive, unspoken problem.

A clever accounting rule[88] allowed banks to value these bonds at their original purchase price—not their dismal new market price—as long as they were 'held to maturity.' This accounting trick papered over the cracks, hiding a staggering $620 billion in unrealized losses across the U.S. banking system.



The growing chasm between the book value and market value of bonds held by banks. (Source: FDIC)

88 Under US GAAP, (the accounting principles) that was put into effect in 1993, banks can classify securities into one of three categories. Held-to-Maturity (HTM), Available-for-Sale (AFS) and Trading Securities. Under first category, HTM securities are recorded at amortized cost, not at fair market value. Any unrealized losses or gains due to market value changes are not reflected on the income statement or in shareholder equity.

Second, customers started getting smarter with their money. Why keep cash in a bank account earning a paltry 0.1% when money market funds were suddenly offering close to 5%? A quiet exodus of deposits began as people moved their money to chase higher yields. This forced banks that were losing liquidity to do the one thing they couldn't afford to do: sell their underwater bonds and turn those paper losses into catastrophic real ones.

The Tipping Point: Concentration and Contagion

This is where the unique risks of the three failed banks came into play. Their downfall wasn't just about bad bond strategy; it was about who they served. This was a crisis of **sectoral concentration**.

The first domino, Silvergate Bank, was the "crypto bank." The third, Signature Bank, was also known for being crypto-friendly. And the big one, Silicon Valley Bank (SVB), was the undisputed banker to the tech and venture capital world[89].

These sectors were ground zero for the boom-and-bust cycle. They were flush with cash during the easy-money era of 2020-21, and they parked it all in these three banks. But when the Fed tightened the screws and venture capital funding dried up, these startups began burning through their deposits just to stay alive.

The customers of these banks weren't your average depositors. They were hyper-connected, tech-savvy founders and investors, all in the same group chats. When whispers of trouble started, the reaction was instantaneous. This was the digital-age volatility the Fed fears most.

Silvergate's demise was a slow burn. Its deep ties to the collapsed FTX

89 Crypto is still new, so most big banks stay away from startups in the space. But crypto companies have unique needs. For example, they operate 24/7, so they can't rely on traditional banking hours. That's why Silvergate launched SEN, a 24/7 money transfer network just for its clients. It created a powerful network effect: if your whole industry is using SEN, joining it means breaking free from one of traditional finance's biggest barriers. The same goes for SVB. Many US banks won't open accounts unless the company's authorized signers have US Social Security Numbers (SSNs). But many founders, especially those incorporating in Delaware, live abroad. SVB became the go-to bank for tech startups because it didn't require SSNs to open an account.

exchange put it under a microscope[90]. Scrutiny from crypto-skeptical senators in a public letter sealed its fate, and it went into voluntary liquidation. Crucially, its assets were enough to cover all deposits without a taxpayer-funded bailout[91].

But Silvergate's failure sparked a new question in the market: "Who's next?" All eyes turned to SVB, the bank with the highest ratio of bonds and the fewest insured deposits. The answer came with stunning speed. Venture capital firms blasted warnings to their portfolio companies: "Get your money out of SVB. Now." What followed was a bank run executed over Slack and Twitter, an exodus of billions in just 48 hours[92]. By Friday, March 10, 2023, regulators had seized the bank.

The panic was palpable. Over the weekend, U.S. authorities stepped in with overwhelming force. In a sweeping announcement, they guaranteed *all* deposits at the failed banks—well beyond the standard $250,000 FDIC limit—and launched a new program to allow banks to borrow against their devalued bonds at face value.

Tucked into that announcement, however, was a curious detail: the closure of Signature Bank. This move struck many as odd. Signature wasn't as exposed to bond losses as SVB or as concentrated in crypto as Silvergate[93]. In crypto circles, the shutdown was seen not as a rescue, but as a message—a sign of the administration's growing hostility towards the digital asset industry[94].

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90 "If it had been a bank for farmers, this wouldn't have spiraled out of control so fast" is sounding more valid by the day.

91 Silvergate voluntarily liquidated in March 2023, its liquidation plan repaid all deposits, without taxpayer funding, and in September 2024 the holding company filed for bankruptcy to repay creditors from remaining assets

92 On Thursday, March 9, 2023 alone, SVB saw $42 billion in withdrawals—about 25% of its total $175 billion in deposits! (Source: DFPI.) Shockingly, Moody's still rated the bank "A" just the week before.

93 Bank officials said the deposit run that began Friday didn't stop until Sunday. Since the bank operated a 24/7 payment system, outflows continued right through the weekend.

94 The FDIC's official review later concluded that the bank's failure was caused by poor management and a devastating, contagion-fueled bank run, rather than a targeted regulatory strike on crypto.

Key Takeaways and Future Implications

Let's get one thing straight: 2023 wasn't a repeat of 2008[95] . This crisis wasn't about bad loans. It was a spectacular failure of basic risk management. Banks made a massive, unhedged bet that low interest rates were here to stay. They were wrong.

A Reckoning for Banks, A Scare for Depositors

The blame lies squarely with the bank executives who made that reckless bet. They lost their jobs, and their investors were wiped out. The Biden administration made it clear there would be no bailouts for those at the top.

While depositors were ultimately made whole, the chaos of that weekend was a brutal wake-up call. Tech founders with payroll locked in SVB aged years in a matter of days[96]. The event triggered a predictable flight to safety, with customers pulling money from smaller banks and consolidating it in the "too big to fail" giants, a trend reflected in plunging small bank stocks[97].

The Fed's Dilemma

The Federal Reserve knew its aggressive rate hikes would eventually break something; it just didn't expect the banking system to crack first. The Fed was caught in a dilemma: keep fighting inflation or protect financial stability?

The government's decision to guarantee all deposits stopped the panic but introduced "moral hazard"—the long-term risk that banks will gamble again, knowing they'll be bailed out. For now, putting out the fire took priority over the inflation fight[98].

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95 While some outlets mentioned crypto client exposure, Treasury Secretary Yellen and official reports emphasized that the bank's problem stemmed from unrealized losses on long-dated bond holdings.

96 It's estimated that around half of US startups banked with SVB. (Source: Delphi Digital).

97 If a bank gets in trouble, deposits are protected—but its share price isn't. That's why investors who fear trouble rush to dump their bank stocks.

98 Some believe quantitative easing leads to inflation. Others argue it boosts asset prices and pushes money into alternative (and riskier) assets instead.

Innovation vs. Regulation

The SVB collapse proved that bank runs are now digital flash mobs, executed in hours via smartphone. This is the new reality of "social media risk," where a firm's reputation can be dismantled overnight.

Amid this chaos, the shutdown of Signature Bank felt less like a rescue and more like a message aimed at the crypto industry. It revealed a deep friction between slow-moving regulators and the relentless pace of innovation. You cannot regulate a 24/7 digital world with a 9-to-5 analog mindset.

This battle between innovation and regulation will define the next decade. While the US system is often slow to adapt, don't bet against its ability to eventually create the frameworks that allow it to lead.

Chapter 5

Exploring Tokenization

If Web3 is a new digital continent, tokens are its lifeblood. They are the currency, the property, and the voting rights of this emerging world, fueling its economy and empowering its citizens. To truly understand Web3, you have to understand tokens.

We'll start with the fundamentals: What is a token? More importantly, what can it *do*? We'll explore the power they unlock, but also the very real barriers holding them back from mainstream adoption.

From there, we'll dive into the rulebook of this new economy, a discipline called "tokenomics." This is where the magic happens. We'll see how tokens are created, designed, and distributed—a process that determines who holds power and value. We'll pay special attention to 'airdrops,' a popular distribution method that gained major attention in 2020 and continued to influence the crypto world in 2024.

Theory is one thing, but reality is another. We'll ground these concepts by examining two pioneering examples. First, we'll look at how Wall Street giant BlackRock is using the Ethereum blockchain to issue BUIDL, a token that pays dividends tied to U.S. Treasury bonds. This isn't a future projection; it's happening now.

Then, we'll explore a prototype from the world of real estate: the story of a house in South Carolina sold as an NFT. While still experimental, it offers a powerful glimpse into a future where physical assets can be owned and traded as easily as digital ones.

Institutions are finally waking up to the power of tokenization. They see the radical cost savings and the potential to unlock new, global markets. The headlines will keep coming, but the real challenge will be separating genuine innovation from simple PR stunts. Time will tell which projects have staying power.

The Boston Consulting Group predicts that tokenized assets could become a $16 trillion market by 2030, representing 10% of global GDP. Will they be right? The answer depends on what we build next.

Tokens Explained

To understand the Web3 economy, you first need to understand its core building block: the token.

What are tokens?

A token is a digital representation of ownership. It can represent a piece of a company, a vote in a network, or a title to a physical object like a house.

To grasp why this is a breakthrough, we have to look at a fundamental problem of the digital world. Physical assets exist in one place at one time. Digital assets—bits and bytes—are different. Their greatest strength is that they can move instantly, unbound by geography. Their greatest weakness? They can be copied just as easily.

The 'Copy-Paste' Problem

Think about it. You can right-click a JPEG and duplicate it endlessly. Each copy is identical to the original. When anything can be infinitely replicated for free, it becomes impossible for it to hold value. So how did we solve this?

The Centralized Solution

For a long time, the answer was trust. Someone had to promise us that the digital numbers in our bank accounts were scarce and couldn't be copied. That "someone" was a bank. We, as a society, trusted these large institutions to manage the ledger.

This system worked well enough to power the digital economy for decades. We now live in a world of credit cards and wire transfers, where money is mostly an abstraction. Some Scandinavian countries have become almost entirely cashless societies[99]. But this entire system rests on a foundation of centralized intermediaries.

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99 Sweden conducts only about 10% of transactions in cash as of 2025.

The Decentralized Breakthrough

This is where blockchain changes the game. It solves the copy-paste problem without needing a bank.

A blockchain is a shared public ledger. When a digital asset is recorded on it, its scarcity is guaranteed and verified by the entire network. Anyone can see it. No single entity can change it. Through the power of mathematics and cryptography, a network of computers can achieve the same social consensus on trust that took banks centuries to build. It creates true, native digital scarcity.

From Concept to Code

So, a token is a scarce digital asset secured by a blockchain, free from the control of any single institution.

Technically, a token is just a small piece of code—a smart contract—that represents digital ownership. But the true magic lies in a single property: this code is *programmable*. Programmability gives these digital assets superpowers, which we will explore next. But first, let's look at the different kinds of tokens that exist.

Token Standards

For tokens to work together across thousands of different applications, they need a common language. Token standards are blueprints that ensure every token speaks the same language, allowing them to be universally understood, traded, and used. Think of them as the shipping containers of the digital world—a simple, brilliant idea that unlocked global commerce.

Fungible Tokens

The first tokens, like Bitcoin, were designed to be *fungible*, a core feature of money. Why does this matter?

Fungibility means that each unit is identical and interchangeable. A dollar is a dollar, no matter its serial number. This property is the bedrock

of commerce. You trust that the dollar you accept for selling a coffee can be used to buy bread, and its value will be the same. History is filled with cautionary tales of kings who debased their currency by mixing gold with cheaper metals. This destroyed interchangeability, shattered trust, and led entire kingdoms into crisis.

The first tokens in the crypto world learned this lesson. Both Bitcoin and Ethereum's native coin, ETH, are fungible. But Ethereum also allows others to build on top of its network. For these new tokens to act like money and circulate freely within the vast Ethereum ecosystem, they must follow a shared blueprint. This standard for creating fungible, money-like tokens is called ERC-20.

Non-Fungible Tokens

As the blockchain world evolved, new ideas emerged that didn't fit the mold of money. How do you represent unique assets like a piece of digital art, a collectible, or a property deed? The fungible ERC-20 standard was the wrong tool for the job. By their very nature, these assets needed to be one-of-a-kind.

In 2018, the Ethereum community introduced a new standard to solve this: ERC-721. This was the birth of the Non-Fungible Token, or NFT.

An NFT is a smart contract that points to a specific asset and gives it a *unique ID*. If you have a collection of 10,000 digital trading cards, each one is assigned a number from 1 to 10,000. While they all belong to the same collection, the unique ID makes each one distinct and individually ownable.

Hybrid Tokens

The software world moves fast, and new needs quickly lead to new inventions. Historically, a major challenge on Ethereum's main network was cost. Deploying and managing a unique smart contract for every different item type in a complex application, like a video game, was incredibly inefficient and expensive due to Layer 1 transaction fees.

This challenge led to the creation of the ERC-1155 standard. It's a hybrid,

multi-token model designed for maximum efficiency. Think of it as a master contract that can act like a vending machine, dispensing both fungible stacks of items (like potions) and unique, individual collectibles (like a legendary sword) from a single interface. While many modern applications now solve the cost issue by building on cheaper Layer 2 networks, the ERC-1155 standard remains a powerful tool that combines the mass-production of ERC-20 with the uniqueness of ERC-721 in a highly efficient architecture.

Tokens vs. Coins: What's the Difference?

You'll often hear the words 'token' and 'coin' used interchangeably, but there's a simple distinction worth knowing.

Think of it like this: a **coin** is the native currency of a specific Layer 1 blockchain. It's the asset that powers the network itself. Bitcoin (BTC) is the coin of the Bitcoin blockchain. Ether (ETH) is the coin of the Ethereum blockchain. AVAX is the coin of the Avalanche network. These coins are essential; they are used to pay for transaction fees, often called "gas," which is the fuel that makes the network run.

A **token**, on the other hand, is an asset built *on top* of an existing blockchain. Thousands of different tokens, from stablecoins to NFTs, are built on platforms like Ethereum using standards like ERC-20 or ERC-721. They rely on Ethereum's infrastructure to exist and are secured by its network.

So, every coin is a type of token, representing ownership of its native network. But not every token's a coin, because most tokens are applications running on a network, not the network itself.

Why Tokenization Matters

What makes tokenizing an asset so powerful? Consultants can list endless benefits, but they all stem from one core feature: **programmability.**

The Superpower: Programmability

Simply digitizing something creates a pale imitation of the real thing. The digital dollars in your bank account today aren't functionally different

from the paper cash you rarely carry. It's just a number on a screen.

But when you tokenize an asset, you're not just creating a digital record; you're embedding it with logic. You're turning it into a small piece of software—a smart contract—that can execute rules automatically. This transforms it into something entirely new.

CBDC's: Programmable Money

Consider the idea of a Central Bank Digital Currency (CBDC). When a nation's currency is tokenized, it becomes programmable. This allows for incredibly precise and efficient policy.

Imagine a flood devastates a farming region. The government could instantly send aid—in the form of a CBDC—to the accounts of affected farmers. But it could also program that money to be usable only for essential recovery purchases, like tools and fuel. The aid goes exactly where it's needed, for the purpose it was intended, with no leakage.

A Double-Edged Sword

This level of control is already being used in the crypto world, particularly with stablecoins. Tether, the largest stablecoin provider, is known to quickly comply with requests from authorities to remotely freeze USDT in user accounts.

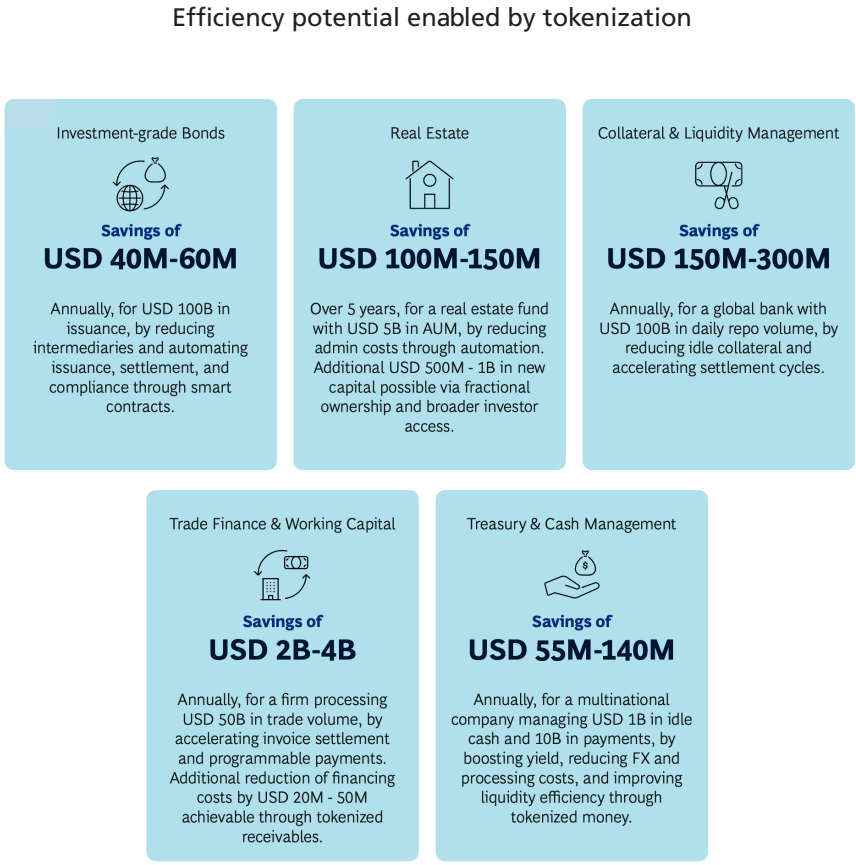
It's a stark reminder that programmability is a tool, and its impact depends on who wields it. It prompts a critical question: If your assets can be frozen by a central party, do you truly own them? Suddenly, the promise of decentralization becomes much more nuanced.

The benefits of programmability, however, are vast. They cascade across the financial, real, and crypto economies, unlocking new efficiencies and markets.

Unlocking New Markets and Efficiencies

Programmability is the key that unlocks a cascade of other advantages.

Assets that live on a blockchain operate on a global, 24/7 financial infrastructure. This leads to faster settlements and radically reduced operational costs.



Example of the advantages of tokenization in various areas (Source: *BCG/Ripple*)

Perhaps the most profound benefit is the creation of **liquidity**. By programming an asset to be divisible into tiny fractions, you make it accessible to a vastly wider audience. A $10 million commercial building is an illiquid asset, available only to a few wealthy investors. A tokenized building, however, can be sold in $100 increments, opening it up to a global market of millions.

Finally, because these tokens are built on shared standards, they are **composable**—they can be plugged into other applications like LEGO bricks. An owner can use their tokenized asset as collateral for a loan in one application, lend it out for a yield in another, and trade it on a market, all without intermediaries. Capital becomes fluid, efficient, and far more productive.

Which Assets Can Be Tokenized?

Theoretically, any asset in the world can be tokenized. The real question isn't *what* can be tokenized, but *how* easily.

The primary challenge is bridging the physical and digital worlds. The more an asset already exists as pure information, the easier it is to bring on-chain. This is why the first wave of tokenization is crashing into the financial markets. Assets like bonds, stocks, and debt are already mostly digital entries in a ledger. Turning them into programmable tokens is a natural next step, and giants like BlackRock are already making moves, as we'll explore in detail later.

After financial instruments, expect to see the tokenization of other digital-native assets, like intellectual property rights. From there, the wave will move to commodities like gold, silver, and oil—physical assets, but ones that are highly standardized.

The final, most complex frontier will be unique physical assets: real estate, art collections, and commercial equipment.

The challenge here isn't their illiquidity—that's precisely the problem tokenization solves. Rather, it's their lack of standardization.

Each house, painting, or machine is unique, making the legal and technical process of tokenizing them more complex than for a barrel of oil or a share of stock.

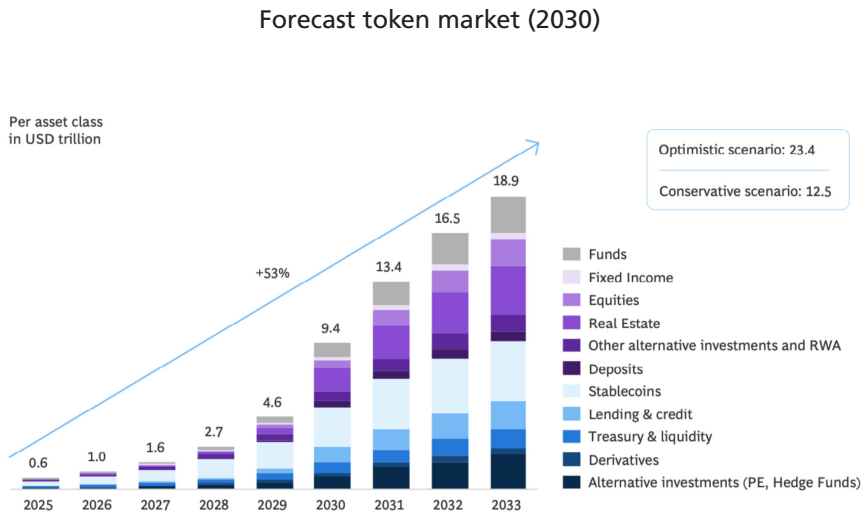
Tokenization examples

Type	Examples
Business Assets	Physical infrastructure, inventory, equipment, and machinery used in the operation of a business
Commodities	Physical goods such as gold, silver, oil, agricultural products, and other natural resources.
Collectibles	Art, antiques, stamps, coins, and other items with historical, cultural, or aesthetic value
Financial Instruments	Bonds, stocks, and other securities that represent an ownership interest or a claim on an OCA or business
Intellectual Property	Patents, trademarks, copyrights, and other forms of protected ideas or creations
Real Estate	Land, residential properties, commercial properties, and other real estate investments
Vehicles	Cars, trucks, boats, airplanes, and other modes of transportation

Types of assets that can be tokenized and case studies. (Source: TheBlock - *Tokenization of Off-Chain Assets-Presented by Avalanche and Ava Labs)*

Understanding the Token Market Size

So, how big is this opportunity? According to Boston Consulting Group (BCG), this isn't a niche market. They forecast that the value of tokenized assets will swell to nearly **$19 trillion by 2033**.



The development of the token market until 2033 according to the renowned consulting firm BCG (Source: *BCG*)

As the forecast reveals, the lion's share of this growth—roughly three-quarters of the total—is set to come from tokenizing traditional financial assets. The remaining quarter will likely emerge from tokenizing real-world infrastructure, from sprawling vehicle fleets to individual patents, turning the world's illiquid value into a dynamic, programmable, and globally accessible market.

How to Tokenize an Asset?

Bringing a physical asset onto the blockchain isn't magic; it's a deliberate process that bridges the worlds of law, finance, and technology. The journey can be broken down into five essential steps.

1. Asset Selection & Strategy

First, you identify the asset to be tokenized. This could be anything from a portfolio of corporate bonds to a single piece of real estate. A crucial decision at this stage, particularly for assets aimed at U.S. investors, is its legal classification. Will the token be treated as a security or a commodity? The answer dictates the entire regulatory path forward.

2. The Off-Chain Bridge: Law & Value

This is often the most complex step because it's where the messy reality of the physical world meets the clean logic of the blockchain. You must legally prove indisputable ownership of the asset and establish its fair market value. This is a crucial trust-building phase that, for now, inevitably involves third parties. Lawyers are needed to structure the legal framework, and auditors are required to verify the valuation. Getting this right is non-negotiable.

3. Encoding the Rules

With the legal and financial groundwork laid, the next step is to create the token itself. This may require the least physical effort, but it demands the most technical experience. Here, you define the token's DNA. Its features, functions, and the "superpowers" it possesses are all encoded into a smart contract. This code dictates the total supply of tokens and embeds all the rules and restrictions that will govern the asset on-chain.

4. The Birth of the Token - Token Generation Event aka TGE

Once the smart contract is finalized, it's deployed to the blockchain. This is the moment of creation, known as the Token Generation Event (TGE). The act of "minting" brings the tokens into existence, creating a permanent, public record of the digital asset. The token is now live.

5. Custody & Continuous Tracking

The final step is an ongoing one: ensuring the digital token remains permanently linked to its physical counterpart. This requires a robust system of governance. The physical asset, whether it's a gold bar or a building, must be secured by a specialized trustee. Simultaneously, the digital tokens must be managed by custody service providers who safeguard access. This dual-custody system ensures the integrity of the tokenization, maintaining the essential bond between the on-chain representation and its real-world value.

The Hurdles to a Tokenized World

While the vision of a tokenized future is compelling, its arrival has been uneven. Native cryptocurrencies have exploded in value and use, but the tokenization of real-world assets has, until recently, moved at a slow pace, but is now beginning to accelerate. The one shining exception has been stablecoins, which have successfully demonstrated how to build a robust bridge between traditional finance and the on-chain world.

So, what's holding everything else back? The challenges aren't trivial; they are a complex mix of legal uncertainty, technical limitations, and deep-seated image problems.

The Core Conflict: Regulation vs. a Global Ledger

The biggest obstacle is the philosophical clash between blockchain's nature and the reality of regulation. Blockchains are global, open, and designed to be permissionless. Governments, by necessity, create local rules designed to protect investors, enforcing procedures like Know-Your-Customer (KYC).

This creates a fundamental tension. While on-chain KYC solutions exist, they are far from standardized. We still lack a universal, trusted digital identity layer for the blockchain world, forcing every project to reinvent the wheel.

More importantly, a token's power ends where the blockchain does. A smart contract can transfer ownership of a tokenized house instantly, but it can't evict a tenant or resolve a property line dispute in the physical world. This **off-chain enforcement gap** is the Achilles' heel for real-world asset tokenization. Until our legal systems can reliably interpret and enforce on-chain events, the trust required for widespread adoption will remain elusive.

The Data Problem: Oracles and Trust

There are also significant technical hurdles in securely connecting a token to its real-world value. For liquid, standardized assets like gold or oil, information providers known as oracles can reliably feed real-time prices

onto the blockchain.

But what about illiquid assets? There is no public price feed for a unique office building or a private art collection. Determining their value requires appraisers and auditors, reintroducing a layer of human trust and intermediation that blockchain is supposed to eliminate. Users are often forced to simply trust the data provided by the centralized party holding the asset.

Crypto's Baggage: An Image Problem

Finally, tokenization is burdened by its association with the wilder side of "crypto." The industry's reputation pushes away a huge segment of potential users and investors who remain skeptical.

This has led to a fork in the road. On one path, you have institutions like JPMorgan building permissioned, "walled garden" systems accessible only to pre-vetted clients. This approach solves for compliance but sacrifices the open, permissionless ethos of Web3. It's unclear if these closed ecosystems can achieve the scale and network effects of their open counterparts.

On the other path, many of the first projects to embrace open tokenization have been relatively risky ventures that couldn't secure financing from traditional markets. This creates a "lemons problem," where the projects most visible to the public are often the least sound, souring the perception of the entire field.

Conclusion

Tokenization is poised to reshape our financial world, but its future hinges on resolving a single, fundamental conflict.

The core dilemma is this: to satisfy today's regulations, projects are pushed toward private, permissioned blockchains. Yet, we have seen this movie before. The private "intranet" blockchains of the late 2010s failed to gain traction precisely because they abandoned the very principle that makes this technology revolutionary: open, permissionless access. Walled

gardens, by definition, cannot tap into the global, liquid markets that public chains promise.

This leaves the industry at a crossroads, navigating the tension between compliance and composability. Still, the potential is undeniable. The regulatory clarity that has now been established in key markets like the European Union, and which continues to emerge elsewhere, will only accelerate development. The search is on for the holy grail: a new generation of tokens and on-chain identity solutions that can provide the guarantees governments require, without sacrificing the open spirit that will unlock a trillion-dollar market. The projects that solve this puzzle will define the next decade.

Understanding Tokenomics

Tokenomics is easily one of the most debated topics in the crypto world. So what's all the fuss about?

The Economics of Tokens

The term itself is a mashup of "token" and "economics," which hints at its core idea: building an entire economy on top of tokens.

Think of tokens as the native currency of any given ecosystem. They are the assets people use to exchange value within that digital world. The entire lifecycle of these assets—how they're created, distributed, used to incentivize people, and eventually removed from circulation—forms a unique economic system.

Tokenomics is the art and science of designing that system. It's what ensures an ecosystem can grow and sustain itself over the long run.

A Quick Trip to the Traditional World

To understand what makes tokenomics so different, let's first look at how value is shared in the world we already know. For a traditional company, the math is relatively simple.

A company generates value and distributes it to everyone who helped create it. Employees get salaries and bonuses. Suppliers get paid for materials. Banks get interest on loans, and the government gets its taxes. Whatever profit is left over is either reinvested back into the company or paid out to shareholders. The company share is the fundamental unit for distributing this profit.

You issue a set number of shares, and you divide them among the owners[100]. The first owners are usually the founders and the early investors who backed them. The main drama here often revolves around negotiating

100 Later, you can increase the total number of shares through a capital raise if needed.

the different rights assigned to various shareholder groups, especially in the early funding rounds.

In Web3, tokens take the place of stocks. But that's where the similarities end.

Instead of a company, you have an ecosystem. This shift introduces a much wider array of stakeholders, all with a claim on the value the ecosystem creates. And how that value gets distributed is a completely different game. Let's dig in.

Who Gets a Piece of the Pie? Token Distribution

Distributing tokens is a far more intricate dance than issuing stock, because you're no longer just dealing with founders and their investors. You're dealing with an entire ecosystem.

Beyond the core team and its financial backers, you have the miners or validators who secure the network. You have a community of external developers building on and battle-testing your software. And most importantly, you have the users themselves, the lifeblood of the system's growth.

This gets to the heart of Web3's promise: the value created by an ecosystem should be shared fairly among all who helped build it. When you design a token economy, you're not just creating a currency; you're designing a system to reward every single one of these participants for their contribution.

The Blueprint for a Token Economy

Designing a token economy requires a blueprint. You need a plan that balances four critical elements: how tokens are created, how they are distributed, how they are used to keep everyone motivated, and finally, how they are removed from circulation.

But weaving through all of these is the crucial element of timing. Deciding who gets which tokens, and when, can make or break the entire system.

Before we dive into those four pillars, let's trace the journey of a project *before* a single token is even minted.

The Pre-Token Era

Every project starts with a small, dedicated team. They work relentlessly to build a product or service they believe in, publishing their progress and vision in the project's public documentation.

Soon, others join the mission. If the project's code is open-source on GitHub, volunteer developers might spot vulnerabilities or suggest improvements. Believers in the project's vision start contributing directly or building new tools that integrate with it.

Of course, passion doesn't pay the bills. The founding team and even the contributing developers eventually need funding to survive. In the early days of Web3, before 2020, projects often turned to the public to raise money.

This method was modeled after the traditional stock market's Initial Public Offering (IPO), but with a crypto twist: the Initial Coin Offering, or ICO. For a while, especially during the 2017-18 boom, it was the go-to fundraising strategy. Then, it all came crashing down.

Why? Two reasons.

First, the retail investors who bought into ICOs were impatient. They wanted quick returns. But these projects were often little more than a vision on paper, needing significant time and effort to come to life. This created a fundamental mismatch in expectations.

Second, drawing up a grand vision is easy. Executing it is hard. When people saw the fortunes being raised, thousands of projects flooded the market with big promises and hollow plans. The well was poisoned. ICOs dried up because trust evaporated.

Post-2020, many projects adopted early token giveaways—airdrops—to reward contributors. Meanwhile, traditional crowd sales waned and projects increasingly relied on crypto-focused venture capital—even as VC funding shifted toward later-stage, utility-driven ventures.

Minting the Token

A project minting its token is more than a milestone; it's the moment it sets sail for decentralization. I use the term "setting sail" intentionally. The journey to a truly decentralized future is treacherous, and many promising projects have sunk after their Token Generation Event (TGE) because they couldn't navigate the storms.

While every project has its own unique approach to this moment, a few common questions always surface.

How Many Tokens Will Ever Exist?

Most Web3 projects commit to a fixed total supply of tokens. This is a radical departure from the stock market, where a company can simply convene a meeting and decide to double the number of shares, diluting every existing owner. A fixed supply is a powerful statement. It's a promise of scarcity and a sign of a project's long-term conviction.

Can that number ever change? Technically, yes. The token holders themselves—the ultimate decision-makers in a decentralized network—could vote to mint more. However, everyone understands this would likely harm the token's value, making it a rare and contentious event. It's worth noting that foundational infrastructure projects like Ethereum are an exception; they often launch without a predetermined cap on their total supply.

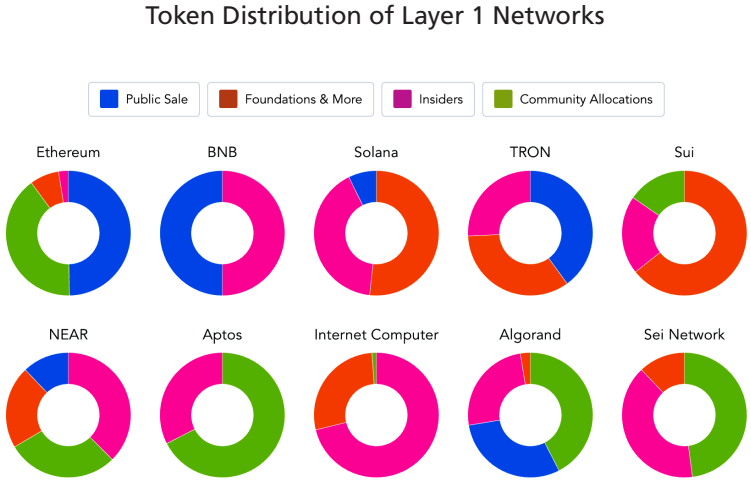
How Are the Tokens Divided?

Once the total supply is set, the critical work of allocation begins. Who gets what?

While there's no single formula, a common pattern has emerged, heavily influenced by community expectations. The founding team and advisors now typically receive around **15-20%** of the total supply. Investors who funded the early stages get a slice in the **15-25%** range.

Critically, the majority of the tokens—often **60% or more**—is reserved for the ecosystem itself. A large portion is set aside as a treasury, often con-

trolled by a DAO or a foundation, to fund future development and award grants. Finally, a slice of the pie, typically ranging from **7% to 20%**, is allocated to early users and supporters through airdrops to bootstrap the network.



The token allocations of Layer 1 networks can vary greatly from one another. (Source: *Messari*)

Finally, a slice of the pie is given away for free to early users and supporters through airdrops. While the allocation is often between 5-10%, the strategy behind airdrops has evolved significantly. Given how much interest this topic generates, it's worth a closer look.

Everyone's Favorite Topic: Airdrops

The word "airdrop" sounds like magic—money appearing out of thin air. It's a strategy that nearly every project now uses to capture the community's attention. But what started as a simple giveaway evolved into a complex and fascinating game, especially after the decentralized finance boom in 2020.

The First Wave

While projects had long used tokens to incentivize people, 2020 was the year airdrops became a phenomenon. The first big splash came from Com-

pound, a lending platform that rewarded users with COMP tokens just for using the protocol.

Then came the drop that changed everything: Uniswap.

As the largest decentralized exchange, Uniswap was facing a serious threat from a rival, Sushiswap, which was luring away its liquidity with generous token rewards. To counter, Uniswap launched its own token, but with a revolutionary twist. It didn't just reward current users; it retroactively airdropped 400 UNI tokens to *every single wallet* that had ever made a trade on the platform.

This represented ~$1,200–$1,600 at launch, but those holding UNI saw values reach up to ~$40,000 within six months.

The community was stunned. The move did more than just reward Uniswap's loyalists; it ignited a gold rush. Users began flocking to promising new applications that hadn't yet launched a token, hoping to qualify for the next big retroactive airdrop. A new behavior was born: "airdrop farming."

The Game Evolves

After Uniswap, a flood of projects followed suit with their own airdrops. But soon, the system began to creak under its own weight. Since creating a new wallet is trivial, a single person could create hundreds of accounts, perform one transaction with each, and wait for the reward. The game was becoming too easy to beat.

In response, projects got smarter.

The Arbitrum airdrop marked a major turning point. Instead of just rewarding a single action, the Arbitrum team designed a sophisticated system to identify and reward genuine, active users. They looked at several key behaviors:

- **Early Adopters:** Were you there from the beginning?
- **Sustained Activity:** Did you use the platform across different months?
- **Deep Engagement:** Did you interact with multiple smart contracts?

- **Significant Volume:** Did you transact a meaningful amount of value?
- **Commitment:** Did you bridge significant assets over from Ethereum?

By rewarding users across these different metrics, Arbitrum created a blueprint for how to distinguish real community members from opportunistic farmers. It was no longer about just showing up; it was about contributing real, sustained value.

What Purpose Do Airdrops Serve?

On the surface, airdrops are a tool for rewarding early and active users, which is fantastic for building a positive community image. But their utility runs much deeper.

For projects, especially those based in the US, airdrops have become a clever shield against the SEC's argument that "your token is a security." How? It's all about how value is established. When a founding team takes money from venture capitalists, they promise to deliver tokens in the future. At the moment of the TGE, investors know *how many* tokens they'll get, but not what they're worth. Unlike a traditional IPO where shares are sold at a set price, a token's value is unknown until it hits the open market on exchanges like Uniswap.

Because investors' tokens are locked up for a period, they can't influence that initial price. By airdropping a portion of the supply to the public for free, projects can argue that there was no initial "investment of money" from the community with an expectation of profit—a key prong of the SEC's test for what constitutes a security. They aren't selling anything; they're giving it away to build a network. This makes the regulatory argument far more nuanced.

The Rise of the Airdrop Farmer

As we've seen, this beautiful idea of rewarding the community had an unintended consequence. Once people realized the potential windfall, a new class of user emerged: the airdrop farmer.

This wasn't just a few people; it was an organized effort. Farmers would create thousands of wallets and use bots to perform basic interactions across dozens of new projects, hoping to catch the next big airdrop. This swamped projects with fake users and meaningless transaction volume, making it difficult to see if they were achieving real product-market fit. It created a shadow economy where the goal wasn't to use a product, but to extract value from its token launch. This is precisely why sophisticated scoring systems, like the one pioneered by Arbitrum, became not just a good idea, but a necessity for survival.

Why Projects Adopt Scoring Systems

You would think projects would fight the wave of airdrop farmers and their fake transaction volumes. Instead, many leaned into it. They not only embraced the inflated metrics but began actively encouraging them with a new weapon: the point system.

Suddenly, users were rewarded with "points" for every conceivable action: making a trade, holding funds in the app, or even just mentioning the project on social media.

This "points game" is, by its nature, a opaque—and often exploitative—system. A user might rack up thousands of points and feel like they're earning a significant stake, only to be crushed when they discover the project has issued billions of points in total. Your slice of the pie is meaningless if you have no idea how big the pie is. For the project, it makes no difference if they give you ten points or ten thousand; the number of tokens in the final reward pool is already fixed.

So why do it? Why create this elaborate illusion?

First, even fake usage generates real commission fees. But the real reasons are deeper.

In the high-stakes world of venture capital, teams need to show investors that their metrics are going "up and to the right." Surging user activity, even if juiced by point-seekers, helps a team hit its targets and strengthens its hand when asking for more funding before the token launches.

This inflated sense of scale also becomes leverage. When a protocol with high "active user" counts wants to partner with another project, it can negotiate a much better deal. It's a show of strength.

Most importantly, the points system gives projects ultimate flexibility. Unlike a hard promise of tokens, points are an IOU with no fixed value. The project can change the rules, tweak the incentives, and control the timeline however it sees fit, all while keeping the community engaged and churning transactions. It's the art of the non-committal commitment.

The Hamster Wheel of Seasons

As the points game dragged on, user fatigue inevitably set in. To keep the machine running, projects introduced a new tactic: "seasons."

They would close one chapter and launch "Season Two," often with bigger point multipliers to attract a fresh wave of users. This created a strange tension. The earliest, most loyal supporters saw their initial efforts dwarfed by the inflated rewards offered to newcomers. Yet, they couldn't afford to leave, trapped by the hope that their history would eventually pay off. They were stuck on the hamster wheel, forced to keep running just to protect their spot.

The final allocation also became a major point of contention. A project can do everything right and then fumble the ball at the one-yard line. If the final airdrop is too small, it insults the community's effort. If the allocation seems unfair, it can break trust instantly.

This is exactly what happened to Starknet. Widely considered one of the most brilliant Layer 2 solutions on Ethereum, its reputation was shattered by its airdrop. The community perceived the distribution as heavily favoring developers and insiders, leaving genuine users with scraps. The backlash was swift and brutal. Users who felt cheated dumped their tokens and abandoned the platform in a mass exodus. In the months immediately following the airdrop, projects building on Starknet struggled to attract anyone, a stark reminder that community goodwill is priceless.

Value Outlasts Hype

Ultimately, this entire cycle of airdrops, points, and seasons reveals a simple truth: you can't trick people into long-term loyalty. The users you attract with these schemes are mercenaries, not community members. They will leave the moment a better offer appears.

A project's real challenge has nothing to do with token incentives. It's about creating lasting value. When deciding whether to engage with a project, the question to ask is the same one investors have asked for a century:

"What real-world problem is this actually solving?"

Token Unlocks: When Owners Can Sell?

A crucial piece of any token's design is the schedule that dictates who can sell their tokens and when. This single element can create enormous tension in the market.

As a rule, tokens distributed to the community via airdrop are liquid immediately. You can sell them the moment they hit your wallet. For insiders—the founding team and early investors—it's a different story. Their tokens are almost always locked for a significant period.

Over the years, these lock-up periods have gotten longer and longer. The market learned the hard way that projects with short lock-ups often suffered from intense selling pressure. An upcoming unlock for insiders hangs over a project like the Sword of Damocles, often suppressing the token's price as traders anticipate a flood of new supply.

The timing of these unlocks is just as critical as their existence. Sudden, massive unlocks, often called "cliff unlocks," can have a brutal impact on price. Arbitrum, despite its many successes, provides a stark example. After its initial airdrop of 1.1 billion tokens, it scheduled another unlock of a similar size for its team and investors in March 2024.

The result? Even though Arbitrum is one of the most used and asset-rich projects on Ethereum, its token, $ARB, struggled. In the months before and

after this massive unlock, its performance lagged significantly behind comparable projects like Optimism. The market's fear of the impending supply dump became a self-fulfilling prophecy.

The Regulatory Maze

So, what are these tokens in the eyes of the law?

This is one of the most complex and unsettled questions in Web3. The legal status of a token shifts dramatically from one country to another, creating a confusing maze for projects and users alike.

Amid this uncertainty, Switzerland became an early pioneer, offering one of the first and most influential frameworks for classifying tokens. The Swiss approach is elegantly simple: ignore the marketing hype and focus on the token's economic purpose. It sorts tokens into three main categories.

1. Payment Tokens Think of these as digital cash. Their primary use is to buy goods and services or to transfer value. Familiar cryptocurrencies like Bitcoin (BTC) fits this description. The defining feature is that the issuer isn't promising you a return on an investment; they are providing a tool for commerce.

2. Utility Tokens These tokens act as a digital key or a pass, granting you access to a specific application or service. In a way, many payment tokens also have a utility function. For example, you need ETH (the utility token) to pay for transactions and interact with applications on the Ethereum blockchain. It's the native currency required to make the network function.

3. Asset Tokens This is the most straightforward category. Asset tokens are digital wrappers for real-world assets. They are direct representations of ownership, whether that's a share in a company, a bond, or even a piece of physical property. When you hear about bringing traditional financial products onto the blockchain, people are talking about asset tokens.

The Battleground: America

While Switzerland offered a blueprint for sensible regulation, America is where the real fight is—a chaotic, high-stakes battle for the internet's

future. To understand the landscape today, you have to understand how we got here.

When Bitcoin first appeared in 2009, Washington D.C. barely noticed. It's easy to see why. For a global superpower, a tiny, speculative digital token was hardly a blip on the radar.

By the 2020s, that had changed. A consensus was forming in D.C.: crypto was here to stay, and it needed rules. But just as that conversation began, the industry was shattered by the collapse of FTX. Its founder, Sam Bankman-Fried, had been a prolific political donor, pouring over $40 million into campaigns, including President Biden's.

When FTX imploded in November 2022, revealing a multi-billion dollar fraud, the political climate turned toxic overnight. The scandal empowered the hardliners, especially SEC Chairman Gary Gensler. He relentlessly pushed a new narrative: crypto doesn't need new laws, it just needs to submit to the old ones.

Gensler's position is that nearly every crypto asset—with a lone, begrudging exception for Bitcoin—is a security. He has famously evaded questions on Ethereum's status, while telling every other project to "come in and register." This wasn't an invitation to collaborate; it was a demand to bend the knee.

But the political pendulum, as it always does, swung back. The election of a new Trump administration signaled a dramatic reversal. After campaigning on a promise to foster a friendly environment for crypto, the new president began a systematic overhaul.

The administration's appointments sent a clear message. David Sacks was named the new 'czar of AI and crypto.' The cabinet was stacked with crypto advocates, like Treasury Secretary Scott Bessent and Commerce Secretary Howard Lutnick. Soon after, key regulatory posts were filled by industry allies, including Paul Atkins at the SEC and Brian Quintenz at the CFTC[101]. The message from the White House was unmistakable: America is open for business.

101 At the time of writing Senate still yet to approve Brian Quintenz as CFTC chair.

Congress followed suit, with crypto supporters taking the chairmanships of key committees in both the House and Senate.

The impact was immediate. The SEC reversed course, dropping its high-profile lawsuits against Coinbase and Ripple. The legislative logjam finally broke. In July 2025, President Trump signed the GENIUS Act into law, bringing much-needed clarity to stablecoins. A broader bill to regulate crypto markets passed the House and moved on to the Senate.

In the space of a year, the American regulatory climate transformed from crypto's greatest headwind into a powerful tailwind.

Europe Takes the Lead

In a surprising turn of events, "Old World" Europe—often seen as a laggard in tech—has pulled ahead of the US on crypto regulation. While America is stuck debating 80-year-old legal tests, the EU passed a comprehensive framework in 2023 called MiCA, the Markets in Crypto-Assets Regulation.

MiCA's goal is to create a single, clear set of rules for the entire EU, designed to protect investors and ensure market stability. The regulation establishes a unified licensing regime for crypto service providers and imposes rules to prevent market manipulation, with a particular focus on bringing stability to the world of stablecoins.

What makes MiCA particularly interesting is what it chooses *not* to cover. In a pragmatic move, the framework explicitly excludes protocols that are "fully decentralized[102]." Regulators acknowledged the obvious: you can't force a leaderless, global software protocol to register with a national authority. This carves out a space for decentralized finance (DeFi) to innovate.

NFTs also get a special mention and are exempt on a case-by-case basis, hinging on the concept of "singularity." A unique digital artwork, for example, falls outside MiCA's scope. However, if you were to fractionalize

102 The precise definition of this term remains a subject of ongoing discussion and clarification by regulators.

that artwork into a thousand interchangeable pieces, those fractions would be treated as financial instruments and fall under the regulation.

MiCA provides a general framework that will apply across all EU member states, creating a unified market. A transition period is in place to allow existing companies to adapt, but the deadline is not uniform. While a 'grandfathering' clause extends to July 1, 2026, individual EU member states can set an earlier deadline, and many are expected to do so.

Case Study: When BlackRock Went On-Chain

The crypto world's relationship with Wall Street is entering its final act. It brings to mind the old quote, often attributed to Gandhi: 'First they ignore you, then they laugh at you, then they fight you, then you win'[103].

Nothing captures this arc better than BlackRock—the world's largest asset manager—placing a $100 million tokenized fund on the Ethereum network in March 2024. To understand why this is a landmark event, we have to look at how BlackRock's perspective on crypto completely transformed.

A Titan's Change of Heart

BlackRock is not just another firm; it's a $12.5 trillion behemoth. In the world of finance, it's often said, "There is BlackRock, and then there is everyone else."

Like the rest of Wall Street, BlackRock kept its distance from crypto for years. In a 2017 interview, its legendary CEO, Larry Fink, dismissed Bitcoin as an "index of money laundering." But the ground began to shift. As institutional interest grew, especially during the 2020 pandemic, BlackRock's stance softened. In August 2022, the fund announced a partnership with Coinbase to give its clients a gateway to crypto.

The real bombshell dropped in June 2023: BlackRock had filed for a spot Bitcoin ETF. An ETF is essentially a stock that tracks the price of an asset like gold or oil, allowing people to invest without holding the asset itself. A Bitcoin ETF was the holy grail for two reasons: it would cement Bitcoin as a legitimate investment vehicle and open the floodgates for mainstream capital.

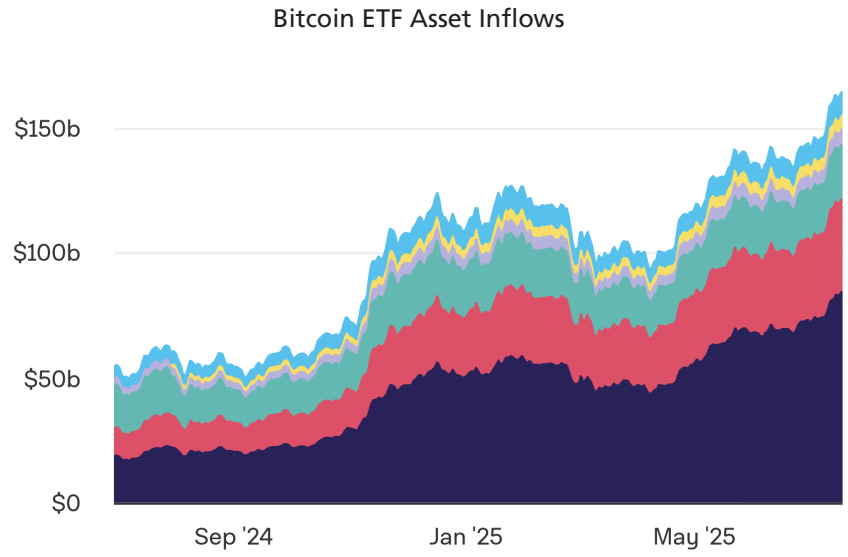
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103 Kit Miller, director of the Gandhi Institute, confirms the well-known English phrase "First they ignore you, then they laugh at you, then they fight you, then you win," is not actually Gandhi's. The original quote was made in 1918 by Nicholas Klein, a US union leader, during a demonstration: "First they ignore you, Then they ridicule you. And then they attack you and want to burn you. And then they build monuments to you."

This was the moment the tide turned. For a decade, the SEC had rejected every Bitcoin ETF application that crossed its desk. But Larry Fink is a man who can get the SEC Chairman on the phone, and BlackRock has a near-perfect 99.8% approval rate on its ETF applications. The filing wasn't just a request; it was a signal. Wall Street had finally arrived[104].

Fink's pivot didn't stop there. In October 2023, he called the rising price of Bitcoin a "flight to quality." A few months later, he described Bitcoin "as an 'international instrument' capable of mitigating localized economic fears."

When the Bitcoin ETFs were approved in January 2024, BlackRock's market sense was proven right. Their fund exploded out of the gate, amassing over $85 billion in assets and rocketing to first place among all Bitcoin ETF issuers.



Cumulative inflows into US-based spot Bitcoin ETFs (USD billion). (Source: *TheBlock*)

104 The company also announced its Ethereum ETF application on November 16, 2023. Indeed, BlackRock's iShares Ethereum ETF was among the first Ethereum ETFs to start trading on July 23, 2024.

Understanding BlackRock's Tokenized Fund

BlackRock's latest move was to create a $100 million money market fund built on a simple, powerful idea: bring safe, yield-bearing US Treasury assets onto the blockchain. Shares in the fund are represented by a dollar-pegged token, and in a clever nod to the crypto ethos, BlackRock named it BUIDL[105].

Here's how it works: the fund invests in low-risk assets like cash and T-bills. Each month, the income earned is paid out directly to investors' wallets in the form of new tokens[106].

So, why does this matter? Large crypto institutions and companies often hold millions in digital cash, sitting idle in stablecoins like USDC and earning zero return. To earn a yield, they had to move that capital back into the traditional financial system—a slow, cumbersome process.

BUIDL changes the game. It allows institutions to keep their capital on-chain, earning a yield, and ready to be transferred to other qualified clients 24/7. This makes their assets vastly more efficient. It's a liquid, on-chain savings account that also happens to be a building block for a new financial system. In the future, these BUIDL tokens could become collateral for loans or the foundation for new derivative products.

Of course, BlackRock didn't do it alone. It assembled a dream team of crypto-native and traditional finance players. While BlackRock manages the investments, the Bank of New York Mellon holds the real-world assets. Securitize[107] handles the tokenization and client management, while a roster of crypto custody specialists—Anchorage, BitGo, and Coinbase—secure client funds. Fireblocks protects the fund's own on-chain assets.

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105 A quick story from crypto history about "BUIDL": During Bitcoin's volatile early days in 2013, its price surged from $15 to $1,000 and then collapsed from $716 to $38 overnight. At that chaotic time, a (probably not sober) Bitcoin Forum member famously posted, "I AM HODLING." It was a typo for "holding," meaning "I'm holding my Bitcoin no matter what." Initially mocked, the phrase quickly became a beloved motto among long-term investors. Similarly, "BUIDL" is a playful misspelling of "build," meaning "building something lasting."

106 You can view the blockchain record of this initial USD 100 million transaction after the fund's inception, as well as its current size of USD 408 million.

107 Wanting to minimize crypto risks, BlackRock invested in Securitize, became a strategic partner, and appointed one of its executives to the company's board of directors.

The demand was immediate. Launched at $100 million, the fund swelled to $521 million in just the first six months, proving that Wall Street's biggest player had built something the on-chain world desperately wanted.

How Does BUIDL Differ from ETFs?

At first glance, the BUIDL fund might look like another version of the Bitcoin ETF. Both bridge the worlds of crypto and traditional finance, but they travel in opposite directions.

The ETF Pulls Crypto into the Old World

A Bitcoin ETF is a tool for traditional investors. It pulls a crypto asset *into* the legacy financial system. Someone can buy exposure to Bitcoin through their existing brokerage account, just like a stock, without ever needing a crypto wallet or an exchange account. It brings the asset to them, on their terms.

BUIDL Pushes the Old World On-Chain

The BUIDL fund does the exact opposite: it pushes a traditional asset *onto* the blockchain. It's a tool built for crypto-native institutions, allowing them to use a yield-bearing, real-world asset directly within the crypto ecosystem.

This addresses a common critique of Bitcoin ETFs—that they "tame" crypto, forcing the unruly child to play by the old system's rules. BUIDL, in contrast, is a structure built *on* the blockchain, designed to pull more capital and activity into the new world.

The Real Strategy: Tokenizing Everything

This isn't just BlackRock chasing a trend. BUIDL is the first move in a much larger, long-term strategy. In nearly every interview, Larry Fink emphasizes the massive potential of tokenizing real-world assets. While we might think of tokenizing houses or art, the lowest-hanging fruit is classic financial funds, which are already digital.

With BUIDL, BlackRock is stepping through that door. And the room on the other side is vast. The consulting firm BCG predicts the market for tokenized assets will reach $16 trillion by 2030.

Why an Open Blockchain Matters

Crucially, BlackRock built this fund on Ethereum, a public blockchain. This is a deliberate and meaningful choice, breaking from the "private blockchain" experiments favored by other Wall Street giants.

Carlos Domingo, the founder of BlackRock's partner Securitize, puts it best. He argues that private blockchains—like those used by JPMorgan—are limited by closed ecosystems, whereas public networks allow broader innovation and open access. A private blockchain is a sandbox where only a few privileged institutions get to play. If you issue a token representing a dollar, the only way for the broader world of innovators and startups to build new products with it is if that token lives on a public chain.

According to Domingo, BlackRock was visionary. They understood that the future of tokenized assets is on open networks, and they didn't need convincing. Ethereum was the natural choice as the largest and most battle-tested smart contract platform. Still, Domingo suggests the future will likely involve multiple interoperable public chains.

Conclusion

If the Bitcoin ETF was Wall Street dipping its toes in the water, the BUIDL fund is the dive in. This isn't one of JPMorgan's sterile initiatives on a private, permissioned chain—a project that only *pretends* to embrace the new paradigm. This is a real, yield-bearing financial asset from the world's largest manager, set loose in the wild of an open blockchain. The game has changed.

Case Study: Tokenizing a US Home

In 2022, a suburban, two-story house in South Carolina made history. It wasn't the architecture that was special; it was how it was sold. The entire transaction happened on the blockchain.

So, how did they pull it off?

Instead of selling the property directly, the house was first placed into a limited liability company (LLC). Then, the ownership of that LLC was turned into an NFT and sold for cryptocurrency. The deal got even more interesting when the buyer secured a loan against the NFT itself. This pioneering sale was a collaboration between two key players: Roofstock and Origin Protocol.

Roofstock, founded in 2015, isn't new to disrupting real estate. They specialize in single-family rental homes and have already brokered transactions worth several billion dollars. Fresh off a $240 million funding round that valued the company at nearly $2 billion, they launched roofstockonchain, a marketplace designed to bring property investing onto the blockchain.The venture was soon rebranded to Roofstock ONE[108].

Their partner, Origin Protocol, lives at the intersection of NFTs and DeFi. Their platform, Origin Story, makes it simple to turn real-world assets into NFTs. They had already powered multi-million dollar sales, like the musician 3LAU's $11 million collection, and provided the technical know-how for Roofstock's marketplace.

Here's the brilliant part of the process: Roofstock registers each house as its own LLC in Wyoming, a state known for its crypto-friendly laws. The ownership of this LLC is then minted as an ERC-721 NFT on the Ethereum blockchain.

Why go through all this trouble? Because an NFT can be traded almost instantly. This simple fact bypasses the mountain of paperwork, bureaucratic costs, and lost time that plague traditional real estate closings. Suddenly, transferring ownership of a house becomes as easy as trading a digital collectible.

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108 While pioneering, the project's activity has since paused, and it is no longer an active marketplace.

For its part, Roofstock handles the messy details—gathering documents, ensuring the property is debt-free, and even managing it for the first year—all for a 3% fee.

The final piece of the puzzle was the financing. The house sold for 175,000 USDC. The buyer was financed by USDC Homes, a startup focused on funding tokenized real estate[109]. After vetting the buyer's finances, they provided a loan for up to 80% of the property's value. It's worth noting that this groundbreaking transaction was, at the time, their first and only project[110].

Lingering Questions

So, why hasn't real estate tokenization completely taken over? This single transaction reveals the friction still slowing down the revolution. The most critical challenge remains the bridge between the physical and digital worlds.

For all the talk of cutting out the middleman, this deal was crowded with them. Blockchain promises disintermediation, but here we see a new cast of intermediaries taking the stage. This proves that many of the constraints of the physical world haven't vanished; they've simply migrated onto the blockchain.

The biggest trade-off? Anonymity. While the house's ownership became a fluid NFT, the ability to trade it is anything but. To buy or sell on Roofstock's platform, you must first pass a Know-Your-Customer (KYC) check—a process that firmly ties your real-world identity to your digital wallet.

Once approved, members are issued a "Soulbound" Token (SBT), a non-transferable NFT that acts as a digital passport for the platform. No SBT, no trading.

This walled-garden approach has a powerful upside: security. If a prop-

109 The venture was a proof-of-concept tied to the initial Roofstock sale and did not continue as an ongoing business, failing to finance any other known properties.

110 By September 2023, several more had occurred.

erty NFT is stolen—a huge risk in the digital world—Roofstock can simply issue a new one to the verified owner, the holder of the SBT. Is sacrificing the core crypto ideal of anonymity for this kind of safety net the perfect answer? Probably not. But it's a pragmatic solution for a world that still needs guardrails.

A Glimpse of the Future

Selling a three-bedroom house as an NFT and financing it with stablecoins was a watershed moment. It showed us what's possible when you translate real-world assets into digital tokens.

However, the layers of bureaucracy and the centralized checkpoints show there's a long road ahead. Still, this sale should be seen as a vital experiment. It provides a real-world blueprint, highlighting the problems we need to solve to make the process seamless.

Widespread adoption won't happen overnight. The path is filled with obstacles. But it's inspiring to see progress, however slow, pointing toward a more fluid and accessible future for everyone.

Chapter 6

What's Next for Web3?

Our journey through the architecture of Web3 has brought us to the final, most important question: What happens next?

Depending on when you're reading this, the hype around Web3 might feel like the dawn of a new age or a solution in search of a problem. This whiplash is normal for a technology this new. Outside of finance, Web3 is still finding its killer apps, which is why sentiment can swing from "world-changing" to "worthless" overnight.

The truth, as always, isn't in the headlines but in the space between the extremes.

Rather than get caught up in market speculation, we're going to focus on the fundamental technological shifts on the horizon. The projects we'll explore are the foundational layers—the bedrock upon which the future will be built.

To map out what's coming, we'll look at the road ahead in two stages. First, we'll examine the current critical period (2025-2026), which is seeing foundational technologies mature at a rapid pace. Then, we'll look further out, to the long-term evolution between 2026 and 2030.

Short-Term Expectations (2025-2026)

The next two years are about moving from promise to product. The core infrastructure of Web3 is maturing, shifting the spotlight onto user-facing

applications. For these projects, the singular measure of success will be achieving 'product-market fit.'

Infrastructure Has Nearly Arrived

The foundational layers of Web3 have been built over more than a decade. Bitcoin kicked things off in 2009, and Ethereum introduced the smart contracts that power the ecosystem in 2015. After a long period of infrastructure development, the first real products began to emerge around 2020. While the markets churned between 2022 and 2024[111], the underlying technology was quietly hardening.

For Web3 to go mainstream, its infrastructure must handle massive demand cheaply and quickly—without sacrificing the core principles of security and censorship resistance. To do that, the networks must break free from a few final constraints.

Tackling the Scaling Problem

The largest networks now have a clear roadmap for meeting future demand.

While Bitcoin was not designed for high throughput, a robust ecosystem of Layer 2 solutions has established itself to bring scalable applications to the network.

Ethereum's strategy is to delegate the heavy lifting to its own Layer 2 ecosystem. It's largely solved its scaling bottleneck, but the core protocol continues to evolve with a long-term plan[112] to make transactions even cheaper. When these Layer 2 networks win, Ethereum wins[113].

Meanwhile, networks like Solana are engineered for speed from day

111 For a detailed analysis of these crises, check the "Crisis 2022 Act I, II, and III" sections at the end of chapter four.

112 Ethereum Foundation, the organization that leads the research on Ethereum has gone through a major reorganization during the first half of 2025. It changed its leadership as well as announced 'Protocol' which narrows to organizations focus into three key areas: L1 and L2 scaling and user experience.

113 Check out our second chapter on Ethereum's Layer 2 solutions, "Layer 2 Solutions."

one[114]. Having already addressed the scaling challenge, Solana's primary task is proving it can become sufficiently decentralized[115].

Strengthening Security Infrastructure

Zero-knowledge proofs (ZK) are a technology that has come to define this new era of security. ZK is a cryptographic breakthrough that allows something to be verified as true without revealing the underlying information—a revolution for privacy, security, and scaling[116].

Layer 2 networks built with ZK technology (known as zk-rollups) can achieve incredible scale. Once considered too computationally expensive to be practical, recent advances have made ZK systems not just feasible, but increasingly common.

But security isn't just about cryptography; it's about trust. For an infrastructure to be trusted, it must be neutral. And in Web3, the only path to credible neutrality is decentralization. This is why the Ethereum ecosystem, in particular, is pushing its Layer 2 solutions to decentralize their operations more quickly.

Simplifying Cross-Chain Transfers

Not long ago, each blockchain was a digital island, isolated from the others. Transferring value between them was a slow and cumbersome process. For years, this was handled by "bridges[117]", many of which had smart contract flaws that led to catastrophic losses from 2020 to 2023.

The future of cross-chain transfers is moving away from clunky bridges toward more elegant solutions. A new model using user-defined 'intents' is gaining traction. Instead of manually bridging assets, a user simply declares

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114 Beyond Solana, other leading smart contract platforms include Aptos and Sui, which are built on the Move programming language. Avalanche remains a major Layer 1, while leading Ethereum Layer 2 networks like Base now rival many Layer 1s in user activity and transaction volume.

115 Solana claims it has sufficient decentralization and shows Nakamoto Coefficient of 20 as a proof for that.

116 Technically speaking, zero-knowledge proofs allow you to prove to someone else that you possess certain specific information without revealing what that information actually is.

117 You can find detailed information about bridges in the "Bridges" section of chapter two.

their goal (e.g., "I want to swap Asset X on this chain for Asset Y on that chain"), and a competitive market of solvers finds the most efficient and secure path. Meanwhile, Circle's CCTP is already live across multiple blockchains and rapidly being integrated into ecosystems.

Apps Designed for Everyday Users

With the foundations of Web3 now solid, the industry's focus is pivoting from building the basement to designing the living room. Investors are following suit, shifting their attention from core infrastructure to the applications that will finally deliver on Web3's promise for everyday users.

The next frontier for Web3 isn't code; it's design. For too long, using a crypto app has felt like taking an engineering exam, assuming users understand the technical plumbing. For this technology to reach its potential, the experience must become seamless.

You shouldn't need to know which blockchain you're on. You shouldn't have to write down a 12 or 24-word seed phrase and worry about where to hide it. Every action should feel intuitive, all managed through a simple, secure wallet[118]. That complexity has to disappear.

Web3 developers should look to FinTech as a powerful role model. Over the past decade, FinTech companies mastered the art of hiding the complexities of traditional banking behind elegant, user-friendly interfaces. Web3 must do the same[119].

How Will Regulations Shape Web3?

Widespread adoption can't happen in a vacuum. Clear, intelligent regulation is the final piece of the puzzle. In the near term, regulatory attention is focusing around two key areas: the custody of digital assets and the rules governing stablecoins. Broader questions about decentralized systems will

118 To learn about wallets, which are critical for Web3 adoption, please visit the "Wallets" section in chapter two.

119 The previously popular app Friendtech, now closed, provides an insightful case study.

likely follow, but getting the basics right is the first order of business.

In the United States, the engine of both technology and finance, the political winds have shifted. With the Republican party securing the presidency and majorities in both the Senate and House in the recent elections, the industry anticipates a friendlier regulatory approach. This has cleared a path for long-awaited legislation, with a bill focused on stablecoins— the GENIUS Act passed Congress and was signed in mid-July 2025. Further legislation addressing broader crypto regulation is still moving through Congress[120].

Across the Atlantic, the European Union is implementing its landmark Markets in the Crypto-Assets (MiCA) framework, creating a unified rulebook for its member states. For now, MiCA's primary focus is on regulating token issuers and asset custodians within the EU. It notably leaves most of the DeFi and NFT space for a later regulatory phase.

Which Web3 Areas Will Thrive First?

Widespread adoption will follow the path of least resistance, which means the first major impacts of Web3 will be felt in fully digital sectors. The growth here will advance on two fronts.

Embracing Fully Digital Sectors

First, expect rapid evolution in digitally-native industries like gaming and AI, which are natural fits for Web3's architecture. The second front will be the tokenization of real-world assets. Because they aren't tied to any physical object, securities are the lowest-hanging fruit, and we'll see this area grow quickly as platforms make it easier to trade digital representations of traditional financial assets.

DeFi, Web3's pioneering sector, will continue its steady march. Its role will be less about being the star of the show and more about being the essential plumbing that enables growth in all the other sectors it serves.

We'll likely see DeFi protocols packaged and offered to users through familiar, centralized interfaces. Large financial institutions will probably wait on

120 Additionally, a market structure bill called CLARITY act has passed the House of Representatives with Democratic support and is now moving in the Senate.

the sidelines for complete regulatory clarity. Instead, nimble fintech companies and digital neo-banks will carry the flag. The "fintech in front, DeFi behind" model—where a slick user interface is powered by decentralized rails—is set to become the dominant strategy.

Gaming and social media have yet to produce a durable, long-term hit, but recent experiments prove the model is getting closer. Apps like Friendtech and the Telegram-based game Hamster Kombat successfully onboarded millions of users by hiding the usual wallet complexities. By abstracting away the friction, they created short-term, high-activity ecosystems. These experiences are crucial learning moments, increasing the odds that a breakout success is just around the corner.

In contrast, sectors that rely on physical hardware, like the Metaverse and Decentralized Physical Infrastructure Networks (DePIN), have a much longer road ahead. Their development is tied to the pace of real-world manufacturing and deployment, a timeline measured in years, not months.

Finding Product-Market Fit

For all the technological progress, a hard truth remains: most Web3 applications haven't yet found true product-market fit. This challenge—moving from a clever idea to an indispensable product—will be the central drama of the next few years.

But even in this crowded and noisy market, a few clear signals have broken through. These are the areas where Web3 isn't just a promise; it's a utility.

- **Stablecoins:** This is perhaps Web3's most undeniable success. For millions of people, especially in developing nations, dollar-backed stablecoins aren't a speculation—they are a lifeline. They offer an escape from hyperinflation and a way to send money across borders without the friction and expense of the traditional banking system.
- **Decentralized Finance:** DeFi has achieved a powerful, if partial, fit. While many financial products are still geared toward speculation, its core engine has proven its worth. The ability to borrow against your digital assets is a clear bright spot, offering a new kind of capital market. It's a powerful machine, even if it's still mostly used on the racetrack.

- **Prediction Markets:** Once a niche hobby, prediction markets have become a powerful new form of information discovery, gaining significant traction around major global events like the US presidential elections. By being open to anyone, anywhere, they can react to developments with astonishing speed. Their newfound relevance is clear: even traditional news outlets now watch these markets as a real-time sentiment gauge.

What's Ahead for Web3 in the Long Term?

Peering into the long-term future is notoriously difficult. The technology landscape shifts so fast that today's bold prediction can be tomorrow's punchline. Still, by tracing the trajectory of today's most powerful trends, we can outline a sketch of what's to come:

- By 2026, the market's center of gravity will shift from individual enthusiasts to institutional capital.
- CeDeFi will be the common model for financial services. You'll use your favorite banking app, but its most innovative products will run on DeFi protocols in the background, making decentralized finance both invisible and mainstream.
- Tokenization will expand beyond securities into the physical world, as legal frameworks and new infrastructure unlock the ability to represent real-world assets on-chain.
- The wallet will become the only interface that matters. Users won't know or care which network they're on; the wallet will manage risk and use 'intents' to execute their goals seamlessly in the background.
- A true breakthrough in the metaverse will arrive, but only after the hardware challenges are solved—a reminder that progress with atoms is always slower than progress with bits.
- Core infrastructure will be upgraded to become quantum-resistant, a necessary evolution to secure the network against future threats.
- Successful DAO governance models will mature, becoming powerful vehicles for funding ambitious projects in decentralized science (DeSci) and physical infrastructure (DePIN). Don't be surprised to one day see

a DAO rank among the world's largest institutions.

- By 2028, the conversation will be dominated by one thing: AI. The central conflict will be the hegemony of Big Tech versus a new wave of decentralized, Web3-native AI projects.
- The fusion of AI and blockchain technology will create entirely new industries we can't yet imagine.
- The world will have one billion Web3 users by 2030, a number that could be multiplied by AI agents acting as network participants.
- Autonomous AI agents will become the primary users of Web3. Humans may initiate only 10% of the network's transactions; the rest will be executed 24/7 by tireless agents whose only need is electricity.

WEB3

UNLOCKED

In Web3 Unlocked, Turan Sert steps back from the daily noise to map this new territory. He unpacks the machinery of the ownership economy and offers a clear guide for anyone trying to make sense of what comes next.

Inside, you will explore:

The Evolution: How we moved from the open protocols of the early web, through the commercialization of Web 2.0, to the digital property rights of today.

The Engines: The distinct philosophies driving the new economy, including the competing architectures of Ethereum, Bitcoin, and Solana.

The Mechanics: A look under the hood at tokenomics, the debate between modular and monolithic blockchains, and the critical role of stablecoins.

The Landscape: The frontiers of digital identity, NFTs, the metaverse, and Decentralized Finance.

Whether you are new to crypto or looking to go deeper, this book shows you the full picture. Don't stand on the sidelines. Own the future.

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