



The DeFi wave is approaching

How institutions can navigate this new form of financial intermediation



Building a better
working world

In brief

- ▶ Decentralized finance (“DeFi”) is a broad term that refers to various applications of blockchain and cryptocurrency technologies that are aimed at transforming the current centralized global financial infrastructure by introducing a new internet-based decentralized model for financial interactions with less reliance and trust on centralized financial intermediaries.
- ▶ DeFi has grown significantly over the past few years and is likely to present traditional financial institutions with a series of growth opportunities, while also threatening existing financial services they offer and their core business models.
- ▶ How institutions respond to this new form of decentralized autonomous financial intermediation will impact their role in the coming evolution of the global financial system.
- ▶ While DeFi is still in the early stages of adoption there are still opportunities to help shape the ecosystem and become market leaders. Traditional and centralized finance firms should decide where they are best positioned to participate and contribute to proactively address the risk that this market innovation presents to their business models.



Background

Over the past year, the digital assets and cryptocurrency industry has evolved rapidly. Major milestones were achieved, including the entrance of large institutions, such as PayPal facilitating purchases and sales of cryptocurrencies,¹ global custodial banks outlining plans to offer digital asset services,² VISA accepting USD coin (USDC) as a form of payment,³ and a number of institutions like MicroStrategy and Tesla adding cryptocurrency to their balance sheet.⁴ Further, central banks continued to explore the possibility of central bank digital currencies (CBDCs), with an estimated 80% currently researching or piloting some form of a CBDC.⁵

While these important examples above have undoubtedly pushed the digital asset and cryptocurrency ecosystem forward, the meteoric adoption of DeFi led by the digital native firms and retail investors in the last year may be the most impactful development to date. DeFi has the potential to impact the underpinnings of the broader financial system by redesigning the fundamental infrastructure used to facilitate payments, lending, investing and more.

The DeFi ecosystem grew from less than \$1 billion in total value locked (TVL)⁶ to \$86 billion in May of 2021⁷ and produced all-time high protocol-based revenues, totaling more than \$370 million during May, with the top revenue generator being Uniswap, a decentralized exchange that returned approximately \$154 million⁸ in protocol-based revenues to liquidity providers (LPs).

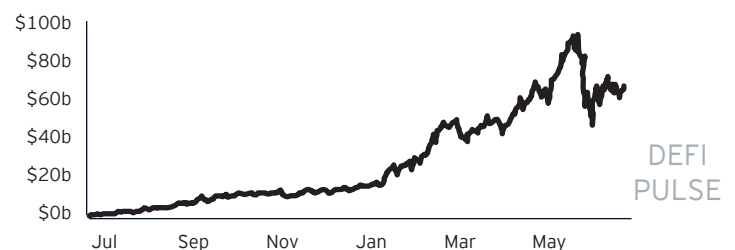
1 PayPal Launches New Service Enabling Users to Buy, Hold and Sell Cryptocurrency, *PayPal Newsroom website*, October 21, 2020 (updated November 2020), <https://newsroom.paypal-corp.com/2020-10-21-PayPal-Launches-New-Service-Enabling-Users-to-Buy-Hold-and-Sell-Cryptocurrency>

2 BNY Mellon Forms New Digital Assets Unit to Build Industry's First Multi-Asset Digital Platform, *BNY Mellon website*, February 11, 2021, <https://www.bnymellon.com/us/en/about-us/newsroom/press-release/bny-mellon-forms-new-digital-assets-unit-to-build-industrypercent27s-first-multi-asset-digital-platform-130169.html>

Total value locked (USD) in DeFi

TVL (USD) | ETH | BTC

All | Year | 90-day | 30-day



The growth of DeFi has profound implications for the global financial system and how institutions, regulators, investors and individuals interact around the world. Areas such as decentralized governance, scalability, regulation, credit, identity, and interoperability are still unfolding, but the foundation and framework of the ecosystem have been established and are continuing to evolve rapidly.

3 Visa Becomes First Major Payments Network to Settle Transactions in USD Coin (USDC), *Visa USA website*, March 29, 2021, <https://usa.visa.com/about-visa/newsroom/press-releases.releaseid.17821.html>

4 <https://bitcointreasuries.net/>

5 Infrastructure and Design of Central Bank Digital Currencies (report), *Bison Trails website*, <https://bisontrails.co/cbdc/>

6 A common metric that aims to track the growth of DeFi via the US dollar-denominated value of cryptocurrencies and digital assets that are locked in smart contracts, primarily on top of the Ethereum blockchain

7 <https://defipulse.com/>

8 DeFi protocols generated more than \$370 million in revenue during May, *CoinMarketCap website*, June 1, 2021, <https://coinmarketcap.com/headlines/news/defi-protocols-ethereum-may-revenue/>

Defining DeFi

Decentralized Finance, DeFi for short, is the term given to decentralized applications (DApps) built on public blockchain infrastructure that facilitate financial transactions. Projects considered DeFi are typically open source, highly interoperable, internet-based protocol stacks that leverage smart contracts built on public blockchains, such as the Ethereum (ETH) blockchain, to execute financial services functions.

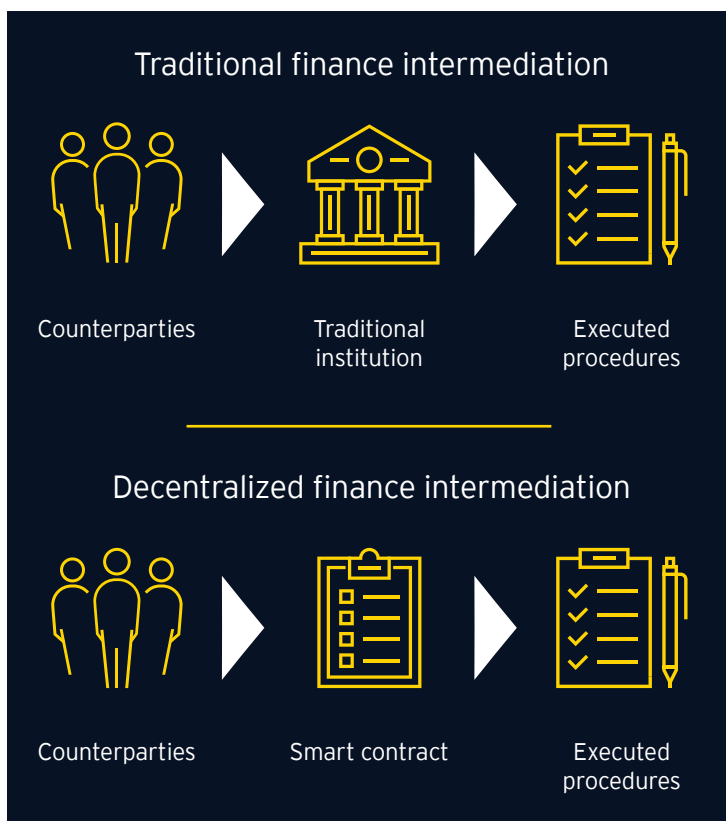
It is important to understand how and why public blockchains that facilitate smart contracts, like Ethereum, are a critical component of DeFi. Smart contracts are code on a blockchain platform that automatically perform actions, pursuant to terms of an agreement, without the need for an intermediary to facilitate execution. For example, a smart contract could be programmed to exchange a certain amount of currency for another, between two counterparties. If the smart contract code verifies that the required currency from each counterparty has been provisioned, it will execute the transaction, thus eliminating the need for third parties to facilitate the transaction. Once deployed, these smart contracts are immutable and transparent to anyone.

DeFi paradigm shift

At first glance, this may not appear to be a tectonic shift in financial intermediation given individuals have been able to exchange cash/coins without an intermediary for hundreds of years. However, if you apply this “cash exchange” peer-to-peer model on a global basis to more forms of financial transaction that require an intermediary today (e.g., collateralized lending, interest-bearing deposits or investment portfolio management), the potential impacts to the existing global financial system and its intermediaries can become significant. DeFi enables the ability for individuals to retain control over their assets and have the financial freedom to execute financial transactions without the need to rely on an intermediary. This does not mean that individuals will no longer need financial guidance or that traditional financial institutions will become obsolete overnight, but the way individuals and institutions interact within the financial system could look very different in the future.

DeFi also has the potential to impact business-to-business interactions. As institutions begin to plug into the blockchain ecosystem and the tokenization of assets such as derivatives and securities continues to mature, there is potential for smart-contract-based decentralized applications to act as intermediaries between institutions. An example of this would be if instead of clearing trades through brokers or exchanges, institutions are able to instantaneously trade tokenized securities in an open marketplace facilitated by smart contracts on the internet.

The scope and breadth of decentralized finance is still expanding, and many DeFi applications are still working to find product-market fit, but any financial interaction between two parties that requires an intermediary today has the potential to be facilitated via a decentralized application using smart contracts in the future.



Existing market players

Current services offered by DeFi platforms largely focus on replicating existing financial service offerings, including but not limited to lending, borrowing, exchanging, insuring, and pricing of digital assets. There are also novel financial innovations such as flash loans and autonomous liquidity pools. Through June 2021, total value locked or “TVL”, a measure of the value of digital assets locked in smart contracts on the protocols, peaked at approximately \$86 billion, according to DeFi Pulse.⁹ This value was across various protocols and categories with the largest share being held on lending platforms. As of June 22, the total value locked across categories and for a subset of DeFi protocols is illustrated here (as excerpted from defipulse.com).

Category	Example DeFi protocols	TVL (\$ billions)
Lending	Maker, Aave, Compound, InstaDApp, Liquidity	29.3b
Payments	Flexa	1.5b
Exchange	Curve Finance, Uniswap, SushiSwap	13.8b
Derivatives trading	Synthetix	0.7b
Insurance	Nexus Mutual	0.3b
Asset management	yearn.finance	3.9b

⁹ As of September 6, 2021, this number had increased to \$98 billion.

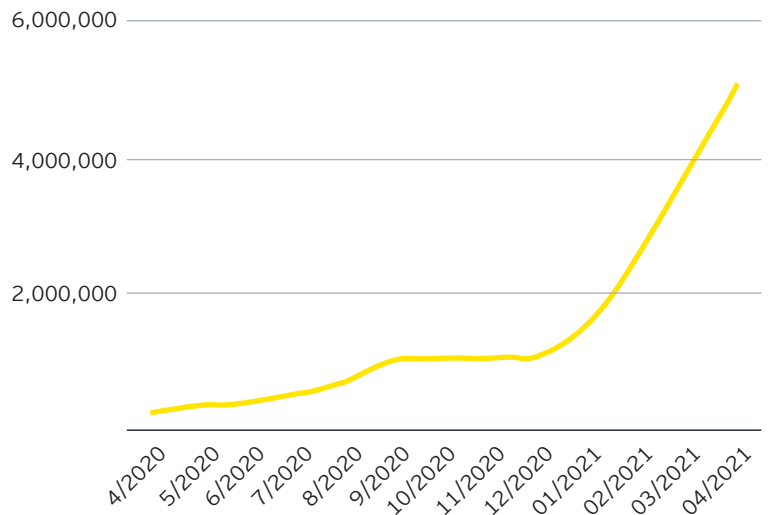


DeFi adoption

Wallets and user interfaces

Although many popular DeFi applications have been deployed since 2017, the tremendous spike in DeFi users and transaction volume did not occur until 2020. One hurdle to widespread DeFi adoption was the amount of technical background required to get comfortable transacting with DeFi protocols, until recently it was complex to use and manage individual wallets. However, when DeFi development matured, the experience became more user friendly when applications began to look and feel like existing internet websites and wallet providers enhanced user interfaces to facilitate interacting with multiple DeFi protocols. For example, MetaMask offers an internet-based wallet or “hot wallet” that can be downloaded through a web browser and is fully compatible with exchanges and DApps on the Ethereum blockchain. By Q1 2021, MetaMask was hosting more than 5 million wallets, approximately a 500% increase over the previous six months,¹⁰ as illustrated in the graph below, and extended their wallet service to mobile devices.¹¹

MetaMask monthly active users

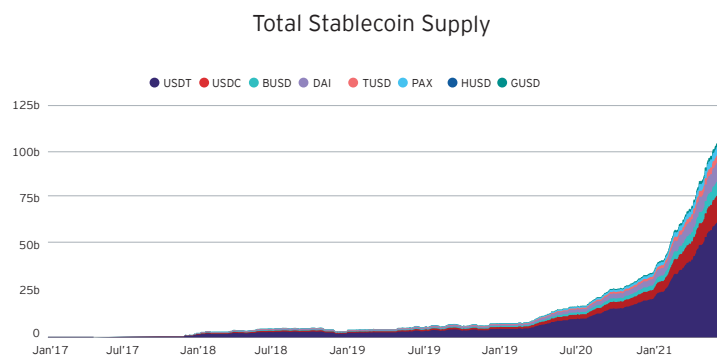


¹⁰ MetaMask Surpasses 5 Million Monthly Active Users, ConsenSys website, April 27, 2021, <https://consensys.net/blog/metamask/metamask-surpasses-5-million-monthly-active-users/>

¹¹ As of August 2021 Metamask surpassed 10 million monthly active users. <https://consensys.net/blog/press-release/metamask-surpasses-10-million-maus-making-it-the-worlds-leading-non-custodial-crypto-wallet/>

Stablecoins

Another crucial innovation serving as a catalyst to DeFi adoption has been the advent of “stablecoins.” In order to build a tiered financial system, there must be a stable unit of account. Historically, cryptocurrencies were considered too volatile to facilitate financial transactions other than for speculative trading. The answer to this problem came in the form of “stablecoins,” which are assets that utilize either complex algorithms (as with Dai) or legal relationships with a trusted centralized entity (as with USDC) to peg their market value to an external (off-blockchain) reference (such as a fiat currency). Stablecoins act as the stable unit of account that allows for more complex financial transactions and derivatives to occur. There was tremendous growth in stablecoins beginning in 2020 and continuing into 2021, topping the \$100 billion mark in May of 2021. Another factor on the horizon that may provide an additional building block to DeFi applications are CBDCs. As CBDCs enter the mainstream they can act as another source of stable value and liquidity that can be plugged into these existing DeFi protocols.



Source: <https://www.theblockcrypto.com/data/crypto-markets/spot>

Composability

DeFi platforms continue to rapidly innovate, expand service offerings, and act as catalysts for one another. The interoperability of tokens across protocols, due to the adoption of the ERC-20 token standard for Ethereum-based tokens, has simplified the development of platforms and allowed users the ability to seamlessly move tokens between protocols. In addition to the horizontal capabilities of moving tokens between protocols, a key component of DeFi has been the ability to stack protocols vertically to create new avenues for innovation (compound innovation). For example, users can stake Maker (MKR) tokens from the MakerDao¹² protocol on the Synthetix¹³ protocol to allow for the issuance of a derivative asset that mirrors the price of MKR. Given this interoperability, protocol dashboards, or “aggregators,” like InstaDApp.io and Zapper.fi, have been developed that enable additional tools and interfaces to interact with various DeFi protocols all in one place.

Governance

Another area where notable improvements were made on DeFi protocols in 2020 is governance. Each DeFi protocol aims to minimize the amount of centralized authority that any one user can have over the protocol. Most protocols currently maintain some degree of centralization and are managed by a group of users that vote via a digital token to facilitate changes or updates to the protocol. A platform that is fully decentralized and purely governed by the source code is called a decentralized autonomous organization (DAO). There are inherent risks in a fully decentralized environment, including bugs or hacks, but there are also tremendous efficiencies and benefits to be gained if implemented correctly. These protocols and networks do not appear to be going away. As more individuals and institutions begin to participate, trust in these networks will grow, as seen with Bitcoin (BTC) over the previous 12 years. Like early internet companies, some may succeed, some may not, but all will contribute to propelling financial technology forward.

¹² MakerDao website, <https://makerdao.com/en/>

¹³ <https://synthetix.io/>

The DeFi opportunity

There has been tremendous growth and innovation in decentralized finance, mainly driven by private companies, individuals, hedge funds, and venture capitalists. Despite these significant achievements, compared to the size of the existing global financial system, there is still significant room for growth. DeFi is still in the early stages of innovation. Institutions will likely play a prominent role in developing the DeFi ecosystem and expanding the number of use cases. They may also look to leverage DeFi protocols to take advantage of financial opportunities and/or increase resource efficiencies. While not exhaustive, some current opportunities for institutions to participate in DeFi include the following:

- ▶ **Access** – Provide access to DeFi services for individuals with more robust customer service and a secure custody solution
- ▶ **Trust** – Participate in governance to add a layer of assurance that protocols are operating effectively and efficiently
- ▶ **Liquidity** – Provide liquidity to protocols as a source of revenue or leverage protocols to manage liquidity needs
- ▶ **Innovation** – Build on and improve existing protocols and services offered by utilizing industry knowledge and expertise

Access and trust

DeFi currently lacks the historical precedence needed to create a foundation of trust. Traditional financial institutions have built trust over decades of boom-and-bust economic cycles, creating some of the most stringent market standards and practices of any industry. This trust and existing network are the greatest assets that traditional financial institutions can bring to DeFi. If institutions are able to build on existing platforms that users are familiar with – for example, existing banking applications – to incorporate the array of financial products offered by DeFi, they could serve as an efficient on-ramp for individuals into the digital asset ecosystem. This would allow institutions to retain existing client bases, offer new services, provide enhanced customer service, and create new revenue opportunities. Additionally, as the number of users on DeFi protocols grows, the governance and maintenance of these protocols will become more vital. Institutional participation in governance could provide a layer of expertise and accountability that enhances the reliance on these protocols.



Liquidity

DeFi protocols are currently being used by digital asset native institutions for swapping between different digital assets to assist with liquidity needs. As tokenization of assets grows, the pools of liquidity could expand beyond cryptocurrencies to include tokenized versions of real-world assets as well. These pools would have a global reach and be accessible to anyone with an internet connection. Institutions able to access these pools or marketplaces would have an unprecedented ability to access liquidity and trade across a spectrum of assets, unlocking capital, and enhancing flexibility. Institutions can also become liquidity providers to generate additional revenue. Adding liquidity to protocols in some cases entitles the provider to a percentage of each token swap fee. The fee amount allocated to each provider is based on the proportion of liquidity that was provided into the liquidity pool. Institutions could also interact with lending protocols to generate yield in the form of interest payments for providing liquidity to borrowers, as well as providing protocols with liquidity via staking to receive staking reward payments.

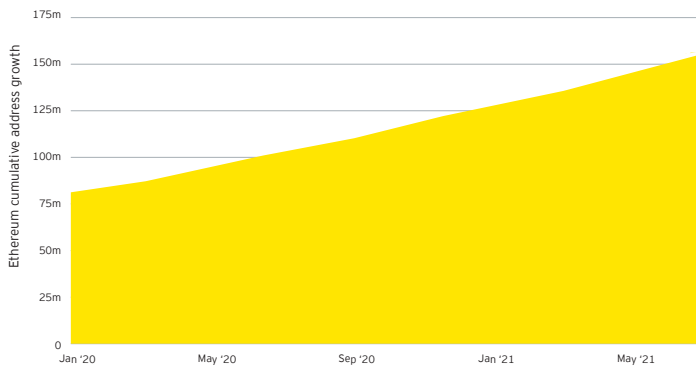
Innovation and growth opportunities

While digital asset native institutions and traders currently interact with DeFi protocols, the widespread adoption by retail consumers has not taken place. The number of individuals holding cryptocurrencies and digital assets has continued to rise with approximately 21.2 million¹⁴ adults in the US owning some form of cryptocurrency according to Gemini, a US-based crypto exchange. Ethereum addresses alone have grown by 57% in the past year to more than 154 million unique addresses as illustrated in the graph below.

As of December 2020, it was estimated that less than 1% of these addresses interacted with DeFi protocols,¹⁵ which demonstrates there is a significant amount of growth left to come in DeFi. If an entity can provide users with a one-stop shop of DeFi alternative investment options across various blockchains with a friendly user interface, serve as an initial identity screener (KYC/AML), provide an efficient on-/off-ramp between traditional and new infrastructure, and connect users to the broader blockchain ecosystem (exchanges, marketplaces, and blockchain applications), they would be a critical component in the emerging decentralized economy.

Ethereum unique addresses chart

Source: Etherscan.io



14 State of Crypto: 2021 US Report, Gemini website, 2021, <https://www.gemini.com/state-of-us-crypto>

15 DeFi Hits 1 Million Users, Ethereum Usage Surging, Crypto Briefing website, December 5, 2020, <https://cryptobriefing.com/defi-million-users-ethereum-surging/>

DeFi challenges

With any nascent technology or innovation there are several obstacles to overcome – DeFi is no different. There are concerns surrounding regulatory uncertainty, scalability of public blockchains, security and technology risks (software bugs and hacks), governance of decentralized applications and several others. Private companies, regulators, developers, and public officials are all working to address these concerns, but given the depth and breadth of DeFi, it will take time.

Regulation

Regulatory uncertainty is one of the most significant challenges in the digital asset and cryptocurrency space. Regulators are in the process of understanding how the public blockchain and decentralized finance ecosystem work in order to develop guard rails that protect individual consumers and investors but do not inhibit innovation and growth. This requires coordination between regulatory bodies within jurisdictions (i.e., the Office of the Comptroller of the Currency, the Securities and Exchange Commission, and the Commodity Futures Trading Commission) as well as across jurisdictions (i.e., the Bank of International Settlements or the Financial Action Task Force (FATF)). DeFi presents this challenge in a unique way given its activities are not confined to individual institutions, intermediaries, or jurisdictions that can be regulated in silos. If done correctly, regulation can protect users and still facilitate growth by setting clear boundaries and expectations that allow for developers and entities to build and interact without regulatory concerns. Institutions looking to interact or participate in DeFi will

need to develop policies and procedures around monitoring regulatory updates to achieve compliance across local and global jurisdictions.

Anti-Money Laundering/Know Your Customer

The largest unknown in DeFi relates to the current lack of anti-money laundering/know your customer (AML/KYC) guidance or framework. Proposed guidance by the FATF seeks to provide clarity around how institutions interacting with DeFi applications should consider AML/KYC requirements but there are still significant factors that need to be clarified.¹⁶ Given DeFi's unique and complex services, regulatory clarity will likely take time to evolve.

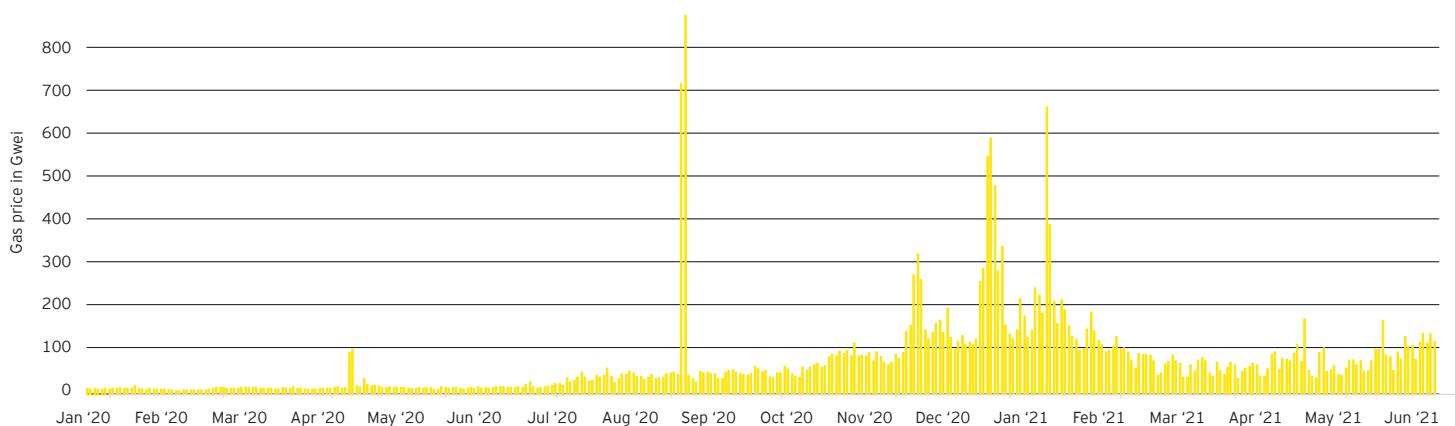
Scalability

As noted above, the majority of the DeFi applications are built on the Ethereum blockchain. As the number of users and activity on the network has grown, this has given rise to concerns around the scalability of the network. In order to transact on the network, participants must pay a fee, frequently referred to as a "gas fee," for their transaction to be processed. During times of high demand and transaction volumes, these fees can rise significantly and impact a user's ability and willingness to transact. The chart below from Etherscan, an Ethereum blockchain explorer, demonstrates the volatility in gas prices in 2020.

¹⁶ Virtual Assets and Virtual Asset Service Providers, Financial Action Task Force website, <https://www.fatf-gafi.org/media/fatf/documents/recommendations/RBA-VA-VASPs.pdf>

Ethereum average gas price chart

Source: Etherscan.io



For Ethereum to scale and reach widespread adoption, it will have to provide a solution that is able to facilitate a high volume of transactions and demand that is feasible for individuals and institutions participating on the network. Ethereum has the largest developer base of any blockchain in the cryptocurrency space, and transaction fees along with scalability have been cited as primary goals of ETH 2.0 and EIP (Ethereum Improvement Proposal) 1559 upgrades. Additionally, several Layer 2 solutions are being developed to provide scaling opportunities. The industry is highly competitive and other blockchains are offering lower fees and faster transactions as an incentive to switch blockchains.

Security

In 2020, 17 major exploits and hacks took place related to DeFi protocols, resulting in the loss of \$154 million.¹⁷ As of May 2021, this number had already been surpassed, with roughly \$156 million stolen from DeFi protocols.¹⁸ While alarming at face value, this is still less than 1% of the TVL in DeFi and a small amount compared to the overall losses recorded by corporations today due to cybercrime. According to McAfee, an American global computer security software company, estimated global losses from all cybercrime to date, totaled over \$1 trillion.¹⁹ Most of the hacks related to cryptocurrencies result from either a weakness in the smart contract source code that is exploited by a malicious actor or an inherent design feature that allows an individual the ability to syphon or withdraw user assets at

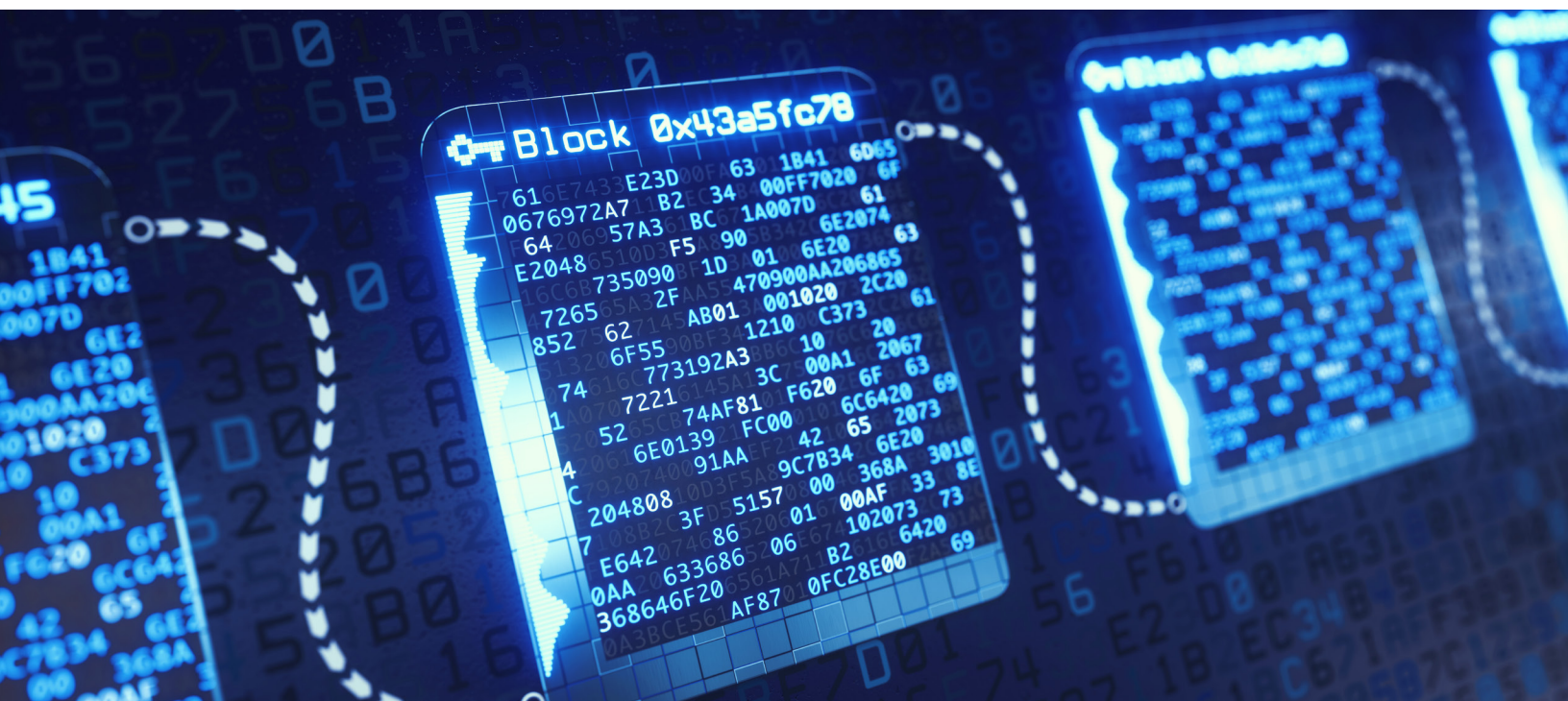
their discretion. In both cases, a thorough review of the smart contracts and protocol could mitigate a substantial amount of the risk.

There are no perfect measurements for system risk in DeFi applications, security audit results, amount of time running without significant bugs or hacks, and the track record and quality of the developer teams are all good places to start to assess the risks present in individual DeFi applications and smart contracts. This presents an opportunity for private companies to step in and provide third-party reviews, full unit tests coverage, smart contract security audits, and other forms of assurance that can enhance the reliability of the smart contracts and protocols. There have already been significant investments in building out smart contract review capabilities by companies such as EY and Consensys, as well as a number of others. With the assistance of experts from the space, controls and standards can be put into place to minimize the operational risk that retail users face when participating in DeFi.

17 The DeFi hacks of 2020, CoinGeek website, December 31, 2020, <https://coingeek.com/the-defi-hacks-of-2020/>

18 \$156 Million Stolen in DeFi Hacks This Year: CipherTrace, Decrypt website, May 13, 2021, <https://decrypt.co/70690/defi-hacks-2021-ciphertrace-report>

19 New McAfee Report Estimates Global Cybercrime Losses to Exceed \$1 Trillion, McAfee website, December 7, 2020, https://www.mcafee.com/enterprise/en-us/about/newsroom/press-releases/press-release.html?news_id=6859bd8c-9304-4147-bdab-32b35457e629



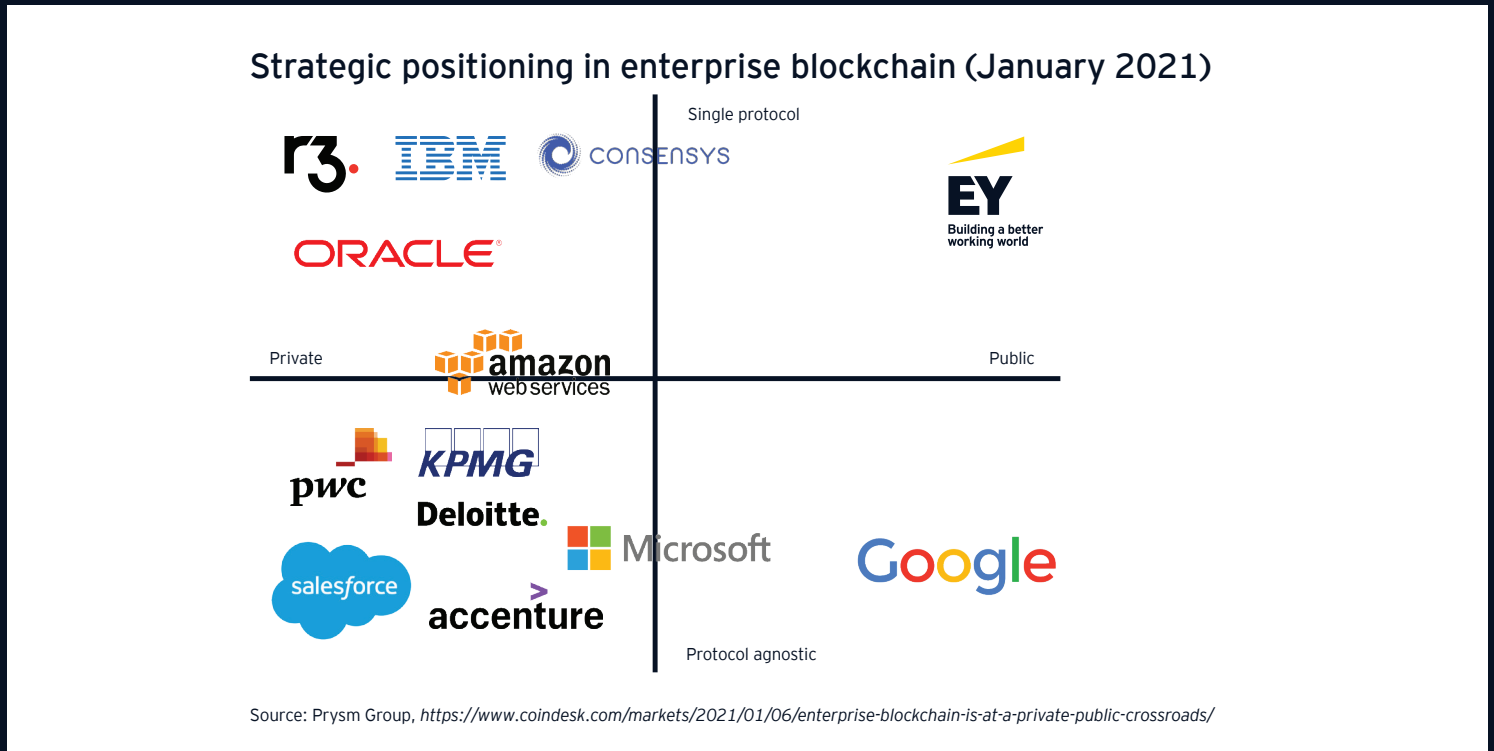


In conclusion

The evolution of internet-based digital assets and finance (AKA Internet 3.0) has been compared to the adoption of the internet, the widespread use of over-the-counter (OTC) derivatives, and various significant milestones in the evolution of money and currencies. Institutions must determine the extent to which they will participate in DeFi. There are challenges and risks to participating, as discussed in this paper, but there are also competitive risks associated with not participating as this new model of financial intermediation continues to evolve rapidly.

How EY can help

We have extensive knowledge and are considered a “world leader” in developing and promoting cutting-edge blockchain technology. For example, together with its partners, EY has developed and released into the public domain several zero-knowledge proof protocols (such as Nightfall and Baseline).



To date, we have provided traditional financial service organizations and digital asset natives a broad array of blockchain services. These services include:

- ▶ Design and implement custody solutions, including wallet, key, and storage considerations
- ▶ Provide guidance on tokenization development
- ▶ Design, develop, and review smart contracts
- ▶ Develop policies and controls frameworks specific to digital assets
- ▶ Design and implement integration capabilities with existing systems
- ▶ Perform attestations and audits of digital assets
- ▶ Perform due diligence assessments of digital assets
- ▶ Provide guidance on tax implications and filings
- ▶ Provide guidance to establish blockchain and cryptocurrency product strategy

We have invested heavily to develop internal tools compatible with blockchains, such as analyzers and a smart contract review tool, while also aiding firms in building and securing their own tools. We have worked with crypto native companies, such as exchanges, DeFi protocol foundations, wallet providers, and banks, in addition to working with traditional institutions. In addition to our blockchain qualifications, we have broad experience across the traditional banking and capital markets value chain. With this unique perspective we can be a critical strategic partner in your broad digital assets journey or as you assess the threats and opportunities of DeFi specifically.

For additional details on the services and tools available, refer to blockchain.ey.com or reach out to the authors of this piece.

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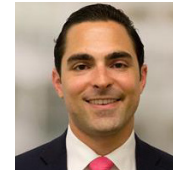
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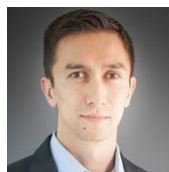
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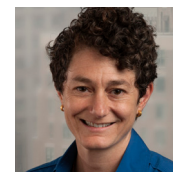
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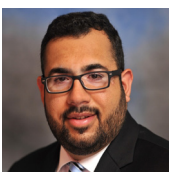
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