

Special Commentary

from the Investment Advisory Group

Plain talk about Smart Contracts, Ethereum, the “Merge” and why it matters

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Key highlights

- Smart contracts perform the same intended function as paper contracts helping buyers and sellers exchange property, goods, and services at agreed upon terms in agreed upon currencies.
- Smart contract software utilizes blockchain technology to enforce contract execution without involving a middleman or centralized authority required by a paper contract.
- Ethereum is the largest smart contract platform and its native token, ether, is the 2nd largest digital asset. If it was a stock, it would be the 28th largest S&P 500 company, just ahead of Disney.⁽¹⁾
- The “Merge” brings together two parallel transaction validation methods and is the first of many future Ethereum upgrades designed to improve performance.

Summary

This paper offers “jargon-free” guidance providing a high-level understanding of smart contracts and Ethereum. We use concise examples, distilling the complex “crypto-speak” vocabulary of digital assets into simpler terms. We’ll offer context and clarity around this week’s widely publicized “Ethereum Merge”, a software upgrade that is the first of many future steps to secure Ethereum’s status as the dominant smart contract platform. The “Merge” represents one of the biggest moments in the short history of digital assets and provides an opportunity to continue the learning journey for this nascent asset class.

Below we:

- Define smart contracts differentiating their decentralized functionality from the centralized nature of traditional paper contracts by removing the middleman.
- Explain the mechanics of decentralized transaction validation in common sense terminology, differentiating it from centralized transaction settlement.
- Introduce Ethereum’s prominence in the digital asset ecosystem and its dominance within the smart contract sector, the crypto super-highway.
- Illustrate that the “Merge” is simply a software conversion where old and new systems run in parallel to test them prior to “merging” into the upgraded platform.
- Differentiate between the “proof-of-work” mining and “proof-of-stake” validation consensus mechanisms in smart contract transaction settlement.
- Offer potential future paths and implications.

Smart contract primer

Smart contracts perform the same intended function as paper contracts helping buyers and sellers exchange property, goods, and services at agreed upon terms in agreed upon currencies. They are computer programs (software) stored on blockchain ledgers that automatically execute the terms of a contract between a buyer and seller once pre-defined conditions have been met. Upon settlement, the seller receives payment usually in ether (the native crypto token for the Ethereum blockchain) or a stablecoin. Smart Contracts are a fast, secure and decentralized way to effect digital asset business and financial transactions. They are the new information super highway and critically important to other decentralized crypto applications (DApps) that depend on them to function.

Past performance does not guarantee future results.

Investing in speculative investments, like those related to cryptocurrency, involves a high degree of risk and is not suitable for all investors.

Investment and Insurance Products:

- Are not FDIC or any other Government Agency Insured
- Are not Bank Guaranteed
- May Lose Value

Key concept: decentralized vs centralized

Decentralization simply means that the services of a middleman or intermediary, such as an attorney or financial institution, are not required to set the terms of an agreement or enforce its execution. Decentralization is at the heart of crypto assets and dates to Bitcoin's October 31, 2008 launch when it stated in its white paper:

"...any two willing parties to transact directly with each other without the need for a trusted third party."

In this case, the third party reference was to the U.S. banking system. The reliance on decentralization was born from the Bitcoin creator's distrust of the Federal Reserve at the heights of panic during the great Financial Crisis in 2008 and has become a central tenet of most public blockchain projects and cryptocurrencies. Below are some of the key differentiators between smart contracts utilizing blockchain technology and traditional paper contracts.

Feature	Smart Contracts	Traditional Contracts
Decentralized	Yes	No
Intermediary involvement	No	Yes
Objectivity	Yes. Once conditions of the mathematic formula in the computer program are met, the contract is enforced.	Yes and no. Contract interpretation, execution and enforcement could be subject to interpretation.
Relationship of trust	No. Smart contracts are trustless where trust lies in the computer code itself not another entity.	Yes. There is a human element of trust between two parties entering into a contract with legal consequences for violating that trust.
Transparent	Yes. Blockchain is typically append only without prior transaction reversals or revisions.	Typically, but more prone to human judgment and manipulation.
Unique risks	Errors in computer code could subject it to hacks.	Greater counterparty risk due to issues with trust.
Currency paid to seller in financial contracts	For the Ethereum blockchain, typically ether or an agreed upon stablecoin.	Fiat currency such as the U.S. dollar or Euro.

This comparison is not intended to condemn traditional contracts or endorse smart contracts, but rather illustrate their differences. Each is well suited for satisfying the enforcement of a specific transaction depending on the situation, the desired outcome and transactional complexity.

Two real world examples

The Vending Machine: Like smart contracts, vending machines don't require a human relationship or an intermediary to execute a transaction. The vending machine is programmed with code to dispense a product (like a candy bar) for a defined currency in a specified amount. The transaction only executes when both the correct code is entered, and the correct amount of currency is inserted.

Microsoft Excel: Smart contracts operate similarly to Excel's "If/Then" function. If a user is seeking to identify a desired value or outcome, they program the desired conditions into the program such that "if" a particular condition is met, "then" a sought-after outcome results.

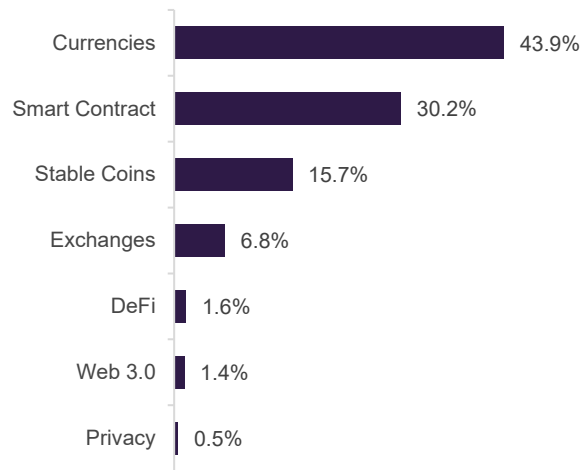
Smart contracts as a digital asset sector

Digital assets remain in their nascent developmental stage, having only existed since 2008. They are a high risk, growth asset and have gained traction as an asset class. As they mature, the investment community may increasingly apply a similar lens to them that it applies to common stocks by segregating them into sectors.

Among the various digital asset sectors, the smart contract sector, is led by Ethereum, which started as recently as 2015. Ethereum is currently valued at approximately \$200 billion within the \$1 trillion crypto ecosystem. As the chart below shows, that makes it the second largest crypto sector at 30% of the total market cap. Regulatory progress, expanding use cases and broader institutional adoption are three primary catalysts that could position the smart contract sector for future growth.

Smart contract platforms represent 30% of the \$1 trillion digital asset ecosystem. Smart contracts are the new information super-highway that other decentralized applications (DApps) depend on to function.

Digital asset ecosystem sector composition



Source Data: Truist IAG, Messari. Data as of 9/12/2022.

Key Concept! The Blockchain Trilemma: The catalyst driving the Merge

This is important. Solving the "blockchain trilemma" is the primary catalyst driving the Ethereum Merge. It does not require expert knowledge to understand the logic behind it as we explain below.

The blockchain trilemma has three primary pillars. A blockchain should be:

Decentralized: The distribution of a blockchain's control network to all participants instead of a central entity or authority.

Secure: Blockchain networks should have an embedded defense to prevent malicious attackers.

Scalable: As with any business, scale relates to growing a network or business without sacrificing speed.

Ethereum founder Vitalik Buterin long ago proposed that any smart contract blockchain (including his own) could only achieve two out of these three pillars. In the case of Ethereum, it achieves decentralization and security, but not scale. **The merge is one of many future Ethereum upgrades designed to solve this problem as it seeks to improve scalability.**

Real world example: The super-highway

Consider a super-highway you've traveled on. Traffic moves quickly without interference from traffic lights or stop signs. Usually, you will notice service roads alongside the super-highway. Service roads have three characteristics. First, they reduce congestion along the super-highway. Second, you'll notice that most businesses are not on the super-highway, they are located on the service roads to provide easy access to their customers. Lastly, service roads have entrance ramps to the super-highway.

Application: In this example, **Ethereum is the super-highway**. In "cryptospeak" this is referred to as a **Layer 1** smart contract blockchain. It is a fast, secure and unencumbered way to effect transactions, but lacks adequate **scale** to access all the stores you see along the service roads.

Service roads, in this example, would be referred to as **Layer 2** smart contract blockchains. Crypto examples of these Layer 2 blockchains would be **Polygon, Loopring and Skale**. At a high level, these Layer 2 blockchains are programmed for the scale that Ethereum does not have because of their access to the stores along their roadside.

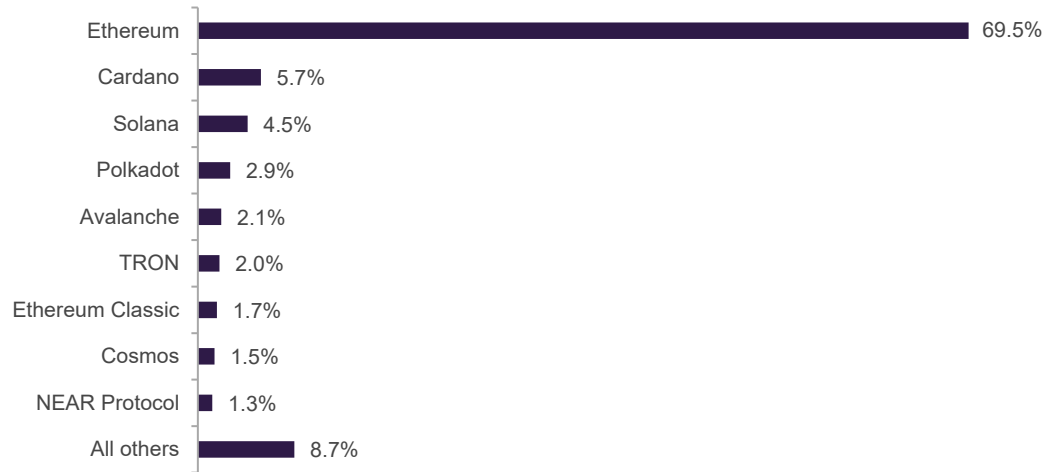
Finally, the actual stores along the service roads can be thought of as the decentralized applications (DApps). This category includes the popular decentralized finance (DeFi) applications. They are often co-dependent on Layer 2 solutions to scale their businesses with an on-ramp to Layer 1 solutions (Ethereum). By this, DApps gain decentralization and security to efficiently distribute their product or service. **The interoperability, or connection between Layer 1 and 2 smart contract platforms is the current solution to solving the blockchain trilemma. Over time, Ethereum aims to solve for the scalability issue with future upgrades enhancing its relationship with Level 2 scaling solution networks.**

Ethereum

Ethereum is the dominant smart contract blockchain. Its native token, ether, is the second largest crypto asset behind only bitcoin. Some quick facts:

- YTD, over \$6 trillion in transactions have been conducted through Ethereum generating over \$8 billion in fee revenue.⁽²⁾
- Ether has a roughly \$200 billion market value. If it was a stock, it would be the 28th largest S&P 500 company, just ahead of Disney.⁽³⁾
- Ether's market cap is roughly 20% of the entire digital asset ecosystem and almost 70% of the entire smart contract sector.⁽⁴⁾

% of total smart contract sector



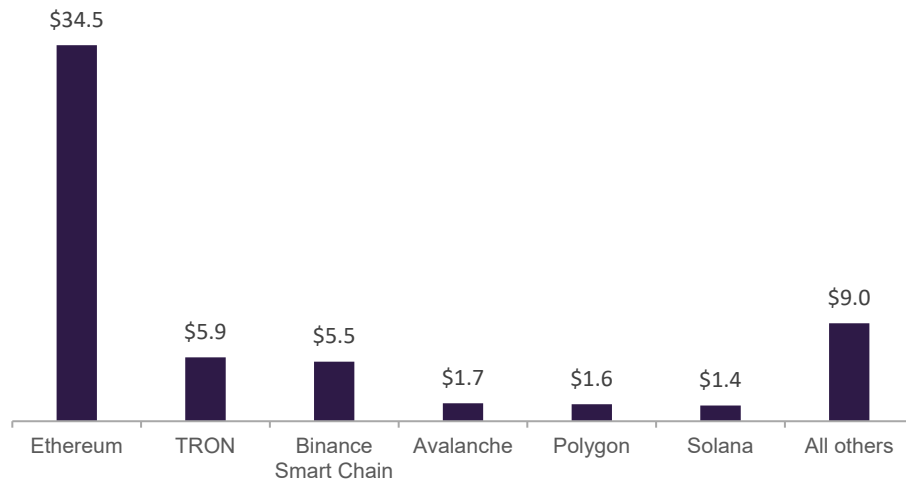
Source Data: Truist IAG, Messari, Coin Metrics. Data as of 9/12/2022.

Ethereum’s importance to decentralized finance (DeFi)

Decentralized finance (DeFi) provides peer-to-peer financial services to participants utilizing blockchain technology bypassing traditional financial service providers such as banks. Total Value Locked (TVL) measures the value of crypto tokens deposited into smart contract platforms by investors for purposes of earning a return. It is loosely analogous to deposits in a traditional banking context. Presently, Ethereum commands a roughly 60% share of the TVL by DeFi protocols.

DeFi total value locked by platform

The overall TVL has declined precipitously since its peak of roughly \$200 billion in November 2021. A primary reason for its decline is that the market value of crypto locked in contracts has itself fallen 60%-70% during the ongoing crypto winter.



Source Data: Truist IAG, DeFi Llama. Data as of 9/12/2022.

The Mechanics of the Ethereum Merge

Ethereum's "Merge" is a software upgrade that will shift the way that transactions on its network are settled.

Ethereum is merging their old software (Mainnet), that utilizes Proof-of-Work mining to validate transactions, with their new software (Beacon Chain) that utilizes Proof-of-Stake to validate transactions. The Beacon Chain was first launched in December of 2020 and has undergone multiple tests and subsequent upgrades prior to launch. Though it has taken longer than originally anticipated, tests have proven successful enough to green-light a final conversion this week. It is important to note that this is just the first of many pre-planned upgrades over the next few years that could eventually put Ethereum in a better position to solve the Blockchain Trilemma and improve its scalability, primarily by enhancing its interoperability with Layer 2 smart contract platforms as mentioned earlier.

Proof-of-Work vs Proof-of-Stake and its implications

The first concept to understand is that of a **consensus mechanism**. This simply means that a consensus must be met in order to prove and verify the accuracy of every transaction. This is critical due to the **decentralized** nature of blockchains where there is no one central authority performing this function. By contrast, in traditional finance, banking transactions clear through the Federal Reserve's (Fed) **centralized** system where each member bank in the Fed's system reconciles their institution's respective customer transactions with their own account at the Fed.

Proof-of-Work (POW): A POW consensus mechanism relies on the computing power of several computers often housed in large warehouse sized facilities owned by market participants called miners. Many of these miners are publicly traded companies. This process, known as mining, performs complex calculations requiring extensive power resources to solve these equations. Broadly speaking, the first one who solves the calculation wins. Winners are primarily compensated with the cryptocurrency they are solving for. The energy expended in this effort is so great that it is feared to be environmentally harmful. It has been estimated that by abandoning the POW consensus mechanism, the power usage expended by Ethereum mining will decrease by as much as 99%.⁽⁵⁾ Mining, due to its climate repercussions, is of great concern to some and draws the ire of many legislators.

Proof-of-Stake (POS): A POS consensus mechanism differs in that it can be performed, in the case of Ethereum, by anyone who has 32 ether tokens (currently valued at around \$52,000). These participants deposit or **stake** their ether tokens into a pool from which "validators" will be randomly selected. Validators may not withdraw their tokens as they remain "staked" or committed. Chosen validators will be compensated at an established interest rate. Those with the most tokens have a higher probability to be chosen but as a check and balance, dishonest validators will have some portion of their "staked" tokens taken from them as a penalty.

This change of a consensus mechanism from POW to POS is the primary purpose of the Merge as a first step in Ethereum's progression toward better scalability as use cases grow and adoption increases in the future. Additional upgrades are planned in 2023 and 2024.

Bottom line

We hope this paper helped steer you through what is a complex topic with a completely new vocabulary. Though we remain in the early days, we believe it is important to continue to gain an understanding of blockchain technology whose adoption will likely accelerate. As the leading smart contract digital asset, Ethereum is at the epicenter of this transformative technology and sector.

In the coming days, weeks and months we anticipate a wide range of potential outcomes to the Ethereum Merge. The price of the ether token could exhibit greater volatility. It could decline as a “buy the rumor/sell the news” type of story. Conversely, ether could rally as current short interest is quite high and investors hedging their bets could be forced to unwind those positions amid positive price momentum.

We remain consistent with our message that we believe blockchain technology is here to stay, even though many of the digital assets utilizing it might go away. However, we remain in a macro-economic environment where digital assets are not immune to shrinking liquidity and the aggressive tightening of monetary policy by the Federal Reserve. This could remain a short-term headwind to risk assets, including crypto assets. The regulatory environment remains very fluid with more jawboning than legislative action. Yet, we anticipate that as government agencies soon respond to the President’s executive order on digital assets from earlier this year, that the narrative could begin to take on a more productive tone as we head toward 2023.

Disclosures

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Sources corresponding to superscripts:

- (1) Factset and Messari as of 9/12/2022
- (2) Coin Metrics
- (3) Factset and Messari as of 9/12/2022
- (4) Messari as of 9/12/2022
- (5) Coin Metrics

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