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One Blockchain to Rule Them All

- TYPE: Smart Contract
- CHAINS:
  ETH, LUNA, AVAX, SOL, ADA, ALGO, DOT
- MARKET CAP: $549 BILLION
- TVL: $163 BILLION ($206B Total)

Layer 1 Competition

The hunt for the elusive, "ETH Killer," peaked after January's selloff leveled the playing field among smart contract network competitors. Value seekers sift through a growing haystack to find the network to end all networks. Others insist the competition will build a multi-chain future, where the specialization will create value across top networks. In either scenario, efficient markets will reward the best innovators and developers where community and collaboration attract new users and sustain early adopters. Until happily ever after, fundamentals can help identify opportunity within the existing inefficiency and volatility.

Though limited, fundamental valuations enable simple frameworks to evaluate and project network success. Over time, capital should concentrate in high-growth environments. Effective incentive models should encourage network activity, growth, and stability. Total Value Locked, or TVL, represents capital concentration and reflects a network's financial capacity, especially relative to its Market Cap. Similarly, the Network Value to Transaction ratio, or NVT, indicates the value of network activity. These measures provide a level field from which to compare each network's prospects for innovation and growth.

*Note: terms in purple are defined in the Glossary at the end of this report.

Smart Contract Networks

Smart contract networks provide security with a defined system of rewards and punishments for participants to create consensus on the state of the blockchain. The blockchain's state includes all transaction records generated by user and smart contract accounts. Each network implements smart contract blockchains with unique combinations of technology and

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economic incentives. Various network architectural designs prioritize performance, resiliency, and security – the "trilemma," popularly considered impossible to maximize within any one distributed system.

In PoS networks, security is measured by the difficulty to obtain control of 33% of the network's consensus resources. These networks require 66% of consensus participants to agree on each block to finalize and add it to the blockchain. Once part of the blockchain, transactions are permanent. If more than 33% of network participants disagree on a block, the transactions can be amended, reversed, or even censored by a malicious actor.

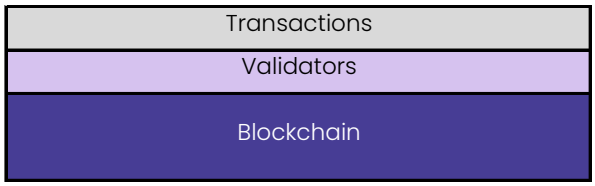
On balance, decentralization is measured by the nodes that validate transactions and participate in Sybil Resistant consensus. A network is more decentralized as the number of participating nodes increases, and more centralized as the number decreases. Also, the required hardware cost can limit the number of nodes, with more consensus participants as cost decreases.

The first and original blockchain architectural framework deploys one set of nodes, or validators, that settle transactions to build one blockchain. The validators use one consensus algorithm to secure the network. All transactions, smart contracts, and applications that use the network directly interface with the nodes. This means that speed and resources are constrained by the theoretical validator limit.

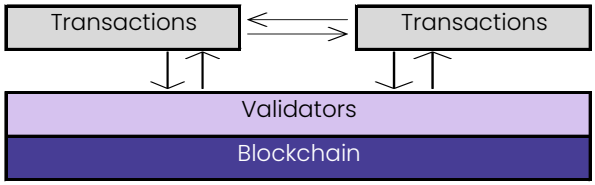
A multichain network can generally take one of two forms. First, transactions can occur on external computing networks and settle to the

Layer 1 Architecture

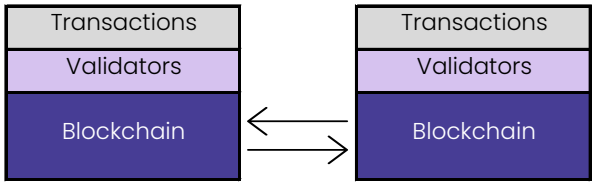
One Validator Set, One Chain



One Validator Set, Multiple Chains w/ Interchain Communication



Multiple Validator Sets, Multiple Chains w/ Interchain Communication



Source: "Layer-1 Platforms: A Framework for Comparison. Andrew Cahill. The Block Research. 2021.

main blockchain. Those networks can communicate amongst each other so transactions can take place among users, applications, and smart contracts spread across the external networks. All transactions settle to one chain via one set of validators. This allows the transaction applications to specialize and scale, secured by the main validator and blockchain security. Second, individual blockchain networks that share common communication protocols can operate in individual networks. Validator sets secure each blockchain, which can all communicate amongst themselves, to enable specialization at the blockchain layer.

The report evaluated top projects by TVL: Ethereum, Terra, Avalanche, and Solana. Then, Cardano, Algorand, and Polkadot, were chosen as top MC platforms with diverse incentives and ecosystems.

Layer 1 Smart Contract Network Comparison

Network	Ethereum	Terra	Avalanche	Solana	Cardano	Algorand	Polkadot
Token Symbol	ETH	LUNA	AVAX	SOL	ADA	ALGO	DOT
Architecture	Multi-chain L2 Chains	Multi-chain Cosmos IBC	Multi-chain Subnets	Single-Chain Synchronous	Single-Chain Synchronous	Single-Chain Synchronous	Multi-chain Parachains
Reference Basis	Account	Account	Account	Account	UTXO	Account	Account
Security	Shared	Global	Shared	Global	Global	Global	Shared
Consensus	PoW	Delegated PoS	PoS	Delgated PoS	PoS	PoS	PoS
Algorithm	Casper	Tendermint	Avalanche	Proof-of-History	Ouroboros	Pure	Nominated
Virtual Machine	EVM	Cosmos SDK	Avalanche VM	Sealevel	Plutus	Algorand VM	Substrate
EVM Compatible		Yes	Yes	No	No	No	Yes
Development	Solidity	WebAssembly	Go	Rust	Haskell	Go	Rust
Validators, 24H	NA	130	1249	1514	2961	1825	297
Pct Tokens Staked	7%	37%	60%	117%	69%	45%	46%
Economics	Inflation Txn Fees recycled, burned	Inflation Txn Fees recycled	Inflation Txn Fees burned	Inflation Txn Fees recycled	Inflation Txn Fees recycled	Supply minted Txn Fees recycled	Inflation Txn Fees recyled; Parachain auctions, leases

Notes: PoW: Proof-of-Work; PoS: Proof-of-Stake; Dpos: Delegated Proof-of-Stake; PoH: Proof-of-History

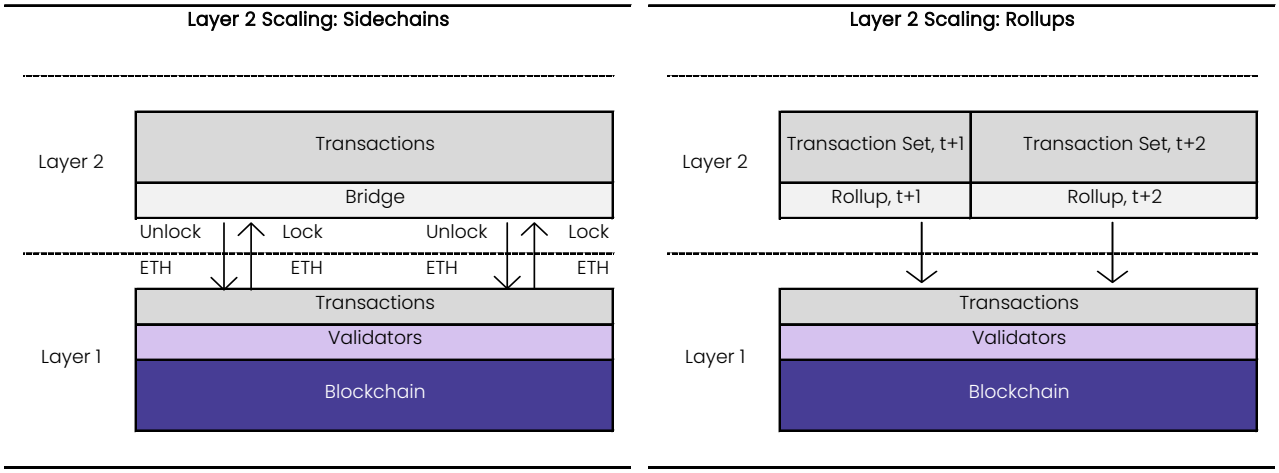
EVM: Ethereum Virtual Machine; SDK: Software Development Kit; AVM: Avalanche Virtual Machine

Though most financial institution transaction speed is measured in days, performance among blockchains is measured in seconds. Throughput, or TPS, measures the number of transactions a network can process each second, on average. Block time measures the seconds for a network to complete a block of transactions. Finality describes the number of seconds for a block to be certified for addition to the blockchain ledger. Users can observe TPS and finality for existing networks, while developers report theoretical or Testnet TPS while a network is in

progress. Metrics observed or estimated in testing environments may not maintain in operating conditions.

On-chain transaction volumes show Ethereum has no peer, yet. In 2021, Ethereum reached its block capacity. Until the network's governance approved EIP 1559 to change the gas fee, or transaction fee, structure, Ethereum spent months at the gas fee limit per block. Simultaneously, Layer 2 scaling solutions launched to relocate Ethereum computational demand from the Layer 1 blockchain, or main chain. Layer 2s fall into two categories that have similar tradeoffs to Layer 1 designs. Sidechains process transactions and send them back to the main chain for settlement. Rollups process and batch transactions for settlement to the main chain. Both use L1 security and consensus and have subtle differences among the various L2 providers.

Layer 2 Scaling Examples



Until newer networks reach similar activity, current claims of TPS, block times, and finality are incomparable. With that said, all the top projects launched with Ethereum's lessons in mind: designed for speed, scalability, and affordability. The medium term will reveal the superior technology among the newcomers, while Ethereum's competition may emerge after several years.

Valuation

The Total Value Locked, or TVL, in each network, provides a clear comparative measure. Valued in USD, TVL shows how much value is stored in the network, distributed among the consensus mechanism, DeFi, and other applications. For example, Ethereum's staking is a small portion of TVL as the network will not transition to PoS consensus until the second half of 2022. Comparatively, Algorand and Cardano TVL are concentrated in consensus staking with few nascent DeFi applications on either network. For any distribution, the listed L1 tokens exhibit strong relationships between their respective market cap and TVL. Theoretically, network TVL should decouple from market cap as DeFi applications and tokens proliferate. The value deposited in those applications diversifies beyond the L1 token and reflects financial capacity on the chain.

Market Cap to Total Value Locked Correlations for Smart Contract Network Tokens

(in billions USD) **2/8/22**

		Total	ETH	LUNA	AVAX	SOL	ADA	ALGO	DOT
	MC/TVL	2.7x	2.8x	1.6x	1.9x	4.4x	441.7x	122.6x	16,674.8x
2/8/22	MC	$560	$368	$24	$20	$37	$39	$10	$25
	TVL (1)	$206	$130	$15	$11	$8	$0	$0	$0
1D	MC	0%	-1%	-2%	-3%	-4%	2%	5%	6%
	TVL	1%	1%	8%	-3%	-1%	1%	3%	-1%
	Correlation (2)	0.18	0.12	0.12	0.51	0.01	-0.33	0.46	0.20
7D	MC	12%	12%	9%	11%	6%	19%	19%	14%
	TVL	8%	8%	18%	11%	4%	2%	19%	9%
	Correlation	0.64	0.61	0.31	0.48	0.47	-0.66	0.51	0.86
30D	MC	-3%	-1%	1%	-11%	-27%	-16%	0%	-1%
	TVL	-7%	-11%	4702%	-5%	3%	-12%	-2%	-10%
	Correlation	0.67	0.64	0.19	0.85	0.74	-0.84	0.78	0.90
200D	MC	63%	49%	0%	72%	27%	394%	993%	677%
	TVL	82%	47%	284%	6652%	694%	NA	291%	NA
	Correlation	0.93	0.86	-0.21	0.78	0.87	NA	0.39	NA

Notes: (1) Includes DeFi & consensus staking. All other smart contract networks: $42B

(2) Correlation key: -1 … 0 … 1

Strong Negative — Uncorrelated — Strong Positive

Sources: TVL: DeFiLlama.Com; MC: Messario.io

Newer networks, like Avalanche, and Solana, gained popularity in step with their respective DeFi sectors. The Avalanche community encouraged TVL with over $180M incentives to DeFi protocols in August 2021. Algorand, however, has a brand new DeFi ecosystem with comparatively low token variety, so TVL is predominately ALGO. With virtually no DeFi activity, Cardano and Polkadot have the highest MC/TVL ratios of the group. Like Algorand, Polkadot's TVL has historically reflected DOT consensus staking, so it moves with DOT market cap.

The Network Value to Transaction ratio provides a comparative measure of each network's valuation. Below, each network's token market cap is divided by on and off-chain token volume. Though limited, the ratio indicates each's network's activity value. If expected to produce economic surplus, each network should gain value as its activity on-chain increases. Likewise, relatively low activity should fetch lower comparable valuation. Networks with relatively low on-chain transactions, like ADA and DOT, are priced above the median.

Comparative Valuations for Layer 1 Smart Contract Networks **2/8/22**

(in USD billions, except where noted)

		Total Digital Assets Market	Smart Contract Networks	ETH	LUNA	AVAX	SOL	ADA	ALGO	DOT	All Others
Price				$3,117	$57	$86	$114	$1	$1	$22	
Market Cap, USD B		$1,913	$560	$368	$24	$20	$37	$39	$10	$25	$37
Outstanding Supply, B				0.118	0.417	0.236	0.329	33.069	10.041	1.139	
Expected Inflation/Y (to 2050)				0.30%	2.84%	3.90%	3.29%	0.51%	-0.37%	9.56%	
Validator Staked				7.29%	37.12%	59.91%	117.34%	68.94%	45.22%	46.47%	
Reported Staking APY				4.84%	7.93%	9.70%	5.86%	5.15%	9.42%	13.98%	
Volume Off-Chain, 24H (1)				$4.010	$0.634	$0.628	$0.754	$0.506	$0.088	$0.368	
Volume On-Chain, 24H (2)				$3.468	$0.001	$0.094	$0.573	$0.000	$0.172	$0.000	
Total Volume, 24H				$7	$1	$1	$1	$1	$0	$0	
Annualized				$2,729	$232	$263	$484	$185	$95	$134	
NVT, 24H	*Average:*		***46.65x***	**49.22x**	**37.60x**	**28.29x**	**28.11x**	**76.84x**	**39.45x**	**67.03x**	
NVT, 24H Annualized			*0.13x*	0.13x	0.10x	0.08x	0.08x	0.21x	0.11x	0.18x	
Total Market Share, MC			29%	19%	1%	1%	2%	2%	1%	1%	2%
Smart Contracts				66%	4%	4%	7%	7%	2%	4%	7%
TVL, USD B			$205.61	$129.59	$14.58	$10.57	$8.47	$0.09	$0.08	$0.00	$42.22
Market Share, TVL				63%	7%	5%	4%	0%	0%	0%	21%
Validator Staked to TVL (3)				21%	61%	116%	517%	30452%	5543%	774796%	
MC/TVL	*Median:*		*4.41x*	2.8x	1.6x	1.9x	4.4x	441.7x	122.6x	16,674.8x	0.9x

Notes: (1) Off-chain volume excludes non-certified exchanges, via Messari

(2) On-chain volume estimated with network tokens only, does not include protocol assets

(3) AVAX, SOL allow consensus staking and simultaneous deposits into select protocols

Sources: MC, Volume On-Chain - Messari.io; TVL - DeFiLlama.com; Validator APY - StakingRewards.com

Terra's divergence reveals a notable exception. Most of Terra DeFi runs through Anchor, an application that lends UST stablecoins at a fraction of staked LUNA collateral. If LUNA and bLUNA value decline, users repay their loans to maintain their collateralization ratio. This mechanism is designed to decrease the system's leverage when prices are down and encourage liquidity via borrowing when prices are high. On the longest historical timeframe, Terra's UST design drives TVL in the opposite direction of LUNA market cap.

Conclusion

Further study will prove whether these models can create meaningful benchmarks among smart contract networks. Current limitations, like data availability and design differences, require significant caveats to any findings. Fundamentally, the NTV and TVL quantify and contextualize a smart contract network's current and potential financial activity.

As network applications and tokens diversify, the network's asset value may not reflect increased economic activity. Staking rewards that grow with network activity will closely link value to transactions. Assuming mean reversion over time, an opportunity emerges if the network token is inexpensive relative to current activity and capacity. For example, Ethereum appears under-valued in this framework with low MC/TVL but above average NVT. Relatively low staking returns indicate saturated staking and high expected network growth. However, Ethereum's staking capacity is limited until its PoS implementation. At 21% of the network's TVL, and the lowest among peers, room exists for ETH staking to drive demand in the near term.

The next few years will see rapid activity growth beyond financial transactions, like the last year's non-fungible token explosion that continues to revolutionize digital property. These new economies will be built on today's smart contract economic and financial infrastructure. Fundamental analysis must keep pace to identify successful innovations in real time.

Glossary

Blockchain: form of distributed ledger technology, or database, shared across a network of participants designed to eliminate the need for a central party to maintain and update the ledger. Blockchains networks validate and group new transactions into blocks and link them to previous blocks. The ledger is controlled by a peer-to-peer network of nodes that maintain and verify all transactions recorded on the blockchain.

Node: computer hardware that runs the blockchain software. Nodes vote and validate blocks of transactions, communicate with other nodes to agree on blockchain history (state), and provide endpoints for users and applications to interact with the blockchain. Nodes operate on a spectrum from full nodes that perform all functions to light or archival nodes that only store blockchain historical data.

Sybil resistance: security incentive frameworks blockchains use to prevent malicious entities from subverting the network to the detriment of other participants. Sybil resistance mechanisms pool resources from members and distribute rewards according to a combination of resource contribution and/or performance. All sybil resistance frameworks encourage participants to create consensus on the blockchain state (history), reward entities for participating, and punish participants that stall or disrupt the consensus process.

Consensus: algorithm with which a blockchain network's nodes decide transaction validity, maintain the blockchain state, and secure the network. Consensus algorithms operationalize internode communication and define the rules under which agreement is reached.

Smart Contract: computer programs on blockchain networks to execute under a predefined set of conditions. Smart contract outputs, like simple transactions, cannot be reversed once deployed on a blockchain.

Proof-of-Work (PoW): perform computational work to solve cryptographic, or mathematical proofs to reach consensus on the ledger status (ETH).

Proof-of-Stake (PoS): deposit financial resources to gain a rewards for reaching consensus and risk principal loss for signing invalid transactions (LUNA, AVAX, SOL, ADA, ALGO, and DOT).

Proof-of-History (PoH): PoS variation where validators order transactions based on block height instead of timestamp (SOL).

Layer 1: core blockchain system infrastructure that defines the rules for network security and consensus.

Layer 2: Scale enhancements to Layer 1 blockchains that consolidate and process sets of operations to reduce demand on the underlying blockchain's computational resources. Layer 2 networks process transactions and package them for settlement and inclusion in the blockchain. These scalability solutions rely on the Layer 1 network for security and finality.

Glossary sources:

"Blockchain." Max Hinchman, Messari. 7/2/2019.

"Layer-1 Platforms: A Framework for Comparison." Andrew Cahill. The Block Research. 8/11/21.

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