Decentralization Factors for Tokenized Consensus Protocols (Layer 1s and Layer 2s)

Category	Type	Factor	Centralized	Partially Decentralized	Significantly Decentralized	Decentralized
Computation	T & E	**Block Creator Concentration** — How concentrated is the pool of block creators (validators (measured by US$ amount staked) or miners (measured by hash power)) for the protocol's consensus mechanism?	• Protocol is in testnet phase or, if in mainnet phase, block creation is controlled by the Company.	• Majority of block creation power is controlled by independent third parties. • Company and Foundation may act as block creators. • Block creation may be permissioned. • Company and Foundation can likely unilaterally affect a block reorganization (reorg).	• Majority of block creation power is controlled by independent third parties that are non-Insiders. • Significant number of unaffiliated parties would have to coordinate in order to obtain a majority of the block creation power. • If large block creator pools exist, controls are in place at such pools to prevent over-concentration such that the power of the pools is distributed. • If block creation is permissioned, permissions are granted by a decentralized process. • A block reorg would require significant community participation.	• Vast majority of block creation power is controlled by independent third parties that are non-Insiders. • A significant number of unaffiliated parties would have to coordinate in order to obtain a majority of the block creation power. • If large block creator pools exist, controls are in place at such pools to prevent over-concentration such that the power of the pools is distributed. • Block creation is permissionless. • A block reorg would require significant community participation and likely be a hotly contested community decision.
	T	**Node Diversity** — What different nodes are contributing to the protocol?	• Small number of nodes operated by the Company, the Foundation, or Insiders. • Node operation may be permissioned.	• Multiple nodes operated by independent third parties. • Small number of nodes crashing would not halt the network. • Nodes are located across multiple geographic locations, potentially in multiple continents. • Node operation may be permissioned.	• Large number of nodes, the majority of which are operated by independent third parties that are non-Insiders. • Significant number of nodes would need to crash to halt the network. • Nodes are spread across a diverse geographic area including multiple continents. • Node operation is permissionless.	• Thousands of nodes, the majority of which are operated by independent third parties that are non-Insiders. • Nodes are run in dozens of countries around the world. • Node operation is permissionless.

** There are three different but interrelated lenses through which to view decentralization: **Technical (T), Economic (E), and Legal (L)**. For a more in-depth discussion, see our article here.*

LATHAM & WATKINS LLP

a16z crypto

Category	Type	Factor	Centralized	Partially Decentralized	Significantly Decentralized	Decentralized
Computation	T	**Client Diversity** — What different clients are being run by nodes to facilitate consensus and execution?	• Single client developed and maintained by the Company.	• One primary client that is open source, likely developed by the Company. • Foundation and/or community may contribute to the improvement or maintenance of the client. • Additional clients may be in development.	• Primary client (if applicable) is maintained by the Foundation and/or community, and is open source. • Additional clients may be in development.	• Multiple clients are in use and are maintained by independent third parties that are non-Insiders. • Additional clients may be in development.
	T	**Diversity of Data Availability** — How diverse are the redundancies of data availability?	• There may be no relevant chain data as the protocol is still in testnet. • The Company may maintain and store all relevant data centrally.	• Multiple nodes store the state data and historic chain data including several independent nodes.	• Many nodes store the state data and historic chain data, the majority of which are operated by independent third parties that are non-Insiders.	• There is a robust ecosystem of data availability nodes with a significant number of redundancies operated by independent third parties that are non-Insiders.
	T & E	**Layer 2 (L2) Integration** — For Layer 2, is the process of recording transactions to the Layer 1 (L1) and ensuring fraud proof decentralized?	• Company controls the mechanism (e.g., a relayer) for recording of transactions to the L2's L1. • Company controls mechanism (e.g., a sequencer) for determining the order of transactions recorded to the L2's L1. • Company may run core infrastructure for fraud proofs (e.g., a verifier).	• Foundation may control the mechanism (e.g., a relayer) for recording of transactions to the L2's L1. • Foundation may control mechanism (e.g., a sequencer) for determining the order of transactions recorded to the L2's L1. • Foundation and/or community may run core infrastructure for fraud proofs (e.g., a verifier).	• Mechanism (e.g., a relayer) for recording of transactions to the L2's L1 relies on multiple entities. • Mechanism (e.g., a sequencer) for determining the order of transactions recorded to the L2's L1 is reliant on multiple entities. • There are multiple redundancies for core infrastructure for fraud proofs (e.g., a verifier).	• Mechanism (e.g., a relayer) for recording of transactions to the L2's L1 is controlled by a broad, decentralized group. • Mechanism (e.g., a sequencer) for determining the order of transactions recorded to the L2's L1 is controlled by a broad, decentralized group. • There are many redundancies for core infrastructure for fraud proofs (e.g., a verifier).
Development	T & L	**Completeness of Protocol** — Is the protocol fully functional?	• Protocol may still require significant additions. • May not be fully functional.	• Protocol is fully functional and includes the features expected at launch of mainnet. • Company may have publicly discussed minor upcoming developments or improvements.	• Protocol is fully functional and includes all material features publicly discussed by the Company. • Company has not promoted upcoming developments or improvements, but industry participants may expect some ongoing contribution from the Company.	• Protocol is fully functional and includes all material features publicly discussed by the Company. • Company has not promoted upcoming developments or improvements, and industry participants could have no reasonable expectation that material improvements could only be pursued and implemented by the Company.

Category	Type	Factor	Centralized	Partially Decentralized	Significantly Decentralized	Decentralized
Development	E & L	**Ongoing Development** — If ongoing development of the protocol is being undertaken, what proportion of such development comes from one entity or a group of related entities?	• Company is responsible for virtually all of the protocol's ongoing development.	• Company is primarily responsible for the protocol's ongoing development, but implementation of such new code is subject to governance/community approval. • Additional code is sourced from independent third parties.	• Foundation is primarily responsible for coordinating the protocol's ongoing development. • Independent third parties are responsible for a majority of new code created for the protocol whether at the direction of the Foundation, community, or otherwise. • Implementation of all new code is subject to governance/ community approval.	• Foundation or community is responsible for coordinating the protocol's ongoing development. • Independent third parties are responsible for vast majority of new code created for the protocol at the direction of the Foundation, community, or otherwise. • Implementation of all new code is subject to governance/community approval.
	T & L	**Protocol Roadmap** — If ongoing development of the protocol is being undertaken, who defines the roadmap of future protocol improvements or expansions?	• Company is solely responsible for defining the roadmap of the protocol.	• Company has completed much of the initial roadmap and the community largely looks to the Company for future developments. • Community feedback helps drive Company decisions, but the community itself minimally dictates the roadmap.	• Foundation or community primarily drives the roadmap of future developments of the protocol. • Company and/or its founders may be influential community members but do not effectively control direction.	• Foundation or community entirely drives the roadmap of future developments of the protocol. • Company and/or its founders are one of many community members.
	T	**Risk Management** — Who is responsible for audits of new code deployments and who is responsible for protocol state monitoring?	• Company directly hires third parties to perform code audits. • Company is primarily responsible for monitoring protocol state and identifying and fixing any hacks, bugs, or irregularities.	• Code is public and Company ensures updates are audited before implementation. • Public bug bounty programs may be implemented. • Company is primarily responsible for monitoring protocol state but independent third parties may also help monitor.	• Code is public and the Foundation or community implements code audits for updates. • Public bug bounty programs may be implemented. • Independent third parties are paid by Foundation or from protocol treasury to monitor the protocol state.	• Code is public and the Foundation or community implements audits for new and existing code. • Public bug bounty programs may be implemented and payments are honored by governance. • Independent third parties are paid by protocol treasury or otherwise incentivized such that non-Company community is primarily responsible for monitoring the protocol state.

Category	Type	Factor	Centralized	Partially Decentralized	Significantly Decentralized	Decentralized
Development	E & L	**Development of Third-Party Protocols** — How much third-party developer activity occurs with respect to third-party protocols being built and deployed to the protocol?	• No fully functional independent third-party protocols have been deployed or only a small number in development by third parties. • Smart contract deployment may be permissioned.	• Small number of fully functional third-party protocols have been deployed. • Large number of third-party protocols in development by independent third parties. • Smart contract deployment may be permissioned.	• Large number of decentralized and fully functional third-party protocols have been deployed. • Large number of third-party protocols in development by independent third parties. • Smart contract deployment is permissionless.	• Hundreds of decentralized and fully functional third-party protocols have been deployed. • Large number of third-party protocols in development by independent third parties. • Smart contract deployment is permissionless.
	E & L	**Development of Core Applications** — How many of the core applications (wallet, explorer, etc.) for the protocol does the Company control?	• Company retains 100% control over all core applications (wallet, explorer, etc.) for the protocol.	• Company retains control over updates to its own applications (wallet, explorer, etc.). • Other competing applications may be operated by third parties.	• Core applications are operated by a number of independent third parties, including the Company.	• Core applications operated by a number of independent third parties, including the Company.
	E & L	**Ongoing Development Funding** — How is ongoing protocol development and third-party protocol development funded?	• Company may operate an ecosystem fund designed to incentivize third-party development and/or participation. • Fund may include cash raised through equity financing or a token sale.	• Company has deployed most of its allocated funds to third parties for ongoing development. • Small number of third-party protocols are independently financed. • Independent ecosystem fund may be operated by the Foundation, community, or an independent third party to incentivize ongoing development. • Native token may be awarded by governance mechanism to incentivize some ongoing development.	• Large number of third-party protocols are independently financed. • Independent ecosystem fund is the only protocol-sponsored funding mechanism for the protocol's ecosystem, including continued development, and is operated by the Foundation, community, or an independent third party. • Native token may be awarded by governance mechanism to incentivize some or most ongoing development.	• Large number of third-party protocols are independently financed. • If any protocol-sponsored ecosystem fund exists, it is directly or indirectly controlled by a highly decentralized governance mechanism. • Continued community development is properly incentivized without any centrally managed fund.
Governance	E & L	**Voting Control** — Who has the ability to vote and what is the distribution of voting power?	• Company has 100% control of governance.	• Neither the Company or its employees unilaterally control governance (potentially through restrictions on voting under applicable company policies or delegations). • Insiders may collectively control governance if acting in concert.	• None of the Company, its employees, or its other Insiders unilaterally control governance (assuming no voting restrictions apply). • The votes of a number of unaffiliated parties are necessary in order to approve or block any governance proposal.	• None of the Company, its employees, or its other Insiders can control or significantly influence governance. • The votes of a number of unaffiliated parties are necessary in order to approve or block any governance proposal.

Category	Type	Factor	Centralized	Partially Decentralized	Significantly Decentralized	Decentralized
Governance	T	**Protocol Development Control** — Who controls the process for protocol code implementation?	• Company retains 100% control over code implementation decisions.	• Code implementation decisions primarily require governance approval. • Company or the Foundation may retain veto/triage power over third-party proposals.	• All code implementation requires governance approval. • Any veto/triage capability is narrowly structured and held by the Foundation or a distributed group elected by governance.	• All code implementation requires democratic approval from governance and/or protocol has limited or no upgradeability.
	E & L	**Functionality Control** — What protocol functionality is controlled?	• Company retains 100% control over functionality of the protocol.	• Company retains little to no control of functionality of the protocol. • Company may retain control over emergency pause ability.	• Company retains no control of functionality of the protocol. • Foundation may retain control over emergency pause ability.	• Company and Foundation retain no control of functionality of the protocol. • Unaffiliated group elected/ nominated by the community may retain control over emergency pause ability.
	E	**Significant Influence** — Do any stakeholders have significant and outsized power over key decisions?	• Company has final say over key decisions, including decision-making not subject to governance (i.e., community management, grant programs, etc.).	• Company and its founders relinquish control over key decisions but may exert significant influence over such decisions. • The Foundation may exert some influence over key decisions. • The community may exert limited influence over key decisions.	• The Foundation and community exert significant influence over key decisions. • Company and its founders continue to exert influence over key decisions.	• The Foundation and community exert significant influence over key decisions. • Company may have dissolved, or its influence and the influence of its founders may be no greater than other participants in the protocol's ecosystem — may be viewed as advisors or thought-leaders but not possessing outsized power/control.
	E	**Communications** — Who controls the protocol's social media, community channels, and communications?	• Company controls all of the protocol's social media accounts, its community channels, and its communications.	• Company may control primary social media accounts and community channels, but additional accounts may be controlled by the Foundation. • Company primarily responsible for public communications but Foundation and active community members may promote the protocol.	• Foundation or community controls the primary protocol social media accounts and community channels. • Majority of public communications are Foundation- or community-driven. • Company may have separate social media accounts distinguished from Foundation/ community accounts.	• Foundation or community controls protocol social media accounts and community channels. • Public communications are largely or entirely community-driven. • Company may have separate social media accounts distinguished from Foundation/community accounts.

Category	Type	Factor	Centralized	Partially Decentralized	Significantly Decentralized	Decentralized
Value Accrual	E & L	**Token Value** — What are the sources of value accrual to the tokens of the protocol?	• The protocol may not have a token; or • The protocol may have a token and the Company is the sole source of value accrual (through development, implementation, etc. of the protocol).	• If the token has a mechanism for explicit value accrual (gas or sequencer fees paid with token), a majority of on-chain transaction value accrues to the tokens through third-party protocols and related applications. • If no explicit value accrual mechanism, Company may be perceived as the primary driver of value.	• If the token has a mechanism for explicit value accrual (gas or sequencer fees paid with token), a significant majority of on-chain transaction value accrues to the tokens through third-party protocols and related applications. • If no explicit value accrual mechanism, market forces and independent third parties are significant drivers of value.	• If the token has a mechanism for explicit value accrual (gas or sequencer fees paid with token), substantially all on-chain transaction value accrues to the tokens through third-party protocols and related applications. • If no explicit value accrual mechanism, market forces and independent third parties are the drivers of substantially all value.
	E	**Token Ownership** — How concentrated is ownership of the token of the protocol?	• The protocol may not have a token and Insiders may have contractual right to a future token; or • The protocol may have a token and the tokens are held by the Company, affiliates, and Insiders.	• Insiders may own a significant portion or even a majority of the outstanding tokens of the protocol. • Independent third parties own a substantial number of the outstanding tokens of the protocol (via airdrop, early adopter rewards, token sale, etc.).	• Insiders own less than a majority of the outstanding tokens of the protocol. • Independent third parties own a significant majority of the outstanding tokens of the protocol. • Development funds, staking rewards, and other incentives are in place to continue increasing the disbursed ownership of the tokens of the protocol by independent third parties.	• The outstanding tokens of the protocol are widely distributed. • No person or group of related persons (including the Company and its employees) holds 20% or more of the outstanding tokens of the protocol. • Development funds, staking rewards, and other incentives are in place to continue increasing the disbursed ownership of the tokens of the protocol by independent third parties.
	E	**Outstanding Tokens** — What proportion of the tokens of the protocol are outstanding and in circulation as opposed to being locked up (due to contractual agreements) or unreleased?	• The protocol may not have a token; or • The tokens may be issued but are not yet in circulation or are entirely subject to lockups.	• A small portion (less than 25%) of the tokens of the protocol are outstanding and in circulation. • The tokens of the protocol held by Insiders may be mostly locked up or unvested. • Any tokens of the protocol earmarked for an ecosystem fund, staking rewards, or protocol incentives remain largely un-deployed.	• A significant portion (at least 33%) of the tokens of the protocol are outstanding and in circulation. • A portion of the tokens of the protocol held by Insiders have been vested and released from any applicable lockups. • Any tokens of the protocol earmarked for an ecosystem fund, staking rewards, or protocol incentives have been partially deployed.	• A majority (at least 50%) of the tokens of the protocol are outstanding and in circulation. • A majority of the tokens of the protocol held by Insiders have been vested and released from any applicable lockups. • A majority of any tokens of the protocol earmarked for an ecosystem fund, staking rewards, or protocol incentives have been deployed.

Category	Type	Factor	Centralized	Partially Decentralized	Significantly Decentralized	Decentralized
Value Accrual	E	**IP Rights** — Who owns any intellectual property (IP) relating to the protocol?	• Company owns all IP rights relating to the Protocol.	• The majority of the protocol's code is open source, but may be subject to certain use restrictions. • Company may hold residual IP relating to the protocol, such as trademarks, domain names, and its proprietary application.	• All of the protocol's code is open source, but may be subject to certain use restrictions (controlled by the Foundation or community). • Foundation or community owns most residual IP relating to the protocol, including trademarks. • Company may hold residual IP relating to the domain names and its proprietary application.	• All of the protocol's code is open source and can be used/forked by third parties. • Foundation or community owns residual IP relating to the protocol, including trademarks. • Company may hold residual IP relating to the domain names and its proprietary application.
Usage, Participation, and Accessibility	E	**Liquidity** — How liquid are the secondary markets for the tokens of the protocol?	• There is no secondary market for the tokens.	• A small amount of liquidity for the token of the protocol is available on secondary markets, but token price and trading volumes remain volatile. • Company or the Foundation may be directly funding or incentivizing liquidity by paying market makers or conducting buybacks.	• A substantial amount of liquidity for the token of the protocol is available on secondary markets. • Company or the Foundation are not directly funding or incentivizing liquidity by paying market makers or conducting buybacks.	• A robust and diverse secondary market exists for the token of the protocol. • The market for the token is seasoned and is not unduly influenced by any third party.
	E	**Protocol Adoption and Participation** — How broad is the adoption of the protocol and participation with the protocol?	• Limited or no adoption.	• At least some adoption, but could be concentrated among Insiders or early users.	• At least meaningful adoption and usage outside of Insiders and early users. • Significant community engagement and participation. • Likely one or more protocol-level service provider agreements, such as independent third-party treasury management, provision of custom oracle feeds, or protocol state monitoring.	• Network has become a core/foundational development in its particular ecosystem, with many independent users and contributors. • Insiders account for a negligible percentage of usage. • Rich and robust community engagement and participation. • Likely several protocol-level service provider agreements, such as independent third-party treasury management, provision of custom oracle feeds, or protocol state monitoring.

Disclaimer: *These materials were written in partnership between a16z crypto and Latham & Watkins LLP and are for informational purposes only. The materials do not and should not be construed as legal advice for any particular facts or circumstances. None of the materials provided hereby are intended to be treated as legal advice or to create an attorney-client relationship. The materials might not reflect all current updates to the law or applicable interpretive guidance and the authors disclaim any obligation to update the materials. We strongly urge you to contact a reputable attorney in your jurisdiction to address your specific legal needs.*

Under applicable Rules of Professional Responsibility, portions of this communication may contain attorney advertising. Prior results do not guarantee a similar outcome. Results depend upon a variety of factors unique to each representation. Please direct all inquiries regarding the conduct of Latham & Watkins attorneys under New York's Disciplinary Rules to Latham & Watkins LLP, 885 1271 Avenue of the Americas, New York, NY 10020, Phone: +1.212.906.1200.

Additionally, the views expressed here are those of the individual AH Capital Management, L.L.C. ("a16z") personnel quoted and are not necessarily the views of a16z or its affiliates. a16z is an investment adviser registered with the U.S. Securities and Exchange Commission. Registration as an investment adviser does not imply any special skill or training. Certain information contained in here has been obtained from third-party sources, including from portfolio companies of funds managed by a16z. While taken from sources believed to be reliable, a16z has not independently verified such information and makes no representations about the enduring accuracy of the information or its appropriateness for a given situation. In addition, this content may include third-party information; a16z has not reviewed such material and does not endorse any advertising content contained therein.

This content is provided for informational purposes only, and should not be relied upon as legal, business, investment, or tax advice. You should consult your own advisers as to those matters. References to any securities, digital assets, investment strategies or techniques are for illustrative purposes only, and do not constitute an investment recommendation or offer to provide investment advisory services. Furthermore, this content is not directed at nor intended for use by any investors or prospective investors, and may not under any circumstances be relied upon when making a decision to invest in any fund managed by a16z. (An offering to invest in an a16z fund will be made only by the private placement memorandum, subscription agreement, and other relevant documentation of any such fund and should be read in their entirety.) Any investments or portfolio companies mentioned, referred to, or described are not representative of all investments in vehicles managed by a16z, and there can be no assurance that the investments or investment strategies will be profitable or that other investments made in the future will have similar characteristics or results. A list of investments made by funds managed by Andreessen Horowitz (excluding investments for which the issuer has not provided permission for a16z to disclose publicly as well as unannounced investments in publicly traded digital assets) is available at https://a16z.com/investments/.

Additionally, this material is provided for informational purposes solely and should not be relied upon when making any investment decision. Past performance is not indicative of future results. Investing in pooled investment vehicles and/or digital assets includes many risks not fully discussed herein, including but not limited to, significant volatility, liquidity, technological, and regulatory risks. The content speaks only as of the date indicated. Any projections, estimates, forecasts, targets, prospects, and/or opinions expressed in these materials are subject to change without notice and may differ or be contrary to opinions expressed by others. All materials used in this document, unless otherwise stated, are joint copyright works of a16z crypto and Latham & Watkins. Please see https://a16z.com/disclosures/ and https://www.lw.com/ for additional important information regarding regulatory disclosures.

LATHAM & WATKINS LLP a16z crypto