Hedera Hashgraph

Hbar Economics

A deep dive into the dual role of hbars & detailed release schedule

HEDERA HASHGRAPH, LLC

Hedera Hashgraph is a public distributed ledger technology (DLT) platform that lets people interact and transact online efficiently and securely, without the need for third-party companies, which often collect and sell their users' personal information.

The purpose of Hedera is to provide a stable, trustworthy platform for a wide variety of decentralized, enterprise-grade applications, not to provide a cryptocurrency. Like all public DLT platforms, however, Hedera needs a cryptocurrency to function.

Hedera's cryptocurrency—called "hbars"—serves two vital purposes: **1.** to secure the network against cyberattacks through Hedera's coin-weighted, proof-of-stake consensus mechanism, and **2.** to be the "fuel" that incentivizes and pays for the computing resources necessary to make it all work.

This paper describes how hbars are used on the Hedera platform and the expected distribution of Hedera's fixed supply of 50 billion hbars. The information presented herein is provided for informational and illustrative purposes only and remains subject to change. To the extent this paper presents information obtained from third parties, Hedera has deemed the information to be reliable, but it has not been independently verified.

01.

Overview

HEDERA TECHNOLOGY

The Hedera platform works through a groundbreaking form of distributed consensus technology—the hashgraph consensus algorithm. Like blockchains and other DLTs, Hedera allows online communities to create a shared, trustworthy database without the need for a third-party middleman. Yet, while other DLT platforms face trade-offs in terms of performance and security (if you're faster, you're less secure; if you're more secure, you're forced to slow down), hashgraph technology provides superior levels of performance and security. Transactions are processed at speeds that are orders of magnitude faster than proof-of-work blockchain, and the hashgraph algorithm has been proven mathematically to offer the highest level of security for distributed networks.

Because Hedera is dramatically faster and more secure than blockchain-based platforms, the Hedera technology enables a whole range of new applications, use cases, and business models—including ad hoc micropayments (payments of fractions of a penny) and device-to-device transactions—that are not currently possible on other DLT platforms. Developers and enterprises can use Hedera's platform services (cryptocurrency, smart contracts, and file service, and soon the Hedera Consensus Service) to create applications that run on top of the platform, from music-streaming services to pharmaceutical supply chain management to energy microgrids and multi-player online games.

HEDERA GOVERNING COUNCIL

The Hedera platform is governed by the Hedera Governing Council, a rotating group of leading global enterprises distributed across different industries and geographies. The Governing Council makes key decisions over software upgrades and network pricing. Governing Council members are term-limited and do not receive any profits from Hedera. In these ways, the Governing Council is structured to ensure decentralized, wise, stable governance in the long-term interests of the platform. Hedera won't be governed by unknown groups of miners and developers, and this enterprise-led structure greatly reduces the risk of ideological or personal disputes that have affected governance of other public DLT platforms.

In short, we believe Hedera's technology and governance make it scalable and well-suited to become the first public DLT platform to achieve widespread adoption, particularly by enterprises.

HEDERA'S "HBAR" CRYPTOCURRENCY

The Hedera network was launched in August 2018. At that time, the platform's total fixed supply of hbars—50 billion hbars—was minted and placed into the Hedera Treasury's account. The Hedera Treasury is a cryptographically secure, multi-signature account, and hbars can only be transferred out of it when a transaction is cryptographically signed by a majority of the Council members. This ensures control over the platform's cryptocurrency is decentralized and vested in large, trustworthy entities.

The Hedera network is currently going through a testing period. During this phase, network access is restricted to hundreds of developers and users. Only a small number of hbars have been distributed to developers and users to test the network during this phase.

Hedera expects to complete its testing programs and provide open access to the Hedera network to anyone who wishes to use it during the summer of 2019. At that time of open access, the Hedera Treasury account will also begin to distribute hbars more broadly. It is also expected that hbars will start to appear on cryptocurrency exchanges, so that anyone can purchase them to be able to use the Hedera platform.

For reasons of network security explained in Part III, the plan is to have a very slow and measured release of hbars out of the Hedera Treasury. Less than 8% of the total hbar supply is expected to be circulating before the end of 2019 and less than 34% will be circulating for the first five years after network launch. This release schedule is one of the mechanisms that will ensure that no attacker will be able to disrupt the network and will allow the price of hbars to be determined primarily through market forces, rather than by the Hedera Council.

02.

Hbars as “fuel” to pay for network services and incentivize node participation

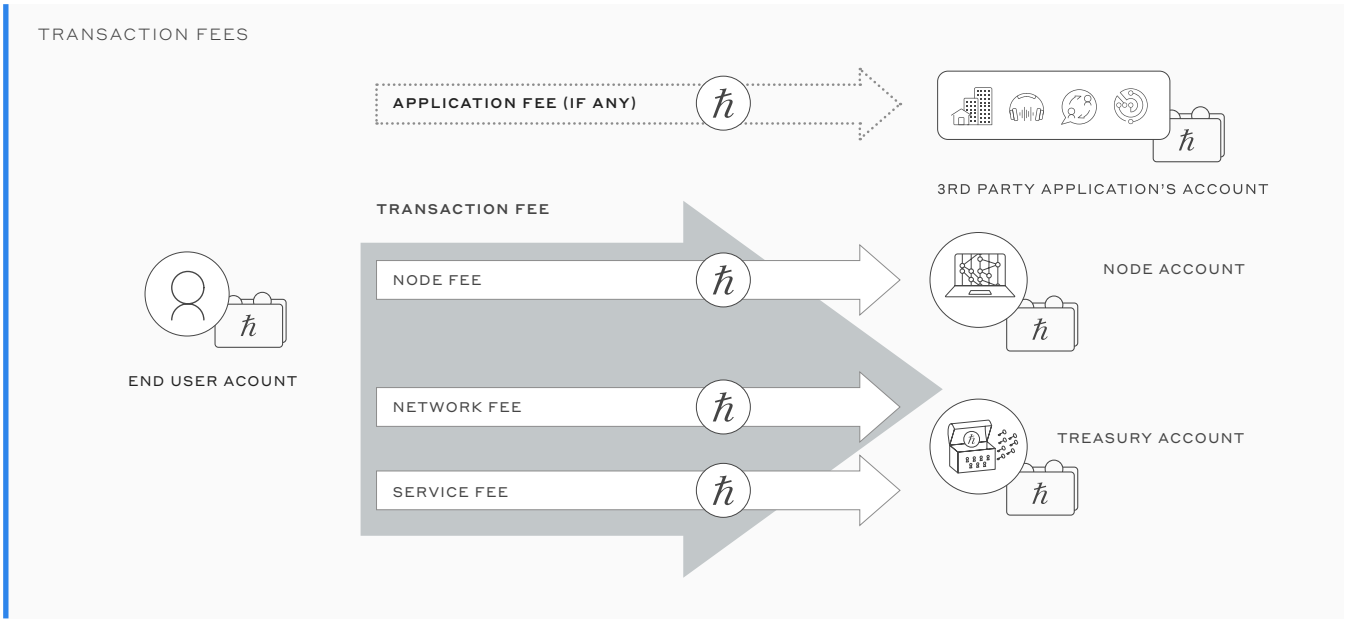
All public DLT platforms need computers to serve as nodes in the decentralized network. These nodes serve two purposes: **1.** they maintain a shared ledger of the balances in each network user’s account and **2.** they verify and execute new transactions and place those transactions into chronological order, so that user account balances are updated on an ongoing basis.

Each node must provide computing power to run the platform’s consensus algorithm and process transactions. To incentivize nodes to participate—as computing power is not free—DLT platforms typically compensate nodes with payments of the platform’s native cryptocurrency.

On the Hedera network, hbars are used as a “fuel” to pay for network services (i.e., to submit transactions, run smart contracts, and store files) and to reward nodes for providing their computing resources (bandwidth, processing power, memory) to the network. The fees per transaction will be very low such as to facilitate native micropayments, with each cryptocurrency transfer expected to cost ≈US$0.0001.

The economics of a Hedera transaction have been designed to balance these costs and incentives to create an efficient flow of funds. This flow consists of **1. transaction fees** paid by end users (or third-party applications as end users) into a Hedera account and **2. reward payments** paid out of that Hedera account as **(a)** node reward payments to node hosts and **(b)** proxy-staking reward payments to hbar owners who proxy-stake their hbars to nodes[1]. For example, if Alice sends 5 hbars to Bob, those 5 hbars are sent directly from Alice’s account to Bob’s account—the 5 hbars do not pass through a Hedera account—but Alice pays a node fee, a network fee, and a service fee to effect the transaction.

[1] Proxy-staking is explained in Part III.



End users pay fees to use the platform, such as when they transfer hbars or add data to the Hedera hashgraph ledger. The fees for a particular action will depend on the type of network services used (cryptocurrency, smart contracts, file service) and the degree and duration of network resources consumed in processing the transaction. The overall fee for an action on the network is called a Transaction Fee and is composed of three distinct fees—a Node Fee, a Network Fee, and a Service Fee—each of which relate to how the transaction is submitted to and validated by the network. Developers offering applications on the Hedera platform may also charge their users for that application, which is called an Application Fee.

1. **NODE FEE.** A user or application seeking to complete an action on the platform will send the corresponding transaction to a single node, which will then submit that transaction to the network. In doing so, the node will expend resources and energy (albeit a small amount). Node Fees compensate nodes for those resources and incentivize nodes to take on this critical role. Initially, the Hedera Council will set the amount of the Node Fees, but Node Fee amounts will eventually be left to each node to determine itself. Node fees are paid by end users directly to the account of the node that submits the user's transaction.

2. **NETWORK FEE.** After a transaction is submitted to the network, it is communicated to nodes that validate digital signatures, further communicate the transaction to other nodes, and temporarily store it in their memory while the network reaches consensus. Users pay a Network Fee that compensates all participating nodes for this activity of calculating consensus on the transaction. The computing resources consumed by this process can vary based on the file size of the transaction and its number of digital signatures. Network Fees are paid by users into the Hedera Treasury account and a portion of such collected amounts are subsequently distributed daily to participating nodes as Node Reward Payments (described below).

3. **SERVICE FEE.** Service Fees compensate the network for the ongoing job of maintaining or supporting the transaction. For a file service transaction, the platform will charge a Service Fee corresponding to the amount of energy and memory needed to store a file of its size for the requested duration. For a smart contract transaction, the Service Fee will be based on the processing power required by network nodes to perform the computation required by the smart contract. Service Fees are paid by users into the Hedera Treasury account, and a portion of such amounts are distributed out daily to participating nodes as Node Reward Payments.

4. **APPLICATION FEES (OPTIONAL).** Developers who build applications on top of the Hedera platform may want to monetize those applications to compensate themselves for the value they provide to the end users. A wallet application, for example, may choose to charge a small percentage of each deposit or withdrawal. A ridesharing dapp that connects drivers to passengers with no intermediary may choose to take as a fee a small percentage of each ride completed and paid. Like many existing applications, some Hedera-based applications may offer both free services and paid services. A third-party developer will determine the amount of Application Fee she wishes to charge, and these fees will be paid by end users directly to the developer.

NODE REWARD PAYMENTS AND PROXY-STAKING REWARD PAYMENTS

A distributed network needs to incentivize nodes to contribute resources to validate transactions and maintain the shared ledger. Like most DLT platforms, Hedera rewards nodes by paying them in the platform's native cryptocurrency.

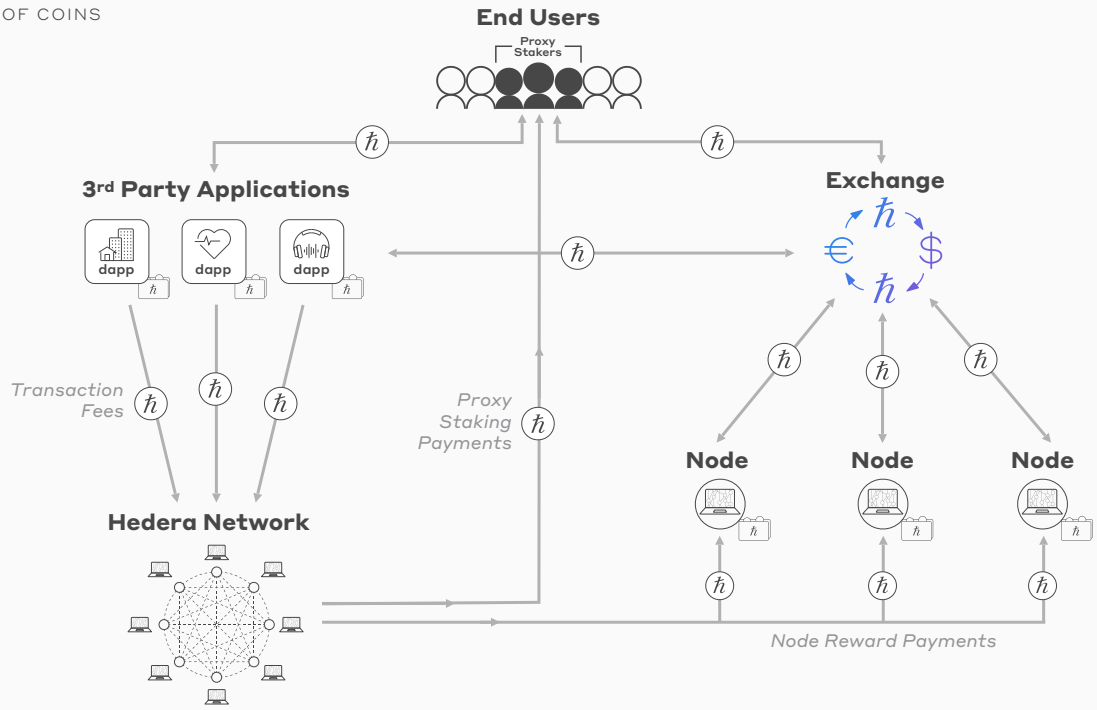
As discussed above, the Hedera Treasury collects Network Fees and Service Fees on behalf of all the nodes processing transactions and performing services. A portion of these collected fees will only sit in the Hedera Treasury a short amount of time, though, as every twenty-four hours, the Treasury account will automatically redistribute hbars as Node Reward Payments to all the nodes that participated in validating transactions during that period and Proxy-Staking Reward Payments to users who proxy-staked their coins to nodes during such period (proxy-staking is explained in Part III).

This node incentive system is far more efficient than proof-of-work, "winner-take-all" networks. In those networks, mining nodes expend energy to try to solve the cryptographic puzzle, but only the winner receives a payment (and all the energy consumed by the other nodes is wasted). On the Hedera network, no energy is wasted, as nodes don't expend energy on useless math problems, but directly on communicating, validating, and supporting transactions.

Node Reward Payments will be distributed to nodes in proportion to the amount of hbars staked and proxy-staked by a node. Proxy-Staking Reward Payments relating to a user's proxy-staked coins will be split 50-50 between the node's account and the user's account. To be eligible for payment, a node must have been online and participating in consensus for that previous 24-hour period.

Hbars that are staked or proxy-staked always remain under the control of their owner. Their owners can spend them at any time, and those who proxy-stake their hbars can turn off or redirect the proxy-staking to another node at any time.

LIFECYLE OF COINS



DUAL ROLE OF HEDERA COINS

NETWORK "FUEL"

Coins are used to pay for network services (i.e. submit transactions, run smart contracts, store files)

Coins are used to reward nodes for providing services to the network

Coins enablemicropayments (< $0.01)

NETWORK PROTECTION

Any distributed ledger can be attacked if a malicious actor controls 1/3 of voting power

Hedera's proof-of-stake system uses coins to weight the votes, making it dificult and expensive for a bad actor to gain control of 1/3 of the voting power, i.e., 1/3 of the coin supply

03.

Hbars protect the network through coin-weighted, proof-of-stake consensus

Hbars play a fundamental role in how the Hedera network achieves consensus on transactions and protects the network from cyberattacks.

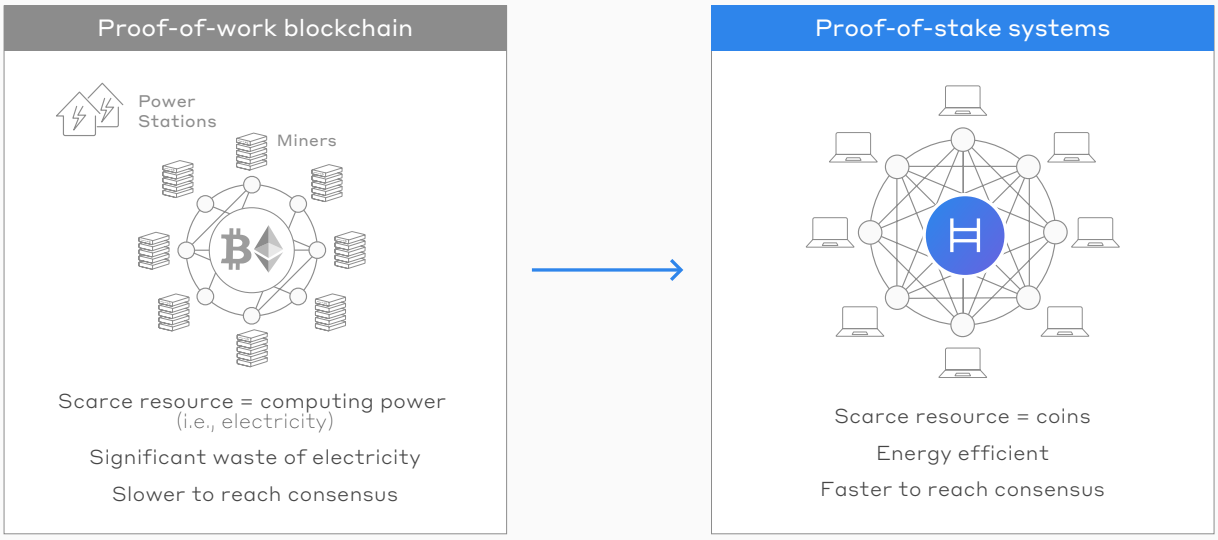
ALL PUBLIC DLTs NEED A LIMITED RESOURCE

In any public, open DLT network—one in which anyone can run a node that participates in consensus—there is a need to guard against malicious actors that seek to disrupt the network and prevent it from reaching consensus on transactions. Hackers can do this by obtaining control of one-third of the network's total voting power over consensus. Public DLT networks need a scarce resource to secure the networks against such attacks.[2]

IN PROOF-OF-WORK, THE LIMITED RESOURCE IS COMPUTING POWER/ENERGY CONSUMPTION

In "proof-of-work" blockchains, such as Bitcoin and Ethereum, the limited resource is computing power and associated energy consumption. Network nodes ("miners") group transactions into "blocks" and compete to solve a complex cryptographic puzzle in order to "win" the race to add the next block to the ledger, creating an ever-growing, immutable chain of blocks. The nodes are incentivized to do this work because the winner receives a payment of cryptocurrency. The proof-of-work mechanism—i.e., the cryptographic puzzle—is designed to add friction, to slow the system so that blocks are not added more quickly than the network can reach agreement on their order. Solving the cryptographic puzzle requires significant computing power, and that computing power in turn requires significant energy consumption. A would-be attacker cannot easily set up enough nodes to disrupt the process of consensus, because doing so would require a prohibitively expensive amount of computer hardware and energy consumption.

PROOF-OF-WORK VS PROOF-OF-STAKE



[2] Any distributed network can be hacked if malicious actors control one-third of the network's voting power over consensus.

IN PROOF-OF-STAKE, THE LIMITED RESOURCE IS THE PLATFORM'S CRYPTOCURRENCY

In "proof-of-stake" DLT systems, the limited resource is the platform's digital coin, and a node's ability to validate transactions is proportional to the amount of coins the node holds (i.e., its "stake"). The particular manner in which a node's stake relates to achieving consensus varies from platform to platform, but it always occurs through the platform's algorithm and is in some way proportional to a node's stake of cryptocurrency.

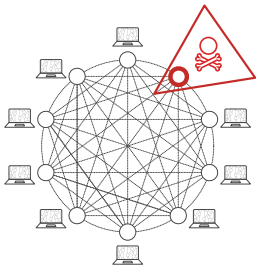
In proof-of-stake systems, all of the platform's coins are created at the launch of the network (e.g., all 50 billion hbars were created at the time of the Hedera network's launch). There is no "mining" of new coins through expensive, energy-inefficient computations. As a result, proof-of-stake systems have much lower transactions costs and can process transactions much more quickly and much more cheaply than proof-of-work systems

HEDERA PREVENTS CYBERATTACKS THROUGH COIN-WEIGHTED VOTING ON CONSENSUS

Hedera is a proof-of-stake system, with hbars functioning as the limited resource to protect the network. Any distributed ledger using the hashgraph consensus algorithm will achieve consensus on a transaction when the transaction is validated by more than two-thirds of the network's voting power. A malicious attacker, then, would need to attain one-third of the total voting power over consensus to disrupt the network.[3]

COIN-WEIGHTED VOTING ON CONSENSUS

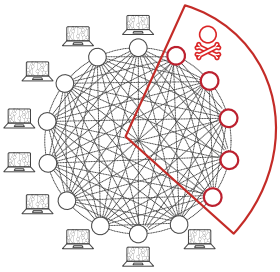
SCENARIO A: Networks with no coins – Attack threshold: **1/3 of nodes**



- 10 nodes
- 1 run by bad actor
- 1 of 10 is malicious (10% < 33.3%)

✓ Consensus achieved

Attacker sets up 4 virtual nodes

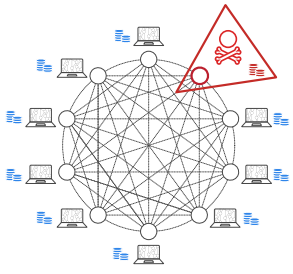


- 14 nodes
- 5 run by bad actor
- 5 of 14 are malicious (36% > 33.3%)

✕ Network disrupted

✕ Vulnerable to Sybil attacks

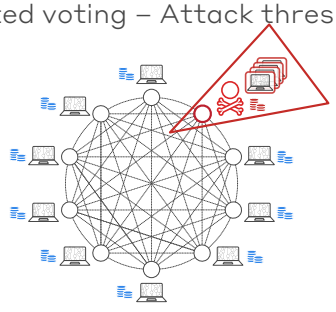
SCENARIO B: PoS networks with coin-weighted voting – Attack threshold: **1/3 of coins**



- 10 nodes, 100 total coins
- Each node has 10 coins
- 1 run by bad actor
- 1 node holding 10 of 100 coins is malicious (10% < 33.3%)

✓ Consensus achieved

Attacker sets up 4 virtual nodes



- 14 nodes
- 5 run by bad actor
- Still only 100 total coins
- 4 nodes holding 10 of 100 coins are malicious (10% < 33.3%)

✓ Consensus achieved

✓ Resistant to Sybil attacks

- In a distributed network, consensus is reached when a transaction is validated by >2/3 of the network's voting power
  - To mount a successful attack, a bad actor must control 1/3 of the voting power
- Coin-weighted, PoS voting protects against Sybil attacks by making it difficult to reach that 1/3 threshold

[3] Note: The Hedera Governing Council does not exercise discretion over node voting to validate transactions. On the Hedera platform, governance (in which Council members vote through individual representatives) is separated from consensus (in which nodes vote automatically per the hashgraph consensus algorithm). While the Council Members operate the initial nodes, those nodes "vote" automatically by running the algorithm.

For private, permissioned DLT networks, in which all node hosts are known and trusted by each other, the voting power could be calculated based on a one-node, one-vote basis. Once a transaction is validated by more than two-thirds of the nodes, the network would have reached consensus and the transaction would be placed into the shared ledger. For public ledgers, however, in which anyone can set up a node, this one-node, one-vote approach leaves the network vulnerable to attackers who create virtual nodes (known as "sock puppets") at little to no cost. In this scenario, an attacker could create a horde of sock puppets to increase their voting power and surpass that one-third attack threshold (known as a "Sybil attack").

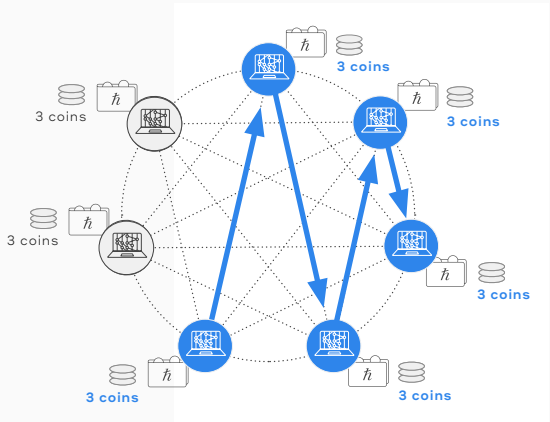
To protect against Sybil attacks, the Hedera network calculates a node's voting power over consensus on a one-hbar, one-vote basis. After a node submits a transaction to the network, the transaction gets communicated to random nodes who validate the transaction's authenticity. Each node's vote is weighted by the number of hbars that are staked (or proxy-staked) to it, and consensus on a transaction is reached once the transaction is validated by nodes representing more than two-thirds of the total supply of coins. This coin-weighted system prevents Sybil attacks, because the creation of additional nodes by an attacker would have no effect on the attacker's stake of hbars, and thus the attacker's voting power over consensus. A bad actor would only be able to disrupt consensus by amassing and staking one-third of the total coin supply.

In addition, because consensus is determined by the number of staked hbars, not the number of nodes, it does not matter if a node goes on or offline while consensus is being calculated.

HEDERA NETWORK WITH COIN-WEIGHTED VOTING

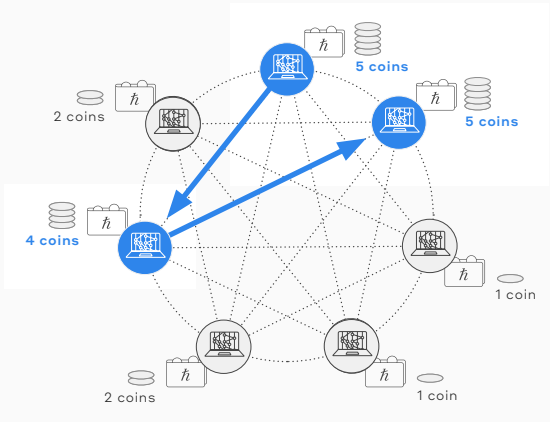
The network will reach consensus on a transaction once the transaction is validated by nodes holding >2/3 of the coins
SCENARIO: Assume 7 nodes and 21 total coins

EXAMPLE A
- Coins distributed equally to each node (3 coins/node)
- Consensus after transaction validated by 5 nodes (5x3=15, 15/21 coins = 71.4% > 66.6%)



3+3+3+3+3=15
15/21=71.4%

EXAMPLE B
- Coins distributed unequally across nodes
- Consensus after transaction validated by nodes holding stake of 14 coins (14/20 coins = 70% > 66.6%)



5+4+5=14
14/20=70%

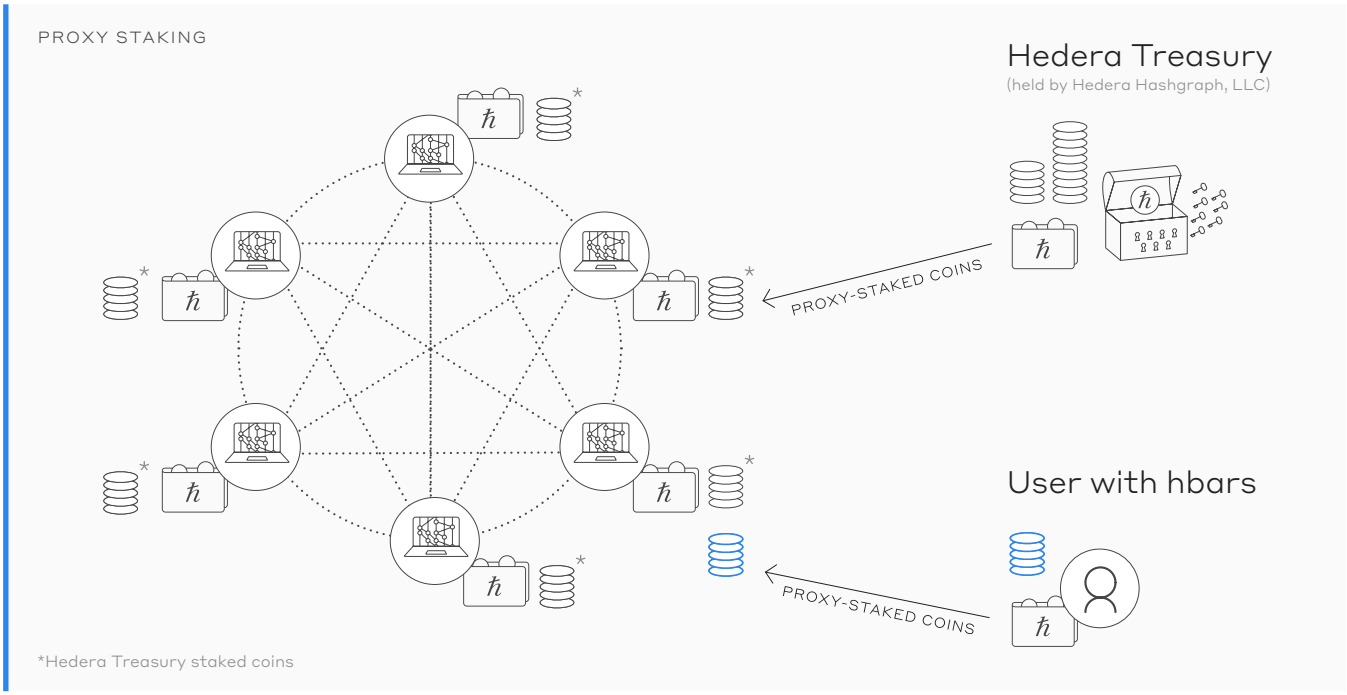
STAKING AND PROXY-STAKING

As Hedera's coin-weighted consensus algorithm requires that a transaction be validated by nodes representing more than two-thirds of the total hbars, it is important to ensure that well over two-thirds of the total hbars are actually staked to nodes. Yet while everyone who wishes to use the Hedera network will need hbars to pay for transactions on the network, most users are not likely to be interested in running a node.

"Proxy-staking" will allow hbar owners who don't run nodes to still stake those coins and so be compensated for contributing to consensus by proxy-staking their hbars to a node[4]. Hbars proxy-staked to a node are considered part of that node's stake (i.e., voting power) when validating transactions.

Node Reward Payments are paid to nodes in proportion total amount of hbars staked (including proxy-staked hbars) and will be split between the node and the owner of the hbars being proxy-staked. In this way, hbar owners are incentivized to proxy-stake their hbars.

Proxy-staked hbars will still remain under the control of their owner; the node to which they are proxy-staked cannot spend them. The owner will also be able to turn off or redirect the proxy-staking to another node or spend the hbars at any time.



[4] Proxy-staking by network users will not be an available feature when the network first opens for public use, but will be added in a later phase of the platform's development.

04.

Hbar Distribution & Hedera Treasury Management

On August 24, 2018, Hedera launched its mainnet and created the fixed supply of 50 billion hbars, held in the Hedera Treasury account.

Well before the network launched, Hedera developed a plan for hbar distribution to ensure the network could grow in a stable and secure manner. This plan was informed by key considerations of:

- Regulatory compliance
- Network security
- Decentralization, and
- Reliance on market forces for retail sales and pricing (rather than centralized decision-making)

The resulting plan calls for a slow, measured release of hbars between open access and August 2033, the 15-year anniversary of network launch.

INITIAL HBAR ALLOCATIONS AND RELEASE

Note: This section describes the initial planned hbar allocation and release schedules. Presently, Hedera anticipates releasing its hbar supply between open access and August 2033. The release schedule described below may vary in the future due to unforeseen business or regulatory changes, and Hedera assumes no liability whatsoever for any variations therefrom.

To fund the development of the Hedera platform and initial operations of the network, Hedera accepted investments in the form of Simple Agreements for Future Tokens ("SAFTs"). Overall, Hedera raised $124 million via SAFTs. The SAFTs were offered at a fixed price per token, not a discount to a future sale price. The initial two rounds of SAFTs have long release schedules of three to four years, while the final SAFT round offered a choice between a four-year release schedule and a eight-month release schedule. The first two SAFT seed rounds were at a price of close to zero dollars, and the third SAFT was available with two pricing options and different release schedules, either 12 cents for a release

FIRST 5 YEARS: COIN ALLOCATION AND RELEASE

Year	Seed SAFTs	SAFT 3	Hedera Team*	Community Earn Programs**	Advisors, Vendors & Others	Market Development Funds	Swirlds	Treasury	Incremental Supply	Total Supply	% Circulating
OA Day	194,062,857	185,263,841	0	1,208,333,333	1,957,864	0	0	0	1,589,617,895	1,589,617,895	3.18%
End Week 1	194,062,857	0	0	0	11,000,000	0	0	0	205,062,857	1,794,680,752	3.59%
Rest of 2019	658,221,234	273,510,244	310,246,318	0	137,235,057	7,297,952	60,000,000	450,000,000	1,896,510,805	3,691,191,557	7.38%
2020	2,076,801,486	322,018,909	1,752,517,526	0	280,153,579	88,902,294	120,357,977	431,279,328	5,074,391,058	8,765,582,615	17.53%
2021	1,956,904,787	48,508,723	439,526,433	0	114,622,450	145,200,650	301,729,644	479,929,740	3,484,062,465	12,249,645,080	24.50%
2022	1,450,322,972	48,508,723	490,577,959	0	75,811,488	145,200,650	168,146,581	479,929,740	2,858,498,113	15,108,143,193	30.22%
2023	693,987,432	48,508,717	1,156,170,025	0	168,033,196	251,562,259	226,955,235	981,609,047	3,526,825,911	18,634,969,104	37.27%

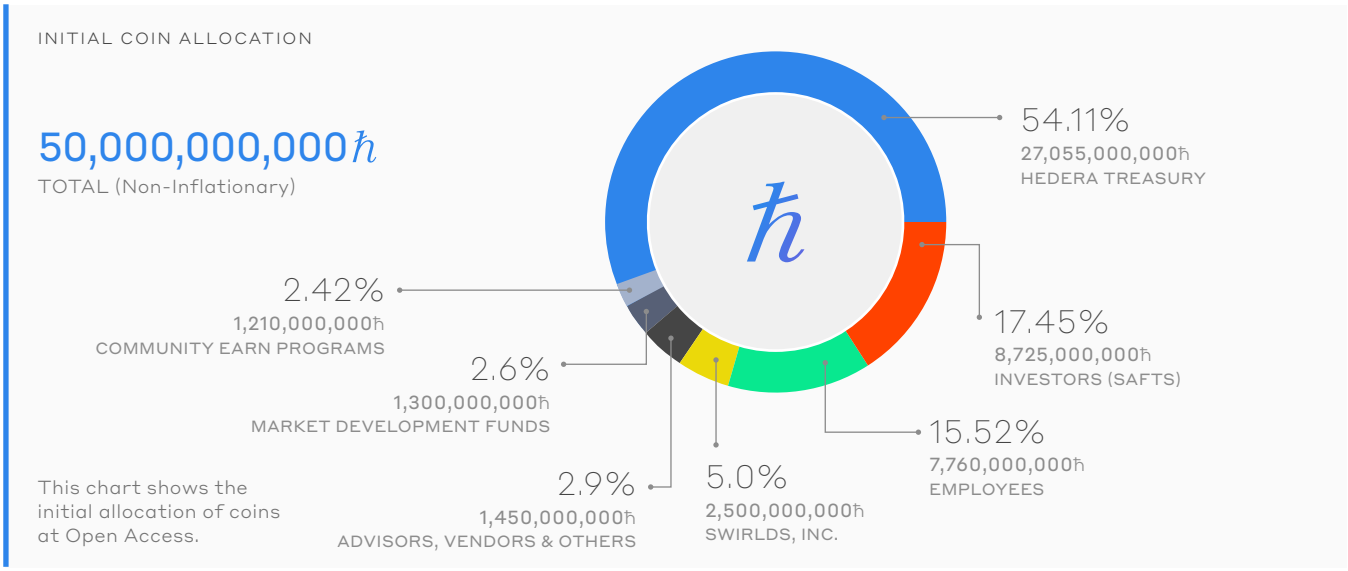
Table above shows allocation by type, along with anticipated release schedule from open access, expected to be September 16, 2019, through December 31st, 2023

* Includes current team tokens + budget for hiring through 2022

** 208.3mm hbar are in the process of being distributed to the community as part of Hedera's community testing program, 1bn is set aside for a committed earn program

schedule over 8 months or 9.6 cents for a 4-year release.
Hedera has also allocated coins to its founders and certain employees, advisors, strategic partners, and early developers and users of the network that have a cost basis of zero dollars.

Approximately 54% of all hbars remain unallocated



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OPEN ACCESS

In summer 2019, Hedera expects to complete the current phase of testing of the platform and to open up the network to allow anyone to create a Hedera account and use the network. At this time of "Open Access," Hedera expects to make the initial distribution of hbars to SAFT holders, employees, advisors, and vendors.

At the initial release of hbars at Open Access, only 3.18% of the total supply of hbars will have been released and be in circulation. This is referred to as the circulating supply. At the end of one week after Open Access, 3.59% of the total supply of hbars will have been released and be in circulation.

The remaining hbars under the SAFTs and agreements with employees, advisors, and vendors will be distributed over varying periods of time up to six (6) years after open access, with the co-founders and other early senior executives having the longest distribution schedules.

None of the hbars that Hedera's co-founders, Leemon Baird and Mance Harmon, are receiving as compensation (employee grants) will be released before January 1, 2020. While Leemon and Mance also own SAFTs and will receive some hbars under the SAFTs, they are also further delaying the release of 76% of all of their hbars (whether from SAFTs or grants) until after August 2023 (i.e. after the fifth anniversary of mainnet launch). Other early senior executive employees currently on staff have also agreed that none of the hbars they receive through employee grants will be released before January 1, 2020, and that a substantial portion of their total hbars will be further delayed until after August 2023.

In addition, Hedera's seed SAFT holders have agreed to a more consistent release schedule, which provides for the

vast majority of coins to be released on a frequent basis (between daily and monthly) over the course of three to four years. Instead of 40% of their tokens being released on Day 1 of Open Access (based on the original SAFT distribution schedule), early SAFT holders will now receive up to 10% of their coins in the first week after Open Access. The remainder will be stretched out evenly over 36 to 48 months on a regular basis, with no balloon payments.

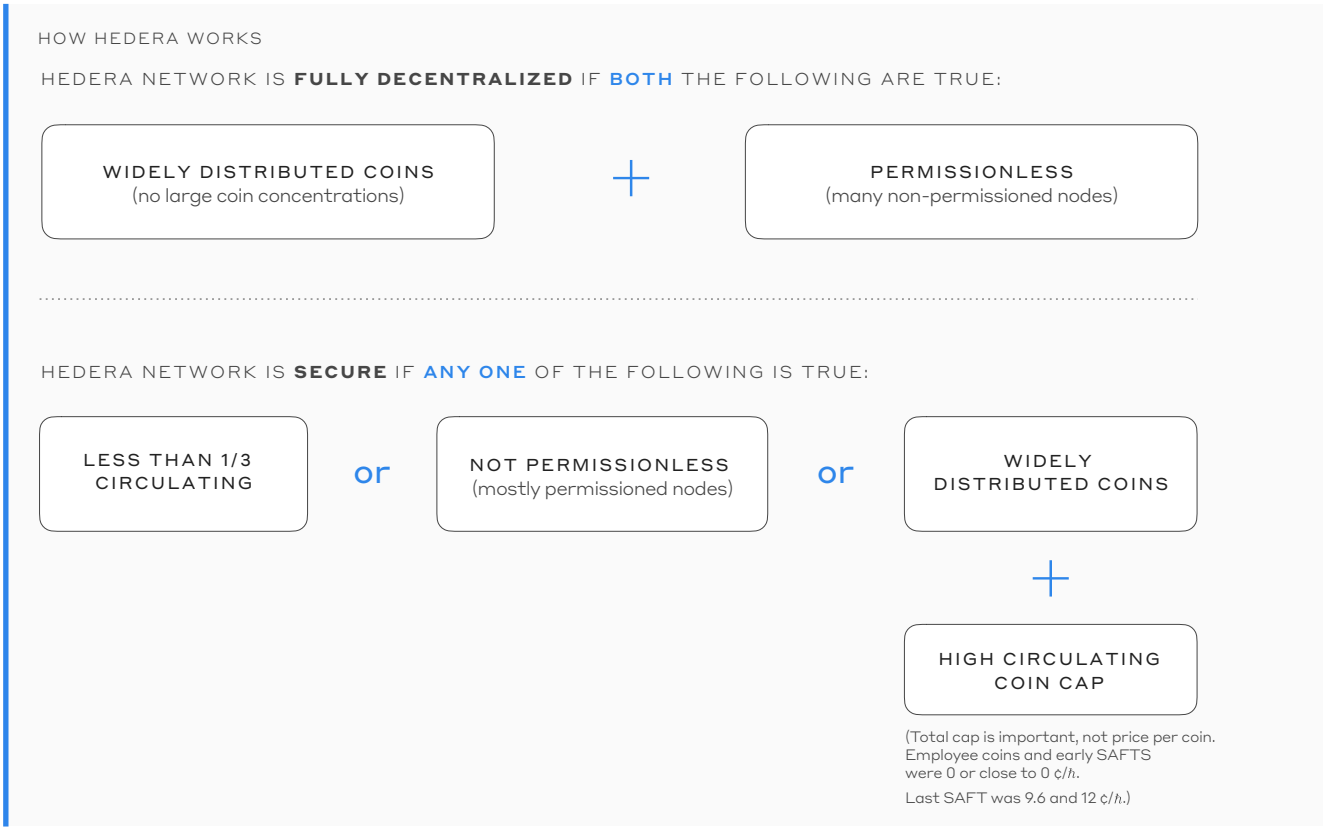
HBAR RELEASE SCHEDULE AS PART OF THE SECURE PATH TO DECENTRALIZATION

At Hedera, we believe there are four key requirements along a secure path to broad and continued decentralization– 1. decentralized governance, 2. network utility, 3. permissionless nodes, and 4. coin distribution. Hedera's model of decentralized governance is covered in detail in other documentation [https://www.hedera.com/council]. Network utility simply means the network must be useful in its own right and provide value to its users. So, for the purposes of this paper, we will focus on permissionless nodes and coin distribution, and the role they play in securely achieving and maintaining decentralization.

"Permissioned" networks are those in which a person or entity must have permission to run a node. "Permissionless" networks those in which anyone can run a node on the network. A public network can be permissioned and/or permissionless, depending on who is running it. Hedera's path to decentralization starts with a handful of permissioned nodes, which over time will grow in number. Further down the path, we relax how much permission someone will need to run a node, and eventually Hedera will be permissionless, allowing anyone to run a node. Hedera's decentralization roadmap has always had the end goal of allowing anonymous nodes.

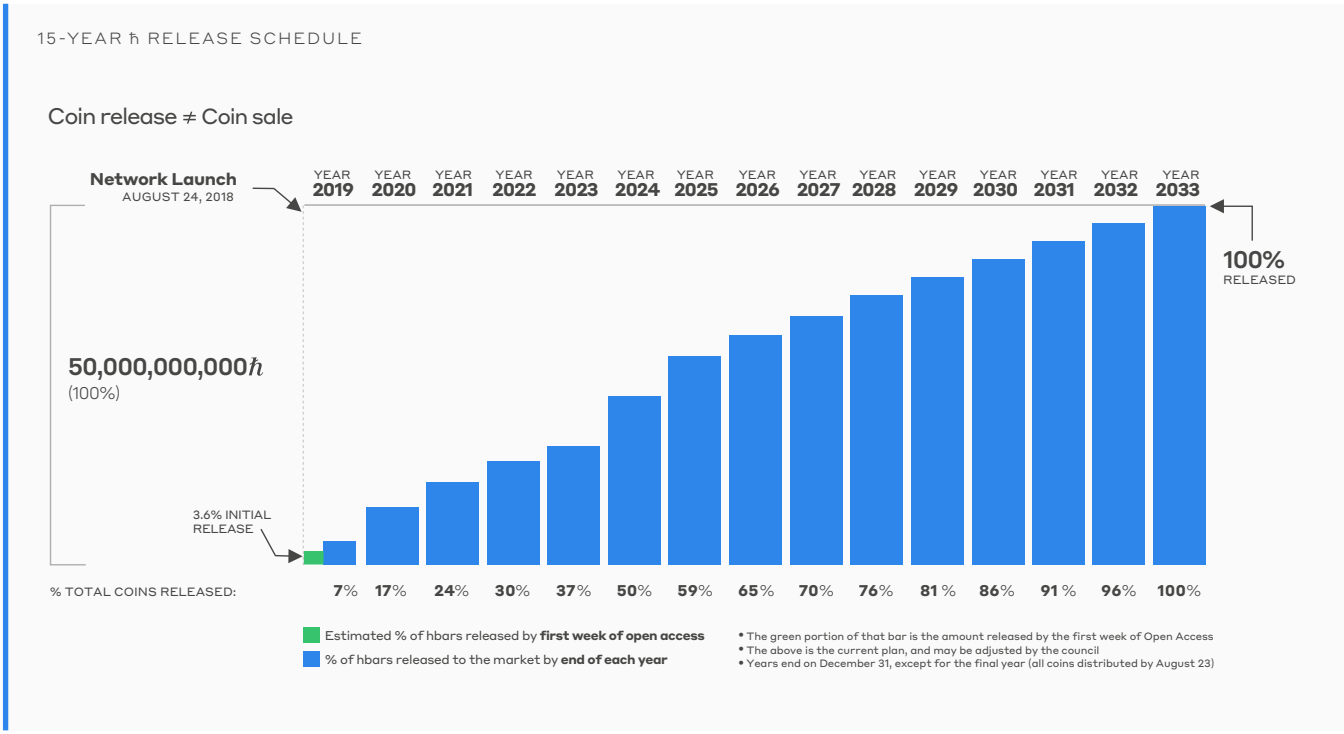
In addition, for continued decentralization, Hedera also needs coins to be widely distributed. Coins are the stake in a proof-of-stake network, and stake is how the network determines consensus --more stake equals more weight over consensus. For distributed consensus, you need distributed stake, and therefore distributed coins. The hbars need to be widely distributed, so no attacker can get a third of the coins.

Hedera aims to use take a combination of a 'path to permissionless' and a 'path to widespread token distribution' to keep the network secure while working to achieve greater decentralization



First, Hedera can control the schedule for moving from permissioned to permissionless nodes hosting the network. Coin concentration is irrelevant with permissioned nodes, because the nodes can be capped at how much can be staked to a node. For the security of the network, the network can remain permissioned until the total value of all the circulating coins is high enough as to be too expensive for a malicious user (or group of users) to buy a third of them in order to conduct an attack.

Second, Hedera has a long, steady, 15-year release schedule for hbar coins starting from the network's launch in August 2018. The initial release of hbars at Open Access will be only 3.18% of the total supply of 50 billion coins, for a total of ~1.59bn coins. By the end of 2019, only 7.53% of hbars will be released, and no more than 33% of hbars are expected to be released until the middle of 2023. After 2023, we expect that it will be another 10 years before all hbars are gradually released out of the Hedera Treasury and into circulation.



This slow release schedule is intended to provide for the stable and orderly growth of the platform so that it can reach scale without sacrificing the safety that is necessary for a truly useful and widespread platform. It is also tailored to match projected user needs to discourage excessive speculation in the coins. In addition, by publicly communicating the expected release schedule and requiring any material changes to be implemented through the vote and signature of a diverse set of Council members, Hedera provides transparency and predictability about the total circulating supply in order to further dampen speculation, minimize information asymmetry and protect against market manipulation.

For more information on Hedera's path to a sustainably decentralized network, watch this webinar by Dr. Leemon Baird, the inventor of the hashgraph consensus algorithm.

AVAILABLE NOW AT **youtube.com/hederahashgraph**

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