

Phase

A Mobile-First Layer-1 Blockchain

with Reputation-Based Consensus and a Mobile Proxy Network for AI Agents

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This document describes technology and mechanisms that are under active development. Architectural decisions described herein, including consensus parameters and protocol mechanics, may change materially before mainnet launch. Statements about future capabilities or performance are forward-looking and subject to material uncertainty.

The PHASE token, if and when issued, will be issued only pursuant to separate offering documentation and applicable regulatory requirements in each relevant jurisdiction.

1. The Problem

Billions of smartphones are active globally. In many regions, the smartphone is the primary computing device and the main gateway to financial services. Yet the infrastructure underlying most blockchains was built for an entirely different environment: high-performance servers in data centers, stable fiber connections, and large upfront capital deposits.

This creates a structural mismatch. The people blockchains are supposed to serve are mobile-first. The validators who secure it are not.

Traditional Proof-of-Stake networks require validators to lock up significant capital — often tens of thousands of dollars — before they can participate. Proof-of-Work replaces capital with specialized hardware and energy costs. Both approaches concentrate network security in the hands of professional operators, reproduce the same distribution problem, and exclude the most widely held computing device in the world.

Phase was built around a different premise: if the next large wave of participants is mobile-first, the validating layer must be designed for mobile conditions rather than data-center assumptions.

2. What Phase Is

Phase is a full Layer-1 blockchain designed to run on smartphones. It combines three core components:

1. **A reputation-based consensus layer.** Validators earn the right to participate by demonstrating reliability over time, not by locking up capital. Registration is a free transaction; there is nothing to stake.
2. **A node built for real phones.** A production-grade execution client (built on Reth, fully EVM-compatible), a networking stack designed for devices behind cellular NAT, and a snapshot-first sync path that brings a fresh phone from install to participation in minutes.
3. **A mobile proxy layer for AI agents.** The same smartphone nodes that secure the network can double as a network utility: the node ships an opt-in proxy exit (which the mobile build's defaults do not enable), through which AI agents can route traffic and access the web from real mobile-origin connections, with usage metered and settled on-chain.

Phase is not a Proof-of-Stake network and not Proof-of-Work. Validators register with a smartphone and earn their place through demonstrated, on-chain behavior.

Phase at a glance. Consensus: Chained HotStuff with BLS-aggregated quorum certificates and deterministic finality in seconds. Committee: up to 16 voting seats; the genesis validators are permanent anchors that always hold the quorum. Registration: free system transaction, no deposit. Block time: well under a second on the test networks. Execution: full EVM (built on Reth). Sync: verified state snapshots — minutes, not days. Proxy economy: 100% of revenue committed to open-market PHASE buybacks. Networking: entirely on iroh (QUIC), designed for phones behind cellular NAT.

3. Consensus: Reputation Instead of Stake

Phase uses committee-based BFT consensus (Chained HotStuff). At any given time, a committee of validators collectively produces and certifies blocks. The committee has a budget of 16 voting seats (a client-release parameter, not a function of how many validators register), filled first by the genesis validators — the network’s permanent *anchors*, seated whole in every committee — and then by graduated validators, who hold at most half as many seats as the anchors minus one, so that the anchors alone always form a quorum. With seven anchors the committee seats seven to ten voters with a quorum of five to seven. Votes are aggregated into a compact quorum certificate using BLS signatures, messaging complexity is linear in committee size, and finality is deterministic — a block is final after three chained certificates, seconds after it is produced.

The question the protocol must constantly answer is: **which validators should be in the committee?** In most blockchains, the answer is determined by how much capital a validator has staked. In Phase, the answer is determined by **reputation** — a continuously updated score derived entirely from on-chain behavior.

3.1 Registration is free — and cryptographically strict

Becoming a validator requires a single system transaction with zero gas and no deposit. The transaction registers the validator’s address, a BLS key for consensus voting, and a network identity key, together with a proof-of-possession bound to the sender and chain — the standard defence against rogue-key attacks. All keys are derived deterministically from the phone’s single master key. A registration remains valid for a short window (320 blocks) and is renewed automatically while the node is running, so abandoned devices fall out of the validator set on their own.

3.2 Reputation scoring

Every block records which committee members signed on time and which leader delivered or failed. Those observations accumulate into a per-validator reliability score. The scoring system is designed to be:

- **Conservative** — the score uses a lower confidence bound: a validator with a few perfect votes scores lower than one with hundreds of consistently good votes. Evidence matters, not luck.

- **Adaptive** — recent performance matters more than distant history, so a validator can recover from a bad patch and a new device can graduate into the system over time.
- **Stress-aware** — the scoring model specifies a correction that distinguishes individual unreliability from systemic outages, so a network-wide failure does not destroy individual reputations; it is specified, not yet active.

3.3 Committee selection: deterministic and verifiable

Once per epoch the protocol freezes a *selection snapshot*: the list of active validators with their reputation-derived weights. Each round's committee is computed from that snapshot by a deterministic function — every node in the network derives byte-for-byte the same committee and can verify the legitimacy of any block's signers. There is no hidden operator choosing who validates.

New validators follow a defined lifecycle: they enter a queue (with a per-epoch admission limit that caps Sybil inflows), serve a probation period in *reserved observer seats* — signing and earning reputation, but counting toward no quorum and not yet leading — and graduate to full membership once they have accumulated enough evidence of reliability. Graduates then compete, weighted by reputation, for the voting seats beside the anchors. This guarantees newcomers a real path in, without grace periods or special treatment. Leadership rotates round-robin among the voting members.

3.4 Rewards only after finality

Validator rewards are released only for heights already finalized under a full quorum, and a payout becomes irreversible as soon as the block that credits it is itself final. This turns the validator's future income stream itself into skin in the game: the thing at risk is not a deposit, but the earning position built through honest participation.

3.5 What happens when a validator misbehaves

There is no slashing — there is no bonded capital to slash. Instead, the protocol's answer to a provable fault is **jail** and a **reputation reset**: the validator loses committee eligibility, the income stream that came with it, and the accumulated track record that took months to build. For a long-serving validator this is a substantial economic penalty — and unlike a stake deposit, it cannot be bought back; it can only be re-earned through honest participation. The cost of misbehavior scales with tenure. The fault detector ships today; the automatic jailing step is specified but not yet active, so in the current build the penalty is the score itself — missed votes and failed leadership cost seats, and seats are income.

3.6 Designed for unreliable validators — because phones are

A committee of phones is not a committee of servers: devices lose signal, switch networks, and run out of battery. Classical BFT protocols simply halt when a third of the committee goes silent. Phase is engineered to degrade gracefully instead:

- **Tentative certificates.** If the full quorum is temporarily unreachable, a reduced quorum can keep the chain moving: blocks continue to be produced and transactions continue to execute, while finality — and the rewards gated on it — catches up retroactively once the full quorum returns. The network slows down; it does not stop.
- **Automatic committee rotation.** A committee that makes no certified progress for a minute deterministically moves to a new committee round: the anchors keep their seats, the leader order is reshuffled, and the graduate and observer seats are redrawn wherever more candidates wait than there are seats. Connections to the incoming committee are pre-warmed before the handover.
- **Self-cleaning validator set.** Systematically unreliable devices lose score and fall out of selection on their own — no governance action required.

4. Built for Real Phones

Mobile validation is not only a consensus problem. It is equally a networking, bootstrap, and storage problem. Phase treats all of them as first-class design targets.

4.1 A networking stack built entirely on iroh

Standard blockchain networking assumes a validator is a server: public IP, open ports, stable connectivity. A phone behind carrier-grade NAT, hopping between Wi-Fi and LTE, breaks every one of those assumptions.

Phase replaced the standard Ethereum networking stack entirely with [iroh](#), a modern QUIC-based peer-to-peer transport. Nodes are addressed by cryptographic identity, not IP (*dial keys, not IPs*); connections are established by NAT hole punching with transparent relay fallback; and the transport layer survives a network switch (Wi-Fi ↔ LTE), so a validator riding the metro does not drop out of consensus. To our knowledge, Phase is the first L1 whose complete networking stack — consensus, block sync, mempool, and state bootstrap — runs over iroh.

Consensus votes, blocks, transactions, and snapshots are all multiplexed over a *single* QUIC connection per peer: one NAT binding, one handshake, one keepalive — minimal battery and minimal state in the carrier’s NAT tables. Beacon nodes relay consensus messages between validators that have no direct path to each other; every proposal and vote is signed end-to-end by its author, and a certificate is the aggregate of those vote signatures, so relays accelerate delivery but cannot forge a single vote. Gossip is deduplicated, fanout is deliberately narrow, peers are selected by measured bandwidth, and frame sizes are hard-capped — the stack is engineered for a validator on a mobile data plan.

4.2 Snapshot-first sync: minutes, not days

A classical node replays the entire transaction history from genesis — the single biggest reason “a full node on a phone” has been impossible. A Phase node instead downloads the network’s *current state* at a recent finalized block: balances, contract storage, bytecode,

and the validator registry, fetched as compressed chunks in parallel from multiple nodes.

The bootstrap is trust-minimized and interruption-proof: the snapshot is chosen by a quorum vote of the Foundation-run beacons, which must agree on both its state root and its full content, and taken only from finalized state; every chunk is cryptographically verified against its manifest, and a beacon that serves a bad chunk is penalized and the chunk fetched again from another beacon when one can take it. Downloads resume from the exact chunk where they stopped, and the import itself is checkpointed: it survives the app being killed, the phone rebooting, or the network disappearing mid-way. After the snapshot, the node catches up only the blocks produced since it was published — a tail of one export interval by schedule, a few at most — and joins consensus.

Critically, sync time does not grow with the age of the chain. The network can run for years; a new phone still downloads only the current state — a volume comparable to a large app update.

4.3 Full EVM compatibility

Phase’s execution layer is built on Reth, a production-grade Ethereum client written in Rust, and exposes a fully EVM-compatible chain (Ethereum fork set through Cancun, with blob-carrying transactions switched off on mainnet). Existing smart contracts, wallets, and developer tooling work out of the box. Consensus and execution are cleanly separated through an internal engine interface — the same architectural split as Ethereum itself, running in a single process on a phone.

5. Validator Pools and Onboarding

Phase extends validator participation into a native pool-formation mechanism — a growth loop built into the protocol rather than run as an off-chain marketing campaign.

A registered validator can create an on-chain pool; other validators join it by referencing the organizer’s address. From that moment, rewards earned by any member of the pool are shared equally across the pool, and the organizer earns an additional protocol reward, carved out of the block reward itself, that grows with the size of their active pool — 0.1 PHASE per member per block led by a member, at most 10 PHASE — and saturates at one hundred members, which is also the pool’s cap: a full pool refuses the next join. Short entry and exit locks prevent hopping between pools around payouts, and only registered, active validators can create or join pools — recruiting means growing the actual validating fleet, not a list of sign-ups. Members whose registrations expire are removed from pools automatically.

The mechanics serve both sides. For the organizer, the referral relationship, the reward split, and the bonus are all enforced by block execution — no off-chain tracking, no manual payouts, nothing to dispute. For ordinary members, pooling smooths income: instead of rare lump-sum leader rewards, members receive a steady, predictable stream — the right earnings profile for a phone-based validator.

5.1 Mobile bootstrap, end to end

A smartphone moves from cold start to validator participation through a deterministic flow:

1. The app downloads and verifies a state snapshot instead of replaying chain history.
2. The node syncs the remaining delta to the current chain tip.
3. It submits the free registration transaction and, once registered, can join an organizer's pool with a separate, fee-paying transaction.
4. It enters the queue, serves probation, and graduates into full committee rotation under the standard scoring rules.

6. A Proxy Network for AI Agents

The same smartphone fleet that secures Phase powers a second network function: a mobile proxy layer for AI agents.

6.1 The problem agents face

AI agents are the fastest-growing consumers of web traffic — and the most blocked. Traffic originating from datacenter IP ranges is routinely challenged, rate-limited, or refused outright. Agents need sessions that look like the users they act for: real traffic from real mobile networks. Mobile-origin sessions at scale are exactly what existing proxy providers sell — opaquely sourced, at \$2–9 per GB.

6.2 How the Phase proxy layer works

Every Phase validator node can opt in as a proxy exit node — one flag and the address of a billing service, no extra hardware; the mobile build's defaults do not switch it on. An agent (or its infrastructure) runs a lightweight client that exposes a local SOCKS5 endpoint; traffic travels over the same iroh transport that carries consensus — with the same NAT traversal and relay fallback — to a validator phone, and exits to the internet from that phone's genuine mobile IP. The exit relays encrypted bytes; it never terminates TLS and never sees the content of the traffic.

6.3 On-chain, prepaid, dispute-proof billing

Proxy usage is settled on-chain. An agent pre-funds a balance in a dollar-denominated stable asset; usage is metered per session and settled in idempotent batches — double-charging is impossible by construction, and the unspent balance is always withdrawable. Off chain, the billing service attributes every session to the specific exit node that carried it, and the validators whose phones carry the traffic earn their share of that revenue — proportional to the revenue their exits earned, settled daily, and paid in PHASE acquired on the open market (§6.4) — on top of their block rewards. The underlying demand comes from

agents paying for real infrastructure, a source of network revenue that does not depend on a speculative cycle.

6.4 Proxy revenue becomes PHASE demand

100% buyback commitment. All proxy revenue — every dollar agents spend on mobile egress — is committed to open-market purchases of PHASE. Nothing is held back as operating profit by the Foundation: proxy income is converted into PHASE demand, and the validators who carried the traffic are paid their share in that market-bought PHASE. Every unit of proxy usage therefore translates directly into buy-side demand for the token — revenue from outside the crypto economy, converted on-market, never minted.

The cycle runs daily:

1. **Collect.** Agents' payments for proxy usage accumulate over the day in the dollar-denominated billing asset — say, \$1,000 across the fleet.
2. **Buy.** The full amount is used to purchase PHASE on the open market.
3. **Distribute.** Once per day, the purchased PHASE is credited to the exit devices *pro rata to the revenue each earned* that day. If five phones earned the day's revenue between them and one phone earned half of it, that phone receives 50% of the day's distribution; the remaining four, having earned equal shares, receive 12.5% each.

The billing service already attributes every paid session to the exit that carried it (§6.3), so the split follows metered, paid usage, not an estimate; on chain, settlement records what each agent paid, not which exit carried the traffic. This closes the loop between the network's two functions: the consensus fleet produces the proxy service, agents pay for it in dollars, that revenue buys PHASE on the open market, and the purchased PHASE pays the phones that did the work. The token sits at the center of the flow not by decree but by construction: as agent demand for mobile egress grows, so does recurring, usage-driven demand for PHASE. At launch the buyback-and-distribute programme is an operating policy of the Foundation, executed transparently; moving its execution on-chain is on the roadmap (§9).

6.5 Safe for the validator

The exit enforces strict egress protection: connections to loopback, private ranges, link-local, and cloud-metadata addresses are refused — including IPv6-mapped disguises — so the phone can never be used to reach its own node or internal networks. Global and per-peer connection caps and a per-account rate limit on new tunnels bound how much proxy work the exit admits, and the exit runs on an iroh endpoint of its own, apart from the one that carries consensus. These bound sessions and tunnel openings, not bytes, so they do not by themselves keep proxy traffic from competing with the validator's consensus duties for CPU and bandwidth.

6.6 Roadmap: agent nodes

Alongside validator nodes, Phase is developing a lightweight *agent node* — a minimal client that submits transactions and consumes network services without storing chain state or participating in consensus. It is the entry point for developers who want to plug agents into the mobile proxy layer and settle usage on-chain without operating a full node — turning Phase into agent-facing infrastructure: the chain as the settlement layer for agent commitments, and the mobile fleet as the utility those agents consume.

7. The PHASE Token

PHASE is the native utility token of the Phase network.

Network fees. Transactions on Phase are denominated in PHASE, tying demand for the token directly to network usage.

Validator rewards. Validators earn PHASE through committee participation, released only upon finality. Rewards are calibrated to make sustained mobile participation economically worthwhile — and validators whose phones carry proxy traffic also receive a share of the proxy revenue, paid in PHASE bought on the open market (§6.4).

Proxy-driven buybacks. The proxy economy feeds the token directly: 100% of proxy revenue is committed to open-market PHASE purchases (§6.4), distributed daily to serving devices pro rata to the revenue they earned. Usage of the network’s second product is, by construction, demand for its token.

Not a staking bond. Validators do not lock up PHASE to participate, and there is no minimum holding requirement to register. This is a deliberate design choice: requiring large token deposits would reproduce the capital-concentration problem Phase is built to avoid.

Supply and allocation. Total supply is fixed at 100 billion PHASE. Half of it, 50 billion, is the validator reward budget, paid at a flat 158.55 PHASE per block until it is exhausted — the cap is enforced by the genesis rewards contract; changing it takes a multisig upgrade. A quarter, 25 billion, belongs to the core team: locked for six months after the token generation event, then released in nine equal quarterly tranches through month 30. The remaining quarter, 25 billion, is the Foundation and treasury allocation: 2% of it is liquid at the token generation event as operating float and the rest vests linearly over 36 months. There is no investor allocation and no staking. Circulating supply therefore starts at 0.5% of the total.

The emission schedule, fee mechanics, and the vesting contracts are specified in full in the Phase whitepaper.

8. Why This Matters

Phase is not primarily a scalability story. It is a distribution story.

Blockchains have historically secured themselves by concentrating validation into the

hands of sophisticated operators with significant capital. That model works technically, but it does not match the actual distribution of the people who use financial infrastructure. Most of those people are on smartphones, not running servers.

Phase is an attempt to close that gap at the infrastructure level — to build a network that is secured by the same devices its users already carry, where the right to participate is earned by showing up reliably rather than by locking up capital.

The proxy and agent layer follows from the same logic. If the most valuable property of a smartphone node is that it originates traffic like a real phone, that property should be a primitive the network offers — not something agents have to assemble outside the protocol.

9. Open Questions and Honest Caveats

Phase is under active development, and this litepaper is an introduction, not the authoritative specification.

- The scoring system contains well-motivated statistical claims that are better understood as calibrated heuristics than settled theorems in a non-stationary mobile environment; parameters will continue to be calibrated from testnet data.
- The tentative-certificate degraded mode deliberately trades a constrained amount of safety margin for liveness; its safety analysis is heuristic rather than a full BFT proof and is an active area of work.
- The proxy layer's usage metering and settlement are coordinated by a backend operated by the Foundation at launch, with trust progressively decentralized over time. The 100% buyback commitment (§6.4) is likewise an operating policy of the Foundation at launch — published and verifiable against on-chain flows — rather than a protocol rule; enforcing it on-chain is a roadmap item.
- The exploration tranche, the correlated-failure (stress) correction, automatic jailing and device-attestation Sybil resistance are specified but not active, and the committee's seat budget changes only by a client release; the current configuration is deliberately conservative. The genesis anchors hold the quorum permanently by design: a newcomer can earn a vote, never outvote them.

Phase publishes a full technical whitepaper covering the protocol design in depth; where this document simplifies, the whitepaper governs.

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