SAL Token

Technical Paper

Access Layer for a Logistics Invoice Financing Marketplace

Version 2.0. 19 August 2026. SAL is a BEP-20 access and alignment token on BNB Chain. SAS Worldwide Logistics is the initial marketplace originator and operating company. Maximum supply remains 1,000,000,000 SAL. This document replaces the Version 1 payment-token thesis.

SAL does not pay freight invoices. Logistics clients continue to contract and settle with SAS in fiat currency. Eligible marketplace participants stake SAL for access and fund verified invoice opportunities in USDC or USDT. Any invoice-linked financing claim, settlement priority, recourse, recovery treatment, fee, and transfer restriction is governed by the applicable legal contract pack, not by token ownership alone.

Notice. This paper describes a proposed product and technical model for validation. It is not an offer, solicitation, prospectus, investment recommendation, legal opinion, tax opinion, or guarantee. SAL is not equity, debt, a claim on SAS, a claim on an invoice, or a promise of return. No public launch or financing activity should occur before legal, regulatory, security, treasury, and closed-pilot validation is complete.

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1. Abstract

Freight forwarding requires cash before it receives cash. Carriers, trucking providers, handling agents, warehouses, and suppliers may require payment before a commercial debtor pays its logistics invoice. The working-capital gap can be commercially normal while remaining material for an operating forwarder.

SAL Protocol is a proposed marketplace for verified logistics-invoice financing. It separates three rails that Version 1 incorrectly coupled: fiat remains the commercial rail between SAS Worldwide Logistics and its client; USDC or USDT is the funding and investor-settlement rail; SAL is the access, tier, and fee-alignment rail. A client is not required to buy or use SAL to obtain logistics services.

Eligible participants stake SAL, review a disclosed listing, and contribute USDC or USDT. Funding is used by SAS as disclosed working capital. The debtor pays SAS in fiat under its ordinary invoice terms. After reconciliation, SAS transfers settlement value to the distribution contract, which allocates it pro rata. The return on a position derives from the invoice discount and realized collection, not from SAL emission, price appreciation, or a promised APY.

The protocol can make allocation, lifecycle recording, concentration limits, settlement accounting, and distribution more auditable. It cannot eliminate late payment, default, dispute, fraud, stablecoin risk, legal uncertainty, or misuse of funds. Underwriting, wallet control, legal enforceability, reconciliation, and recovery operations remain determinative.

2. Executive Summary

SAS Worldwide Logistics is the initial proving ground for a logistics invoice-financing marketplace. Its freight-forwarding operations create commercial invoices with observable issuance, due-date, payment, dispute, and collection events. The marketplace is designed to finance selected invoices, not to convert the whole logistics payment system into a token economy.

The design begins from a practical constraint: freight invoices, vendor obligations, tax, payroll, accounting, and treasury require stable units of account. Requiring clients to acquire a volatile token introduces price risk, slippage, double conversion, custody burden, tax complexity, and adoption friction. SAL is therefore removed from the freight-payment path.

For a listing with face value F, tenor T days, and annual discount rate r, the indicative funding price is

$$P = F\left(1 - r\frac{T}{365}\right),$$

and the pre-fee gross spread is $G = F - P$. This is a pricing convention, not a promise. Realized outcomes vary with settlement timing, fees, default, dispute, partial payment, recovery, stablecoin risk, and the legal terms governing the claim.

The investor flow is intentionally direct. An eligible participant stakes at least 50,000 SAL to obtain base access, performs the required eligibility checks, selects a listing, and contributes USDC or USDT. A mapped SAS Invoice Wallet receives funding and SAS uses the proceeds as working capital. The commercial debtor continues to pay SAS in fiat. SAS reconciles the payment and transfers settlement assets to the smart contract for pro-rata distribution.

SAL demand is tied to access, tiered allocation, and eligibility for variable fee-pool rewards. It is not tied to compulsory freight payment. A variable reward may be distributed only from realized protocol fees. If fee income is insufficient,

reward falls; if fee income is zero, reward is zero. A target around one percent annually is a non-binding operating target for validation, never a guaranteed APY.

The paper retains the broader industry, company, governance, security, sustainability, and legal analysis of Version 1. Sections 6 through 18 are revised to reflect the new invoice-marketplace model. The initial launch path is a closed SAS pilot. Expansion to additional originators depends on evidence of data quality, loss-adjusted results, settlement discipline, legal enforceability, and operational security.

3. The Logistics Industry: Context and Problems

3.1 Scale and momentum

Global logistics expenditure runs into the trillions of US dollars annually and touches nearly every physical good in the world economy. Freight forwarding — the coordination of cargo movement across carriers, modes, and borders — sits at the center of this system. The industry is undergoing sustained digital transformation, and blockchain adoption continues to grow across supply chain management, trade documentation, and payments.

3.2 Structural pain points

Despite this progress, the financial and documentary layer of logistics remains encumbered by long-standing inefficiencies:

Pain point	Operational consequence	Cost impact
Cross-border payment delays	Shipments held pending cleared funds	Working-capital drag, demurrage
High banking costs	Correspondent and FX fees at each hop	Margin erosion on every invoice

Limited shipment visibility	Manual status checks, disputes	Support overhead, SLA Penalties
Manual paperwork	Bills of lading, customs docs re-keyed	Labor cost, processing delay
Fraud risk	Document forgery, double-financing	Direct loss, insurance premiums
Slow settlement	Multi-day clearing across time zones	Delayed revenue recognition

These frictions compound across a shipment's lifecycle. A single international consignment may pass through a shipper, a freight forwarder, one or more carriers, customs authorities, a destination agent, and a consignee — each interaction potentially introducing a payment delay, a fee, or a reconciliation error.

3.3 The opportunity

The combination of a large addressable market, persistent structural friction, and maturing blockchain infrastructure creates a clear opportunity. A token-based settlement and incentive layer, integrated directly into logistics operations rather than bolted on afterward, can compress settlement times, reduce cost, and make loyalty and documentation verifiable. SAL is designed precisely for this integration.

3.4 Quantifying the friction

The cost of the status quo is not abstract. Consider a stylized cross-border freight invoice of nominal value I. Under correspondent banking, the total leakage combines explicit fees and the implicit cost of delayed settlement:

$$L = \underbrace{f_{\text{bank}} \cdot I}_{\text{explicit fees}} + \underbrace{I \cdot r \cdot \frac{t_{\text{settle}}}{365}}_{\text{working-capital cost}}$$

where f_{bank} is the aggregate banking and FX fee fraction, r is the annualized cost of capital, and t_{settle} is settlement time in days. With illustrative values $f_{\text{bank}} = 0.03$, $r = 0.10$, and $t_{\text{settle}} = 4$ days, the leakage on a $100,000 invoice is approximately $3,110. On-chain settlement collapses t_{settle} from days to minutes and replaces layered banking fees with a transparent protocol fee, compressing L substantially.

3.5 Why incumbents have not solved it

The friction persists not for lack of technology but because the value chain is fragmented across thousands of independent forwarders, carriers, and agents with no shared settlement standard. Each participant optimizes locally; none can unilaterally impose a common rail. A neutral, token-based layer backed by an operating forwarder, rather than a bank or a pure-software startup is positioned to coordinate adoption from within the industry, using its existing customer and partner relationships as the initial network.

4. Why Blockchain for Logistics

4.1 The theoretical case

Logistics is fundamentally a coordination problem among parties who do not fully trust one another and who operate across jurisdictions with different banking systems, legal regimes, and settlement calendars. Traditional solutions insert intermediaries banks, clearing houses, escrow agents to substitute for trust. Each intermediary adds cost and latency.

A public blockchain offers three properties that directly address this:

- Trust minimization.
  Settlement finality is guaranteed by the protocol rather than by a

counterparty's solvency or goodwill. Parties need not trust each other, only the shared ledger.

- Immutability.

  Once recorded, a transaction or document hash cannot be silently altered, which reduces fraud and dispute surface.

- Programmability.

  Smart contracts allow conditional logic payment on delivery, milestone-based release, automatic fee splitting to execute without manual intervention.

4.2 Delivery-versus-payment for freight

A useful conceptual frame is *delivery-versus-payment* (DvP), long used in securities settlement, adapted to invoice-financing settlement. In a DvP-style flow, release of stablecoin settlement is linked to a verifiable reconciliation condition. Let $D \in \{0,1\}$ denote the authorized settlement attestation and let P be the USDC or USDT settlement obligation. A smart contract can enforce:

$$\text{release}(P) = \begin{cases} P & \text{if } D = 1 \\ 0 & \text{if } D = 0 \end{cases}$$

This removes the classic principal risk in which one party pays before the counterparty performs. Neither the payer nor the payee needs to trust the other; both trust the contract.

4.3 Payment rails compared

Property	Correspondent banking	On-chain SAL settlement
Settlement time	1–5 business days	Seconds to minutes
Intermediaries	Multiple (correspondent, clearing)	None (peer-to-peer)
Operating hours	Business hours, per jurisdiction	24/7/365
Fee structure	Layered, opaque	Transparent, protocol-defined

Auditability	Fragmented statements	Single public ledger
Programmability	None	Native smart contracts

Tokenized incentives further allow the network to reward the behaviors that make it more valuable timely payment, volume growth, partner onboarding in a way that traditional rails cannot.

4.4 Document integrity through hashing

Beyond payments, blockchain addresses the documentary layer. A bill of lading, certificate of origin, or customs declaration can be hashed and its digest anchored on-chain. Let H be a cryptographic hash function and m a shipment document. The anchor stores $h = H(m)$. Any later party can recompute $H(m')$ on a presented document m' and verify integrity:

$$\text{valid}(m') = \left[H(m') = h \right]$$

Because H is collision-resistant, a forged or altered document $m' \neq m$ produces $H(m') \neq h$ with overwhelming probability. This gives every counterparty a cheap, trustless integrity check without exposing the document contents on a public ledger.

4.5 Network effects

A settlement network becomes more valuable as more participants adopt it — a classic network effect. A common heuristic (Metcalfe's law) models the value of a network of n connected participants as proportional to the number of possible pairwise connections:

$$V(n) \propto \binom{n}{2} = \frac{n(n-1)}{2}$$

For logistics, each additional carrier, agent, or shipper on the SAL rail increases the number of counterparties every other participant can settle with instantly. SAS Worldwide Logistics'

existing partner base provides a non-trivial initial n, mitigating the cold-start problem that defeats most standalone payment networks.

4.6 Why BNB Chain

SAL deploys on BNB Chain because it offers low transaction fees, high throughput, short block times, and mature BEP-20 tooling and wallet support. For a payments-oriented utility token where per-transfer cost and confirmation latency directly affect usability, these properties are decisive. The trade-offs of validator-set centralization are acknowledged and addressed through the interoperability roadmap (Section 12.6), which keeps the door open to settling across additional networks as the ecosystem matures.

5. SAS Worldwide Logistics

Established in Singapore, SAS Worldwide Logistics provides integrated logistics solutions across a broad service portfolio:

- Air freight
- Ocean freight
- Trucking
- Warehousing
- ISO tank logistics
- Customs brokerage
- Cargo insurance
- Project cargo

5.1 Service portfolio in depth

Each service line represents a distinct settlement and documentation surface where SAL can create value:

Service	Typical transaction friction today	SAL integration point
Air freight	Time-critical; payment delays hold release of cargo	Instant invoice settlement, priority booking via staking
Ocean freight	Long transit, multi-party documentation	Blockchain-anchored bills of lading, milestone escrow
Trucking	Fragmented regional carriers, cash-on-delivery norms	Automated last-mile settlement, driver incentive rewards
Warehousing	Recurring storage fees, manual reconciliation	Token-metered storage billing, loyalty accrual
ISO tank logistics	Specialized, high-value chemical/liquid cargo	Conditional release tied to inspection attestations
Customs brokerage	Duty payment timing, paperwork	Programmable fee payment, document hashing
Cargo insurance	Claims friction, premium settlement	Invoice-data disclosure and future parametric payout research
Project cargo	Bespoke, multi-leg, high coordination	Multi-signature milestone contracts

5.2 Industries served

The company serves a diverse set of industries, including automotive, healthcare, retail, energy, agriculture, technology, industrial manufacturing, and e-commerce. This diversity may broaden the invoice population available for underwriting, subject to disclosure, concentration controls, and legal eligibility. It does not itself create token demand, yield, or financing quality.

5.3 Why an operating business matters

This operating base is the strategic core of the SAL thesis. Most utility tokens must bootstrap demand from zero; SAL instead attaches to an existing

flow of freight bookings, invoices, and partner relationships. The token's utility is grounded in commercial processes that already generate revenue, which provides a credible path to real transactional demand rather than purely speculative interest.

The distinction is structural. A speculative token's value depends on the arrival of future users who may never come. A utility token attached to a live business converts an existing, recurring cash-flow process into on-chain volume from day one. Every freight invoice that migrates to SAL settlement is a unit of genuine, non-speculative demand — and, through the burn mechanism, a unit of supply removed from circulation.

6. The SAL Ecosystem Architecture

6.1 Architectural boundary

SAL Protocol is an on-chain accounting and access layer around an off-chain logistics and receivables-finance process. The architecture must preserve the boundary between what the blockchain can verify and what SAS must operate. A contract can record a listing, contribution, allocation, attestation, settlement transfer, and distribution. It cannot directly observe a fiat debtor payment, prove an invoice is collectible, or guarantee that working capital was used correctly.

The system therefore has three rails. The commercial rail is the ordinary fiat relationship between SAS and its logistics client. The funding rail is USDC or USDT contributed by eligible participants to a listing-specific route. The access rail is SAL staked to obtain marketplace eligibility and tier policy. No rail is a substitute for another.

6.2 Participant roles

SAS is the initial originator, service operator, collector, and settlement initiator. The debtor is the commercial customer that pays SAS in fiat. The

participant supplies stablecoin funding and receives the contractual invoice-linked claim defined by the listing. A verifier reviews documents, debtor data, and lifecycle evidence. A governance authority controls approved parameters, emergency actions, and originator admission within the limits of the legal and operating framework.

6.3 Invoice lifecycle

The listing registry models the lifecycle as

$$\textbf{Draft} \rightarrow \textbf{Verified} \rightarrow \textbf{Open} \rightarrow \textbf{Funded} \rightarrow \textbf{Active} \rightarrow \textbf{Settled.}$$

Exception paths are explicit: Open may become Cancelled; Active may become Late, Disputed, or Recovery. A transition requires an authorized attestation, evidence reference, timestamp, and event emission. A status must not be advanced solely because a private operator claims that the debtor has paid.

6.4 Module boundaries

The SAL token contract handles balances, transfers, approvals, and staking-compatible ownership. The access controller handles minimum stake, tier, eligibility, lock, and unstake conditions. The listing registry stores immutable identifiers, capacity, timing, risk metadata commitments, and permitted state transitions. The allocation module records contributions, caps, accepted token, wallet mapping, and participant positions. The settlement module accepts the settlement asset, records paid-versus-settled evidence, and distributes value. The treasury and operating wallets remain controlled by multisignature policies outside the assumption of trustless custody.

6.5 Wallet and data mapping

Each listing requires a unique mapping between listing ID, originator, invoice reference, accepted stablecoin, chain, wallet, funding window, and reconciliation reference. A wallet must not be reused across listings unless the

reconciliation model can prove separation. SAS must maintain a spending log and periodic proof-of-use record for funds received as working capital.

6.6 Document integrity

Document contents should remain off-chain. For a private document m, the registry may anchor a digest

$$h = H(m).$$

An auditor can verify that a supplied copy m' matches the anchored bytes when $H(m') = h$. The digest does not prove authenticity, enforceability, debtor solvency, or absence of undisclosed documents.

6.7 Oracle and attestation model

Fiat payment, delivery, inspection, and collection events originate off-chain. The protocol accepts them only through defined attestation roles, evidence requirements, challenge windows, and pause authority. For high-risk transitions, two or more independent attestations may be required. Oracle integration reduces ambiguity in the event log; it does not transfer underwriting responsibility from SAS to the contract.

7. Token Utility and Use Cases

SAL has a narrow utility boundary. It is an access stake and alignment token for the invoice marketplace. It is not a shipping-payment token, invoice denomination unit, debtor-payment rail, yield-bearing receipt, or substitute for USDC, USDT, or fiat.

7.1 Marketplace access

A participant must hold an eligible stake before viewing protected listing details or contributing to a listing. Base access requires at least 50,000 SAL. Higher tiers may alter allocation caps, opening windows, or access to defined risk

bands. Higher tiers must not mechanically increase an invoice's return. A riskier invoice can display a higher discount rate while still having a higher probability of delay or loss.

7.2 Alignment and lock obligations

The stake creates a continuing relationship with the marketplace. A participant cannot unstake while holding an active invoice-linked position, within a defined lock interval, or while subject to an unresolved compliance, dispute, or recovery process. The stake does not guarantee settlement and must not be represented as collateral for an invoice claim.

7.3 Fee-aligned participation

Eligible stakers may receive a variable share of net protocol fee income. The fee pool can contain disclosed listing, access, servicing, settlement, maker, taker, or transfer fees, subject to law and the final product design. No reward is funded by an undisclosed emission promise. This rule keeps the token's economic role separate from the underlying invoice economics.

7.4 Demand and activity relationship

The intended relationship is:

$$\textbf{shipping activity} \rightarrow \textbf{financeable invoice volume} \rightarrow \textbf{marketplace activity} \rightarrow \textbf{access dema}$$

Every arrow requires evidence. Shipping volume does not automatically produce marketplace volume, higher yield, token demand, or token price. The protocol must publish the operating metrics needed to test each link.

8. Tokenomics

8.1 Supply

The maximum supply of SAL is fixed at:

$$S_{\max} = 1{,}000{,}000{,}000 \text{ SAL}$$

No mechanism mints new tokens beyond this cap. Version 2 does not assume a per-transfer burn or other automatic post-issuance supply reduction (Section 9).

8.2 Allocation

Category	Allocation	Tokens
Public sale	25%	250,000,000
Ecosystem rewards	20%	200,000,000
Liquidity	15%	150,000,000
Company treasury	15%	150,000,000
Development	10%	100,000,000
Team	10%	100,000,000
Advisors	5%	50,000,000
Total	100%	1,000,000,000

8.3 Vesting (indicative)

To align incentives and protect the market from concentrated unlocks, the following vesting schedule is proposed. These parameters are indicative and subject to finalization prior to the token generation event.

Category	Cliff	Vesting	Notes
Public sale	None	At TGE	Immediately liquid
Liquidity	None	At TGE	Locked in DEX pools
Ecosystem rewards	None	36 months linear	Emitted per reward schedule
Company treasury	6 months	36 months linear	Multisig-controlled
Development	6 months	24 months linear	Milestone-linked
Team	12 months	24 months linear	Long-term alignment
Advisors	6 months	18 months linear	Service-based

8.4 Circulating supply over time

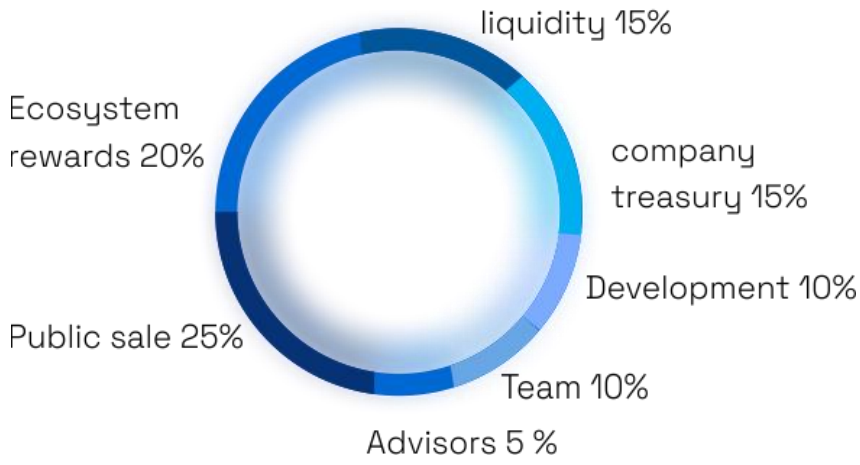
Let $U(t)$ be the cumulative vested (unlocked) tokens at time t and $L(t)$ the amount subject to active access locks. An indicative liquid supply measure is:

$$C(t) = U(t) - L(t)$$

This measure is descriptive only. Lock status can change, does not determine market liquidity, and must not be used as a price prediction.

8.5 Allocation rationale

Each allocation category serves a distinct function in bootstrapping and sustaining the ecosystem:



- Public sale (25%). Broad distribution to establish a decentralized holder base and initial liquidity depth. Fully liquid at TGE.
- Ecosystem rewards (20%). The single largest programmatic pool, funding loyalty accrual, staking emissions, and partner incentives over a 36-month horizon — the fuel for real adoption.
- Liquidity (15%). Locked into DEX pools at launch to ensure tradability and reduce slippage; locking protects against liquidity rug risk.
- Company treasury (15%). Multisig-controlled reserve for operations, contingencies, and governance-directed spending, released over 36 months after a 6-month cliff.
- Development (10%). Milestone-linked funding for engineering, audits, and

platform build-out.

- Team (10%). Subject to a 12-month cliff and 24-month linear vesting to align the team with long-term success rather than short-term price.
- Advisors (5%). Service-based vesting over 18 months.

8.6 Unlock schedule and sell-pressure management

The staggered cliffs and linear vesting are designed to avoid concentrated unlock events that could depress the market. The cumulative unlocked fraction at month t for a tranche with cliff c (months) and linear duration L (months) is:

$$u(t) = \begin{cases} 0 & t < c \\ \min\left(1,\ \dfrac{t-c}{L}\right) & t \geq c \end{cases}$$

By spreading the largest insider tranches (team, treasury, development) behind cliffs and long linear tails, the schedule keeps early circulating supply weighted toward public and liquidity allocations, smoothing sell pressure during the network's formative phase. The team tranche, for example, releases nothing until month 12 and then vests evenly through month 36.

9. Protocol Fee and Access Model

9.1 Replacement of the transfer-tax model

Version 1 proposed a one-percent burn and one-percent treasury transfer tax. Version 2 removes this mechanism from the product thesis. A transfer tax makes SAL unsuitable for precise accounting and does not create a credible relationship between invoice performance and participant return. The core access token must remain operationally simple.

9.2 Fee pool

Protocol revenue is an explicit operating pool rather than an automatic tax on every SAL transfer. Let Q_t denote net realized fee income in epoch t

after approved operating deductions, reserves, and obligations. Governance may allocate a disclosed fraction α_t to eligible stakers, subject to legal and product constraints.

$$0 \leq \alpha_t \leq 1, \qquad D_t = \alpha_t Q_t.$$

The remaining pool may be retained for servicing, technology, security, legal, treasury, reserves, or other disclosed purposes. A fee policy is not a claim that a fee will be collected or that a reward will be distributed.

9.3 Supply treatment

The maximum SAL supply remains fixed at $S_{\max} = 1{,}000{,}000{,}000$. Until a deployed token contract and final allocation are published, no burn, buyback, treasury split, or supply-reduction program should be described as fixed. Any future supply action requires its own legal, governance, and technical disclosure.

9.4 Measurement

The relevant protocol metrics are active stake, eligible participants, funded invoice capacity, funded amount, settled amount, delayed amount, recovered amount, concentration, realized fees, distributable fees, and distribution history. Cumulative token burn is not a valid proxy for marketplace throughput under Version 2.

10. Staking and Variable Rewards

10.1 Access stake

Let s_i be the SAL stake of participant i. Base marketplace access is available only when

$$s_i \geq 50{,}000 \text{ SAL}.$$

Eligibility also requires any applicable onboarding, jurisdiction, sanctions, and

suitability controls. A token balance alone does not confer financing access.

10.2 Reward calculation

Let w_i be participant i's normalized reward weight and let D_t be the distributable fee pool. The variable reward is

$$R_{i,t} = D_t w_i, \qquad \sum_i w_i = 1.$$

Weighting may consider stake amount, lock duration, tier, and anti-concentration limits, but the final formula must be published before use. The protocol must not use hidden discretionary multipliers.

10.3 No guaranteed APY

If $Q_t = 0$, then $D_t = 0$ and $R_{i,t} = 0$. A target near one percent per year is an initial operating target contingent on real fee generation. It is not interest, a deposit rate, a contractual yield, or a guarantee. Invoice returns remain listing-specific and must not be blended with SAL reward communications.

10.4 Unstake and withdrawal controls

An unstake request may be delayed while the participant has active positions, pending settlement, a dispute, a recovery process, a compliance review, or a defined lock obligation. The rule is designed to preserve access alignment and operational accountability, not to prevent a participant from realizing a loss.

11. Governance and the DAO

11.1 Scope of governance

SAL holders participate in decentralized governance over:

- New ecosystem features
- Reward structures
- Treasury spending
- Strategic partnerships
- DAO proposals

11.2 Voting weight

The default model is token-weighted voting. For holder j with voting balance v_j, voting weight is:

$$w_j = \frac{v_j}{\sum_k v_k}$$

To mitigate concentration of power, the DAO may adopt quadratic voting as an alternative, under which weight scales with the square root of holdings:

$$w_j^{\text{quad}} = \frac{\sqrt{v_j}}{\sum_k \sqrt{v_k}}$$

Quadratic weighting reduces the marginal influence of very large holders, favoring broader participation.

11.3 Quorum and thresholds

A proposal p passes when both a quorum and an approval threshold are met. Let Q be the minimum fraction of total voting supply that must participate and θ the minimum fraction of participating votes in favor. With participating supply V_p and total supply V, the proposal passes when:

$$\frac{V_p}{V} \geq Q \quad \text{and} \quad \frac{V_{\text{yes}}}{V_p} \geq \theta$$

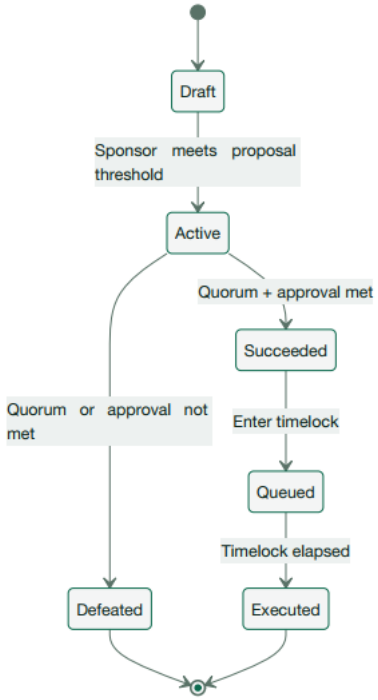
Typical indicative parameters are $Q = 0.10$ (10% quorum) and $\theta = 0.60$ (60% approval), tunable by governance.

11.4 Timelock

Approved proposals that affect protocol parameters or treasury movements are subject to a timelock delay before execution, giving the community time to react and, if necessary, exit. The timelock is enforced by the governance contract and secured by the treasury multisig.

11.5 Proposal lifecycle

Governance follows a staged lifecycle designed to balance responsiveness with safety:



To raise a proposal, a sponsor must hold or be delegated at least a minimum proposal threshold of voting power, which deters spam. Voting uses balances snapshotted at the proposal's creation block, neutralizing flash-loan vote-borrowing (Section 13.2).

11.6 Delegation and snapshots

Holders who do not wish to vote directly may delegate their voting power to a representative, preserving participation without requiring constant engagement. Voting power is measured from a historical snapshot rather than the live balance, so tokens acquired after a proposal opens cannot be used to sway that vote. This time-weighting is a deliberate defense against short-term voting-power rental.

11.7 Governable parameters

The following parameters may be adjustable by governance, within safety bounds encoded in the contracts: access tiers, allocation limits, eligible-originator policy, distributable fee-pool fraction, sustainability allocation share, quorum Q, approval threshold θ, and timelock duration. The maximum supply and the accounting invariants of funded positions must not be changed retroactively. Version 2 does not assume a burn, treasury split, or fixed staking-emission parameter.

12. Smart Contract Technical Specification

12.1 Design objective

The contract system implements access, listing, contribution, lifecycle, settlement accounting, and pro-rata distribution. It does not implement a fee-on-transfer burn, a compulsory freight-payment rail, or an automatic invoice-return promise. The technical specification remains subject to audit and legal review before deployment.

12.2 Access controller

The access controller stores stake amount, tier, lock expiry, eligibility status, and active-position count. Base access requires

$$s_i \geq 50{,}000\ \mathrm{SAL}.$$

The controller must reject listing access and contribution when eligibility is revoked, a participant is restricted, or the proposed contribution breaches a concentration or allocation limit. Unstake is allowed only when active-position and lock conditions are satisfied.

12.3 Listing registry

Each listing has an immutable identifier, originator, face value, funding capacity, accepted stablecoin, funding deadline, target settlement date,

risk disclosure reference, document digest set, and lifecycle state. Mutable fields require role authorization and event emission. Changes after funding must be limited to non-economic metadata or a formally governed exception path.

12.4 Contributions

The allocation contract accepts only the stablecoin and chain configured for the listing. It records participant, amount, timestamp, listing ID, wallet route, and position units. A contribution is rejected when the listing is not Open, the window has expired, capacity is exceeded, the participant is ineligible, or a concentration threshold is breached.

12.5 Settlement and distribution

After SAS has reconciled debtor payment, an authorized settlement role transfers the settlement asset to the distribution contract and submits the evidence reference. For contribution c_i, total contribution C, and distributable settlement S,

$$d_i = S\frac{c_i}{C}, \qquad C = \sum_{i=1}^{n} c_i.$$

The contract must use integer-safe accounting, define rounding treatment, prevent double settlement, and emit a distribution event for every participant. Partial or recovered settlement must be supported without silently changing the position's legal priority.

12.6 Fee accounting

Fees are explicit protocol inputs, not an implicit transfer tax. Let Q_t be realized net fee income in epoch t. If α_t is the approved distributable fraction, the fee pool is $D_t = \alpha_t Q_t$. The contract must reject or record zero distribution when no realized fee balance exists. A target reward rate must never be hard-coded as a guaranteed obligation.

12.7 Roles and permissions

Roles must separate listing publication, verifier attestation, wallet mapping, settlement initiation, emergency pause, parameter update, upgrade authorization, and treasury movement. A role cannot both attest a critical commercial event and unilaterally move the related funds. Role changes require multisignature approval and a timelock where practical.

12.8 Security invariants

The contracts must enforce that a listing cannot exceed capacity; a contribution cannot be counted twice; settlement cannot be distributed twice; a non-approved asset cannot be accepted; an inactive or cancelled listing cannot accept funds; a paused contract cannot process unsafe state changes; and a participant cannot withdraw stake while policy-defined obligations remain.

12.9 Upgrade policy

Immutable accounting invariants should remain outside upgradeability. Upgradeable modules require a timelock, multisignature approval, event disclosure, migration plan, and emergency rollback procedure. Any upgrade that changes a funded position's economic claim requires explicit legal authority and participant disclosure.

13. Security and Compliance

13.1 Security commitments

- Independent smart contract audits prior to mainnet deployment and after material upgrades.
- Multi-signature treasury wallets for all reserve and treasury funds.
- Cold-wallet reserve management for long-term holdings.
- Continuous penetration testing of application and infrastructure layers.

Security is treated as a lifecycle rather than a one-time gate. Before deployment, contracts undergo static analysis, unit and property-based testing, and at least one independent audit. After deployment, a monitoring layer watches for anomalous transfer patterns, and any upgrade to peripheral modules re-enters the audit pipeline. A responsible-disclosure program with bug bounties is intended to align external security researchers with the protocol.

13.2 Threat model (selected)

Threat	Vector	Mitigation
Reentrancy	External calls during transfer/stake	Checks-effects-interactions, reentrancy guards
Fee bypass	Routing through exempt paths	Careful exemption policy, monitoring
Governance capture	Whale accumulation of votes	Quadratic option, quorum, timelock
Bridge exploit	Cross-chain message forgery	Audited bridges, conservative limits
Key compromise	Single-signer control	Multisig for all privileged actions
Oracle manipulation	Falsified delivery/price attestation	Multiple oracle sources, attestation thresholds
Flash-loan attack	Borrowed voting power or price distortion	Snapshot-based voting, time-weighted balances
Front-running / MEV	Transaction ordering exploitation	Slippage limits, private relays where applicable

13.3 Defense-in-depth

No single control is sufficient. The protocol layers controls so that a failure at one level is contained by another: multisig limits the blast radius of a key

compromise; the timelock (Section 11.4) gives the community a window to react to a malicious or erroneous governance action before it executes; fee-exemption is minimized and monitored to prevent burn-bypass; and the core token contract is non-upgradeable (Section 12.5) so its invariants cannot be silently changed.

13.4 Compliance

SAS Worldwide Logistics intends to apply KYC/AML procedures for applicable regulated services and to structure the token and its distribution in accordance with relevant laws. SAL is presented as a utility token; participants remain responsible for compliance in their own jurisdictions (Section 17).

Compliance obligations vary by jurisdiction and by service. For regulated activities — for example, elements of supply chain finance or fiat on-ramps — identity verification and transaction screening may be required. The protocol is designed so that these controls can be applied at the application layer (booking, financing, marketplace) without compromising the permissionless nature of the base token, consistent with the utility-token framing in Section 17.

14. Supply Chain Finance and Revenue

14.1 Invoice marketplace model

The marketplace finances selected logistics invoices at a discount. SAS lists an invoice only after the required verification, data disclosure, concentration checks, and legal documentation are complete. Investors select individual listings or diversified positions; they do not fund an opaque general pool by default.

For face value F, tenor T, and annual discount rate r, funding price is $P = F(1 - rT/365)$. The indicative annualized yield may differ across listings because of debtor quality, dispute risk, recourse, data completeness, concentration, geography, and collection history. It must be displayed before fees, delay, default, and loss unless the disclosure states otherwise.

14.2 Funding and settlement

Funding is contributed in USDC or USDT. The contribution is mapped to a specific listing and SAS Invoice Wallet. SAS uses the funds as disclosed working capital. The debtor pays SAS in fiat. After paid-versus-settled reconciliation, SAS transfers settlement value to the smart contract. For contributor i, contribution c_i, total contribution C, and distributable settlement S, the contract calculates

$$d_i = S\frac{c_i}{C}, \qquad C = \sum_{i=1}^{n} c_i.$$

14.3 Controls

Each listing requires a unique identifier, wallet mapping, funding window, funding capacity, stablecoin route, document-hash record where appropriate, disclosure package, signer matrix, spending log, paid-versus-settled service-level agreement, and late/default workflow. The workflow must specify notice, collection, recovery, reserves, impairment, and investor reporting.

14.4 Expansion

SAS is the first originator, not the permanent boundary. Additional freight forwarders or trade companies may join only after standardized underwriting, data schema, document verification, rating, concentration, wallet-control, reconciliation, collection, and legal requirements are proven. More originators improve choice only when quality remains controlled.

15. Sustainability

Logistics is a carbon-intensive industry: freight transport accounts for a significant share of global emissions, and regulatory and customer pressure to decarbonize supply chains is intensifying. SAL treats sustainability not as marketing but as a funded, governed program tied to real protocol revenue.

15.1 Funded initiatives

A portion of ecosystem revenue may support environmental initiatives aligned with responsible logistics:

- Carbon offset programs. Verified offsets purchased against measured shipment emissions, with retirement certificates anchored on-chain for auditability.
- Sustainable logistics practices. Incentives for lower-emission routing, consolidated shipments, and modal shift from air to ocean where transit time permits.
- Electric vehicle adoption. Subsidies and reward multipliers for partners operating electric or low-emission trucking fleets.
- Green warehousing. Support for solar-powered, energy-efficient, and certified-green storage facilities within the partner network.

15.2 Funding mechanism

Sustainability funding, if adopted, must come from an explicitly approved budget or realized protocol-fee allocation. Version 2 does not impose a one-percent SAL transfer levy and does not claim that freight payment volume automatically funds environmental programs. The specific allocation remains a governable parameter subject to legal and treasury constraints.

15.3 On-chain accountability

Where feasible, emissions data, offset purchases, and program disbursements are recorded or hash-anchored on-chain. This converts sustainability claims from unverifiable statements into auditable records — a direct application of the same transparency property that underpins the settlement layer.

15.4 ESG positioning

Linking a share of protocol revenue to measurable environmental action positions SAL within a broader ESG framework and reflects the growing expectation that logistics networks account for their environmental footprint. For enterprise customers with their own reported sustainability targets, verifiable, on-chain offset records can support Scope 3 (supply-chain) emissions reporting.

16. Roadmap

Phase 1 — Validation

Obtain 24 to 36 months of invoice-level SAS data covering issue date, due date, paid date, dispute, late payment, default, write-off, recovery, debtor, service line, and concentration. Complete legal classification, contract-pack design, stablecoin and custody analysis, wallet architecture, signer matrix, and security threat model.

Phase 2 — Closed SAS pilot

Run a limited pilot with verified participants, selected SAS invoices, per-listing wallet mapping, multisignature control, manual reconciliation, lifecycle reporting, and no public return marketing. Validate funding, funds-use logging, debtor payment, settlement transfer, pro-rata distribution, late status, dispute status, and recovery handling end to end.

Phase 3 — SAS marketplace

Introduce multiple listings, portfolio reporting, concentration controls, fee-pool reporting, governed access tiers, and audited operational service levels. Reward distribution remains variable and occurs only where realized fee income supports it.

Phase 4 — Multi-originator network

Admit external originators only after closed-pilot evidence demonstrates reliable data quality, loss-adjusted results, settlement discipline, security, and legal enforceability. Standardize risk grades, default definitions, document requirements, wallet controls, and collection rules before an originator is onboarded.

Progress is measured through verifiable operating indicators: eligible stake, verified participants, financeable invoice capacity, funded value, settlement timeliness, delayed and impaired value, recovery, concentration, realized fees, and distributable fees. Token price and token burn are not product-success metrics.

17. Risk Factors and Legal Disclaimer

17.1 Invoice and originator risk

An invoice may be late, disputed, partially paid, defaulted, written off, unrecoverable, fraudulent, unenforceable, or subject to set-off, insolvency, contractual defenses, or collection cost. SAS receives and uses funding proceeds as working capital; this operational structure creates originator, reconciliation, misuse-of-funds, and settlement-discipline risk. Smart contracts do not remove these risks.

17.2 Stablecoin, blockchain, and custody risk

USDC and USDT may de-peg, freeze, be restricted, lose liquidity, or be affected by issuer, custody, sanctions, chain, bridge, smart-contract, key-management, or regulatory events. BNB Chain may experience congestion, reorganization, validator, infrastructure, or governance events. Users can lose private keys or interact with malicious contracts.

17.3 SAL risk

SAL may be volatile, illiquid, unavailable, subject to transfer restrictions, or have no market. Staking does not guarantee access, a reward, liquidity, invoice settlement, principal recovery, or price appreciation. Variable rewards can be zero. SAL is not a deposit, share, debt security, ownership right, invoice claim, or investment contract merely because it is used for marketplace access.

17.4 Legal and regulatory risk

Invoice-linked financing positions, stablecoin transfers, marketplace operation, promotion, staking, and token transfers may be regulated or prohibited depending on jurisdiction and participant status. The legal contract pack must determine the actual rights of a participant. Participants are responsible for eligibility, tax, reporting, sanctions, and compliance obligations.

17.5 Disclaimer

This document is for technical and business discussion. It is not an offer, solicitation, financial promotion, prospectus, legal advice, tax advice, or guarantee. All target dates, parameters, tiers, rates, reward formulas, architecture, and roadmap items are subject to change. No public launch should be inferred from this paper.

18. Appendix

18.1 Notation

F is invoice face value. T is tenor in days. r is an annual discount rate. P is funding price. $G = F - P$ is pre-fee gross financing spread. c_i is contribution of participant i. $C = \sum_i c_i$ is total listing contribution. S is distributable settlement. $d_i = S(c_i/C)$ is pro-rata distribution. Q_t is SAL stake. is realized net protocol fee income in epoch t. α_t is the approved

distributable fraction. $D_t = \alpha_t Q_t$ is the distributable fee pool. w_i is normalized reward weight. $R_{i,t} = D_t w_i$ is variable reward.

18.2 Key parameters

Maximum SAL supply is 1,000,000,000 SAL. Base marketplace stake is 50,000 SAL. Funding and settlement rail is USDC or USDT, subject to final deployment and legal approval. Fiat remains the client-to-SAS commercial rail. The initial reward target near one percent annually is indicative, variable, fee-funded, and may be zero. No per-transfer burn, treasury split, or fixed reward emission is assumed in Version 2.

18.3 Lifecycle

The standard invoice lifecycle is Draft, Verified, Open, Funded, Active, and Settled. Exception paths include Cancelled, Late, Disputed, and Recovery. Each transition requires the evidence, role permission, and operating procedure defined by the final contract pack and protocol policy.

18.4 Glossary

Access stake means SAL locked to obtain marketplace eligibility. Commercial rail means the fiat invoice relationship between SAS and its client. Funding rail means USDC or USDT contributed to a listing. Originator means the entity listing an invoice. Paid-versus-settled SLA means the operating deadline and reconciliation standard between debtor payment to SAS and settlement transfer to the distribution contract. Pro-rata distribution means settlement divided by contribution share. Risk band means a disclosed underwriting category, not a guarantee.

18.5 References

Asian Development Bank, ADB Global Trade Finance Gap Survey, December 2025. UN Trade and Development, Review of Maritime Transport

2024. World Bank Group, Technology and Digitization in Supply Chain Finance Handbook. BIS/CPMI, Tokenisation in the Context of Money and Other Assets, October 2024. OECD, Tokenisation of Assets and Distributed Ledger Technologies in Financial Markets, January 2025. Financial Stability Board, The Financial Stability Implications of Tokenisation, October 2024. ICC Digital Standards Initiative, Complete Framework for Supply Chain Digitalisation, April 2024.

End of document — SAL Technical Paper v2.0, August 2026.