

# Entangle White Paper

Version 0.1 Demo Draft

## Abstract

Entangle is a fictional cross-chain messaging and execution protocol built to connect applications, validators, and relay operators across multiple blockchains through a single programmable coordination layer. The protocol is designed around three goals: fast delivery, verifiable security, and sustainable operator incentives.

Entangle introduces a threshold-signed messaging primitive, a sealed-bid relay market, and a dynamic fee engine that distributes rewards between protocol infrastructure and delivery operators. The result is a system that feels simple to developers while still remaining transparent and measurable for node operators and ecosystem stakeholders.

## Problem Statement

Modern blockchains remain fragmented. Assets, applications, and user intent are locked inside isolated execution environments. Traditional bridge systems often rely on trusted multisigs, opaque relayers, or brittle message verification assumptions. This creates security risk, integration overhead, and poor end-user experience for omnichain apps.

## Design Principles

1. One developer interface across many chains.
2. No single validator or relay should control message delivery.
3. Performance and operator quality should be measurable and rewarded.
4. Fee revenue should support a long-lived network beyond pure token emissions.

This document is sample whitepaper content created for demonstration purposes.

# System Overview

Entangle is composed of four coordinated layers:

## Application Layer

Developers integrate through a minimal `sendMessage`-style interface. A source contract encodes destination metadata and payload, then pays the required native fee to dispatch a verifiable cross-chain message into the protocol.

## Scanner Layer

Scanner miners continuously watch connected chains for Entangle-compatible events. They filter malformed payloads, confirm origin contracts, and forward valid dispatches into the validator network.

## Validation Layer

Validators inspect scanner-fed events and produce threshold signatures over message hashes. This allows destination-side contracts to verify that a quorum approved delivery without trusting any single participant.

## Relay Layer

Relay miners compete in a sealed-bid execution window. Each relay proposes a delivery strategy based on latency, gas efficiency, and likelihood of successful settlement. The winning relay executes the destination transaction and submits proof back on-chain.

## Security Assumptions

Entangle assumes heterogeneous failures across scanners, validators, and relays. By separating roles and requiring threshold authorization, the protocol minimizes the blast radius of individual operator failure or malicious behavior.

# Economics and Incentives

## Fee Engine

Every dispatched message pays a native execution fee. A protocol-side fee engine prices delivery according to destination chain conditions, expected gas use, and confirmation requirements. Fees are denominated in the source or destination chain native asset.

## Reward Split

A representative split routes 30 percent of collected fees into the protocol treasury and 70 percent into a relay reserve. In parallel, external subnet emissions can reward scanner and relay operators based on measurable performance.

## Quality Scoring

Operator performance is evaluated across latency, confirmation reliability, gas efficiency, payload integrity, and historical uptime. These signals inform auction outcomes, relay reputation, and optional long-term rewards.

## Token Utility

A future Entangle token could coordinate governance, parameter voting, operator bonding, and treasury stewardship. Token utility should complement fee revenue rather than replace it, ensuring the system can remain economically relevant under multiple market regimes.

## Roadmap

Phase 1 focuses on testnet deployments, validator coordination, and reference integrations. Phase 2 expands mainnet coverage and activates live relay competition. Phase 3 introduces governance tooling, new adapters, and more advanced proof systems.

## Conclusion

Entangle aims to make omnichain messaging feel native, verifiable, and incentive aligned.