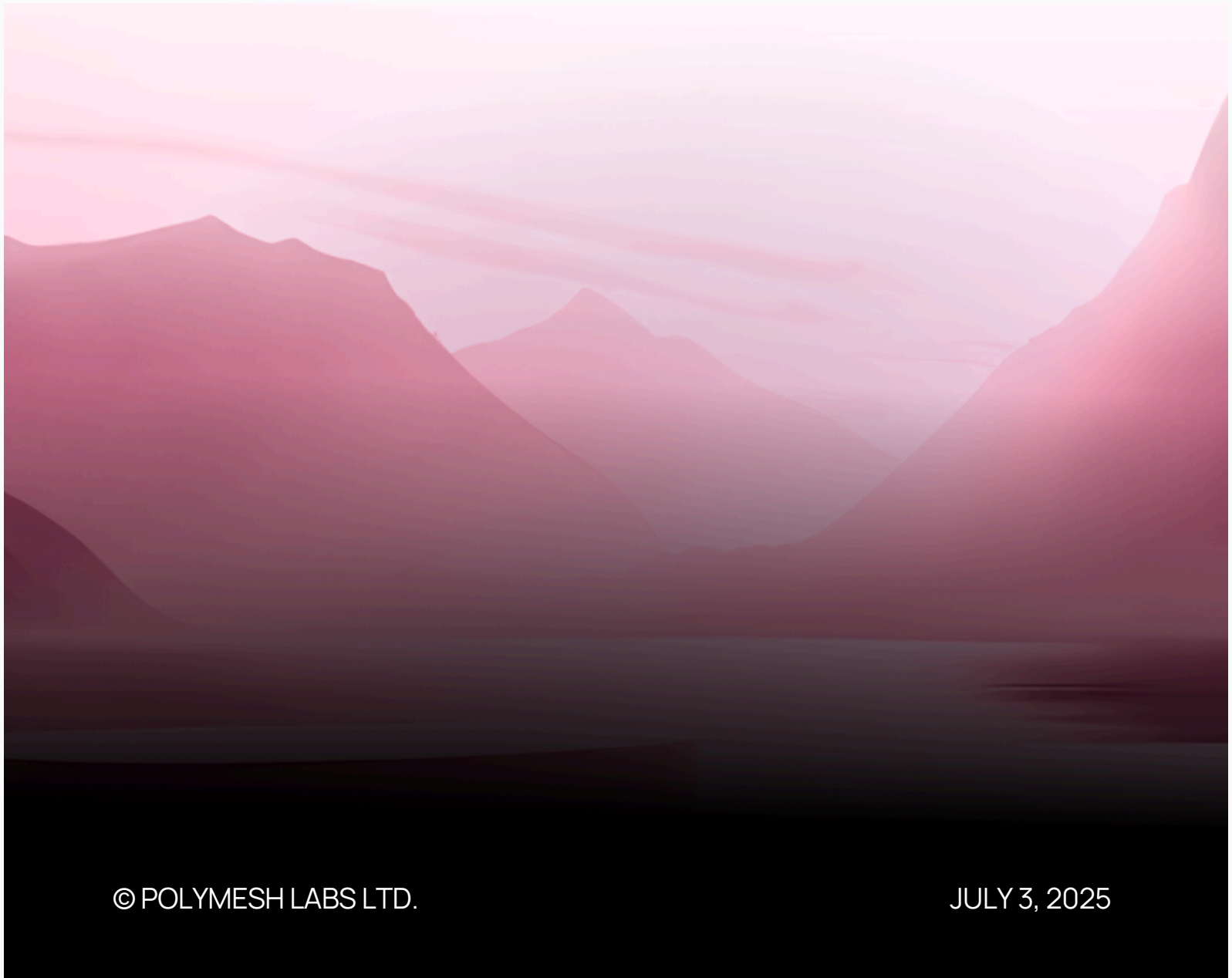
POLYMESH

Polymesh whitepaper

VERSION 3.0



JULY 3, 2025

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Introduction

The Polymesh blockchain (Polymesh) is a public permissioned blockchain purpose-built for the tokenization of regulated and real world assets.

A token is a cryptographically secured digital record, issued on a decentralized ledger known as a blockchain. Transactions involving these tokens occur directly between peers via the internet and are recorded and secured by the blockchain network.

The validity of these transactions (the act of adding transactions to the ledger) is maintained through a consensus mechanism such as proof of work (PoW), which involves 'mining', or proof of stake (PoS), which involves 'staking,' In a PoW consensus mechanism, participants ('miners') use computational resources competitively to verify transactions, receiving protocol-native tokens as rewards. In contrast, PoS is a consensus mechanism used to prove that operators of nodes ('node operators') participating in the network have contributed value to the network that, in some cases, can be forfeited if they act dishonestly.

In a PoS network, a node operator must stake the network's protocol-native token to be selected programmatically by the network's underlying software protocol to validate new blocks of data and update the state of the network. When selected, the Node Operator serves as a 'validator.'

In exchange for providing validation services, validators earn 'rewards' of two types: (a) newly minted (or created) protocol-native tokens that are programmatically distributed to the Validator by the network per its underlying software protocol; and (b) a percentage of the transaction fees, paid in protocol-native tokens, by parties who are seeking to add their transactions to the network.

Tokenization

Tokens may be used to represent ownership interest in assets to enable digital transfer and management. The process of asset owners or issuers converting the ownership value (and any associated rights) stored in intangible assets into tokens is known as **tokenization**.

Tokenized assets that have tangible value in the non-digital world are known colloquially as 'real world assets.' Examples include traditional securities (equity, debt, derivatives, etc.), real estate, commodities, art, collectibles, intellectual property, and other financial products such as carbon credits and receivables.

Tokenization unlocks market value and streamlines asset management by enhancing efficiency through improved transparency and automation, increasing liquidity through wider global investment pools and fractional ownership models, and facilitating the creation of innovative financial products.

Blockchain

A blockchain is a digital distributed ledger where transactions are grouped and represented as a "block." Blocks are sets of transactions that are validated (added to the ledger) simultaneously. Each block in a blockchain is cryptographically linked to the previous block, making it nearly impossible to add, remove, or change the data stored in the ledger.

The blockchain ledger is publicly available (viewable) to anyone and secured using digital signatures based on public and private keys to facilitate transfers. As blockchains gain trust, Polymesh Labs anticipates a significant increase in enterprises leveraging public ledgers for data storage and financial transactions.

General-purpose blockchains

While early public blockchains such as Ethereum pioneered the concept of tokenization, they were not architected with institutional finance or regulatory compliance in mind. As a result, they contain critical limitations that to date have hampered industry innovation and institutional adoption:

- **Governance:** Lack of formal onchain governance mechanisms carries inherent uncertainty and increases the risk of hard forks, introducing various legal, operational, and tax complications.
- **Identity:** Networks originating under principles of pseudonymity pose legal and compliance challenges for institutional participants, particularly where it concerns node-level exposure to blacklisted entities.
- **Compliance:** Permissionless networks that lack transaction-level controls and native compliance primitives make it difficult to enforce compliance rules such as whitelisting, transfer restrictions, or investor eligibility.
- **Confidentiality:** Without native privacy or private execution environments, a transparent ledger model – however beneficial for auditability – is ultimately unusable for most financial use cases, as positions, trades, and amounts may be otherwise publicly viewable.
- **Settlement:** Probabilistic finality and fee volatility leading to variable transaction costs are at odds with the deterministic needs of financial markets.

Polymesh

The Polymesh blockchain (Polymesh) is a public permissioned blockchain purpose-built for the tokenization of regulated and real world assets.

Unlike general-purpose blockchains, Polymesh incorporates core elements – governance, identity, compliance, confidentiality, and settlement – at the protocol level, delivering blockchain infrastructure optimized for regulatory alignment and institutional use.

Polymesh is developed and operated by **Polymesh Labs Ltd.** ("Polymesh Labs", "our").

Polymesh mainnet

Polymesh is purpose-built for tokenization of real world assets ('RWAs').

Many assets are highly regulated and require systems that include features for governance, compliance, identity, confidentiality, atomic transfers, and lifecycle management.

As a public permissioned blockchain, Polymesh allows anyone to verify transactions and view the public state secured by the blockchain. However, only licensed and/or registered entities are permitted to become Node Operators (i.e., an entity that operates nodes that enable and ensure the execution of transactions on a blockchain by maintaining a copy of the ledger, gathering transactions to produce blocks, and voting on the validity of blocks produced by other Node Operators to guarantee consensus).

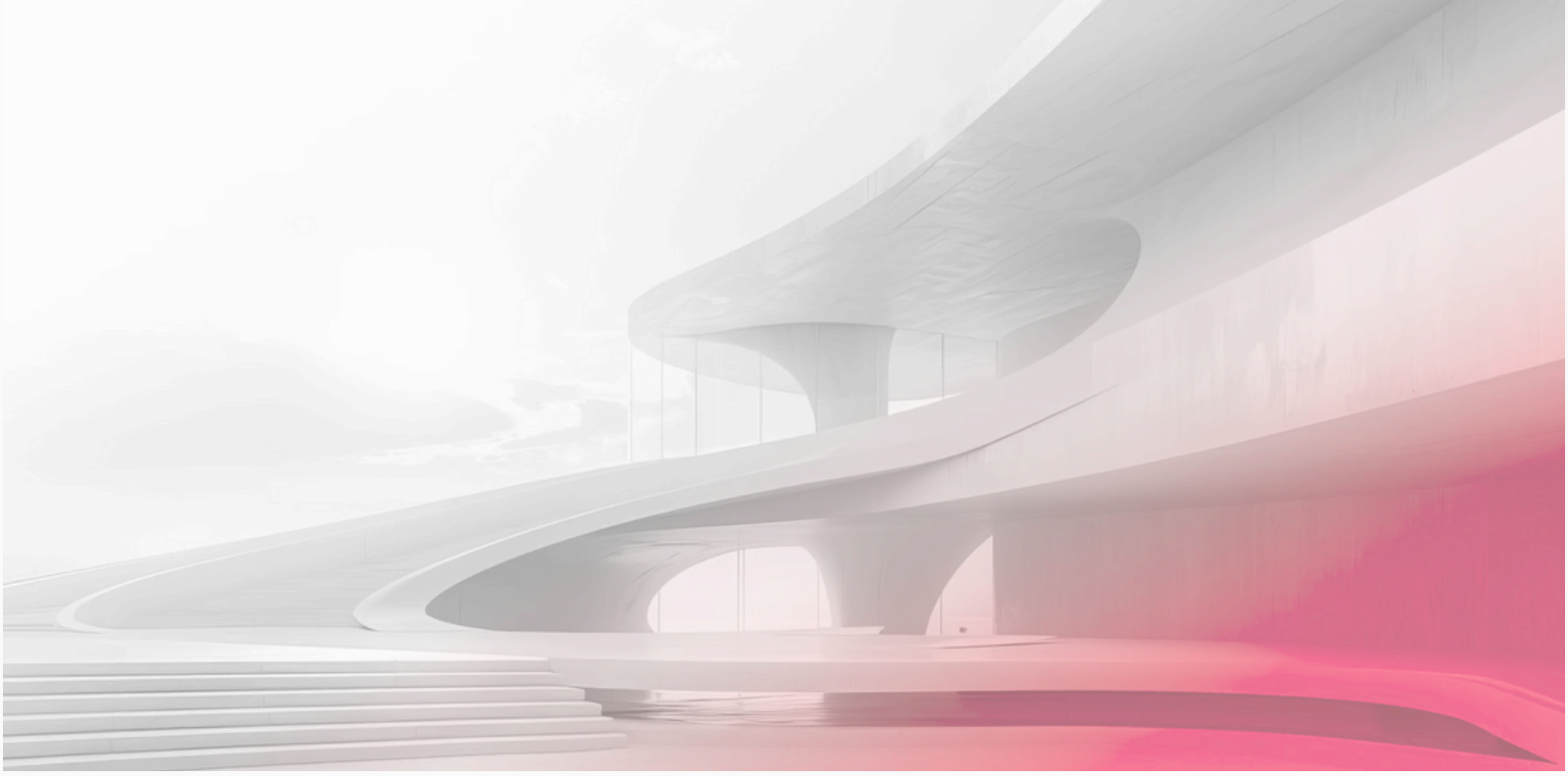
Polymesh Private

Polymesh Private is a variant of Polymesh, designed for deployment as a private blockchain among participating chain operators in infinite independent instances.

Polymesh Private shares much of Polymesh's functionality, with the following differences:

- Polymesh Private chains are intended to run among a limited number of peers on a private network.
- Polymesh Private does not necessitate a public token, including POLYX (defined further below; see POLYX). Transactions can be configured to have no fees or require fees in tokens specific to each Polymesh Private instance.
- The use of Polymesh Private is governed by a license.

Polymesh Labs maintains the development of Polymesh Private.



Architecture

Polymesh is built on the Substrate framework/Polkadot SDK, an open source project developed by Parity Technologies Limited, an infrastructure and innovation-focused company building platforms and applications.

The Substrate framework/Polkadot SDK provides a fully customizable, modular, and extensive framework for blockchain developers.

Financial primitives

Polymesh embeds core business logic into its base layer through native primitives. These primitives provide a comprehensive suite of onchain actions ('extrinsics') that users can execute for asset creation, transaction settlement, and participation in onchain governance.

General-purpose blockchains typically implement minimal core functionality, relying instead on smart contracts for business logic. These extensions – often created by third-party developers – push complexity to the application layer, resulting in scalability challenges, unpredictable transaction costs, and performance limitations.

Instead, by integrating financial primitives into the blockchain's foundation, Polymesh enables users to perform complex operations with predictable, low-cost transactions, while maintaining security and deterministic finality. Its architecture creates an optimized foundation for developers to build innovative decentralized applications (dApps) that leverage these financial building blocks.

01 Tokens

Tokens are the cornerstone of Polymesh. Our initial team's industry-leading expertise drove the creation of the ERC-1400 standard on Ethereum to help balance the challenges of open, transparent, and accessible global systems with jurisdictional compliance.

Polymesh provides a robust, purpose-built framework for creating and managing fungible and non-fungible (NFT) tokens ('assets') directly at the blockchain level.

Unlike general-purpose blockchains, where each token implements its variation of a standard (such as ERC-20), Polymesh defines a unified standard in the blockchain runtime itself. All tokens – from tokenized securities to digital collectibles to stablecoins – share consistent functionality and compliance features without requiring custom smart contract development (although smart contracts are also available for advanced use cases).

Each natively created asset receives a unique identifier and benefits from built-in compliance, settlement, and management capabilities. This standardized approach means that wallets, custodians, and other infrastructure need only integrate once to support all natively created assets on the network, eliminating the fragmentation common in smart contract-based ecosystems while maintaining the consistency and regulatory compliance essential for institutional adoption.

02 Identity

Identity is at the heart of Polymesh. Unlike most blockchains, which mediate via a simple public key, Polymesh mediates onchain actions via verified identities to more accurately reflect how assets are transacted in capital markets.

Each Polymesh identity is both universal and permissioned. Identities can be accessed throughout the network while collecting verifiable claims and attestations issued by network-approved or issuer-specific authorities. These claims enable sophisticated compliance management, controlling asset ownership, transfer restrictions, and participation in the blockchain's consensus mechanism.

The identity system supports flexible key management through a hierarchical structure. Each identity maintains a single administrative key for managing the identity itself, while multiple signing keys can be delegated for specific operations. This enables granular role-based permissions that mirror traditional financial market structures while maintaining cryptographic security.

03 Portfolios

In Polymesh, all assets (excluding POLYX) are held in portfolios associated with verified identities rather than anonymous addresses. This architecture enables real-time compliance enforcement based on identity-level claims while providing sophisticated asset organization and custody management.

Portfolios function as organizational containers that allow users to segregate assets under their identity according to different strategies, compliance requirements, or operational needs. Each identity maintains a default portfolio with the ability to create additional numbered portfolios for further asset segregation and management.

The portfolio system supports flexible permission structures where secondary keys can be granted access to specific portfolios, subsets of portfolios, or all portfolios controlled by an identity. This granular permission model ensures that only authorized keys can transact with assets in designated portfolios, enabling complex organizational structures while maintaining security.

Custody arrangements are facilitated through portfolio-level controls, allowing other identities to manage portfolios on behalf of the owner. Assets can move freely between portfolios within the same identity, while transfers between different identities utilize Polymesh's settlement infrastructure to enforce compliance requirements.

This portfolio-centric approach mirrors traditional financial market structures where institutional investors maintain separate accounts for different strategies or regulatory requirements, while benefiting from the transparency, efficiency, and programmable compliance of blockchain infrastructure.

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04 Corporate actions

Corporate actions represent events initiated by asset issuers that affect the asset or its holders, from dividend distributions and shareholder voting to reorganizations and other material events. Polymesh provides a comprehensive onchain framework for managing these critical processes, automating complex workflows that traditionally require extensive manual coordination.

The system operates through three core components:

- Base corporate action functionality for initiating events and managing parameters like record dates and tax withholdings;
- Capital distribution capabilities for automating benefit payments, such as dividends and interest;
- Onchain voting infrastructure that enables secure, private shareholder governance while maintaining audit trails and preventing manipulation.

Each corporate action is uniquely identified and linked to specific assets, with configurable parameters for targeting eligible participants, setting record dates through checkpoint mechanisms, and attaching relevant documentation.

Asset issuers maintain control over their corporate actions directly or can delegate management to authorized agents, ensuring flexibility while preserving accountability structures required in regulated markets.

This integrated approach transforms traditionally paper-heavy, intermediary-dependent processes into streamlined, transparent, and verifiable onchain operations that reduce costs, eliminate settlement delays, and provide real-time visibility to stakeholders.

Smart contracts and chain extensions

While Polymesh's native primitives handle core asset management functionality without requiring smart contracts, the network supports layer 2 smart contract deployment for specialized business logic and innovative applications. Smart contracts on Polymesh leverage the robust foundation of native identity, compliance, and settlement infrastructure while enabling developers to build sophisticated financial protocols on top.

Smart contracts compile to WebAssembly, expanding the available development languages beyond traditional blockchain options to include Rust, C/C++, C#, TypeScript, and more. Polymesh recommends Ink!, a Rust-based language designed specifically for Substrate/Polkadot chains that offers superior performance and safety compared to alternatives like Solidity, a statically-typed programming language designed for developing smart contracts that run on Ethereum.

Polymesh's unique approach ties all smart contracts to verified identities rather than anonymous addresses. When deployed, contracts are attached as keys to identities, ensuring that all interactions flow through the same compliance and permission frameworks that govern native operations. This architecture maintains structural oversight while enabling innovation, as contracts can manage assets, act as custodians, or implement complex business logic while operating under established identity and compliance controls.

This design enables use cases such as decentralized exchanges that utilize native custody and settlement while implementing custom trading logic, or custodial solutions with additional programmable features—all while maintaining the security, compliance, and interoperability benefits of Polymesh's native layer.

Tokenomics

Extensive research and consultation with leading economic, game theory, and operations experts established the token economy for Polymesh, intending to deliver utility, security, and sustainability for the chain.

The fuel of this economy is POLYX, the protocol-native token that both secures and drives utility to Polymesh.

POLYX token

The network protocol token for Polymesh is POLYX, which serves multiple key functions within the Polymesh ecosystem.

01 Fee payment

POLYX is used to pay fees for all chain uses. There are two types of fees:

- transaction fees: fees charged for transactions on the Polymesh blockchain based on the transaction size (in bytes) and the complexity of the transaction
- protocol fees: fees charged for certain types of native functions (e.g. reserving a token ticker) and set by the Governing Council (as defined below)

Transaction and protocol fees are automatically distributed to Node Operators. Polymesh also supports transaction fee subsidization, where businesses can cover transaction costs on behalf of their employees or customers, enabling smoother onboarding and operation.

02 Staking

POLYX can be used to secure the network by aligning the economic incentives of Node Operators and nominators to the correct operation of the chain through rewards and penalties denominated in POLYX.

As discussed above, holders of POLYX can stake their token with a Node Operator of their choice. Both are either rewarded or fined based on the Operator's performance running the node (i.e., keeping the node online; writing blocks to the chain per the rules of the Polymesh Blockchain).

03 Governance

Holders of POLYX can also use the tokens to signal support under the Polymesh Blockchain's governance structure (further described below) to vote for network upgrades.

04 Block rewards/fines

Block rewards and fines are essential to the Polymesh Blockchain's nominated PoS consensus mechanism (further described below). For each block created, the authoring Node Operators are rewarded in POLYX along with their nominators.

Failure to meet the performance standards of the chain could lead to Node Operators being fined in POLYX. Nominators may also be fined pending Governing Council approval.

Rewards and fines are calculated and enacted per era (every 24 hours). Note that the rewards paid to Node Operators and nominators vary based on the amount of POLYX currently being used to stake and the number of blocks proposed by the Node Operator when serving as a Validator.

05 Grant payments

POLYX may be granted by Polymesh Labs from Polymesh Labs-controlled digital wallets, as grants, by directing payments in either POLYX or in fiat to identities who perform specified actions for the Polymesh Blockchain or any other purpose that the governance process deems reasonable.

Ultimately, POLYX is critical for the correct economic incentivization of actors on the chain, creating a proper structure where network participants benefit from honest behaviour and network growth while bearing the costs of actions that harm the network.

Nominated proof of stake

Polymesh uses the consensus mechanism ‘nominated PoS’ to power Polymesh’s enabling economy and balance security, decentralization, and operational continuity.

The system features two primary participant types, Node Operators (which act as Validators) and nominators. Participants commit their existing POLYX as collateral during the transaction validation process, earning additional POLYX for block rewards as compensation.

01 Node operators (validators)

Validators are selected Node Operators that are permissioned entities that process transactions and maintain network security. They run authoring nodes, and when selected to serve as a Validator, gather transactions into blocks for inclusion in the chain and voting on blocks submitted by other Node Operators. Node Operators earn block rewards as blocks are produced and finalized, but may be penalized in the form of fines (slashing) for malicious, dormant, or incorrect activity.

On Polymesh, Node Operators must be licensed and/or registered entities, enabling their identity to be known to the Polymesh Governing Council. A prospective Node Operator may submit their application to the Governing Council for review and approval (see Governance below).

The only exception to this rule is the three nodes run by Polymesh Labs, which are used to assist participants with ongoing monitoring and support of the network.

02 Nominators

Nominators are POLYX token holders who increase network security by staking POLYX on chosen Node Operators as a signal of trust. Their staked POLYX is distributed across their selected Node Operators evenly as per the algorithmic rules. They share block rewards with these Node Operators, while also facing potential penalties if their nominated Node Operators fail to perform per protocol rules when selected programmatically by the network's underlying software protocol to serve as a Validator.

As of the date of this Whitepaper, nominators may support up to 16 Node Operators.

03 Block rewards

Block rewards are distributed to validators and their nominators at the end of each era based on the performance of the node(s) their POLYX were backing. Rewards are paid from newly minted POLYX, determined by the chain's reward curve. An era on the Polymesh Blockchain occurs every 14,400 blocks produced which approximates 24 hours.

POLYX staked by Node Operators are at risk of being slashed if they misbehave while operating nodes or serving as a Validator. As of the date of this Whitepaper, POLYX staked by nominators are not currently subject to slashing.

04 Bonding period

Polymesh employs a bonding and unbonding period following changes to a nominator or Node Operators' staking preferences.

Initial bonding of POLYX may last for up to 28 hours while the current era ends, as staking only commences when the next election of Node Operators occurs. Following a removal request, POLYX is locked for an unbonding period of 28 days before POLYX can be unlocked and withdrawn.

Locked (bonded) POLYX cannot be transferred without first unbonding, waiting for the unbonding period to elapse, and then withdrawing them.

05 Finality

Nominated PoS enables deterministic finality. Node Operators vote on new blocks, with new blocks finalized once two-thirds of Node Operators have voted in favor.

Blocks are groups of transactions that are validated (added to the ledger) at the same time. The next block in a blockchain is cryptographically linked to the prior block, making it nearly impossible to add, move, or change the data in the ledger. If a block is finalized, its previous blocks are finalized as well.

This characteristic allows finalizing a batch of blocks in one vote rather than having to vote on every block. Batching allows the chain to remain live and scalable with guaranteed finality within seconds, rather than minutes.

Fees

Blockchain fees provide a spam prevention mechanism, particularly for denial-of-service attacks, while helping to incentivize network maintenance for long-term continuity.

Fees on Polymesh are paid in the protocol-native token, POLYX.

Polymesh has two primary types of fees:

- transaction fees
- protocol fees

Both types of fees flow directly to Node Operators rather than a central treasury, ensuring that those maintaining the network infrastructure receive appropriate compensation for their services.

01 Transaction fees

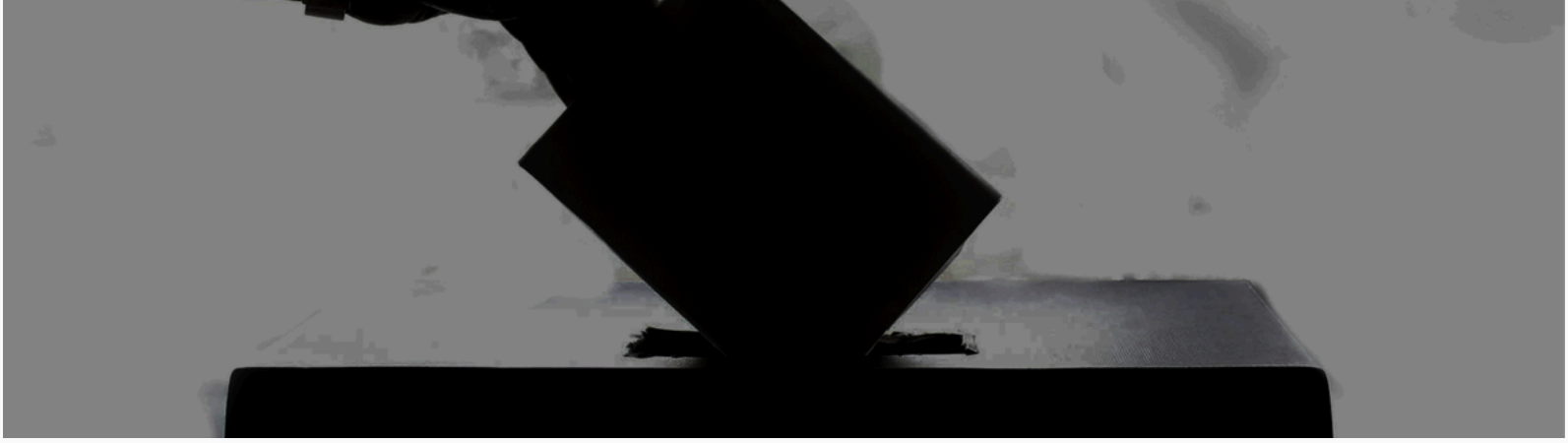
Transaction fees are fees charged for all transactions on Polymesh, calculated as a product of the transaction size (in bytes) and the complexity of the transaction, and paid regardless of a transaction's success or failure. Transactions are processed on a first-in, first-out basis.

02 Protocol fees

Protocol fees are additional fixed fees charged for certain types of high-value native functions, such as reserving a token ticker, and are only charged upon successful completion. These fee amounts and their associated transactions are configurable through Polymesh governance by the Governing Council.

03 Fee subsidization

To reduce friction for enterprise adoption, Polymesh also supports transaction fee subsidization where businesses can cover transaction costs on behalf of their employees or customers, enabling smoother onboarding and operation.



Governance

Governance allows the chain to grow and develop. Polymesh has a sophisticated governance mechanism that combines signals from the broader token holder community with technical experts (Committees) and the Governing Council for actioning proposals.

Polymesh Improvement Proposals (PIPs) can be proposed by any holder of POLYX. Possible PIPs include:

- network upgrades;
- permissioning (or removing) Node Operators and CDD service providers;
- setting the parameters of the network related to consensus and security;

and many other actions.

The governance system is designed to allow both community members and technical experts to collaborate on improving Polymesh and managing network changes.

Polymesh Governance Process

There are three main groups of actors in Polymesh governance:

- POLYX token holders
- Committees (e.g. Technical Committee, Upgrade Committee)
- Governing Council

The governance process begins either via a community-submitted PIP, which is then curated by other POLYX token holders, or a committee-submitted PIP. In both cases, the Governing Council is responsible for assessing the change and determining whether it should be ratified, rejected or temporarily skipped.

The governance system consists of POLYX token holders populating and curating a list of PIPs ordered by their importance to the community, which is determined by each token holder signalling their approval or disapproval of these PIPs by bonding POLYX to the relevant PIP. A POLYX token holder's signal is proportional to the amount of POLYX bonded by that token holder. The Governing Council will then consider this list of PIPs, in their curated order, on a periodic basis (e.g. once per month), ratifying, rejecting or skipping each PIP in order as appropriate.

Committees

In addition to the Governing Council, there are other Committees (e.g., the Technical Committee and the Upgrade Committee) that can submit PIPs directly to the Governing Council for review, bypassing the community curation process. Each Committee has a specified voting threshold (e.g., 2 of 3) that a PIP must pass before the PIP is submitted to the Governing Council.

Governing Council

The Governing Council can be thought of as a Multisig controlled by members of the Governing Council. There is an associated voting threshold that must be reached in order to execute an action through the Governing Council. The Governing Council is ultimately responsible, at their discretion, for effecting a change to the blockchain.

As of the date of this Whitepaper, POLYX token holders do not have the ability to appoint or elect members of the Governing Council or any Committee. The board of directors of Polymesh Labs is responsible for appointing these members.

The Governing Council has the delegated authority from the board of directors of Polymesh Labs to govern Polymesh.

Identity

Polymesh implements a federated root of trust for onboarding users via permissioned Customer Due Diligence (CDD) service providers and completion of an initial identification process (IDI Process).

Identities provide attestation and key management. All users who want to interact with tokens on Polymesh must act through an on-chain identity when interacting with Polymesh.

Identities are referenced through decentralized identifiers (DIDs). Users who wish only to interact with POLYX do not require a DID and therefore do not go through the IDI Process until they choose to interact with a user-created token.

Each identity:

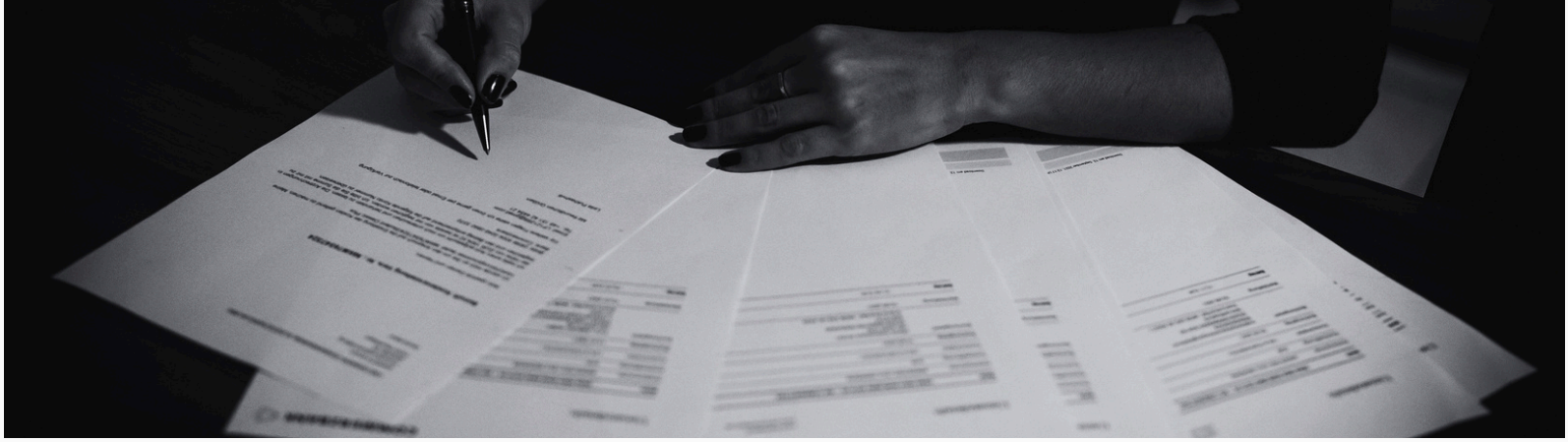
- Is created through the IDI process via CDD service providers;
- Is referenced by a pseudo-anonymous DID (e.g.,
- 0xfc0d2fc058d02c0a89c2cc2ff11726971dd39886a0b80ecfaa80fa3f196d65ce);
- Can hold assets in associated portfolios, claims, and permissioned roles;
- Is controlled by a primary key and optional secondary keys.

Identities can also receive claims from other identities, which are used to enforce on-chain compliance rules for assets. Claims have specific scopes and can be used to represent various attributes, such as KYC status or accreditation.

Each identity has:

- A single primary key with full control;
- Optional secondary keys with configurable permissions;
- Support for Multisig keys as either primary or secondary keys;
- Support for smart contracts as either primary or secondary keys;
- The ability to create child identities.

Polymesh provides robust authorization and permission frameworks to manage access between identities and their keys.



Compliance

Polymesh facilitates claim-based compliance directly in its base layer primitives. Asset issuers can set flexible and extendable rules relating to the claims that their investors are required to have attached to their identity to either send or receive the asset.

These rules can be combined to create complex transfer restrictions that are tailored to the asset's specific type, jurisdiction and regulatory regime.

Compliance on Polymesh is managed by the on-chain Compliance Manager module. Asset issuers (or their agents) can define, update, pause, or reset compliance requirements (rules) for their assets. Each rule specifies which identity claims, claim issuers, and claim scopes are required for transfers, and can apply to senders, receivers, or both.

Compliance is enforced through a set of rules attached to each asset. Each rule consists of one or more conditions that must be satisfied by the sender, receiver, or both. If all conditions within at least one rule are satisfied, the transfer is allowed. Rules are evaluated automatically during every transfer, ensuring that only permitted transactions are executed.

Confidentiality

Confidentiality allows Polymesh users to maintain privacy over certain aspects of their securities transactions. The Confidential Asset protocol, implemented in Polymesh Private, is designed to allow confidentiality within asset transfers using homomorphic encryption and zero-knowledge proofs.

The protocol enables users to transact in assets using a shared global ledger while preserving the privacy of asset balances and transaction amounts.

Currently, Confidential Assets are exclusively available on Polymesh Private deployments and are not supported on the public Polymesh network. The protocol is in the advanced stage of research and development and is anticipated to be ready for deployment in the next twelve to eighteen months.

If successful, the protocol will provide users of the Polymesh Blockchain with features that provide privacy of token balances, token identifiers and the sender and receiver of the token, all consistent with the level of privacy typical of transactions in traditional financial systems. However, like all experimental research, development may face unforeseen obstacles or technological constraints that hinder development or prevent deployment to Polymesh Labs altogether.

Atomic transfers

Asset transfers on Polymesh mimic the traditional process for transferring securities, commonly known as **settlement**, whereby assets are transferred between parties in an atomic fashion.

On Polymesh, transfers of assets occur between Identities and require all counterparties of a transaction to affirm (agree) to an instruction (a set of asset transfers) before the instruction settles (completes). Any counterparty to the instruction can unilaterally reject the instruction.

If an instruction is fully affirmed but settlement fails (for example, as a result of compliance rules), the instruction can be manually executed again at a later date by any one of the counterparties, once the failure cause has been remediated.

Once an instruction has been affirmed by a counterparty, the associated assets are locked in the counterparties' accounts. If the instruction is subsequently rejected, these assets are unlocked and can be used in another settlement instruction.

Lifecycle management

The Polymesh Blockchain has a base layer that provides primitives to help manage onchain records that can be used to coordinate asset lifecycle events. Real-time, onchain compliance is enforced, so every transfer is automatically validated before atomic transfers occur without external smart-contract code.

An integrated settlement engine records delivery-versus-payment instructions and exposes confirmed, pending, or failed states, giving participants direct visibility into each step.

Built-in corporate actions primitives let issuers create dividend, interest, or voting events, attach capital distributions, and execute them transparently under a unique identifier tied to the asset.

Collectively, these features provide an auditable end-to-end workflow for parties.

Standards and interoperability

Polymesh is designed with protocol-level standards that are enforced directly by the blockchain runtime, rather than relying on smart contracts to define or implement asset or compliance logic.

This approach ensures that all assets and fundamental functions on Polymesh adhere to a consistent, robust, and secure set of rules, providing predictability and reliability for all participants.

At the core of Polymesh's interoperability is the Polymesh Asset Standard, which governs native assets on Polymesh, both fungible and non-fungible. All assets created using the Polymesh primitives share a common interface and are managed by the same chain-level logic.

Once an integration is built for one Polymesh asset, it is automatically compatible with all other native assets—eliminating the need for repeated audits, custom integrations, or bespoke compliance checks for each new asset type.

Native assets on Polymesh also automatically receive updates and enhancements as new features are added to the chain, without requiring asset-specific upgrades or migrations. There is no need for complex smart contract orchestration, and protocol-level integrations are inherently more efficient, as they avoid the overhead of virtual machine execution. This is a significant advantage for custodians, exchanges, and other infrastructure providers, as it streamlines onboarding, reduces operational risk, and ensures all assets benefit from ongoing improvements to the protocol.

Beyond assets, Polymesh enforces protocol-level standards for identity, compliance, settlement, and governance. All native asset and identity-related transactions on Polymesh must be associated with a verified on-chain identity, and compliance rules are enforced natively at the transaction level.

Settlement instructions can involve multiple assets and parties, enabling atomic, multi-leg settlement within the chain—something that is difficult to achieve on platforms where standards are defined at the smart contract level.

Within the Polymesh network, all native assets are interoperable by design, supporting complex workflows such as atomic delivery-versus-payment (DvP) and multi-asset settlement. This interoperability is a direct result of the unified standards enforced at the protocol level.

Interoperability with external networks is not currently available at the protocol level. While Polymesh does not have native cross-chain bridges, the architecture allows for future integration with bridging solutions, which could use mint/burn or lock/unlock mechanisms to facilitate asset transfers between chains. For now, any cross-chain settlement or interoperability would require off-chain coordination or third-party bridge solutions, which are not currently in production for Polymesh.

Polymesh's protocol-level standards deliver a high degree of internal interoperability, security, and operational efficiency, while providing a foundation for future external interoperability as the ecosystem evolves.

Ecosystem and tooling

The Polymesh ecosystem is supported by a suite of open-source tools and libraries designed to make it easy for developers, institutions, and service providers to interact with the network and build new applications.

These tools are developed and maintained by Polymesh Labs and the broader community.

Thanks to its foundation on the Substrate framework/Polkadot SDK, Polymesh is compatible with a wide range of ecosystem tooling. This compatibility enables developers to leverage popular tools and infrastructure from the broader Substrate and Polkadot communities, including wallets, explorers, signing solutions, and development utilities, alongside Polymesh-specific tools.

This approach lowers the barrier to entry, accelerates integration, and ensures that Polymesh benefits from ongoing innovation across the wider ecosystem.

Polymesh Node

The official software for running a Polymesh blockchain node, built on Substrate, provides the core protocol logic and network services.

Polymesh SDK

A TypeScript/JavaScript library for interacting with the Polymesh blockchain, supporting asset creation, compliance management, settlement, and more.

The SDK features a modular signing manager system, enabling flexible integration with browser wallets, hardware devices, and enterprise key management solutions such as HashiCorp Vault. This allows institutions to securely manage signing keys and customize transaction signing workflows to meet their operational and security requirements.

Polymesh REST API

A RESTful interface for accessing chain data and submitting transactions, suitable for integration with enterprise systems and backend services.

Polymesh Wallet

A browser extension wallet for managing identities, assets, and signing transactions on Polymesh.

Polymesh Portal

A web-based interface designed to simplify interactions with the Polymesh blockchain. Built using the Polymesh SDK, the Portal provides a platform for managing assets, portfolios, and governance activities. It also supports features such as staking, authorizations, identity claims, and Multisig accounts, making it a versatile tool. With integrated asset management capabilities, the Portal enables issuers to seamlessly create, configure, and manage both fungible and non-fungible assets.

TokenStudio 2.0

TokenStudio 2.0 is an open source self-service decentralized application built on the Polymesh Blockchain.

TokenStudio enables issuers to reserve, configure, and manage their tokens on the Polymesh Blockchain. It provides users with different functionalities, such as ticker symbol reservation, token configuration, compliance rule setup, and token distribution, all of which are accessible through the Polymesh Wallet that is designed for securely managing assets and identities on the Polymesh Blockchain.

TokenStudio 2.0 operates as a module within the Polymesh Portal that allows users to create tokens on the Polymesh Blockchain.

Polymesh Subquery

An indexer and data service for querying historical and real-time chain data, supporting advanced analytics and reporting use cases.

Polymesh Developer Environments

Polymesh provides pre-configured developer environments to simplify application development and testing. These environments use Docker Compose to create a local Polymesh ecosystem, featuring a development-mode blockchain node, Subquery indexing services, REST API instances, HashiCorp Vault integration, and automated setup scripts.

Ideal for developers building applications or testing smart contracts, these environments eliminate the need to connect to public networks.

Additional support and tooling

01 Smart contract support and tooling

Polymesh supports Layer 2 smart contract development. Developers can build smart contracts using a variety of languages that compile to run in the chain's virtual machine.

Ink!, a Rust-based framework designed for Substrate/Polkadot SDK-based chains, is the preferred language for Polymesh smart contract development due to its strong safety guarantees and performance benefits, but other languages may also be supported.

Tooling for compiling, deploying, and interacting with smart contracts is available as part of the broader Substrate/Polkadot SDK ecosystem.

02 Polymesh Private tooling

As described above (see Polymesh Private), Polymesh Private is a variant of Polymesh designed for deployment as a private blockchain among a limited set of participants. In addition to the core tools above, Polymesh Private includes:

- **Polymesh Private SDK and REST API:** Extensions of the public SDK and REST API, these tools add support for confidential asset features unique to Polymesh Private, enabling secure and private asset settlements and interactions. They also provide integration with the Proof API for generating and verifying zero-knowledge proofs as part of confidential transactions.
- **Confidential Asset Module:** Enables private asset settlements between counterparties using advanced cryptography.
- **Proof API:** Provides services for generating and verifying zero-knowledge proofs for confidential transactions.

03 Ecosystem compatibility and integrations

Polymesh benefits from compatibility with the broader Substrate and Polkadot ecosystem, such as the Polkadot.js app, a widely used user interface for interacting with Substrate-based blockchains, including Polymesh.

The Polkadot.js app enables users to perform chain storage queries, submit extrinsics (transactions), and access RPC/Runtime API queries, providing a powerful and flexible UI for developers and advanced users. This compatibility allows Polymesh users to leverage existing ecosystem tooling for a wide range of interactions, from wallet management and transaction signing to blockchain data exploration and custom integrations.

Developers can also use tools such as Subscan (for blockchain data exploration) with Polymesh, thanks to its Substrate foundation. Third-party wallets and services that support Substrate-based chains may also be compatible with Polymesh, further expanding the available tooling and integration options.

The Polymesh ecosystem continues to grow, with ongoing development of new tools, integrations, and features that enhance the network's utility and accessibility.

Prepared by Polymesh Labs

Reach out to us and embark on your tokenization journey today.

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