# Proposal: crosschain messaging protocol

Development and launch plan for an interoperability feature in a crypto platform

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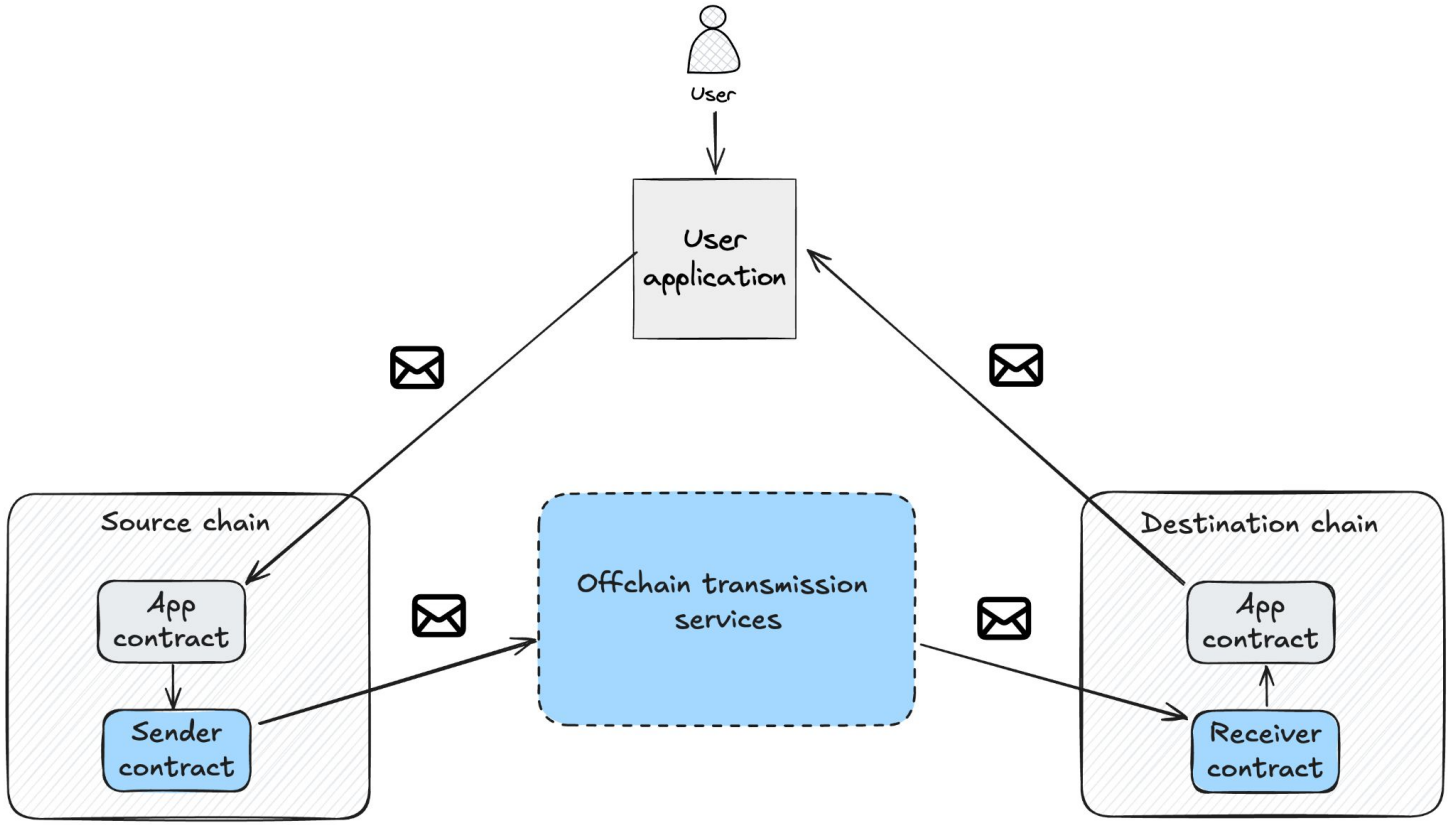
# Content



# Introduction

## General implementation of crosschain messaging protocols



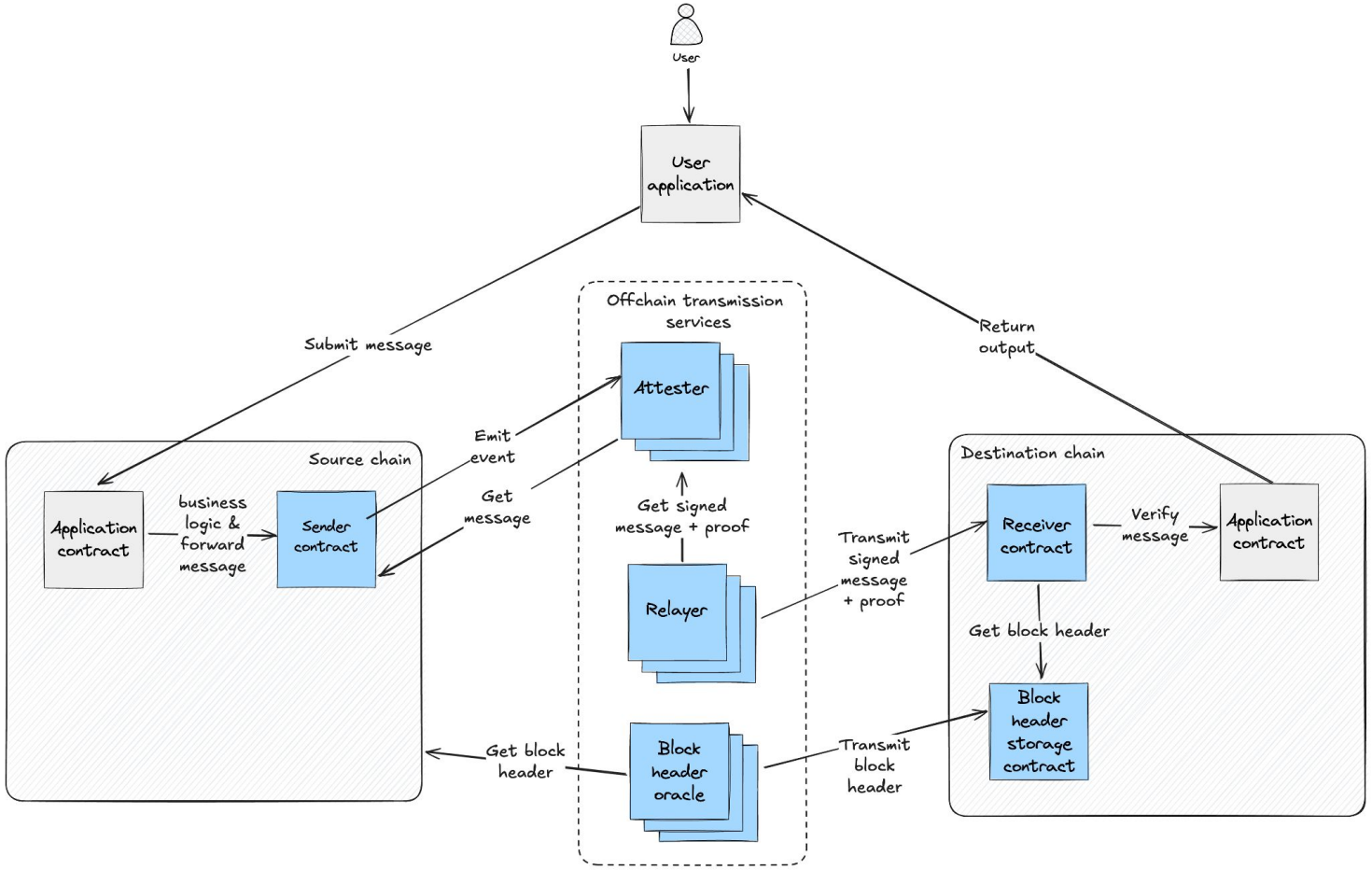

Source: own illustration

**Message flow:**

1. **User**: submits message with instructions to source chain smart contract
2. **Source chain & sender contract**: accepts & stores message in a block
3. **Transmission services**: sends package with necessary proofs to destination chain
4. **Destination chain & receiver contract**: receives package, verifies proofs, and forwards instructions to any other smart contract containing further business logic

# 1. Feature specification

## Proposed architecture (high-level)




**Message flow:**

1. **User** submits a message
2. **Application contract (source chain)** executes any business logic and passes the message to the transmission contract
3. **Sender contract** emits a corresponding event
4. **Attester** listens to event and packages message with a proof
5. **Relayer** takes & forwards signed attestation
6. **Receiver contract** validates received package by verifying merkle proof and comparing block headers using the **block header storage contract** (data from **oracle**)
7. **Application contract (destination chain)** takes validated message and executes logic

Source: own illustration

# 1. Feature specification

## Key functionalities & user stories

| Component | Function | User story |
|---|---|---|
| Sender contract | Integrates with smart contracts to emit and store messages on source chain | As a developer, I want to integrate my smart contract with a contract to securely handle crosschain messages |
| Attester | Generates and signs merkle proof to verify message validity | As a developer, I want transmitted message to be trusted and verifiable |
| Relayer | Delivers message package and facilitates modular crosschain messaging | As a developer, I want protocol to be modular, with different nodes focusing on transmission and attestation |
| Receiver contract | Verifies merkle proofs and block headers on destination chain | As a developer, I want message on destination chain to be verified for authenticity |
| Block header oracle | Provides secure and timely block headers from source chain | As a developer, I want secure and accurate block headers for message validation |
| Block header storage contract | Stores and provides trusted block headers for validation | As a developer, I want secure and accurate block headers for message validation |

**Reasons for chosen architecture:**

- Separation of attesters and relayers (modularity)
- Separate block header oracle (security & trust)
- Zero-knowledge proofs from block header oracles (speed & costs)

# 2. Development plan

## Project size and timeline

| Phase | Subtasks | Person weeks (est.) |
|---|---|---|
| **Product design** | Technical architecture | 2 |
| | Economics / Incentives design | 2 |
| | Requirements specification | 2 |
| **Development** | Sender contract | 3 |
| | Receiver contract | 3 |
| | Attester node | 3 |
| | Relayer node | 2 |
| | Block header oracle | 4 |
| | Block header storage contract | 4 |
| **Audit** | Security audit | 3 |
| **Testing** | Testing (unit, integration, security) | 4 |
| **Rollout** | Rollout buffer (local-testnet-mainnet, monitoring, bug fix, etc.) | 4 |
| Total person weeks | | 36 |
| **Total est. duration with 4 devs, 1 tester, 1 PM (person weeks)** | | **22** |

# 3. Sprint planning

| Sprint 1 (2 weeks) | | | | |
|---|---|---|---|---|
| **Component** | **User story** | **Requirement** | **Identifier** | **PBI** |
| Sender contract | As a developer, I want to be able to connect smart contracts from different chains by integrating with a crosschain messaging protocol. | Functional | sender-contract-1 | Contract interface: accept messages from application contract after executing necessary business logic. |
| Sender contract | | Functional | sender-contract-2 | Emit an event with message details, transaction hash, and metadata for attester. |
| Sender contract | | Functional | sender-contract-3 | Store message and associated data until successfully processed by attester and relayer. |
| Sender contract | | Non-functional | sender-contract-4 | Implement security features such as message nonce (replay attack) |
| Sender contract | | Non-functional | sender-contract-5 | Optimize event emission and storage for gas efficiency. |

| Sprint 2 (2 weeks) | | | | |
|---|---|---|---|---|
| **Component** | **User story** | **Requirement** | **Identifier** | **PBI** |
| Receiver contract | … | … | … | … |

### Criteria for moving tasks from the backlog to the sprint:

- Criticality of features
- Readiness of design and specifications
- Path dependencies
- Risks and challenges
- Stakeholder requirements

# 4. Integration and testing

## Testing strategy

**Environments:**

1. Local blockchains (e.g. using Hardhat Network)
2. Testnet (e.g. Sepolia on Ethereum/Arbitrum)
3. Mainnet

**Testing dimensions:**

- Functionality testing
- Security testing (incl. fuzz testing)
- Onchain costs
- Performance testing
- Load & stress testing
- Regression testing (in case of changes)

## Testing plan

1. **Unit testing:** validate individual functions and components
2. **Security testing:** detect vulnerabilities, stress testing, and code audits
3. **Integration testing:** ensure different components interact correctly across components
4. **E2E testing:** validate the entire business workflow from start to finish
5. **User acceptance testing (UAT):** check with a real business application whether the protocol meets business needs and user/developer expectations, especially regarding performance, cost, and security.

# 5. Documentation and tutorials

## Documentation structure

| Section | Content |
|---|---|
| Introduction | Overview |
| Getting started | Quick start guide |
| | Supported networks |
| Core concepts | Architecture overview |
| | Security model |
| Guides | Basic integration |
| | Advanced features |
| Deployment | Deploying to testnet and mainnet |
| | Contract upgrades |
| API reference | Smart contract AB |
| | Relayer and attester interfaces |
| Resources | Tutorials and examples |
| | Glossary |
| | Support |

## Tutorial structure example

| Section | Content |
|---|---|
| Introduction | Purpose and prerequisites |
| Setup | Tools installation<br>Clone repository<br>Deploy contracts |
| Implementing token contracts | Burn contract<br>Mint contract<br>Event listeners |
| Crosschain messaging | Sender contract integration<br>Attester<br>Relayer |
| Deploying to test or mainnet | Test/mainnet deployment<br>Test/mainnet execution |

# 6. Launch strategy

| Phase | Marketing plans | Key milestones | Steps for success |
|---|---|---|---|
| Testnet launch;<br>First 3-4 months | - Pre-launch announcement on crypto social (X, Farcaster, TG, Reddit, Discord) and developer platforms (e.g. GitHub)<br>- Publish technical blog posts on Medium, Mirror, Paragraph<br>- Engage with crypto communities on crypto social, do AMAs<br>- Organize webinars/podcasts in crypto social | - Core development completed<br>- Security audits passed<br>- Testnet launched<br>- Onboarded early devs/builders | - Finalize core features and test on testnets<br>- Deploy contracts and invite early developers<br>- Initially, attester and relayer will be centralized and permissioned for security reasons<br>- Monitor performance, gather feedback, and resolve issues |
| Mainnet launch;<br>Next 3-4 months | Same as above, additionally:<br>- Launch partnerships with established crypto projects<br>- Participate in major crypto events (e.g., ETHGlobal, Consensus, Devcon)<br>- Host developer workshops and hackathons to promote protocol adoption | - Implemented feedback from testnet launch<br>- Mainnet launched<br>- First apps built using protocol | - Address testnet feedback and finalize product<br>- Scale infrastructure, ensure robustness, and prepare for decentralization<br>- Launch marketing campaign and open access to all developers |
| Decentralization;<br>Next 3-4 months | Decentralization roadmap: announcements on social media, blog posts, and community engagement | - Attesters and relayers are permissionless<br>- Fully open-source code | - Open-source all code<br>- Progressively opening attester and relayer network<br>- If above OK, make them permissionless |

# 7. Customer and developer feedback

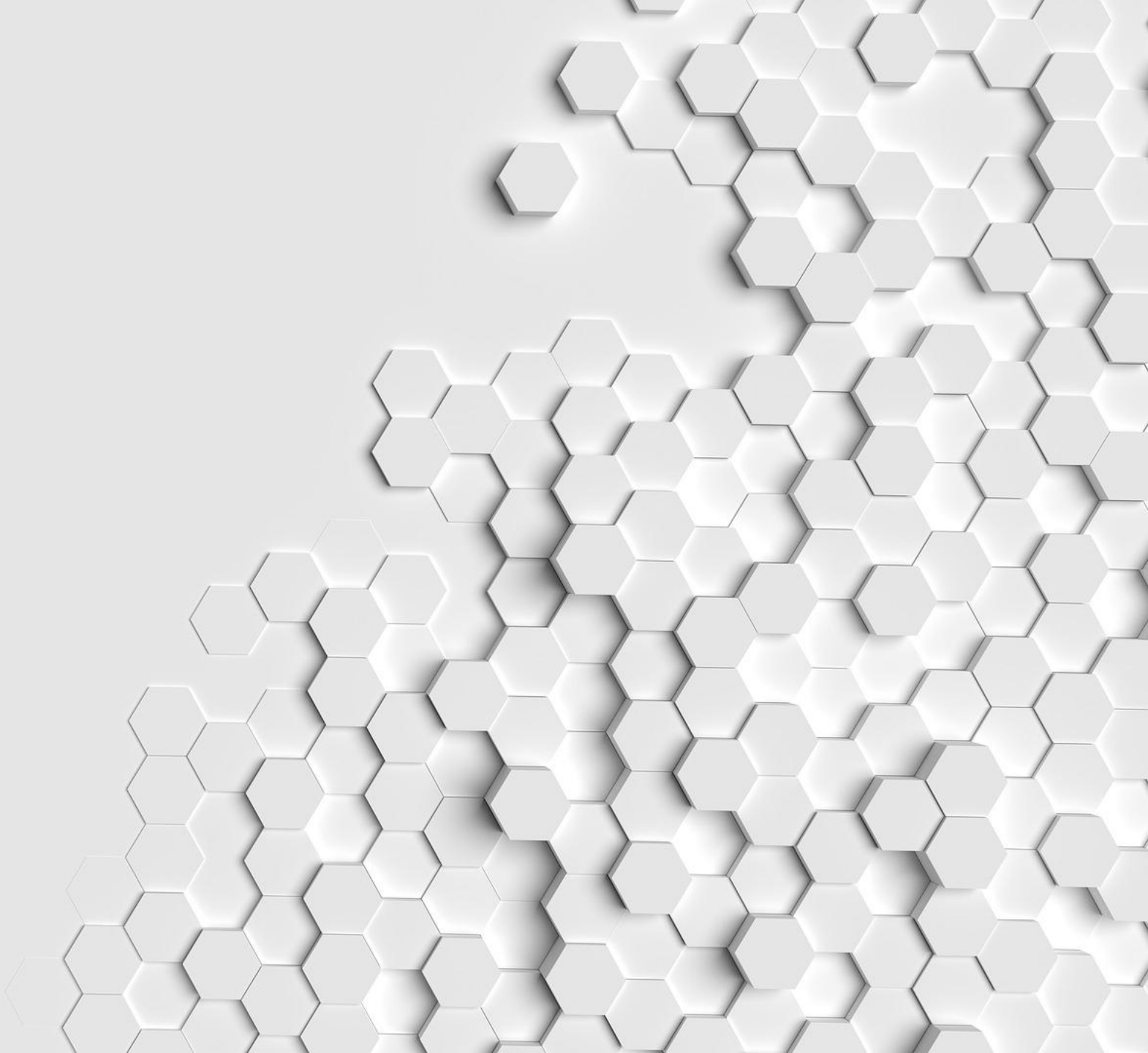
## Strategy to gather and incorporate feedback

- **Define target customers:**
  - Blockchain developers
  - Sophisticated crypto builders
- **Define & prioritize opportunities:**
  - Understand main needs, problems, or desires
  - Save them with user story / experience mapping
- **Continuous client interaction:**
  - Weekly interviews
  - Build in the open: engage with the community
- **Incorporate feedback:**
  - See “Analyzing and integrating feedback”
- **Channels to be used:**
  - Discord/TG for technical Q&A; GitHub for open discussions; X for community-driven insights; Webinars/AMAs/podcasts for attention; hackathons to encourage innovation and active feedback; (bug) bounties for security feedback

## Analyzing and integrating feedback

1. **Prioritization:**
   a. Prioritize opportunities identified (from interviews & UX mapping):
      i. Size: how many target customers requested/impacted
      ii. Satisfaction: how important it is to their satisfaction
      iii. Business: how well it aligns with our business strategy
      iv. Market: how we want to position ourselves in the market
2. **Continuous discovery, continuous delivery:**
   a. Feedback reviews
   b. Rapid iterations
   c. Adjust roadmap
   d. Communicate changes & follow-up

# Q&A



# Appendix

# Current crosschain messaging ecosystem

## Categorizing crosschain messaging protocols

| Protocol type | Details |
|---|---|
| State validating protocols (trustless) | - Validation of state with full nodes<br>- Hashed timelock contract (HTLC) for p2p asset exchange |
| Consensus verifying protocols (spectrum: trust-minimized -> trusted) | - Validation of consensus with light-client in smart contract<br>- Validation of consensus with light-client in chain of chains (e.g., IBC)<br>- Validation with a ZKP + light clients using succinct properties (e.g., SNARKs) |
| Third-party attestation protocols (spectrum: trusted -> trust-minimized) | - Multisig or threshold signature attestation<br>- TEE, SGX attestation<br>- Oracles / oracle networks attestation<br>- Proof of authority (PoA) or proof of stake (PoS) attestation<br>- Central authority attestation |
| Optimistic protocols (spectrum: trusted -> trust-minimized) | - (Permissionless) Attestors + watchers for (permissionless) fault-proof (1 of N trust assumption) |
| Hybrid protocols | - Combining character |

Source: overview inspired by the Crosschain Risk Framework

**Popular crosschain protocols:**

- LayerZero (third-party attestation protocol)
- Wormhole (third-party attestation protocol)
- Chainlink CCIP (third-party attestation protocol)
- Cosmos IBC (consensus verifying protocol; onchain)
- zkBridge / Polyhedra Network (consensus verifying protocols; validity proof)
- Hashi (hybrid protocol; bridge aggregator)
- Across (hybrid protocol; settlement layer for asset transfer intents)