

All about Blockchain Interoperability

Yu Wang

Overview

Overview of Blockchain Interoperability Approaches

Special thanks for this paper

A Survey on Blockchain Interoperability: Past, Present, and Future Trends

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Blockchain interoperability is emerging as one of the crucial features of blockchain technology, but the knowledge necessary for achieving it is fragmented. This fact makes it challenging for academics and the industry to achieve interoperability among blockchains seamlessly. Given this new domain's novelty and potential, we conduct a literature review on blockchain interoperability by collecting 284 papers and 120 grey literature documents, constituting a corpus of 404 documents. From those 404 documents, we systematically analyzed and discussed 102 documents, including peer-reviewed papers and grey literature. Our review classifies studies in three categories: Public Connectors, Blockchain of Blockchains, and Hybrid Connectors. Each category is further divided into sub-categories based on defined criteria. We classify 67 existing solutions in one subcategory using the Blockchain Interoperability Framework, providing a holistic overview of blockchain interoperability. Our findings show that blockchain interoperability has a much broader spectrum than cryptocurrencies and cross-chain asset transfers. Finally, this paper discusses supporting technologies, standards, use cases, open challenges, and future research directions, paving the way for research in the area.

22 Mar 2021

Public Connectors · Blockchain of Blockchains · Hybrid connectors

How to do this?

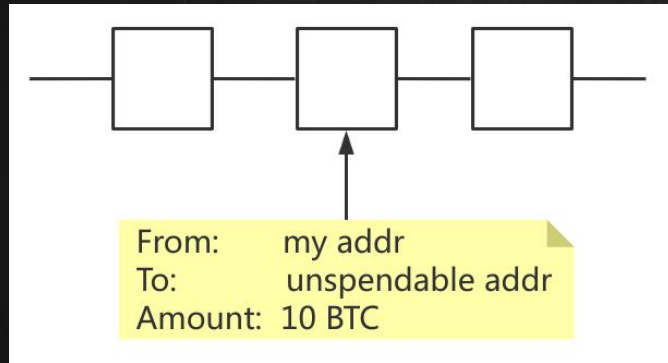
	BTC	→	ETH
State1	10		0
State2	0		10

- Sidechain
- Notary schemes
- Hashed time-lock connectors

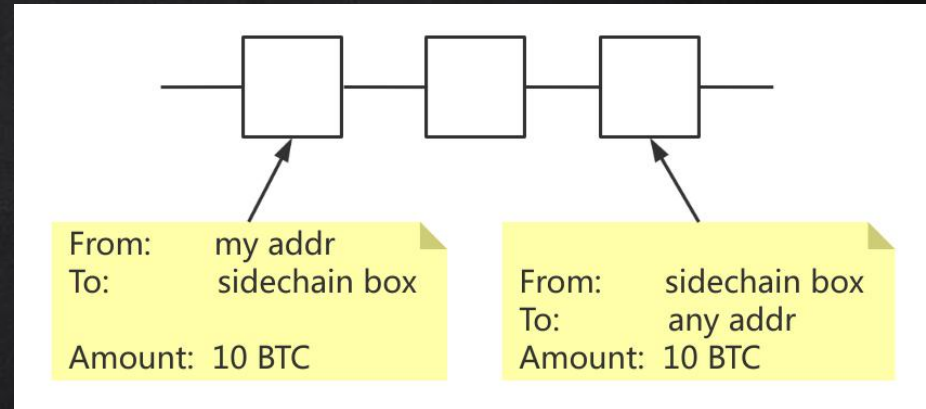
Overview

Public Connectors · Blockchain of Blockchains · Hybrid connectors

one-way peg



two-way peg

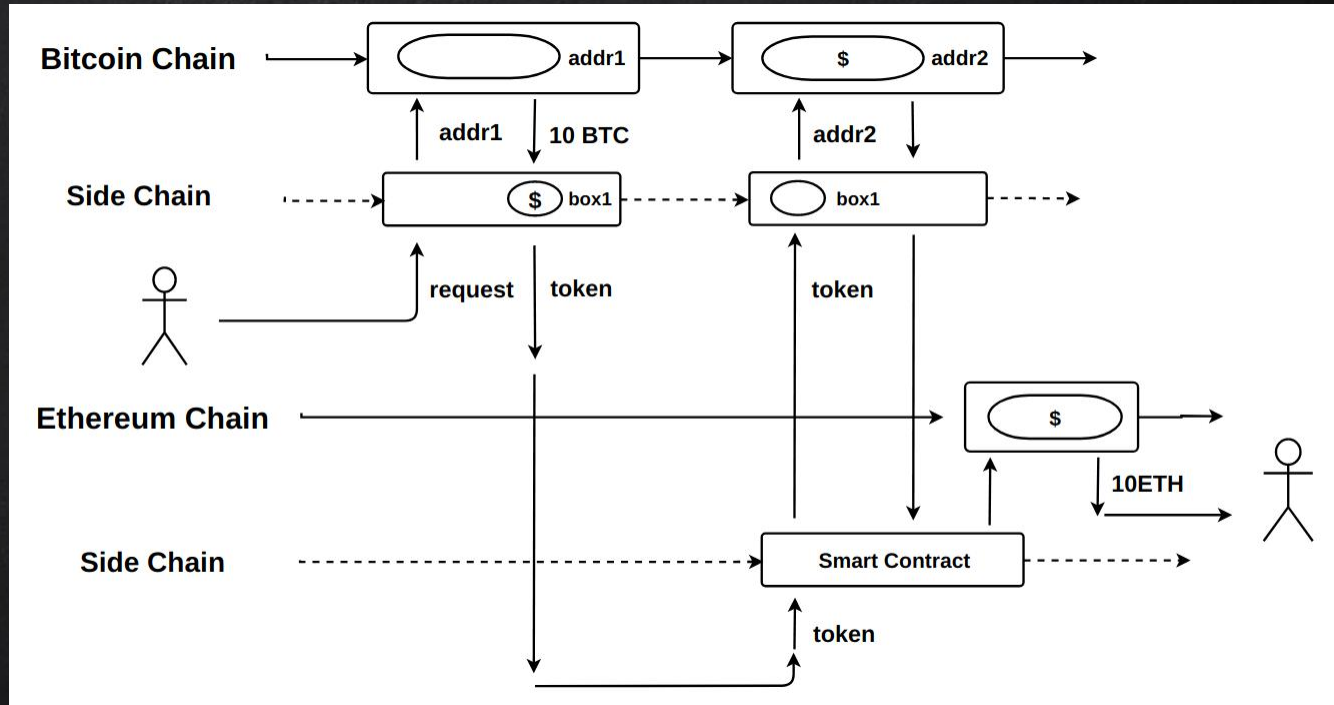


- ❑ Sidechain
- ❑ Notary schemes
- ❑ Hashed time-lock connectors

Overview

Public Connectors · Blockchain of Blockchains · Hybrid connectors

Maybe like this:



- ❑ Sidechain
- ❑ Notary schemes
- ❑ Hashed time-lock connectors

Overview

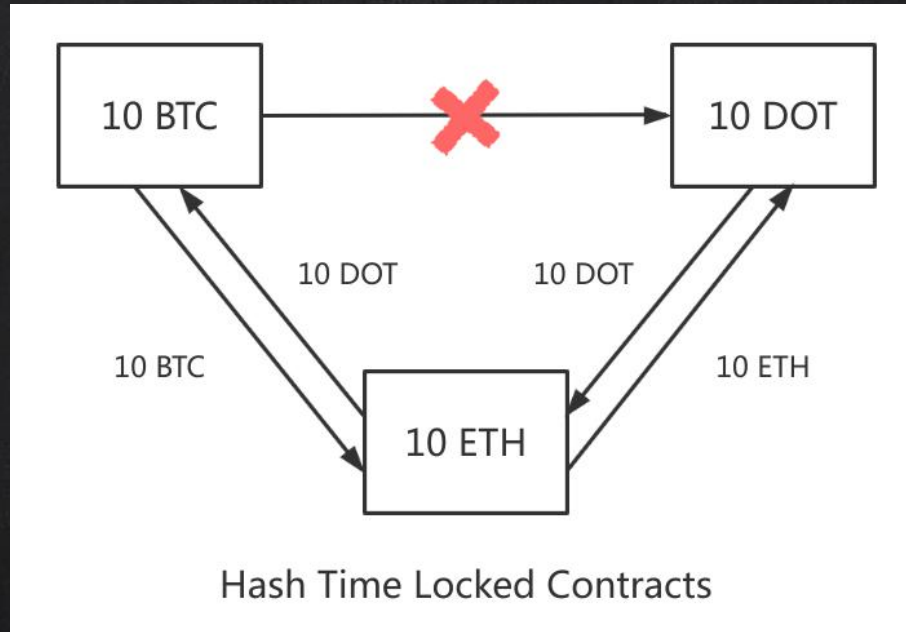
Public Connectors · Blockchain of Blockchains · Hybrid connectors



- ❑ Sidechain
- ❑ **Notary schemes**
- ❑ Hashed time-lock connectors

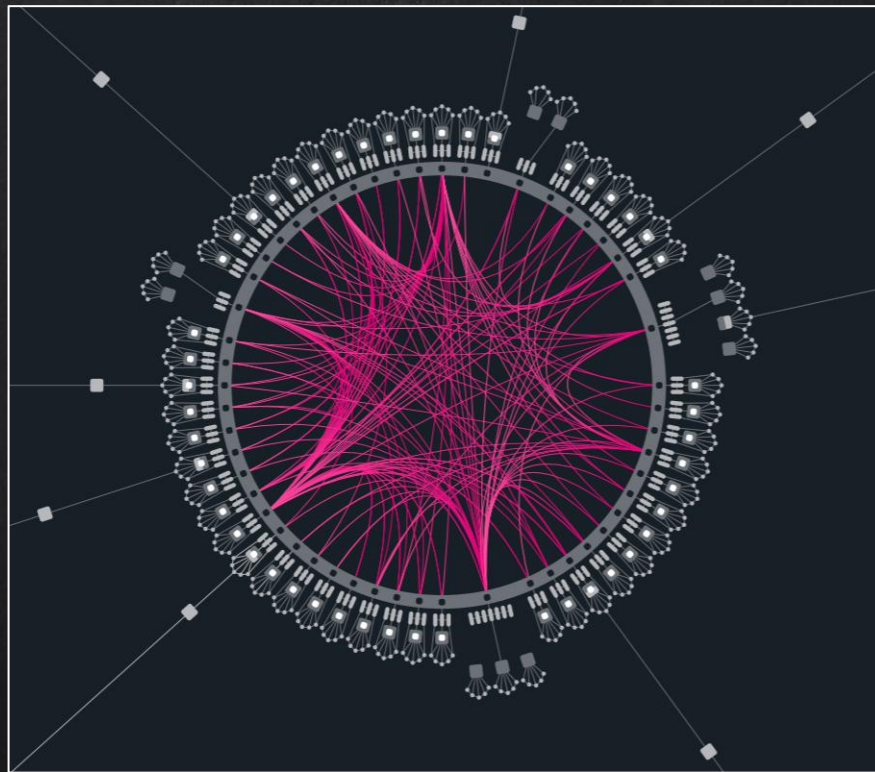
Overview

Public Connectors · Blockchain of Blockchains · Hybrid connectors



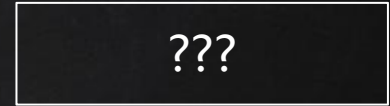
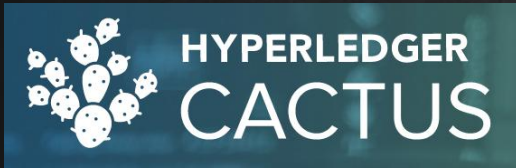
- ❑ Sidechain
- ❑ Notary schemes
- ❑ **Hashed time-lock connectors**

Overview



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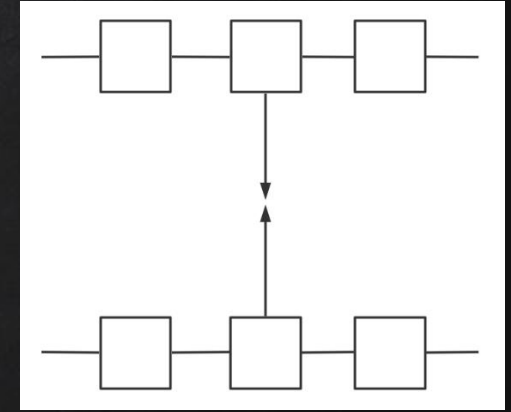
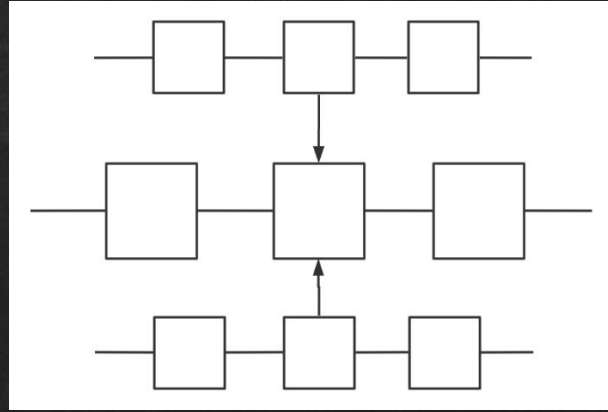
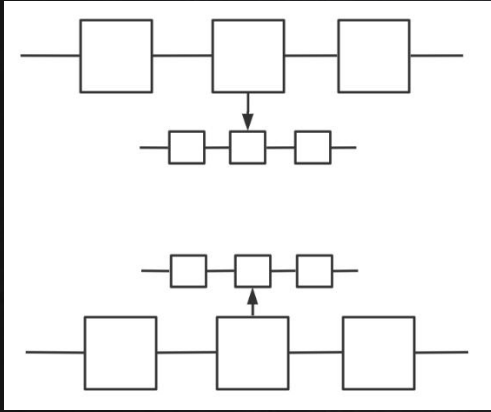
Pulic Connectors · Blockchain of Blockchains · **Hybird connectors**



- ❑ Trusted relays
- ❑ Blockchain-agnostic protocols
- ❑ Blockchain migrators

Overview

Public Connectors vs Blockchain of Blockchains vs Hybrid connectors



Past

Coordination distance : ★

Interoperability : ★

Present

Coordination distance : ★★

Interoperability : ★★

Future

Coordination distance : ★★★

Interoperability : ★★★

Overview

Solutions

Most representative solutions on the market

Polkadot · Cosmos



Dr. Gavin James Wood

Yes, this guy did it.

Five key failure of present technology stacks:

- ❑ Scalability
- ❑ Isolatability
- ❑ Developability
- ❑ Governance
- ❑ Applicability

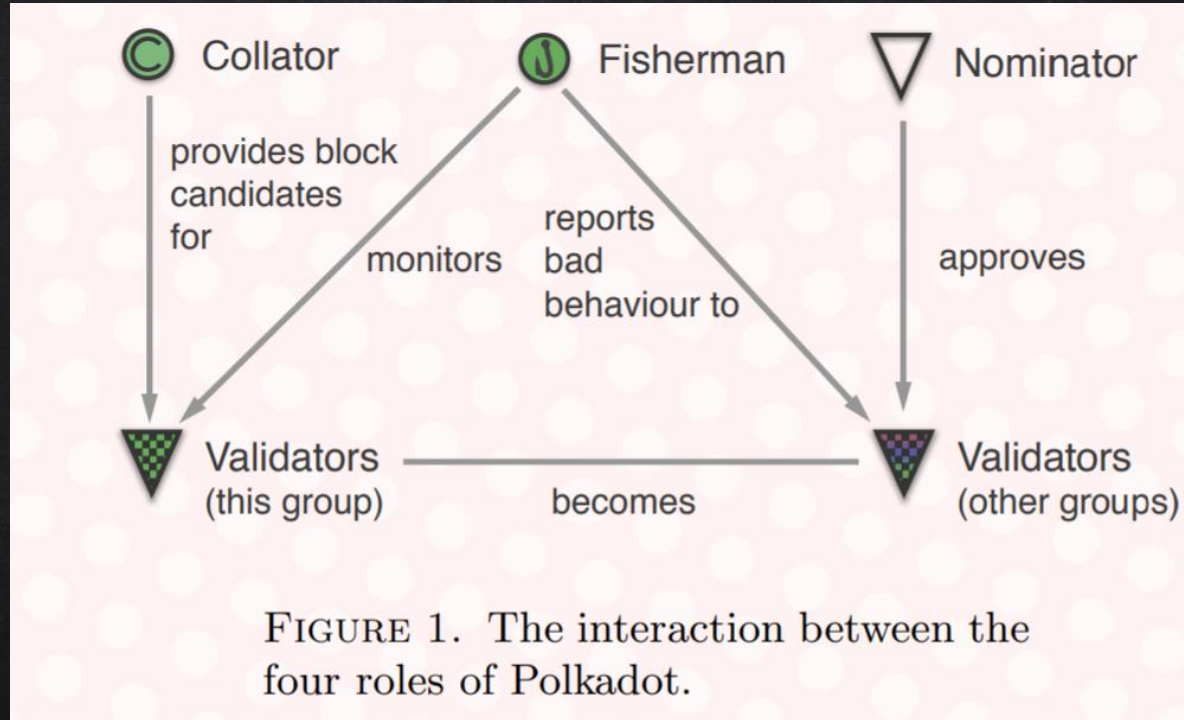
Polkadot: A next-generation blockchain protocol

Polkadot aims to:

- ❑ Scalability
- ❑ Isolatability

Solutions

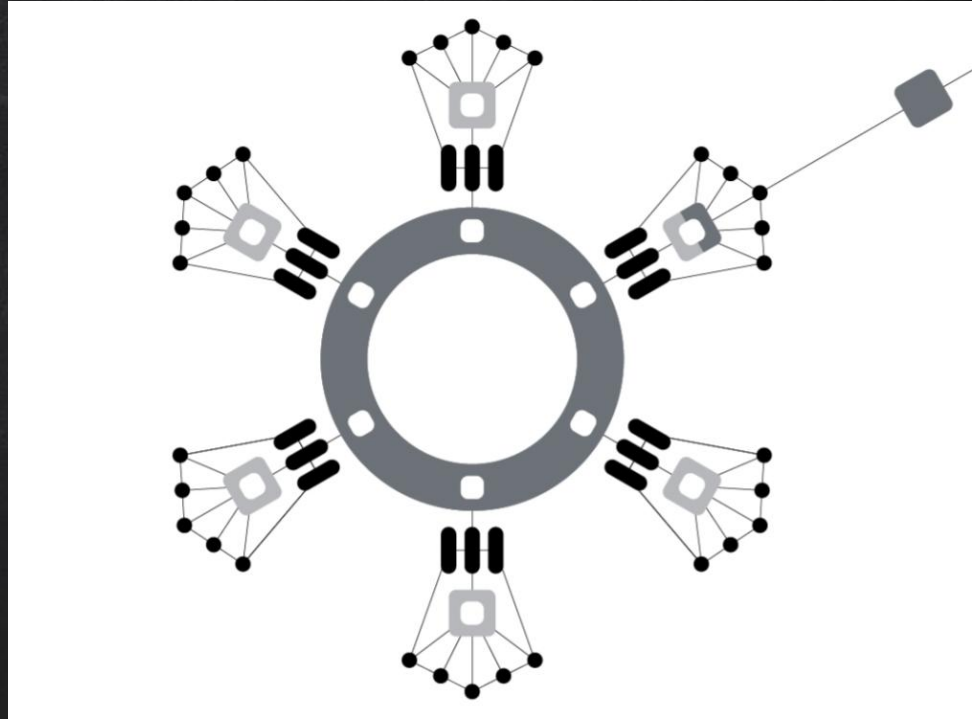
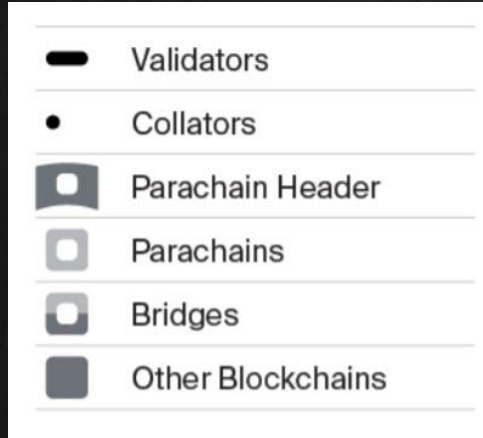
Polkadot · Cosmos



Four basic roles

Solutions

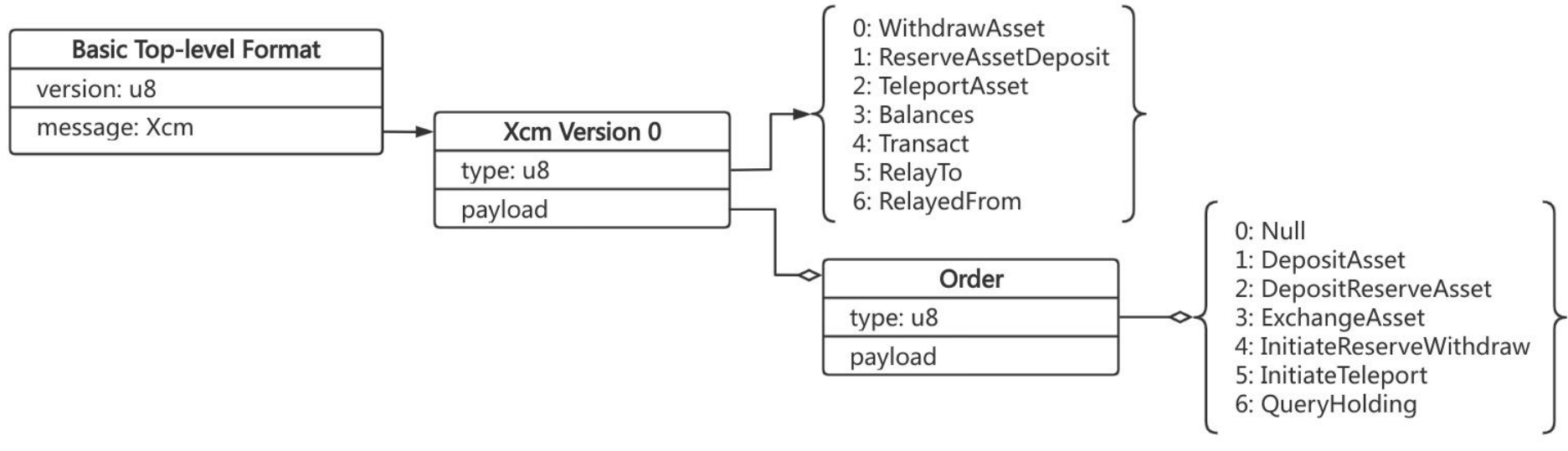
Polkadot · Cosmos



Hybrid Consensus (GRANDPA/BABE)

Solutions

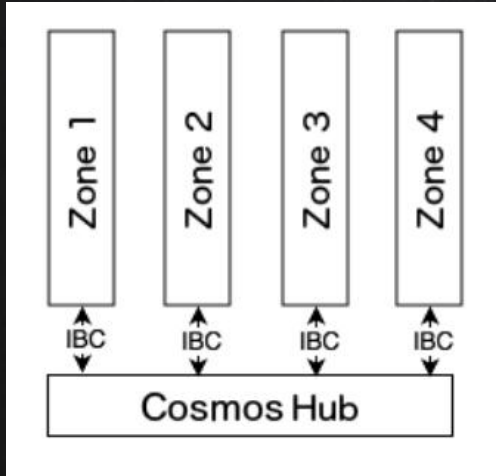
Polkadot · Cosmos



Cross-chain Message Passing (XCMP)

- ❑ Horizontal Relay-routed Message Passing (HRMP)
- ❑ Vertical Message Passing (VMP)

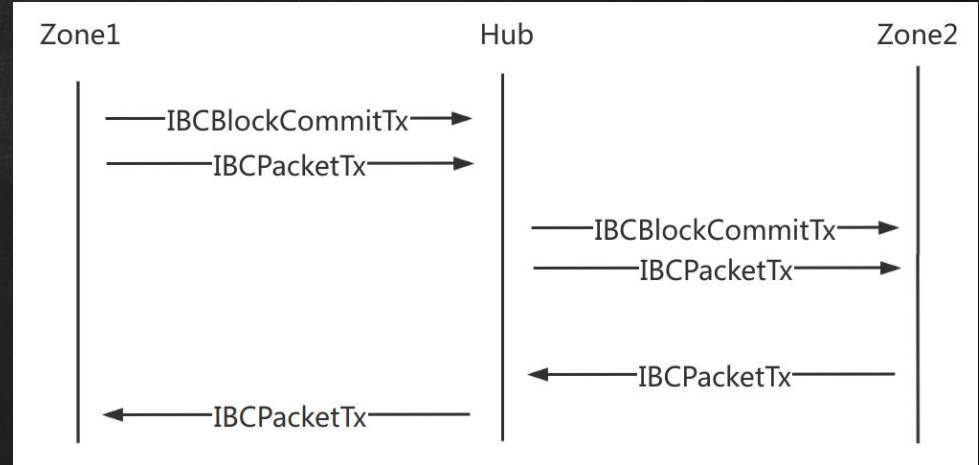
Solutions



Cosmos Hub : Proof of Stake
Zones : Tendermint BFT

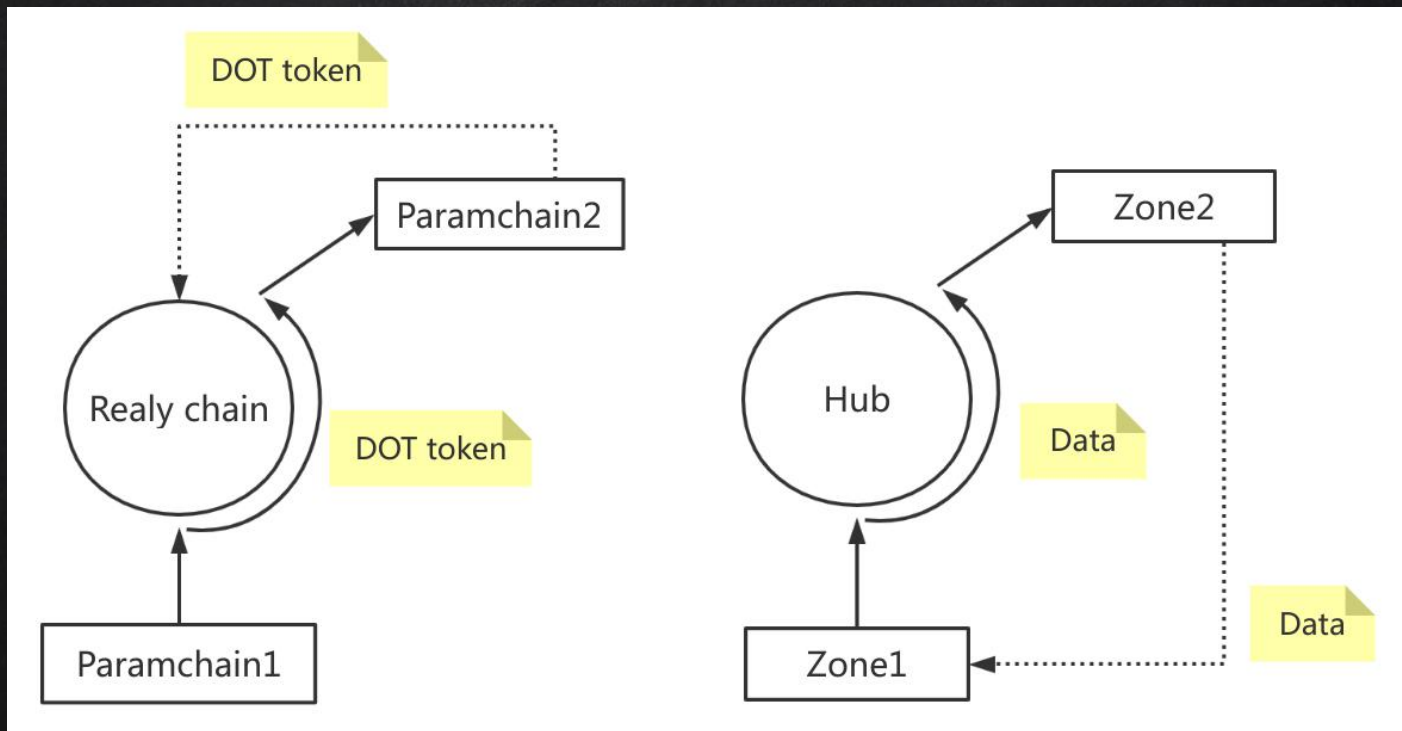
Inter-blockchain Communication (IBC)

- ❑ IBCBlockCommitTx
- ❑ IBCPacketTx



Solutions

Polkadot vs Cosmos



Solutions

Polkadot · Cosmos

Transaction type:

- ❑ SendTx
- ❑ BondTx
- ❑ UnbondTx
- ❑ ReportHackTx
- ❑ SlashTx
- ❑ BurnAtomTx
- ❑ ProposalCreateTx
- ❑ ProposalVoteTx

IBCBlockCommitTx

ChainID (string)
BlockHash ([]byte)
BlockPartsHeader (PartSetHeader)
BlockHeight (int)
BlockRound (int)
Commit ([]Vote)
ValidatorsHash ([]byte)
ValidatorsHashProof (SimpleProof)
AppHash ([]byte)
AppHashProof (SimpleProof)

IBCPacket

Header (IBCPacketHeader)
Payload ([]byte)
PayloadHash ([]byte)

Solutions

Plan

Out plan to implement an inter-blockchain.

About PolyNetwork



Edmond
Honglei-Cong



KSlashh



Daniel Liu
skyinglyh1



tanyuan
tanZiWen



zouxyan
zouxyan

PolyNetwork: An Interoperability Protocol for Heterogeneous Blockchains

Poly Team

2020-05-15

Introduction

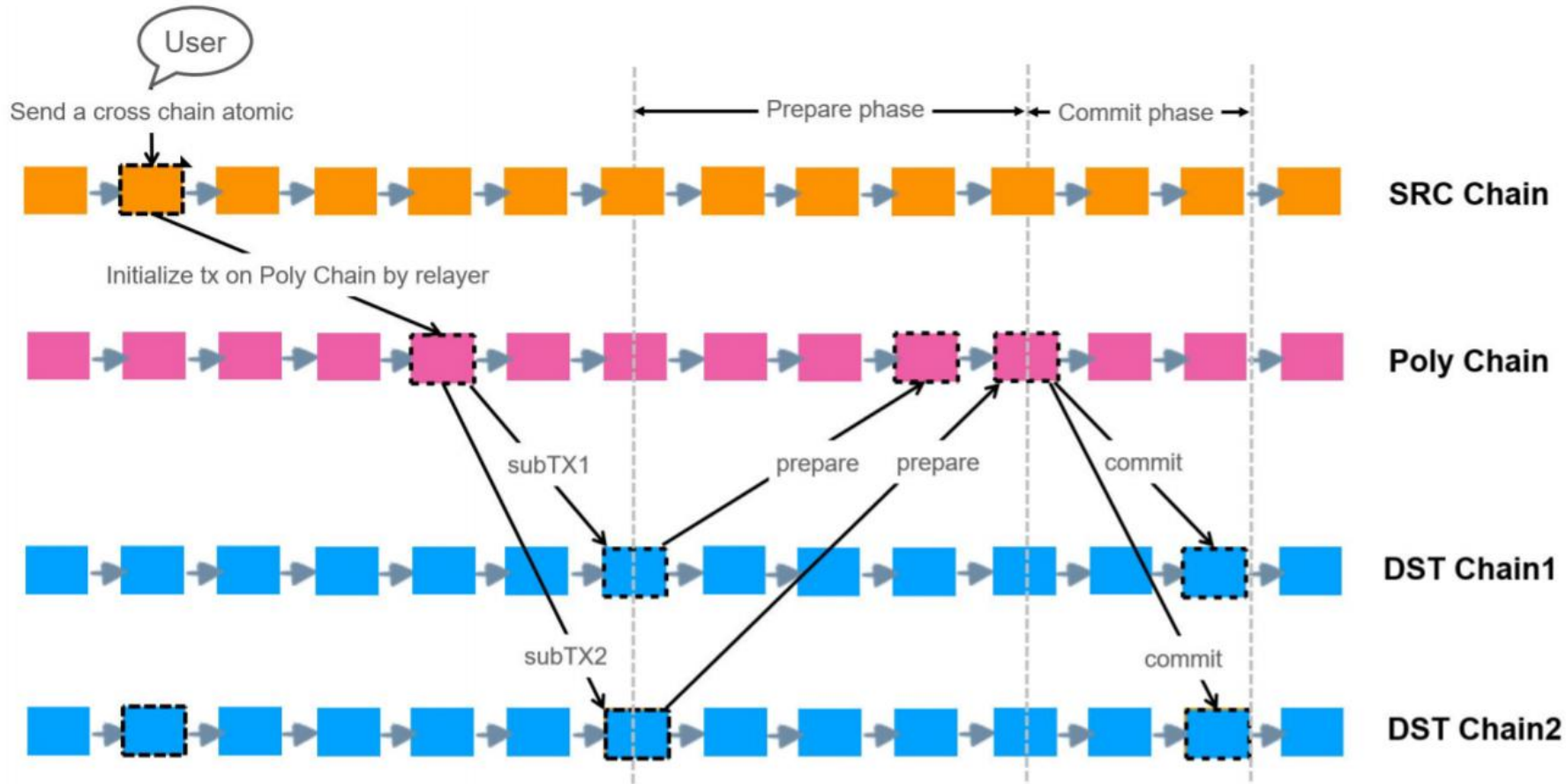
Blockchain technology can make a significant impact on our daily life. Finance¹², supply chain³, identity management⁴, digital assets⁵⁶, and distributed storage⁷⁸ are some areas that allow us to see infinite potential of a new generation of decentralized internet protocols. Blockchain can be a reshaping mechanism for social-economic operations. However, due to the massive development of

Advantage

- ❑ Wide range of support and strong versatility
- ❑ Easy to join in
- ❑ Support atomic transaction
- ❑ Support cross-chain of arbitrary information
- ❑ Security Enhancement
- ❑ Eco Friendly

An Example of a Successful Atomic Cross Chain Transaction While the proposed protocol can support more than two chains, for the sake of simplicity there will only be 2 destination chains in the following example.

- RELAYER is the relayer.
- PLOY_CHAIN is Poly Chain
- DST_CHAIN_1 is the first destination chain
- DST_CHAIN_2 is the second destination chain



Make results with the least effort

The biggest unanswerable problem

What is interoperability for?

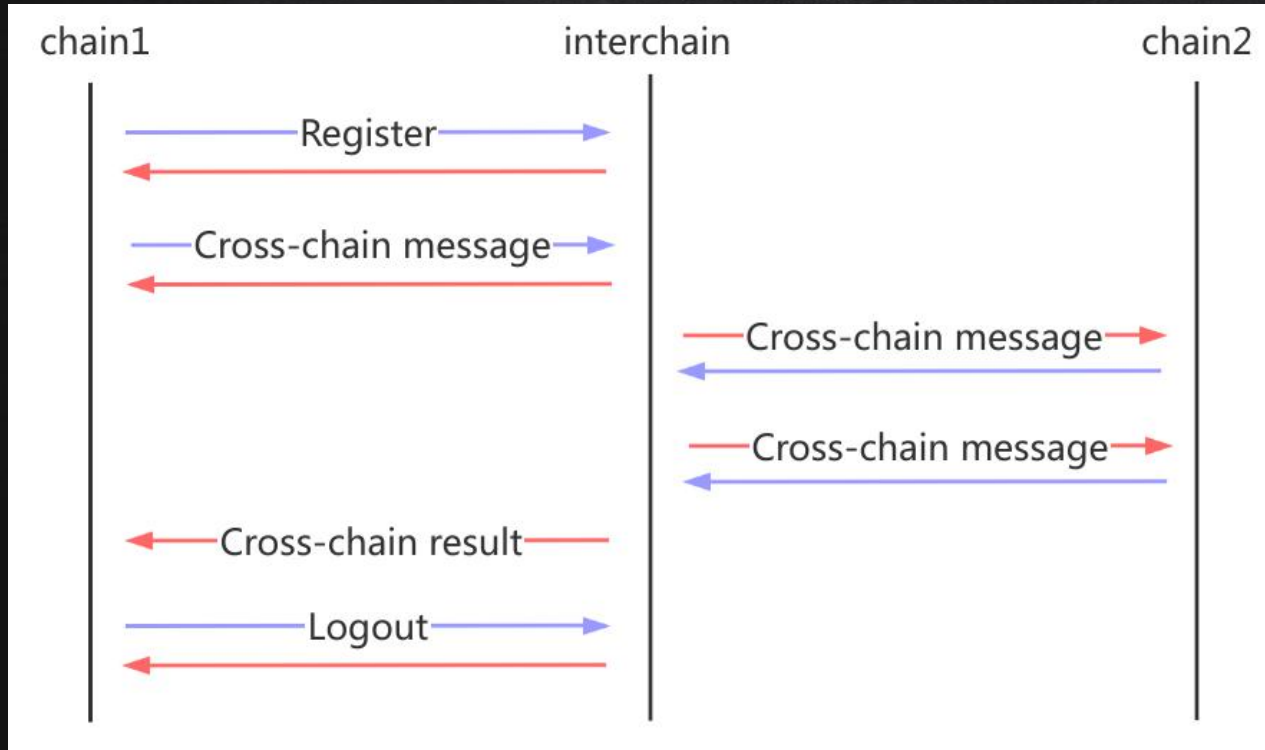
Keep it simple enough:

- HTTP
- JSON
- { type, payload }
-

The basic function we should provide at least:

- Register / Logout
- Cross-chain message routing
- Asynchronous notification
-

Minimal Protocol



For parachains:

- ❑ Send type: 5
- ❑ Receive type: 6
- ❑

Thanks!

Any questions?

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