Analyzing the Role of Bridges in Cross Chain MEV Extraction

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Outline

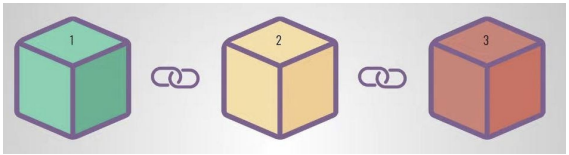
- Background & Motivation
- Problem Statement
- Research Questions
- Methodologies
- Timeline

Background & Motivation

Blockchains

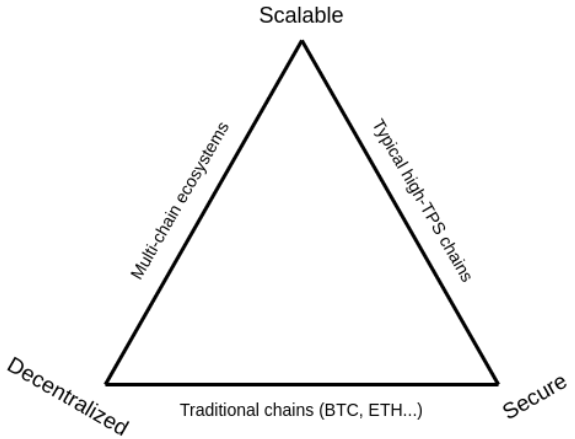
The three pillars of blockchain technology:

- Decentralization
- Transparency
- Immutability



Why do multiple blockchains exist instead of a single unified blockchain?

- Various use cases
- Blockchain trilemma



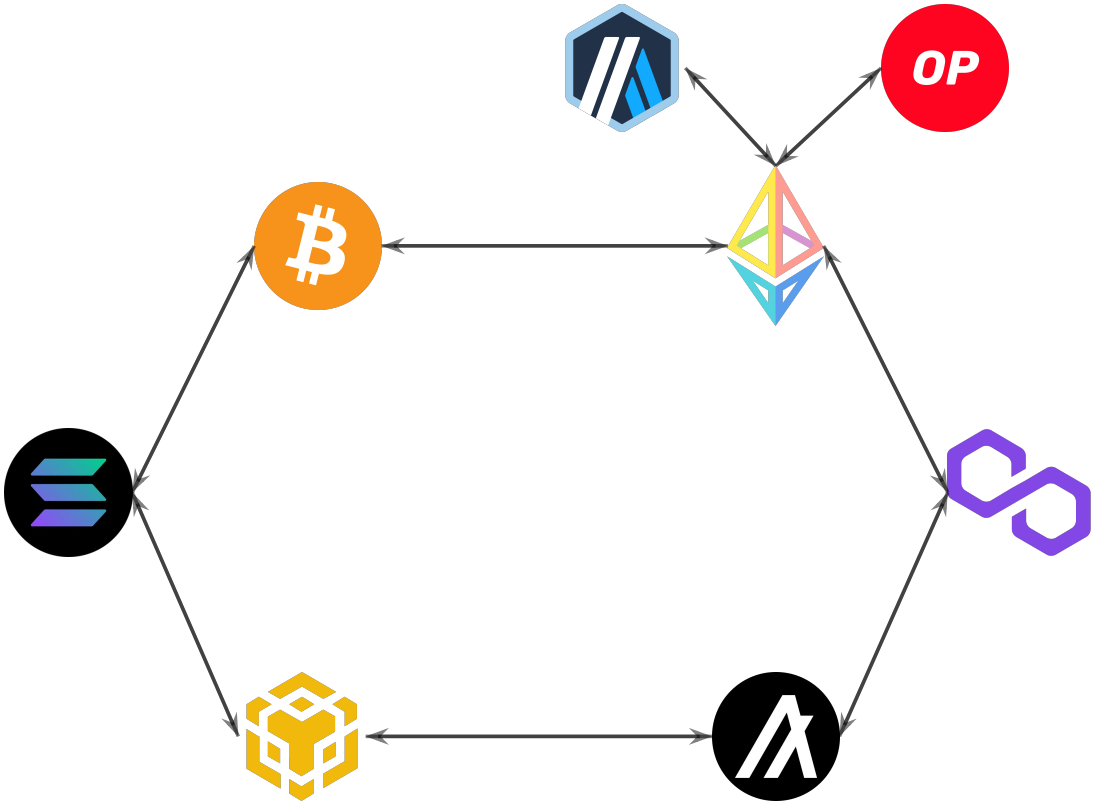
[Blockchain] Simply Explained, How does a Blockchain work on YouTube

[Trilemma] Vitalik Buterin: Why sharding is great: demystifying the technical properties

Background & Motivation

Blockchain interoperability

- Blockchain networks can communicate with each other through interoperability protocols
- These are mechanisms that enable different blockchain networks to share data



Background & Motivation

Blockchain Bridges

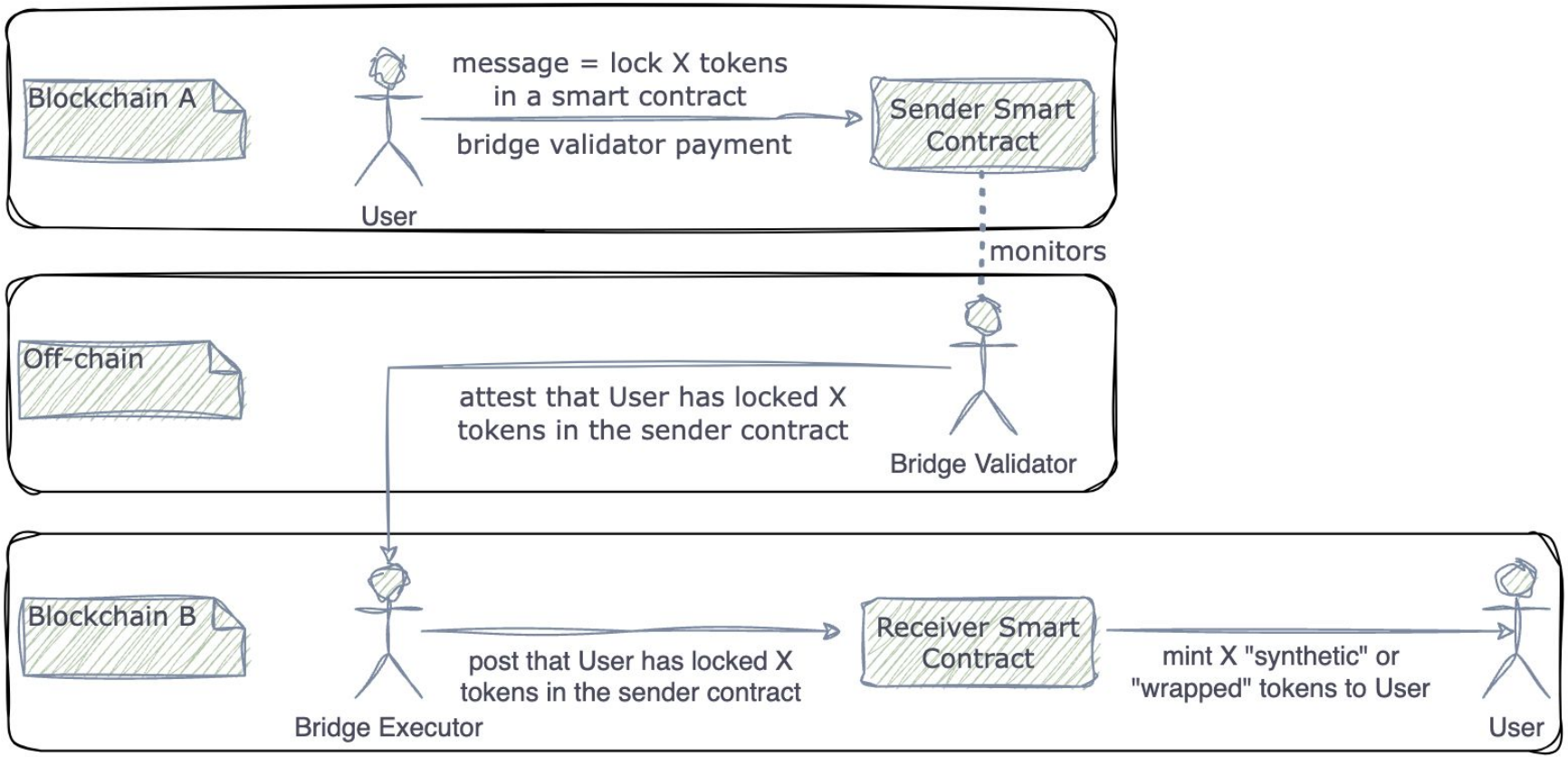
- Bridges facilitate communication between blockchains through the transfer of information and assets
- The demand to move assets across blockchains increases in proportion to the number of blockchains
- Bridges break the interoperability barrier!

[Ethereum] *Ethereum: Blockchain bridges*

[Bitnovo] *Bitnovo: What are blockchain bridges?*

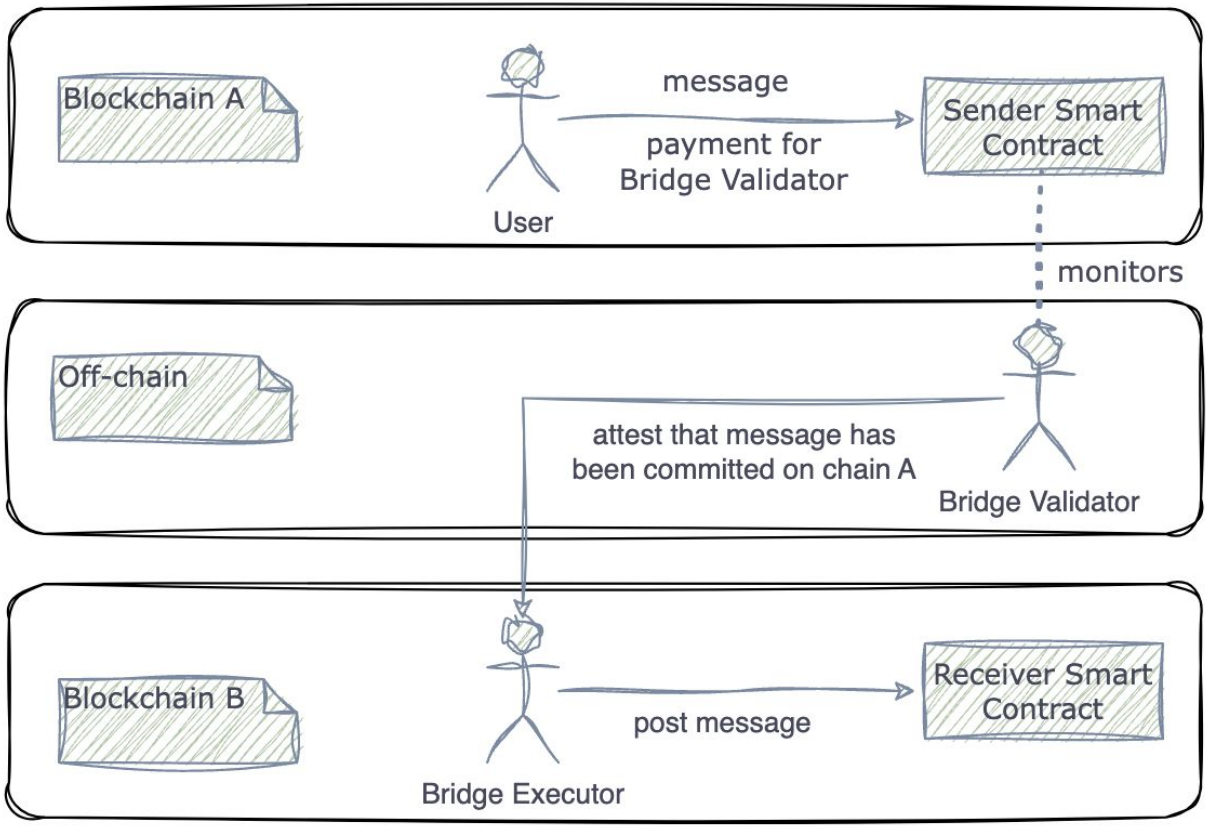
Background & Motivation

Blockchain Bridges



Background & Motivation

Blockchain Bridges



Background & Motivation

Cross-Chain Maximal Extractable Value

[Blocknative] *Blocknative: The Fundamentals of Cross-Chain MEV*

Problem Statement

Blockchain Bridges

Building of a robust blockchain bridge has significant challenges and complexities

- Security Concerns (Bridge hacks: Ronin Bridge, Wormhole, Nomad, etc.)
- Trust and Decentralization:
  - Impossibility result: Cross-chain communication problem cannot be achieved without a trusted third party
- Different Consensus Mechanisms
  - Bridging between blockchains with different consensus mechanisms can be technically challenging
- User Experience

[Bitcoin.tax] Bitcoin.tax: 5 Biggest Crypto Cross-Chain Bridge Hacks in 2022

[Eprint] Zamyatin, A. et al.: SoK: Communication Across Distributed Ledgers

Research Questions

RQ1: What are the existing interoperability solutions for connecting different blockchain networks?

- What is the current status of interoperability solutions, with a particular focus on blockchain bridges?
- Is there a formal classification of blockchain bridges that categorizes them according to their functionality, security features, and decentralization capabilities?
- What specific functionalities of blockchain bridges have the potential to generate MEV?

Research Questions

RQ2: What does the existing literature reveal about the current state of MEV in the context of cross-chain operations?

- Is there any work conducted on the extraction of MEV utilizing the infrastructure of blockchain bridges?

Research Questions

RQ3: How can we quantify cross-chain MEV extraction enabled by a selected blockchain bridge?

- Is it possible to identify historical cases of cross-chain MEV extraction, and if so, what methodologies or tools are available for such identification?

Research Questions

RQ4: What are the negative externalities of MEV in cross-chain environments?

- How can we explore further strategies to mitigate the negative side effects of MEV in the cross-chain domain?

Blockchain Bridges Taxonomy

Type			Protocol	Message Verification
Arbitrary Messaging Bridges			LayerZero	External
			Wormhole	External
			Axelar	External
Token Bridges	Liquidity Networks	Pool Based	Across	Optimistic
			Hop	Optimistic
			Connext	Optimistic
			cBridge	External
			Stargate	External
		Order Flow Based	deBridge	External
			UniswapX	External
	Burn and mint	Stable Coins	Circle CCTP	External
			Maker Teleport	External
		Bridge Standards	Connext xERC20	Optimistic
			LayerZero OFT	External
			Polygon Bridge	Native
	Lock and mint		wBTC	External

[LayerZero] LayerZero: GitBook documentation

[Wormhole] Wormhole: GitBook documentation

[Axelar] Axelar: What is Aexlar?

[Across] Across: The Bridge Ethereum Deserves

[Hop] Hop: GitBook documentation

[Connext] Connext: GitBook documentation

[cBridge] cBridge: GitBook documentation

[Stargate] Stargate: GitBook documentation

[deBridge] deBridge: GitBook documentation

[uniswapX] uniswapX: Uniswap documentation

[Circle CCTP] Circle CCTP: Cross-Chain Transfer Protocol

[Maker Teleport] Maker Teleport: DAI Teleport

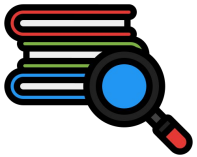
[Connext xERC20] xERC20: Technical documentation

[LayerZero OFT] LayerZero OFT: Technical documentation

[Polygon Bridge] Polygon Bridge: Bridge Layers

[Wrapped Bitcoin] Wrapped Bitcoin: Whitepaper

Methodologies

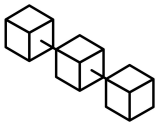


Literature Review

- Research single domain MEV
- Research cross domain MEV
- Research MEV identification methodologies

Bridges protocol analysis

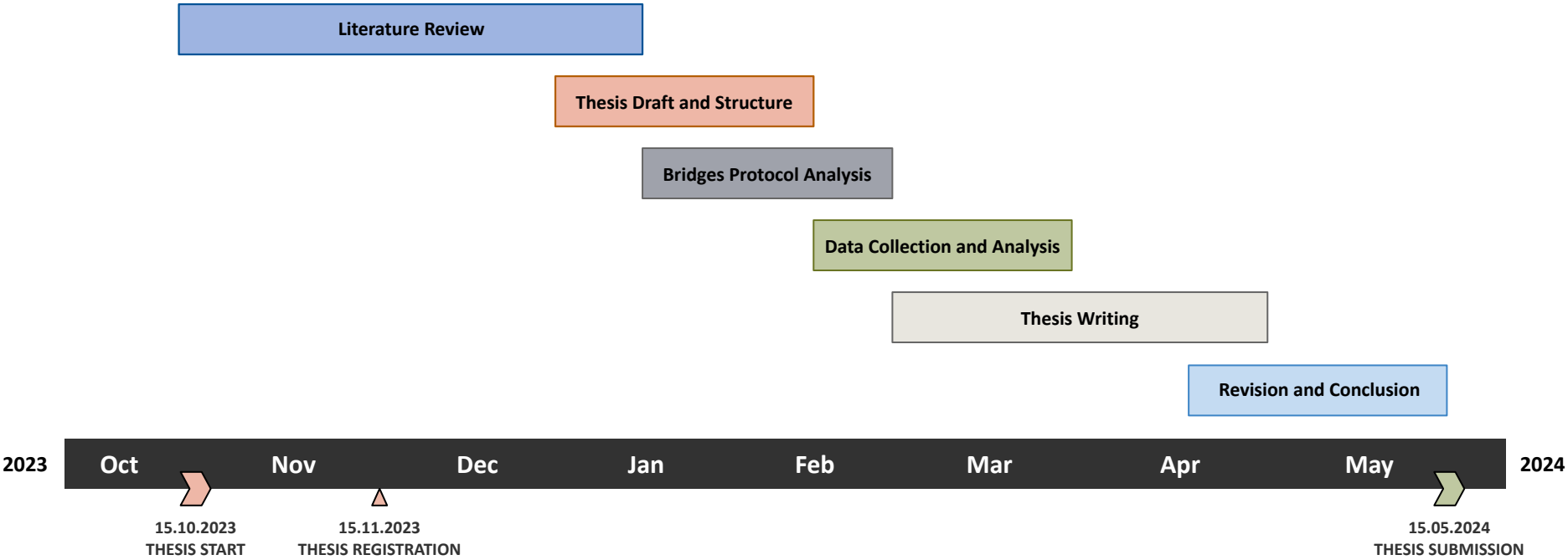
- Study bridges protocol whitepaper
- Understand trade-offs in protocol design
- Understand functionalities and their impact on MEV



Data collection & analysis

- Collect historical data from blockchains
- Employ known methodologies for identifying cross-chain MEV
- Finetune parameters and improve methodology

Timeline


Literature Review
Thesis Draft and Structure
Bridges Protocol Analysis
Data Collection and Analysis
Thesis Writing
Revision and Conclusion
2023
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