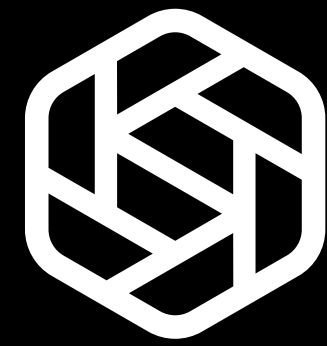




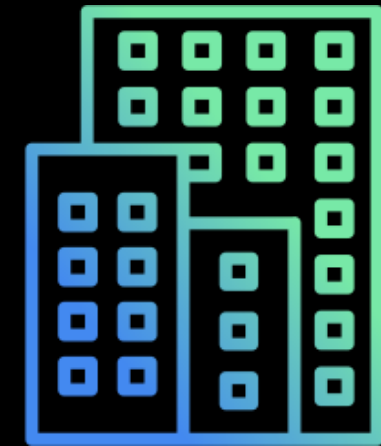
# Streamlining DvP with Hyperledger Technologies

April 2024



# kaleido

THE BLOCKCHAIN BUSINESS CLOUD



**Web3 & Digital Assets**

**Made Radically Simple**

**For Enterprise**

# Kaleido's Product Suite

## Institutional Web3

Digital Assets & Tokenization

## Consumer Web3

Mass scale user applications

## Multi-Party Web3

Business Networks

### Kaleido Asset Platform

Asset Services and Tools

#### Digital Asset

Institutional grade digital assets platform across public and private

#### NFT

Mass scale dedicated NFT platform with zero gas and high performance

#### Consortium

Full stack, decentralized hosting on an automated, compliant platform

### FireFly Web3 Gateway

Asset Middleware & Infrastructure

#### Custody



#### FireFly OS

Web3 Gateway



Data Manager

Transaction Manager

Event Bus

#### Enterprise Integration



First open source SuperNode for blockchain and digital assets

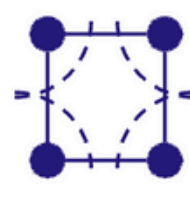
### Chain

Blockchain-as-a-Service infrastructure

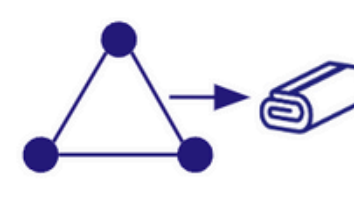
#### Private



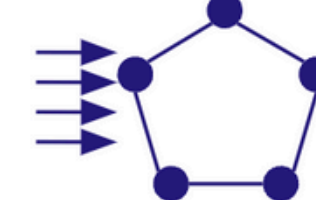
#### Consortium



#### App Chain



#### Side Chain

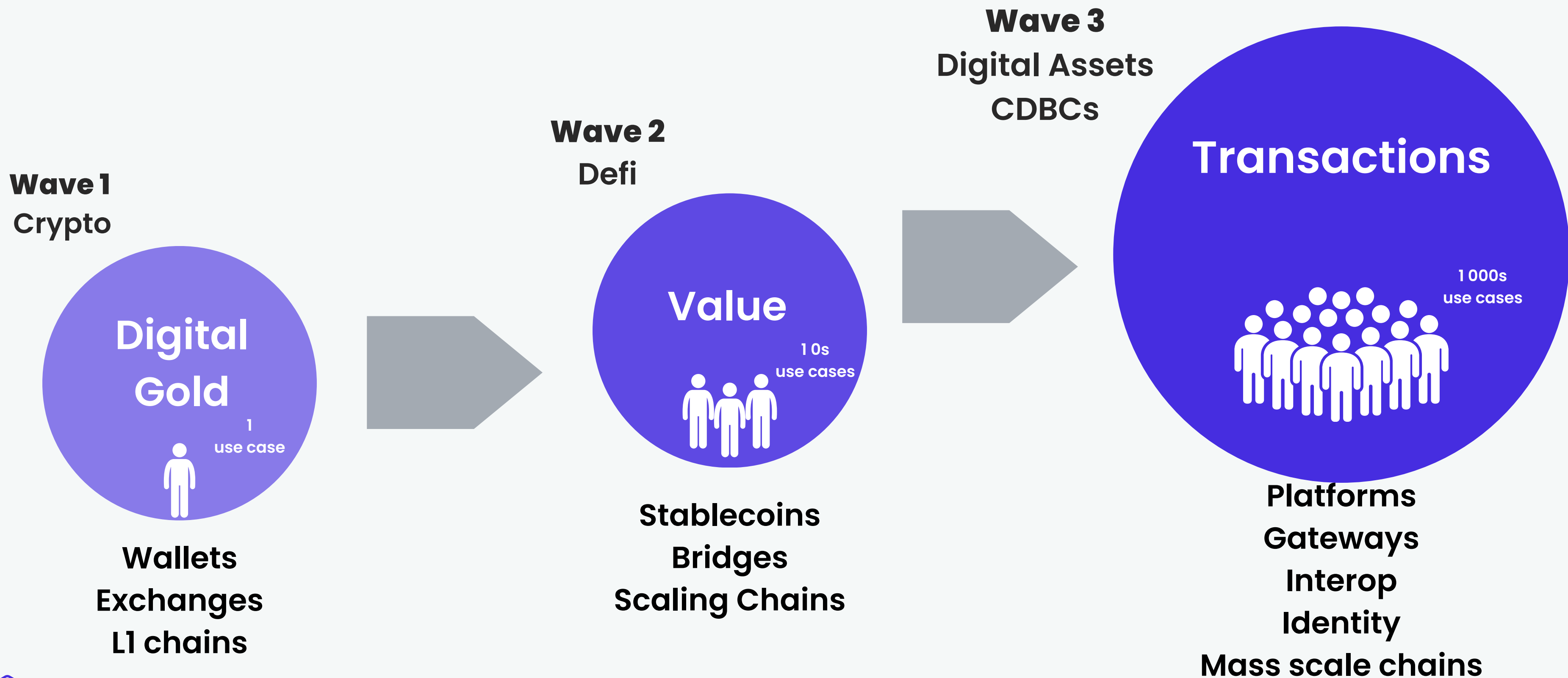


#### Public Chain



Industry leading BaaS - multi-protocol, cross-cloud, and hybrid

# Digital Assets will transform thousands of use cases for enterprises and consumers



# Common Archetypes of Transactions



## Payment vs. Payment (PvP)

A transaction where transfer of funds in one currency is dependent on the simultaneous transfer of funds in another currency



## Delivery vs. Delivery (DvD)

A transaction where delivery of one asset is contingent upon the simultaneous delivery of another asset by the counterparty.



## Delivery vs. Payment (DvP)

A transaction between a buyer and seller whereby the transfer of assets only happens after payments has been made.

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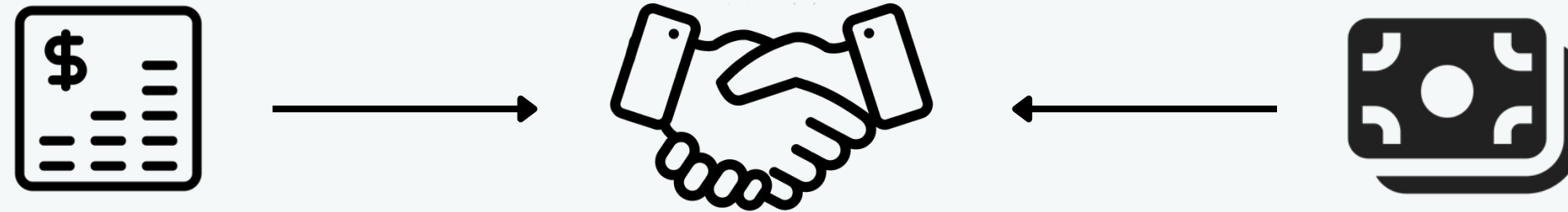
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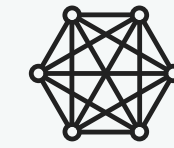
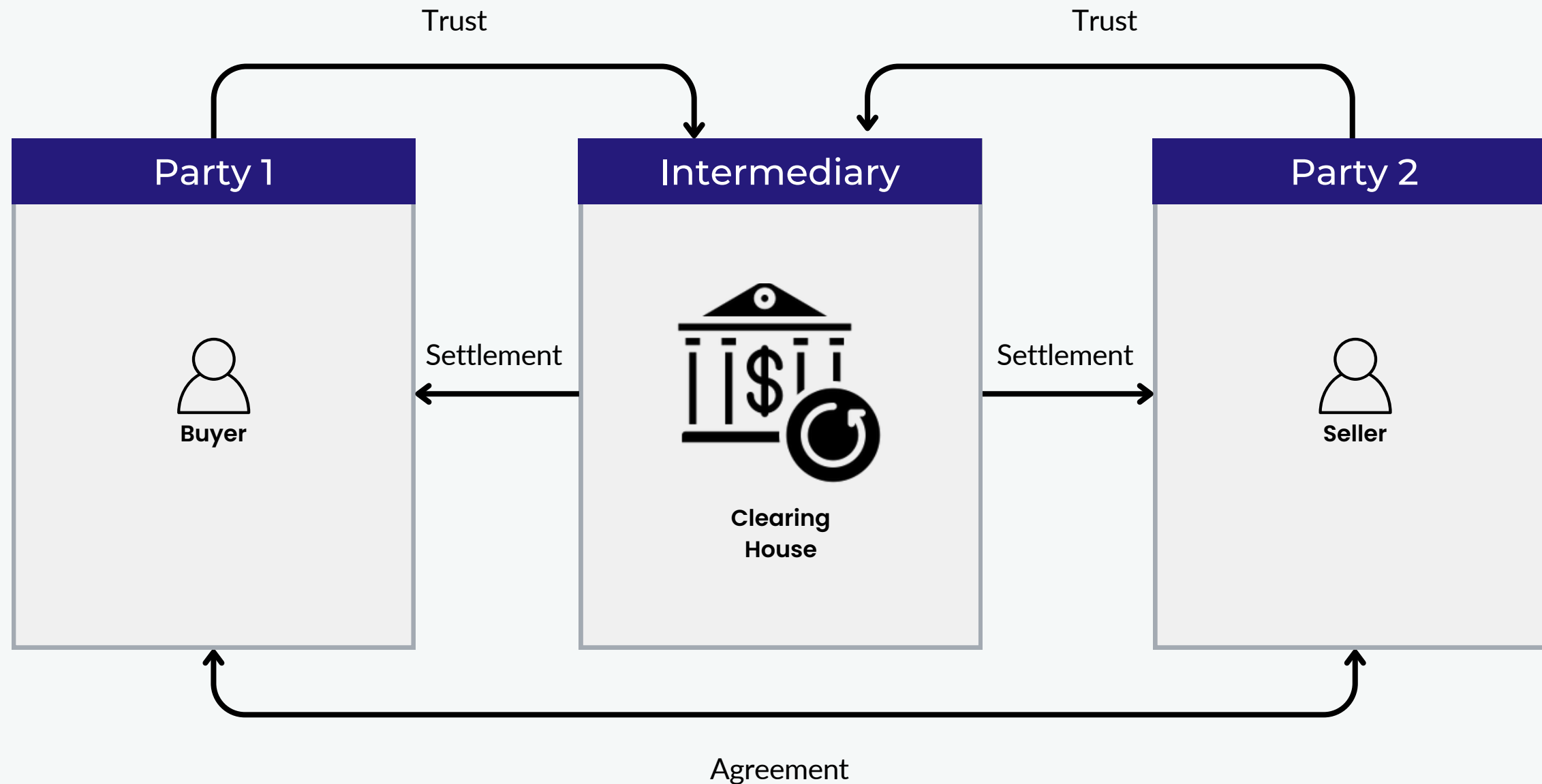
A transaction between a buyer and seller whereby the transfer of assets only happens after payments has been made.

# Questions that must be answered for a successful transaction



- How do we mitigate counterparty risk?
- What are the settlement procedures and timeline?
- How is regulatory compliance ensured?
- How do the systems of the buyer and seller communicate with each other?
- How is asset and payment ownership verified and transferred?
- What are the reporting and documentation requirements?
- What contingency plans are in place?
- How are data security and confidentiality addressed?

# Existing Challenges with Business Transactions



## Complexity

- Traditional systems face increased operational complexities with the need for intermediaries as assets and value are in different, often disjointed systems.



## Inefficient Settlement.

- Clearing and settlement takes up to T+2 days and systems typically operate only during business hours.



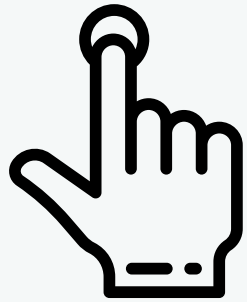
## Counterparty Risk

- Slow movement of funds and assets due to outdated systems increases risk that a party may not fulfill their obligations.



# Benefits of Tokenized Assets

## Operational ease



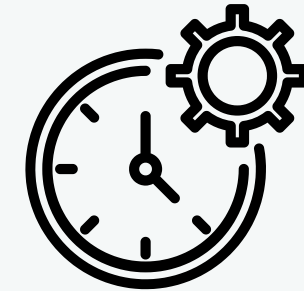
Tokenizing assets allows assets *and* value to be on DLT, bringing a new fundamental era of efficiency and programmability.

## Immutability & Transparency



A transparent and immutable record of transactions allows parties to independently verify integrity of pertinent transactions

## Efficiency



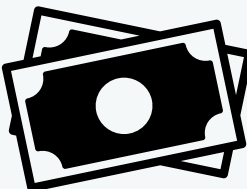
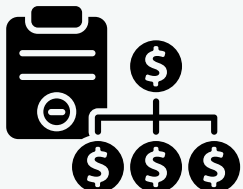

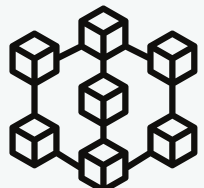
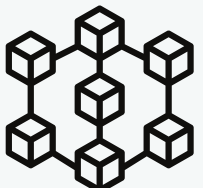
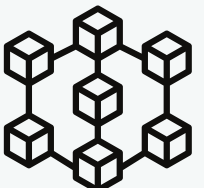
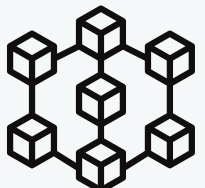



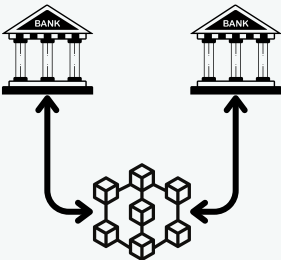
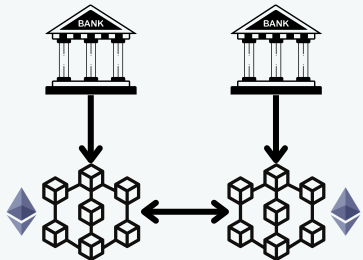
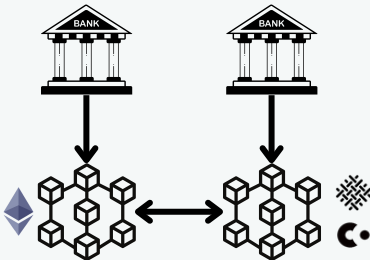
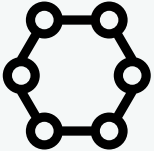








Near real-time settlement enhances liquidity, reduces counterparty risk, and optimizes capital utilization for participants

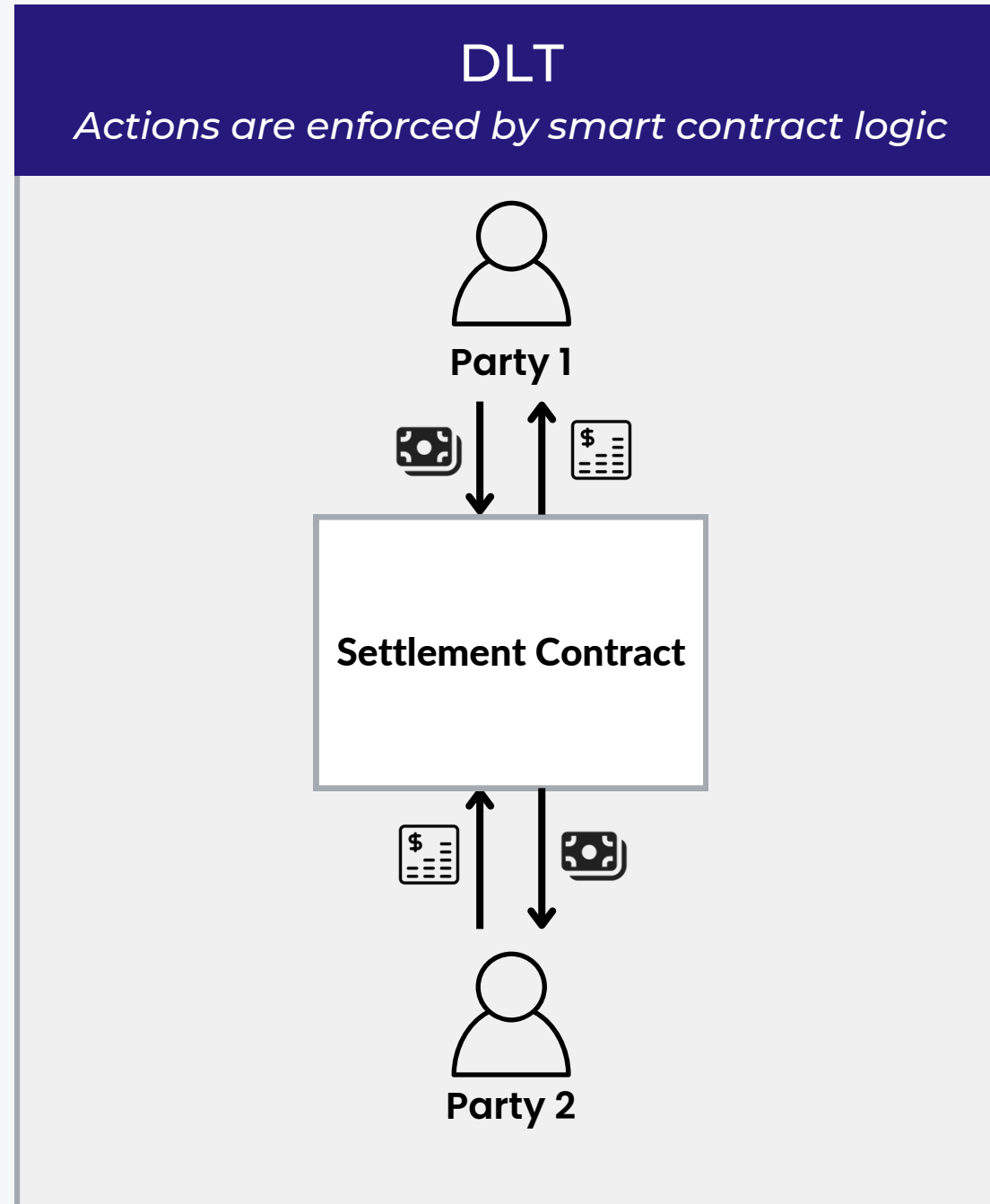


# DvP Technical Details

# Dimensions of DvP

<p><b>Asset Type</b> What is being exchanged?</p>	 Commodities	 Bonds	 Currency	 Derivatives	 Equities		
<p><b>Networks</b> Where is the exchange happening?</p>	<p style="text-align: center;">On-chain Networks</p>				<p style="text-align: center;">Off-chain Networks</p>		
	 Cash Network	 Asset Network	 w-CDBC Network	 r-CDBC Network	 RTGS Systems	 Physical Delivery	 Legacy Systems
<p><b>Interop</b> Who is involved in the exchange?</p>	<p style="text-align: center;">Topologies</p>			<p style="text-align: center;">Bridge Technologies</p>			
	 Single Ledger	 Cross Ledger (Same Protocol)	 Cross Ledger (Different Protocol)	 Tokenized Network	 Trusted Bridge		
<p><b>Settlement</b> How will the exchange be settled?</p>	 Intermediary	 Escrow	 HTLC	 Notary	 Direct		


# Single Chain

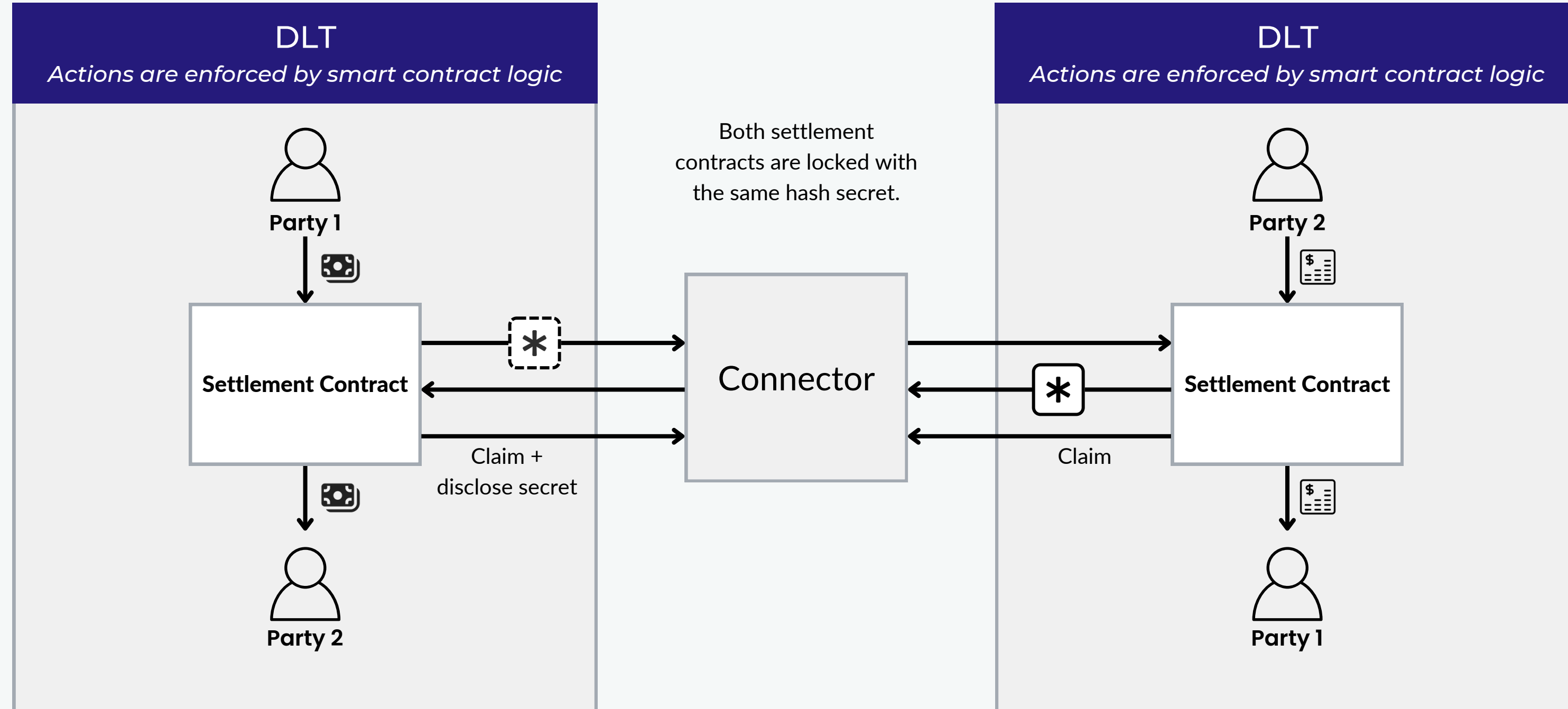


When all commitments are backed by a DLT and confined to a single chain, an atomic swap can be performed by a smart contract. All commitments are registered with the contract and will execute together or not at all.

Locking of committed assets is optional, depending on the nature of the swap and the desired guarantees around completion.

# Multi-Chain


 Transaction is locked

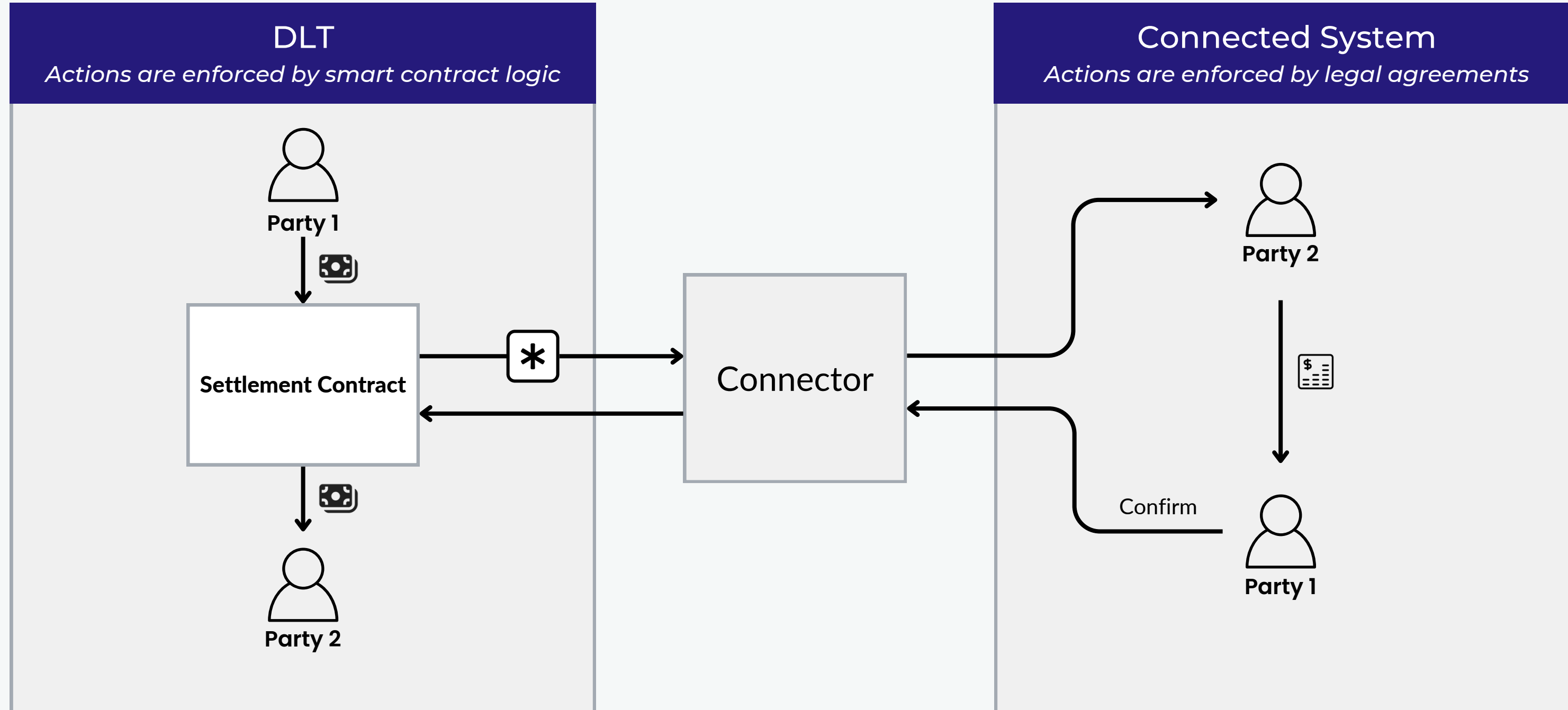


When multiple chains are involved, hash locks are often used to coordinate. One party picks a secret and hashes it. All parties may create settlement terms using the same hash. The originating party must disclose the secret to claim their portion of the settlement, which allows other parties to claim theirs as well.

Time locks can be used in combination, to allow unfulfilled settlements to expire.

# On- and Off-Chain (Trusted)


 Transaction is locked

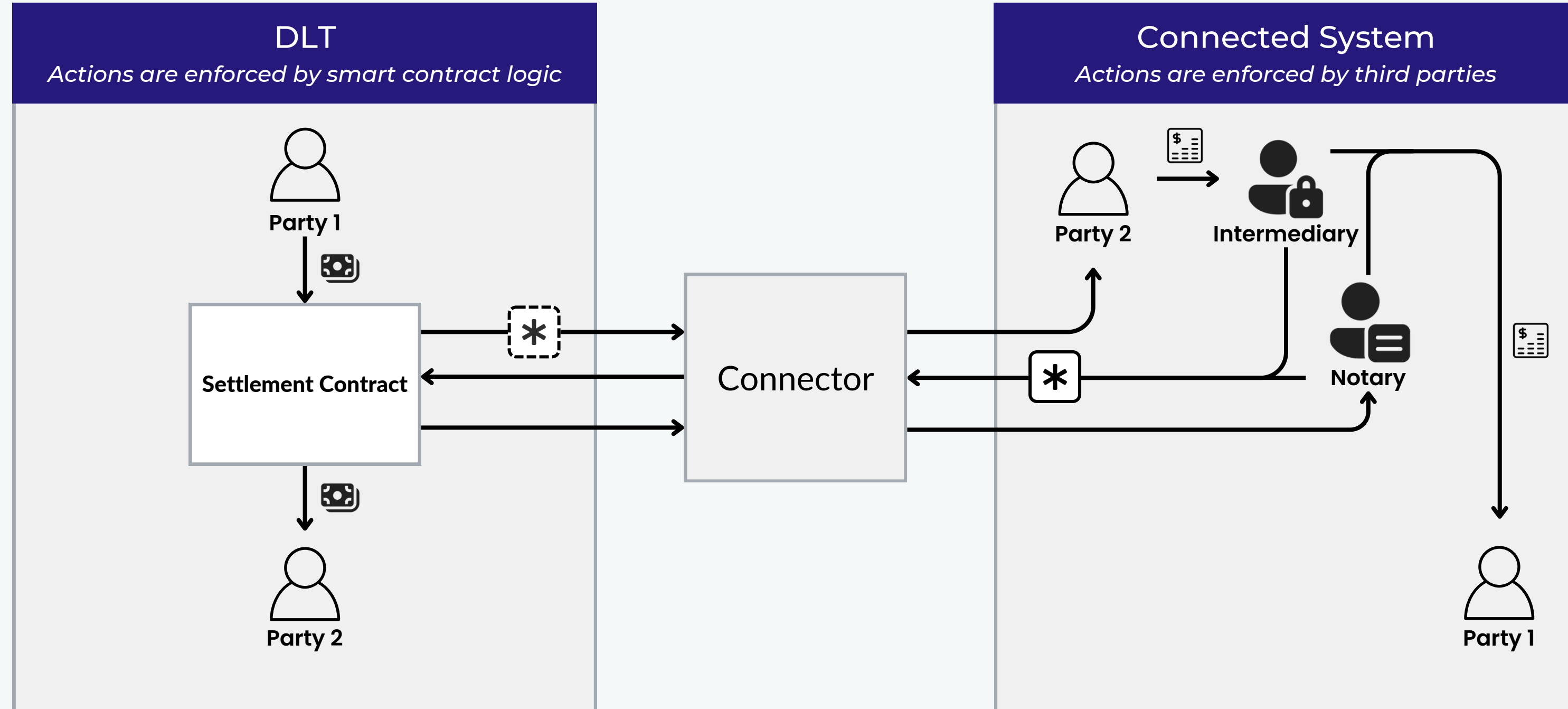


In off-chain domains with some level of trust, required actions (such as physical delivery) may be coordinated via existing legal frameworks. Sending or receiving parties may provide evidence or sign-off of delivery in order to trigger the release of digital settlement assets.

Additional consideration must be given to cancellation/expiry and dispute resolution.

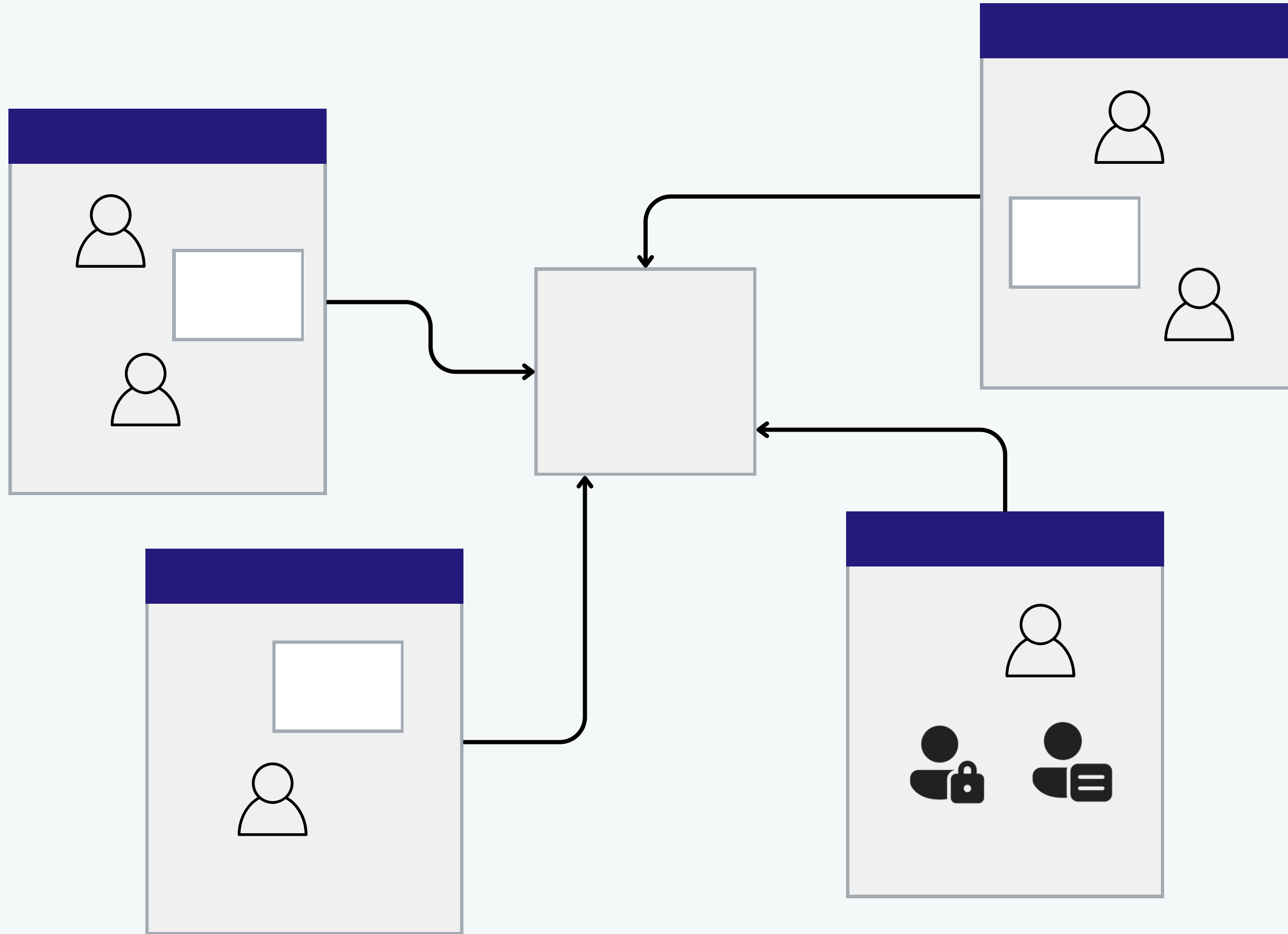
# On- and Off-Chain (Supervised)

 Transaction is locked



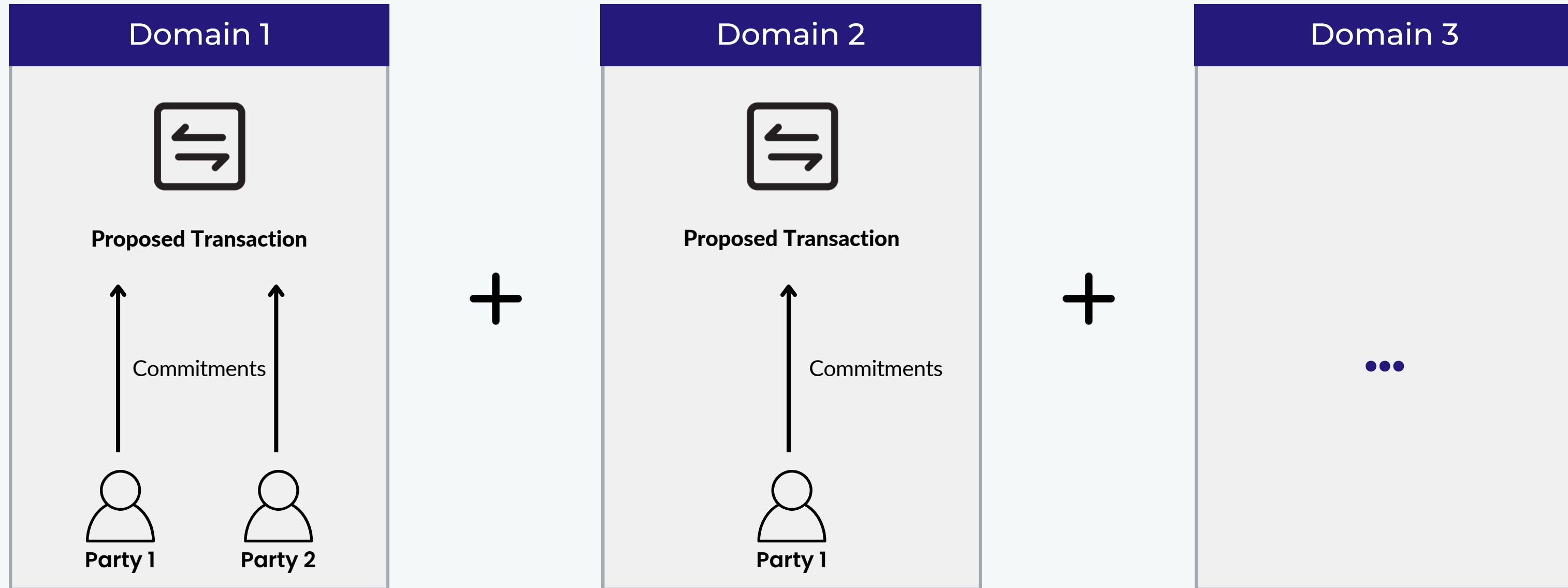
For more sensitive or regulated off-chain domains, third parties may be involved. Examples include intermediaries that hold escrowed assets, or notaries that provide a guarantee that the settlement is valid and will execute. These trusted parties may also have the power to cancel or reverse settlements that do not execute.

# ...and more





# Coordination Across Domains



An individual DvP transaction may require settling multiple commitments across multiple domains - where each domain may be a DLT or an off-chain system (such as a legacy/existing process, a physical delivery of goods, etc).

A successful DvP strategy should ensure that all commitments are fulfilled or rejected together, regardless of the nature of the items involved.

Each domain may have differing rules for atomicity and trust, and execution in one domain can only occur while the others are “locked” from being cancelled or reversed.

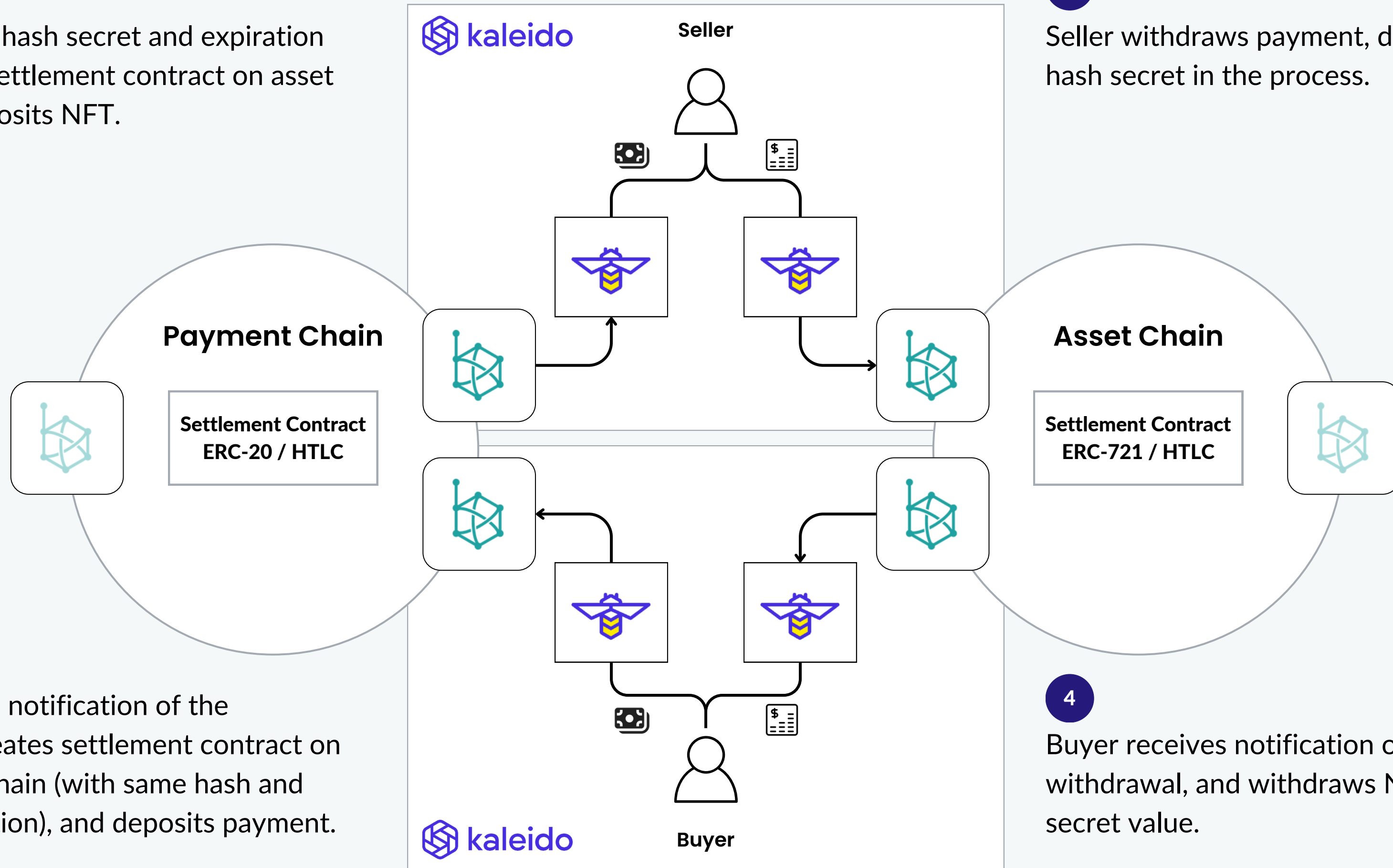
# Demo

1

Seller chooses hash secret and expiration time, creates settlement contract on asset chain, and deposits NFT.

3

Seller withdraws payment, disclosing the hash secret in the process.



2

Buyer receives notification of the settlement, creates settlement contract on the payment chain (with same hash and shorter expiration), and deposits payment.

4

Buyer receives notification of the payment withdrawal, and withdraws NFT using the secret value.

# Thank You



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