

A blurred background image showing two people from the chest up. On the left, a person wearing a plaid shirt is smiling and holding a dark coffee mug. On the right, another person with curly hair is also smiling. The overall mood is positive and professional.

Hyperledger Cactus

-Cactus-samples- Business

Logic Plugins for

Hyperledger Cactus

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Hyperledger Cactus - Cactus-samples - Business Logic Plugins for Hyperledger Cactus

› Introduction

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- › **Hyperledger Project:** Hyperledger Cactus - Cactus-samples - Business Logic Plugins for Hyperledger Cactus

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› **Project Description:**

Build Open Digital Asset Protocol(ODAP) as a business logic plugin of Hyperledger Cactus to standardize cross chain transaction

- › Most works with blockchain interoperability, only realize technical layer
- › We integrate ODAP with Cactus to realize both technical and semantic layer

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- **Project Execution & Accomplishments:**

- Write code for ODAP protocol
- Write code to enable cross chain asset transfer in ODAP with Cactus
- Write the paper

Cactus Intro

- implement technical layer of blockchain interoperability
 - Ledger plugins
 - enable transact on different ledger
 - Business logic plugins
 - implement application business logic, interact through ledgers via ledger plugins
 - Cactus api server
 - enable ledger plugins and business logic plugins register their service api
 - End User
 - call business logic plugin api through cactus api server

However

There is no standardised way for business logic plugin to make cross chain transactions

ODAP Intro

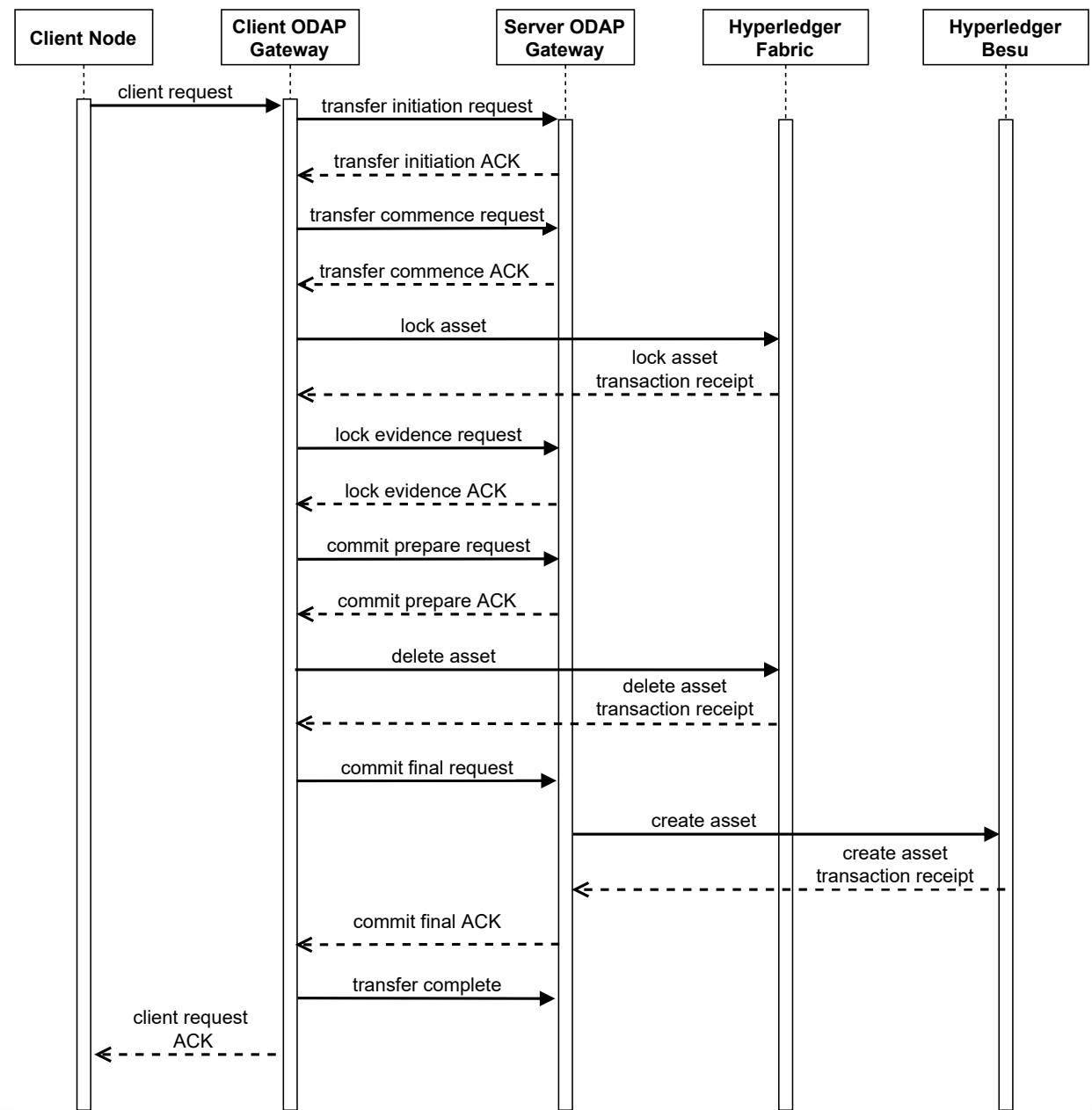
- Implement the **semantic layer** (lacking in Cactus)
 - Format of exchanging message;
 - Format of digital asset profiles;
 - Steps and format of security parameters negotiation;
 - Steps and format of asset profile negotiation;
 - Steps and format of application profile negotiation;
 - Type of actions to assets
 - Format of transaction reception(proof of transaction, focus on private ledger)

ODAP Message Sequence diagram

Transfer initiation: ODAP gateways negotiate asset profile and some security parameters

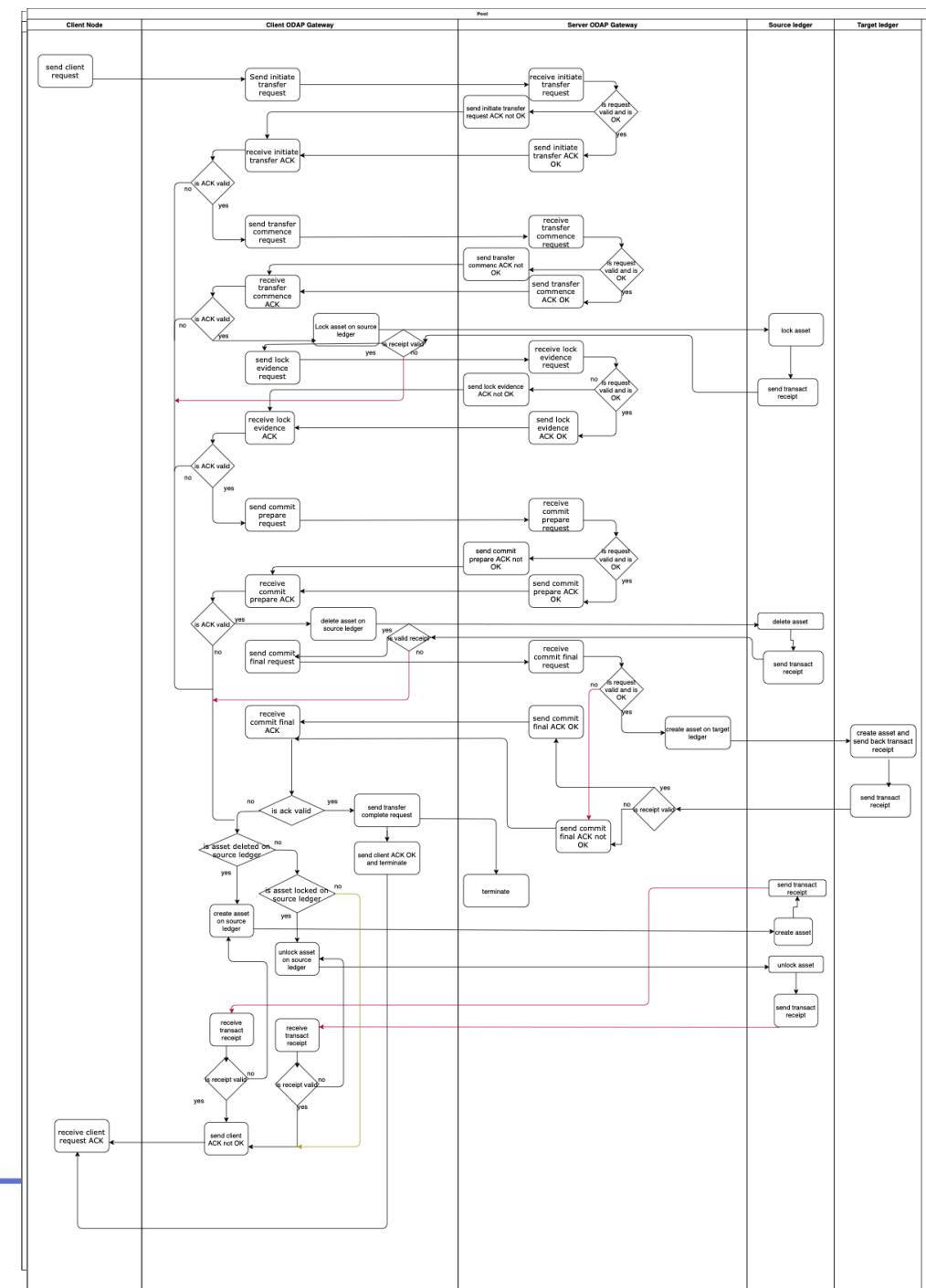
Lock Evidence: Client ODAP gateway proves it has locked the asset on source ledger

Commit Final: Client ODAP gateway proves it has deleted the asset on source ledger; Server ODAP gateway proves it has created the asset on target ledger



ODAP Message Flow Chart

To make cross chain transaction atomic, the client ODAP gateway locks and deletes asset on source ledger if and only if the server ODAP gateway creates asset on source ledger
necessitate of revert function implement
Make sure Reverse operation is implemented



ODAP Log storage

1. Cloud storage
2. Local storage
3. IPFS - Peer to Peer file system, address by file content(hash)

Cloud storage

- Disadvantage
 - centralization, which we should usually avoid when using blockchain

Local storage

- Disadvantage
 - if the business logic execute process is complicated
 - Nodes could be heavy weighted if data is large
 - The number of replication would be linearly dependent to the number of nodes

Utilization of IPFS

We use IPFS to store logs and data of ODAP

- Remove centralization
- Remove linear dependency to the number of ODAP nodes

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› **Recommendations for future work:**

- Crash Recover tolerance
 - Finish the implementation of write ahead log of ODAP to provide crash recovery
- Byzantine tolerance(though not a traditionally byzantine environment)
 - Design how ODAP could resist malicious node
- Dynamic ODAP node execution
 - Consider the business logic execution process could be complicated and long, ODAP node may join and leave anytime
 - Utilize IPFS to help data integrity?(all changes of file content would be recorded, and when a node join it would need to get past data to verify execution)

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- › **Project Output or Results:** <e.g. links to code, reports, demo or anything you created that would be of interest to the rest of the community>
 - <https://github.com/hyperledger/cactus/pull/1275>
 - Pending paper





A photograph of a large conference audience seated in rows of chairs, facing a stage where a speaker is standing. The scene is dimly lit, with stage lights visible. Overlaid on the left side of the image is a graphic element consisting of three teal-colored circles connected by lines to form a triangular network pattern.

THANK YOU!