Hyperledger Fabric Model

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Hyperledger Fabric outlines the key design features into following:

- Assets
- Chaincode
- Ledger
- Channels
- Membership Services
- Consensus

Assets

Assets are represented in Hyperledger Fabric as a collection of key-value pairs, with their state changes being recorded as transactions on a channel ledger where assets are defined.

Assets can range from tangible entities like hard drives, compact discs etc. to intangible entities like contracts etc.

Hyperledger Fabric provides the creation of assets.

Assets are represented in either binary or JSON format.

Chaincode

You can define chaincode as similar to your business logic in traditional applications.

- Chaincode enforces the rules for reading or altering key value pairs or other state database information.
- Chaincode functions execute against the ledger's current state database and are initiated through a transaction proposal.
- Chaincode execution results in a set of key value writes that can be submitted to the network and applied to the ledger on all peers.

Ledger

Ledger is a sequenced, tamper-resistant record of all state transitions in the fabric. State transitions are the resultant of the chaincode innovations submitted by participants.

A separate ledger is maintained per channel and it stores the key and the immutable record of blocks at the current state.

Each peer maintains a copy of the ledger for each channel of which they are a member.

- Transactions are ordered into blocks over the ledger.
- Transactions consist of versions of key/value that are read and written into chaincodes.
- Peers validate transactions against endorsement policies and enforce the policies.
- A channel's ledger contains a configuration block defining policies, access control lists, and other pertinent information.

Channels

Hyperledger Fabric employs a ledger per channel. Chaincodes are present to modify the state of ledger over the channels.

Some key points about the channels:

- A ledger exists in the scope of a channel.
- Participants can connect to one or more channels in a Fabric network.
- Data can further be obfuscated by encrypting the data before putting up on a channel.
- Channels provide a fabrication of assets and participants over the Fabric network.

Membership Services

Hyperledger Fabric governs the participants with their identities. These identities are generated through a trusted Membership Service Provider (MSP).

Public Key Infrastructure is used to generate cryptographic certificates which are tied to organizations, network components, and end users or client applications.

As a result, a permissioned based data control can be maintained over the Fabric Network using the cryptographic certificates.

Consensus

Consensus in Hyperledger Fabric is defined as “the full-circle verification of the correctness of a set of transactions comprising a block”.

Consensus is established when the order and result of transactions meet the policy criteria established under channel.

Following benefits are provided with consensus:

- Versioning check for the current state of ledger.
- Protection against double spend operations.
- Validation against hierarchical layers.
- Verification of transactions from proposal to commitment.