

CLAIMS

1. A computer-implemented method for blockchain-based data storage performed by a blockchain node, the method comprising:

receiving custom clearance data of a document associated with an order, logistics, shipment tracking, or payment, wherein the received custom clearance data is for storage in a blockchain, wherein the custom clearance data is received from at a service platform from a custom clearance agent platform, and wherein the ~~document~~data includes mutable data and, immutable data, ~~and index data as~~ identified by the service platform;

encrypting, using a symmetric key, the immutable data;

encrypting, using a public key of a user having access to the custom clearance data, the symmetric key;

storing the mutable data, the encrypted symmetric key, and a hash value of the encrypted immutable data in a smart contract in a cache storage at the blockchain, wherein the mutable data is to be used to executed ~~by the~~ a smart contract, and wherein the hash value is for linking the mutable data with the immutable data;

initiating, a consensus algorithm to record the encrypted immutable data on ~~the~~ blockchain;

in response to successfully performing the consensus algorithm, ~~recording~~storing, based on invoking the smart contract, the encrypted immutable data ~~on the blockchain, wherein the blockchain is stored and the hash value of the encrypted immutable data in a blockchain database that has lower storage cost than the cache storage; and~~

linking, based on invoking the smart contract, the mutable data and the encrypted immutable data using the hash value ~~based on~~ the index data;

searching the cache storage by an authorized user to obtain the hash value and the encrypted symmetric key;

decrypting the encrypted symmetric key by using a private key of the authorized user;

based on the obtained hash value, locating the encrypted immutable data at the blockchain database; and

decrypting the encrypted immutable data by using the symmetric key that was decrypted.

2. The computer-implemented method of claim 1, wherein the custom clearance data ~~is custom clearance data associated with a purchase order and~~ includes one or more of order data, logistics data, and payment data.

3. The computer-implemented method of any previous claim, wherein the mutable data is associated with a document for custom clearance, and the mutable data includes one or more of a document type of the document, a document status of the document, association information of the document with one or more other documents for custom clearance.

~~4. The computer-implemented method of claim 3, wherein the immutable data is associated with the document and includes an encrypted version of at least a portion of content of the document encrypted by an encryption key associated with an owner of the document.~~

~~5. The computer-implemented method of claim 4, wherein the index data is associated with the document and includes one or more of an identifier of the document and hash values of a plurality of blockchain transactions associated with the document.~~

46. The computer-implemented method of claim 14, wherein the ~~encryption~~symmetric key is derived based on a linear secret sharing scheme through negotiations among at least two of (i) ~~the~~a custom clearance agent platform managed by at least one custom clearance agent or broker who represents importers in preparing and submitting information related to custom clearance to ~~at~~the customs authority, (ii) the service platform, or (iii) the customs authority.

57. The computer-implemented method of any previous claim, wherein the consensus algorithm is one of proof of work (PoW), proof of stake (PoS), or practical Byzantine fault tolerance (PBFT).

68. The computer-implemented method of any previous claim, wherein linking the mutable data and the immutable data based on the index data includes storing the index data and the mutable data under a first data structure in the cache storage and recording the index data and the immutable data under a second data structure on the blockchain.

~~9. The computer-implemented method of any previous claim, wherein linking the mutable data and the immutable data based on the index data comprises enabling a user to~~

~~obtain the mutable data and the immutable data by searching for the index data in the first data structure and the second data structure.~~

~~710.~~ The computer-implemented method of any previous claim, comprising: at the service platform, providing an application programming interface to enable the customs authority to search for the index data to retrieve the mutable data and the immutable data linked based on the index data.

~~811.~~ The computer-implemented method of any previous claim, wherein an address of the smart contract is stored on the blockchain in the database storage.

~~912.~~ The computer-implemented method of any previous claim, wherein the immutable data is stored in a data structure of a state Merkle tree.

~~103.~~ A system for custom clearance data storage, comprising:
one or more processors; and
one or more computer-readable memories coupled to the one or more processors and having instructions stored thereon that are executable by the one or more processors to perform the method of any of claims 1 to ~~912.~~

~~14. An apparatus for custom clearance data storage, the apparatus comprising a plurality of modules for performing the method of any of claims 1 to 12.~~