

CLAIMS

1. A computer-implemented method comprising:

at a service platform, receiving a first information document related to an order, wherein the first information document is ~~provided, or to be provided, to a service authority~~ for requesting custom clearance for merchandize included in the order, and wherein the first document comprises mutable data and immutable data;

at the service platform, adding index data to the first document to link the mutable data with the immutable data, wherein the index data include a transaction hash associated with a transaction related to the first document, wherein the transaction hash is a hash value of the immutable data;

at the service platform, encrypting ~~at least a portion of the first information~~immutable data to generate encrypted first data;~~and for storing in a blockchain database on a blockchain;~~

sending the encrypted first data and the index data to ~~a~~the blockchain~~network~~ to store the encrypted first data and the index data on ~~a~~the blockchain in the blockchain database as managed by thea blockchain network, wherein the encrypted first data are stored on the blockchain through consensus of blockchain nodes of the blockchain network-; and

storing the mutable data and the index data in a smart contract cache storage of the blockchain, wherein the cache storage is for storage of mutable data managed by smart contracts, wherein the smart contract cache storage is a storage medium with a faster read and write speed compared to a read and write speed of the blockchain database, wherein the index data stored at the smart contract cache storage is for associating the mutable data stored at the smart contract cache storage and the immutable data at the blockchain database as associated with the same transaction.

2. The method of claim ~~1~~1, comprising at the service platform, receiving second information related to the order, wherein the second information is ~~provided, or to be provided, to the service authority~~ for requesting clearance for the merchandize included in the order;

at the service platform, encrypting at least a portion of the second information to generate encrypted second data;

sending the encrypted second data to the blockchain network to store the encrypted second data on the blockchain, wherein the encrypted second data are stored on the blockchain through consensus of blockchain nodes of the blockchain network; and

linking the first data with the second data.

3. The method of claim 2, wherein the first data comprises order data,
the order data comprises an order identifier of an order document associated with the order,

the second data comprises logistics data,

the logistics data comprises a logistics transaction identifier of a logistics document associated with the order, and

linking the first data with the second data comprises invoking a smart contract on the blockchain to store the order identifier and the logistics transaction identifier in a data structure corresponding to the order, and linking the order identifier with the logistics transaction identifier.

4. The method of claim ~~2~~, ~~wherein the first data comprises order data,~~
~~the order data comprises an order identifier of an order document associated with the order,~~

~~the second data comprises logistics data, in which the logistics data comprises at least one logistics document,~~

~~wherein the method comprises generating a hash value of the at least one logistics document, and~~

~~wherein linking the first data with the second data comprises invoking a smart contract on the blockchain to store the order identifier and the hash value of the at least one logistics document in a data structure corresponding to the order, and linking the order identifier with the hash value of the at least one logistics document.~~

~~5. The method of claim 3 or 4,~~3, wherein linking the first data with the second data comprises enabling a user to search for the logistics document by searching for the order identifier in the data structure corresponding to the order, and searching for the logistics transaction identifier linked to the order identifier.

~~6. The method of claim 5, comprising at the service platform, providing an application programming interface to enable the service authority to search for the order identifier, and search for the logistics transaction identifier linked to the order identifier.~~

~~75.~~ The method of any of claims ~~3 to 6~~, 3 to 4, wherein the first data comprises order data, the method comprises at the service platform, receiving payment data related to the order, wherein the payment data are provided to ~~the~~ service authority for requesting clearance of the merchandize included in the order;

at the service platform, encrypting at least a portion of the payment data to generate encrypted payment data;

sending the encrypted payment data to the blockchain network to store the encrypted payment data on the blockchain, wherein the encrypted payment data are stored on the blockchain through consensus of blockchain nodes of the blockchain network;

wherein the payment data comprises a payment transaction identifier of a payment document associated with the order, and

the method comprises linking the order data with the payment data, including invoking the smart contract on the blockchain to store the order identifier and the payment transaction identifier in the data structure corresponding to the order, and linking the order identifier with the payment transaction identifier.

~~8. The method of any of claims 3 to 6, wherein the first data comprises order data, the method comprises at the service platform, receiving payment data related to the order, wherein the payment data are provided to the service authority for requesting clearance of the merchandize included in the order;~~

~~wherein the payment data comprises a payment transaction identifier of a payment document associated with the order;~~

~~at the service platform, encrypting at least a portion of the payment data to generate encrypted payment data;~~

~~sending the encrypted payment data to the blockchain network to store the encrypted payment data on the blockchain, wherein the encrypted payment data are stored on the blockchain through consensus of blockchain nodes of the blockchain network;~~

~~wherein the method comprises generating a hash value of the at least one logistics document, and~~

~~the method comprises linking the order data with the payment data, including invoking the smart contract on the blockchain to store the order identifier and the payment transaction identifier in the data structure corresponding to the order, and linking the order identifier with the payment transaction identifier.~~

~~9. The method of claim 7 or 8, wherein linking the order data with the payment data comprises enabling the user to search for the payment document by searching for the order identifier in the data structure corresponding to the order, and searching for the payment identifier linked to the order identifier.~~

~~10. The method of claim 9, comprising at the service platform, providing an application programming interface to enable the service authority to search for the order identifier, and search for the logistics transaction identifier and the payment identifier linked to the order identifier.~~

~~11.6.~~ The method of claim 2, wherein the first data comprises order data,
the order data comprises an order identifier of an order document associated with the order,
the second data comprises payment data,
the payment data comprises a payment transaction identifier of a payment document associated with the order, and
linking the first data with the second data comprises invoking a smart contract on the blockchain to store the order identifier and the payment transaction identifier in a data structure corresponding to the order, and linking the order identifier with the payment transaction identifier.

~~12. The method of claim 11, wherein linking the first data with the second data comprises enabling a user to search for the payment document by searching for the order identifier in the data structure corresponding to the order, and searching for the payment transaction identifier linked to the order identifier.~~

~~13. The method of claim 12, comprising at the service platform, providing an application programming interface to enable the service authority to search for the order identifier, and search for the payment identifier linked to the order identifier.~~

~~147.~~ The method of claim 2, comprising at the service platform, providing an application programming interface to enable ~~the~~a service authority to search for the first data, and search for the second data linked to the first data,~~and search for the second data linked to.~~

8. The method of claim 1, wherein the first data.

~~15. The method of claim 1, wherein the first information document~~ comprises order data, and the order data include information about at least one of (i) an identifier of an importer associated with the order, (ii) a name of the importer, (iii) contact information of the importer, (iv) merchandise to be imported according to the order, (v) number of items ordered, (vi) a price of the merchandise to be imported, (vii) a currency type, or (viii) a merchant that sells the merchandise.

~~169.~~ The method of claim ~~1,1~~, wherein the first ~~information document~~ comprises logistics data including information about at least one of (i) an overseas segment delivery tracking number, (ii) an overseas segment delivery service company name, (iii) a domestic segment delivery tracking number, (iv) a domestic segment delivery service company name, (v) a company name for custom declaration, (vi) a waybill number, (vii) a package weight, (viii) a delivery address, (ix) an identifier of recipient, (x) a company name of sender, or (xi) an address of sender.

~~1710.~~ The method of claim ~~1,1~~, wherein the first ~~information document~~ comprises payment data including information about at least one of (i) a payment transaction identifier, (ii) an order number, (iii) an identifier of payee, (iv) a name of payee, (v) a total actual payment, (vi) a payment method, (vii) time of payment, (viii) payment currency, (ix) an identifier of payor, (x) a name of payor, or (xi) contact information of payor.

~~1811. The method of any of claims 11 to 17, wherein the information is provided by 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 the service authority.~~

~~19. The method of any of claims 1 to 18, wherein encrypting at least a portion of the first information comprises encrypting at least a portion of the first information using an encryption key that is derived based on a linear secret sharing scheme.~~

~~20. The method of claim 19, wherein the encryption key is derived based on the linear secret sharing scheme through negotiations among at least two of (i) 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 the service authority, (ii) the service platform, or (iii) the service authority.~~

~~21. The method of any of claims 1 to 20, comprising generating one or more zero-knowledge proofs (ZKPs) related to one or more values associated with the order.~~

~~22. The method of claim 21, wherein the first data comprises at least one of order data or payment data, and~~

~~generating one or more zero-knowledge proofs comprises generating one or more zero-knowledge proofs related to one or more values associated with at least one of the order data or the payment data.~~

~~23. The method of claim 21 or 22, wherein at least one of the one or more ZKPs is generated based on homomorphic encryption.~~

~~24. The method of any of claims 21 to 23, wherein the one or more ZKPs include at least one of a range proof or a zero test.~~

~~25. The method of any of claims 21 to 24, comprising, at a blockchain node of the blockchain network, verifying the one or more ZKPs and performing consensus based on the encrypted information after the one or more ZKPs are verified, and storing the encrypted information to the blockchain after the consensus is successfully performed.~~

~~26. The method of any of claims 1 to 25, 10,~~ comprising at the service platform, receiving updated first information related to the order,

encrypting the updated first information to generate encrypted updated first information, and

sending the encrypted updated first information to the blockchain network to store the encrypted updated first information on the blockchain.

~~27. The method of claim 26, wherein the updated first information includes updated order data.~~

~~28~~12. The method of any of claims ~~1 to 27, 11,~~ comprising at the service platform, receiving updated second information related to the order,

encrypting the updated second information to generate encrypted updated second information, and

sending the encrypted updated second information to the blockchain network to store the encrypted updated second information on the blockchain,

wherein the updated second information includes at least one of (i) updated logistics data, or (ii) updated payment data.

~~29~~13. The method of any of claims ~~1 to 28, 1 to 12,~~ wherein encrypting at least a portion of the first ~~information document~~ comprises encrypting at least a portion of the first ~~information document~~ using an encryption key,

the method comprises sharing the encryption key with ~~the~~ service authority, and

after the encrypted first data is stored on the blockchain, notifying the service authority that the encrypted first data are stored on the blockchain.

~~30. The method of any of claims 1 to 29, comprising at the service platform, providing an application programming interface to enable a user of the service platform to request that the first information be recorded on the blockchain.~~

~~31. The method of claim 30, wherein providing an application programming interface comprises providing an application programming interface to enable the user of the service~~

~~platform to request that at least one of (i) order data, (ii) logistics data, or (iii) payment data be recorded on the blockchain.~~

~~32. The method of claim 30 or 31, wherein providing an application programming interface comprises providing an application programming interface to enable the user of the service platform to request that at least one of (i) updated order data, (ii) updated logistics data, or (iii) updated payment data be recorded on the blockchain.~~

~~33. The method of any of claims 30 to 32, wherein providing an application programming interface comprises providing an application programming interface to enable the service authority to search for data that are associated with the order and stored on the blockchain.~~

~~34. The method of any of claims 1 to 33, 14. The method of any of claims 1 to 13,~~
comprising generating a digital signature of the service platform, and

adding the digital signature of the service platform to the encrypted first data to generate digitally signed encrypted first data,

wherein sending the encrypted first data to the blockchain network comprises sending the digitally signed encrypted first data to the blockchain network to store the digitally signed encrypted first data on the blockchain.

~~35. The method of any of claims 1 to 34, wherein the first information comprises mutable data and immutable data;~~

~~the method comprises: storing the mutable data in a cache storage dedicated to storing smart contract data for executing a smart contract;~~

~~storing the immutable data on a blockchain;~~

~~linking the mutable data and the immutable data based on index data identified by the service platform.~~

~~36. The method of claim 35, wherein the mutable data is associated with a document for custom clearance,~~

~~the immutable data is associated with the document and include 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, and~~

~~the index data comprise at least one of (i) an identifier of the document, or (ii) hash values of a plurality of blockchain transactions associated with the document.~~

~~37. The method of claim 35 or 36, comprising determining that a volume of the data stored in the cache storage exceeds a predetermined threshold, and
storing at least a portion of the data previously stored in the cache storage in a smart contract pool that is a data structure to be stored on a blockchain.~~

~~38. The method of any of claims 1 to 37, wherein the first information is associated with a user, the first information includes public data and private data,
the method comprises: at the service platform, receiving an encryption key of the user,
encrypting the private data using the encryption key of the user to generate encrypted private data;
— storing the encryption key and an identifier of the first information in a cache storage dedicated to storing smart contract data for executing a smart contract; and
storing the public data, the encrypted private data, and the identifier of the first information on a blockchain.~~

~~39. The method of claim 38, comprising receiving a list of one or more other users permitted to access plaintext of the private data;
encrypting the encryption key by using each of public keys of the one or more other users to generate encrypted encryption keys; and
— storing the encrypted encryption keys in the cache storage.~~

~~40. The computer-implemented method of claim 1, wherein the order is an import order, the first information is first import custom clearance information, the encrypted first import custom clearance data is encrypted first import custom clearance data, and the service authority is a customs authority for custom clearance of the merchandize included in the order.~~

~~41. A system for processing data, the system comprising:
a service platform comprising:
a plurality of service modules and an application programming interface layer comprising a plurality of application programming interfaces (APIs) to enable users to invoke the service modules to process data related to orders associated with importation of~~

~~merchandise, in which the data include information provided, or to be provided, to service authorities for requesting clearance of the merchandize for the order, and~~

~~a rules database that includes information about rules for processing data for multiple countries;~~

~~wherein at the service platform, upon receiving first data for a first order associated with importation of merchandise into a first country, the service modules process the first custom clearance data based on information in the rules database in compliance with rules of the first country, and~~

~~wherein at the service platform, upon receiving second custom clearance data for a second order associated with importation of merchandise into a second country that is different from the first country, the service modules process the second custom clearance data based on information in the rules database in compliance with rules of the second country.~~

~~42. The system of claim 41, wherein a first application programming interface of the plurality of application programming interfaces enables a first user located in the first country to invoke a first smart contract to store first data on at least one of a first blockchain database or a smart contract data cache in compliance with rules of the first country,~~

~~wherein the first application programming interface also enables a second user located in the second country to invoke a second smart contract to store second data on at least one of a second blockchain database or a second smart contract data cache in compliance with rules of the second country.~~

~~43. The system of claim 42, wherein the first smart contract is configured to store an immutable portion of the first data on the first blockchain database and a mutable portion of the first data on the first smart contract data cache in compliance with the rules of the first country, and~~

~~wherein the second smart contract is configured to store an immutable portion of the second data on the second blockchain database and a mutable portion of the second data on the second smart contract data cache in compliance with the rules of the second country.~~

~~44. The system of any of claims 41 to 43, wherein a second application programming interface of the plurality of application programming interfaces enables a third user located in the first country to invoke a third smart contract executing on the first blockchain to request that a first member be added to or removed from a list of authorized members who are~~

~~authorized to access the first data based on information in the rules database in compliance with rules of the first country, and~~

~~wherein the second application programming interface enables a fourth user located in the first country to invoke a third smart contract executing on the first blockchain to request that a second member be added to or removed from a list of authorized members who are authorized to access the second data based on information in the rules database in compliance with rules of the second country.~~

~~45. — A system for processing clearance data, the system comprising:~~

~~a service platform comprising:~~

~~a plurality of service modules and an application programming interface layer comprising a plurality of application programming interfaces (APIs) to enable users to invoke the service modules to process clearance data related to orders associated with purchase of merchandise, and~~

~~a rules database that includes information about rules for processing clearance data, including a rule specifying an amount of fee or donation to be imposed on a specified category of merchandise;~~

~~wherein at the service platform, upon receiving clearance data associated with an order, the service modules are configured to store at least a portion of the clearance data in a blockchain or a smart contract data cache, and process the clearance data based on information in the rules database to determine an amount of fee or donation to impose on the order.~~

~~46. — The system of claim 45, wherein a first application programming interface of the plurality of application programming interfaces enables an administrator to establish new rules for the rules database or revise existing rules in the rules database.~~

~~47. — The system of claim 45 or 46, wherein the clearance platform is configured to invoke a smart contract to store an immutable portion of the clearance data on the blockchain database and a mutable portion of the clearance data on the smart contract data cache.~~

~~48~~15. An apparatus for providing clearance services, the apparatus comprising a plurality of modules for performing the method of any of claims 1 to ~~14~~9.