

CLAIMS

1. A computer-implemented method for managing a blockchain-based centralized ledger system, the method comprising:

transmitting individual timestamp requests for to-be-timestamped blocks in a blockchain to a trust time server by a computing device in the blockchain-based centralized ledger system that stores data in the blockchain, the trust time server being associated with a trust time authority and independent from the blockchain-based centralized ledger system, the blockchain including a plurality of blocks storing transaction data;

receiving respective timestamps and associated signatures for the to-be-timestamped blocks from the trust time server by the computing device; and

storing information of the respective timestamps and associated signatures for the to-be-timestamped blocks in respective timestamped blocks in the blockchain by the computing device, any adjacent two of the timestamped blocks in the blockchain being anchored with each other, wherein one of the adjacent two of the timestamped blocks comprises information that uniquely identifies the other one of the adjacent two of the timestamped blocks,

wherein a block body of each timestamped block in the blockchain comprises no other transaction data except information of a respective timestamp and associated signature for a to-be-timestamped block corresponding to the timestamped block.

2. The method of claim 1, wherein the adjacent two of the timestamped blocks comprise a first timestamped block and a second timestamped block, and the second timestamped block is immediately subsequent to the first timestamped block among the respective timestamped blocks in the blockchain.

3. The method of claim 2, wherein the information that uniquely identifies the first timestamped block comprises at least one of:

a hash of the first timestamped block, or

a first respective block identifier for the first timestamped block, wherein each of the plurality of blocks is associated with a respective block identifier, and the plurality of blocks are stored in order in the blockchain according to the respective block identifiers.

4. The method of claim 2 or 3, wherein one or more non-timestamped blocks exist between the first timestamped block and the second timestamped block in the blockchain, and

wherein the one or more non-timestamped blocks include no timestamp information
5 obtained from the trust time server.

5. The method of any preceding claim, further comprising:

generating the respective timestamped blocks to include the information of the
respective timestamps and associated signatures for the to-be-timestamped blocks as
10 transaction data of the respective timestamped blocks by the computing device.

6. The method of any preceding claim, wherein storing information of the respective
timestamps and associated signatures for the to-be-timestamped blocks in timestamped
blocks of the blockchain comprises:

15 for each of the to-be-timestamped blocks, storing at least one of the respective
timestamp and associated signature or a hash of the respective timestamp and associated
signature in a respective timestamped block that is a block immediately subsequent to the to-
be-timestamped block in the blockchain,

wherein the respective timestamped block stores a hash of the to-be-timestamped
20 block.

7. The method of claim 6, wherein a block body of the respective timestamped block
comprises no other transaction data except the at least one of the respective timestamp and
associated signature or the hash of the respective timestamp and associated signature.

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8. The method of any preceding claim, wherein transmitting individual timestamp
requests for to-be-timestamped blocks in a blockchain to a trust time server comprises:

periodically transmitting the individual timestamp requests for the to-be-timestamped
blocks in the blockchain to the trust time server at a predetermined triggering time period.

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9. The method of any preceding claim, wherein transmitting individual timestamp requests for to-be-timestamped blocks in a blockchain to a trust time server comprises:

transmitting a first timestamp request for a first to-be-timestamped block of the to-be-timestamped blocks in the blockchain to the trust time server at a first time point, wherein
 5 the first to-be-timestamped block is a first most current block in the blockchain at the first time point; and

transmitting a second timestamp request for a second to-be-timestamped block of the to-be-timestamped blocks in the blockchain to the trust time server at a second time point after the first time point, wherein the second to-be-timestamped block is a second most
 10 current block in the blockchain at the second time point.

10. The method of claim 9, wherein receiving respective timestamps and associated signatures for the to-be-timestamped blocks comprises:

receiving a first respective timestamp and associated signature for the first to-
 15 be-timestamped block from the trust time server; and
 receiving a second respective timestamp and associated signature for the
 second
 to-be-timestamped block from the trust time server,

wherein the second respective timestamp and associated signature is
 20 immediately subsequent to the first respective timestamp and associated signature among the
 respective timestamps and associated signatures for the to-be-timestamped blocks, and

wherein storing information of the respective timestamps and associated signatures for the to-be-timestamped blocks in timestamped blocks of the blockchain comprises:

storing information of the first respective timestamp and associated signature
 25 in a first timestamped block immediately subsequent to the first to-be-timestamped block in
 the blockchain; and

storing information of the second respective timestamp and associated signature in a second timestamped block immediately subsequent to the second to-be-timestamped block in the blockchain,

wherein the second timestamped block is immediately subsequent to the first timestamped block among the timestamped blocks in the blockchain and is anchored to the first timestamped block.

- 5 11. The method of claim 10, wherein the adjacent two of the timestamped blocks in the blockchain being anchored with each other comprises:

the second timestamp request comprising information that uniquely identifies the first timestamped block.

- 10 12. The method of claim 11, wherein the information that uniquely identifies the first timestamped block comprises at least one of:

a hash of the first timestamped block, or

- a first respective block identifier for the first timestamped block, wherein each of the plurality of blocks is associated with a respective block identifier, and the plurality of blocks
15 are stored in order in the blockchain according to the respective block identifiers.

13. The method of any one of claims 9 to 12, wherein the first timestamp request comprises a first hash of the first to-be-timestamped block, and

- wherein the second timestamp request comprises a second cryptographic cash of the
20 second to-be-timestamped block.

14. A system for managing a blockchain-based centralized ledger system, comprising:

one or more processors; and

- one or more computer-readable memories coupled to the one or more processors and
25 having instructions stored thereon that are executable by the one or more processors to perform the method of any one of claims 1 to 13.

15. An apparatus for managing a blockchain-based centralized ledger system, the apparatus comprising a plurality of modules for performing the method of any one of claims
30 1 to 13.