

CLAIMS

1. A computer-implemented method for verifying block data, the computer-implemented method comprising:

- 5 identifying newly added data to be stored in a blockchain;
selecting, from a block comprising a plurality of data nodes, a data node configured to store the newly added data;
determining whether the selected data node comprises data associated with the newly added data; and
10 in response to determining that the selected data node does not comprise data associated with the newly added data:
generating a first character string corresponding to the newly added data;
determining a first verification value of the newly added data for the selected data node by executing a predetermined algorithm on the first character string;
15 calculating a second updated verification value of the selected data node based on the first verification value of the newly added data; and
determining a third verification value of the block based on the second updated verification value of the selected data node and original second verification values of other data nodes of the block, wherein the third verification value of the block is used to verify whether
20 data stored in the block is consistent with data stored in other blocks in a blockchain.

2. The computer-implemented method of claim 1, wherein selecting the data node comprises:

- in response to receiving the newly added data, determining a block identifier and a data
25 node identifier, wherein the block identifier and the data node identifier are used to store the newly added data;
searching, based on the block identifier, the blockchain for a block corresponding to the block identifier, wherein results of the search comprise a found block;
determining, from the found block and the data node identifier, a found data node
30 corresponding to the data node identifier; and

selecting the found data node as the data node configured to store the newly added data.

3. The computer-implemented method of claim 2, wherein determining the block identifier and data node identifier comprises:

5 calculating data content corresponding to the newly added data to obtain the block identifier and data node identifier.

4. The computer-implemented method of claim 1, wherein the predetermined algorithm comprises an encryption algorithm and the first verification value comprises an encrypted value
10 of the newly added data.

5. The computer-implemented method of claim 4, wherein the encryption algorithm comprises a hash algorithm and the encrypted value comprises a hash value of the newly added data.
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6. The computer-implemented method of claim 1, wherein, in response to determining that the selected data node comprises data associated with the newly added data, the method further comprises:

20 separately generating a second character string corresponding to the newly added data and a third character string corresponding to the data associated with the newly added data;

obtaining a sorted character string by sorting the second character string and the third character string using a predetermined method; and

determining a first verification value of the newly added data for the data node by executing a predetermined algorithm on the sorted character string.
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7. The computer-implemented method of claim 6, wherein the sorted character string comprises a character string group included in the first verification value of the newly added data.

8. The computer-implemented method of claim 1, wherein calculating the updated second verification value of the selected data node comprises:
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determining an original second verification value of the selected data node obtained before the newly added data is stored; and

calculating the updated second verification value of the selected data node based on the original second verification value and the first verification value of the newly added data.

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9. The computer-implemented method of claim 1, wherein determining the third verification value comprises:

determining a tree structure corresponding to the plurality of data nodes comprised in the block;

10 determining the original second verification values of the other data nodes comprised in the block;

traversing the tree structure based on the updated second verification value of the selected data node and the original second verification values of the other data nodes comprised in the block, to obtain a third verification value of a root node of the tree structure; and

15 using the third verification value of the root node as the third verification value of the block.

10. A non-transitory, computer-readable medium storing one or more instructions executable by a computer system to perform operations comprising:

identifying newly added data to be stored in a blockchain;

20 selecting, from a block comprising a plurality of data nodes, a data node configured to store the newly added data;

determining whether the selected data node comprises data associated with the newly added data; and

25 in response to determining that the selected data node does not comprise data associated with the newly added data:

generating a first character string corresponding to the newly added data;

determining a first verification value of the newly added data for the selected data node by executing a predetermined algorithm on the first character string;

30 calculating a second updated verification value of the selected data node based on the first verification value of the newly added data; and

determining a third verification value of the block based on the second updated

verification value of the selected data node and original second verification values of other data nodes of the block, wherein the third verification value of the block is used to verify whether data stored in the block is consistent with data stored in other blocks in a blockchain.

- 5 11. The computer-readable medium of claim 10, wherein selecting the data node comprises:
in response to receiving the newly added data, determining a block identifier and a data node identifier, wherein the block identifier and the data node identifier are used to store the newly added data;
searching, based on the block identifier, the blockchain for a block corresponding to the
10 block identifier, wherein results of the search comprise a found block;
determining, from the found block and the data node identifier, a found data node corresponding to the data node identifier; and
selecting the found data node as the data node configured to store the newly added data.
- 15 12. The computer-readable medium of claim 11, wherein determining the block identifier and data node identifier comprises:
calculating data content corresponding to the newly added data to obtain the block identifier and data node identifier.
- 20 13. The computer-readable medium of claim 10, wherein the predetermined algorithm comprises an encryption algorithm and the first verification value comprises an encrypted value of the newly added data.

14. The computer-readable medium of claim 13, wherein the encryption algorithm
25 comprises a hash algorithm and the encrypted value comprises a hash value of the newly added data.
- 30 15. The computer-readable medium of claim 10, wherein, in response to determining that the selected data node comprises data associated with the newly added data, the method further comprises:
separately generating a second character string corresponding to the newly added data and a

third character string corresponding to the data associated with the newly added data;

obtaining a sorted character string by sorting the second character string and the third character string using a predetermined method; and

5 determining a first verification value of the newly added data for the data node by executing a predetermined algorithm on the sorted character string.

16. The computer-readable medium claim 15, wherein the sorted character string comprises a character string group included in the first verification value of the newly added data.

10 17. The computer-readable medium of claim 10, wherein calculating the updated second verification value of the selected data node comprises:

determining an original second verification value of the selected data node obtained before the newly added data is stored; and

15 calculating the updated second verification value of the selected data node based on the original second verification value and the first verification value of the newly added data.

18. The computer-readable medium of claim 10, wherein determining the third verification value comprises:

20 determining a tree structure corresponding to the plurality of data nodes comprised in the block;

determining the original second verification values of the other data nodes comprised in the block;

25 traversing the tree structure based on the updated second verification value of the selected data node and the original second verification values of the other data nodes comprised in the block, to obtain a third verification value of a root node of the tree structure; and

using the third verification value of the root node as the third verification value of the block.

19. A computer-implemented system, comprising:

one or more computers; and

one or more computer memory devices interoperably coupled with the one or more computers and having tangible, non-transitory, machine-readable media storing one or more instructions that, when executed by the one or more computers, perform one or more operations comprising:

identifying newly added data to be stored in a blockchain;

selecting, from a block comprising a plurality of data nodes, a data node configured to store the newly added data;

5 determining whether the selected data node comprises data associated with the newly added data; and

in response to determining that the selected data node does not comprise data associated with the newly added data:

generating a first character string corresponding to the newly added data;

10 determining a first verification value of the newly added data for the selected data node by executing a predetermined algorithm on the first character string;

calculating a second updated verification value of the selected data node based on the first verification value of the newly added data; and

15 determining a third verification value of the block based on the second updated verification value of the selected data node and original second verification values of other data nodes of the block, wherein the third verification value of the block is used to verify whether data stored in the block is consistent with data stored in other blocks in a blockchain.

20. The computer-implemented system of claim 19, wherein, in response to determining that the selected data node comprises data associated with the newly added data, the method further comprises:

20 separately generating a second character string corresponding to the newly added data and a third character string corresponding to the data associated with the newly added data;

obtaining a sorted character string by sorting the second character string and the third character string using a predetermined method; and

25 determining a first verification value of the newly added data for the data node by executing a predetermined algorithm on the sorted character string.