

CLAIMS

1. A computer-implemented method performed by a bridge device, wherein the bridge device is communicatively linked to a blockchain network node of a blockchain network, the method comprising:

retrieving a first set of blockchain blocks from the blockchain network node using a first set of threads of the bridge device;

storing the first set of blockchain blocks in the bridge device; and

verifying a second set of blockchain blocks that are stored in the bridge device using a second set of threads of the bridge device; and

wherein retrieving the first set of blockchain blocks and verifying the second set of blockchain blocks are performed asynchronously using the first set of threads and the second set of threads.

2. The method of claim 1, wherein the first set of blockchain blocks comprise a first blockchain block and a second blockchain block, wherein the first set of threads comprise a first thread and a second thread, and wherein retrieving the first set of blockchain blocks from the blockchain network node using the first set of threads of the bridge device comprises:

retrieving the first blockchain block from the blockchain network node using the first thread of the bridge device in parallel with

retrieving the second blockchain block from the blockchain network node using the second thread of the bridge device.

3. The method of any preceding claim, wherein the second set of blockchain blocks comprise a third blockchain block and a fourth blockchain block, wherein the second set of threads comprise a third thread and a fourth thread, and wherein verifying the second set of blockchain blocks that are stored in the bridge device using the second set of threads of the bridge device comprises:

verifying the third blockchain block using the third thread of the bridge device in parallel with

verifying the fourth blockchain block using the fourth thread of the bridge device.

4. The method of any preceding claim, further comprising:
 - maintaining a remote height value and a local height value in a data store of the bridge device, wherein:
 - the remote height value indicates a number of blockchain blocks that are stored on the blockchain network node; and
 - the local height value indicates a number of blockchain blocks that are stored on the bridge device and that have been obtained from the blockchain network node,
 - wherein retrieving the first set of blockchain blocks from the blockchain network node using the first set of threads of the bridge device comprises:
 - determining whether the local height value is less than the remote height value by the bridge device; and
 - in response to determining that the local height value is less than the remote height value, obtaining at least one blockchain block that is not stored on the bridge device from the blockchain network node.
5. The method of claim 4, further comprising:
 - in response to obtaining the at least one blockchain block from the blockchain network node, storing the at least one blockchain block on the bridge device; and
 - updating the local height value by the bridge device.
6. The method of claim 4 or 5, further comprising:
 - in response to determining that the local height value is not less than the remote height value, refraining from obtaining blockchain blocks from the blockchain network node.
7. The method of any one of the claims 4 to 6, further comprising:
 - receiving a notification from the blockchain network node by the bridge device, the notification indicating the remote height value;
 - receiving a transaction request from a client device by the bridge device, the transaction request requesting a transaction to be executed on a blockchain network;
 - sending the transaction request to the blockchain network node by the bridge device;
 - and

receiving a second notification from the blockchain network node by the bridge device, the second notification indicating an updated remote height value, wherein the updated remote height value indicates an increase in the number of blockchain blocks that are stored on the blockchain network node based at least in part on the transaction.

8. The method of claim 7, wherein the notification comprises a new block notification indicating a new block has been added to a blockchain of the blockchain network, and the new block notification indicating the remote height value is increased.

9. The method of claim 7 or 8, wherein receiving the notification from the blockchain network node by the bridge device comprises at least one of the following:

receiving the notification that is pushed by the blockchain network node to the bridge device; or

pulling the notification from the blockchain network node by the bridge device.

10. The method of claim any one of the claims 1-3, further comprising:

maintaining a local height value and a check height value in a data store of the bridge device, wherein:

the local height value indicates a number of blockchain blocks that are stored on the bridge device and that have been obtained from the blockchain network node; and

the check height value indicates a number of blockchain blocks that have been verified by the bridge device;

wherein verifying the second set of blockchain blocks that are stored in the bridge device using the second set of threads of the bridge device comprises:

determining whether the check height value is less than the local height value;

and

in response to determining that the check height value is less than the local height value, verifying a blockchain block that is stored in the bridge device and that has not been verified by the bridge device.

11. The method of claim 10, wherein verifying the blockchain block that is stored in the bridge device and that has not been verified by the bridge device comprises determining a consistency between one or more blockchain transactions in the blockchain block and a transaction request.

12. The method of claim 10 or 11, further comprising:
in response to verifying the blockchain block that is stored on the bridge device and that has not been verified by the bridge device, determining that the blockchain block is trustworthy; and
updating the check height value by the bridge device.

13. The method of any one of the claims 10 to 12, further comprising:
in response to determining that the check height value is not less than the local height value, refraining from verifying blockchain blocks that are stored in the bridge device.

14. The method of any one of the claims 10 to 13, further comprising:
detecting a system fault in a system comprising the bridge device and the blockchain network node by the bridge device; and
in response to detecting the system fault, performing a recovery process based on the check height value, wherein performing the recovery process comprises:
setting the local height value equal to the check height value; and
in response to determining that the local height value is less than a remote height value that indicates a number of blockchain blocks that are stored on the blockchain network node, obtaining at least one blockchain block that is not stored on the bridge device from the blockchain network node.

15. An apparatus for implementing a blockchain-based fault-tolerant system, the apparatus comprising a plurality of modules for performing the computer-implemented method of any one of claims 1 to 14.

16. A blockchain-based fault-tolerant system, 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 computer-implemented method of any one of claims 1 to 14.