CLAIMS

1. A computer-implemented method, comprising:

receiving a blockchain message from a blockchain node of a plurality of blockchain nodes in a blockchain relay communication network;

sending, the blockchain message to a relay node in a relay cluster of a plurality of relay clusters, wherein the relay node determines a target relay cluster of the plurality of relay clusters according to identification information included in the blockchain message, wherein the target relay cluster is connected to a target blockchain node in the blockchain relay communication network indicated by the blockchain message; and

transmitting, by the relay node, the blockchain message to the target blockchain node through the target relay cluster, wherein each blockchain node of the plurality of blockchain nodes is connected to at least one relay cluster of the plurality of relay clusters, and wherein each relay cluster of the plurality of relay clusters comprises a load balancer and at least one relay node connected to the load balancer.

2. The computer-implemented method according to claim 1, comprising:

selecting the relay node from the plurality of relay clusters according to a predetermined load balancing algorithm.

3. The computer-implemented method according to claim 1, wherein the load balancer maintains information about a persistent connection established between each blockchain node connected to the at least one relay cluster and each relay node of a plurality of relay nodes included in the relay cluster.

4. The computer-implemented method according to claim 3, comprising:

determining that the relay node in the relay cluster maintains a persistent connection with the blockchain node according to information maintained by the load balancer about the persistent connection.

5. The computer-implemented method according to claim 1, comprising:

establishing a communication channel between the blockchain node and the relay node in the relay cluster; and

receiving the blockchain message from the blockchain node through the communication channel.

6. The computer-implemented method according to claim 5, comprising:

detecting a communication failure of the communication channel; and

determining, an alternative relay node different from the relay node in the relay cluster in response to a connection establishment request sent by the blockchain node.

7. The computer-implemented method according to claim 6, comprising:

establishing an alternative communication connection between the blockchain node and the alternative relay node.

8. The computer-implemented method according to claim 1, comprising:

selecting the relay node from the relay cluster according to a predetermined load balancing algorithm.

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

receiving a blockchain message from a blockchain node of a plurality of blockchain nodes in a blockchain relay communication network;

sending, the blockchain message to a relay node in a relay cluster of a plurality of relay clusters, wherein the relay node determines a target relay cluster of the plurality of relay clusters according to identification information included in the blockchain message, wherein the target relay cluster is connected to a target blockchain node in the blockchain relay communication network indicated by the blockchain message; and

transmitting, by the relay node, the blockchain message to the target blockchain node through the target relay cluster, wherein each blockchain node of the plurality of blockchain nodes is connected to at least one relay cluster of the plurality of relay clusters, and wherein each

relay cluster of the plurality of relay clusters comprises a load balancer and at least one relay node connected to the load balancer.

10. The non-transitory, computer-readable medium according to claim 9, comprising operations of:

selecting the relay node from the plurality of relay clusters according to a predetermined load balancing algorithm.

11. The non-transitory, computer-readable medium according to claim 9, wherein the load balancer maintains information about a persistent connection established between each blockchain node connected to the at least one relay cluster and each relay node of a plurality of relay nodes included in the relay cluster.

12. The non-transitory, computer-readable medium according to claim 11, comprising operations of:

determining that the relay node in the relay cluster maintains a persistent connection with the blockchain node according to information maintained by the load balancer about the persistent connection.

13. The non-transitory, computer-readable medium according to claim 9, comprising operations of:

establishing a communication channel between the blockchain node and the relay node in the relay cluster; and

receiving the blockchain message from the blockchain node through the communication channel.

14. The non-transitory, computer-readable medium according to claim 13, comprising operations of:

detecting a communication failure of the communication channel;

determining, an alternative relay node different from the relay node in the relay cluster in response to a connection establishment request sent by the blockchain node; and

establishing an alternative communication connection between the blockchain node and the alternative relay node.

15. The non-transitory, computer-readable medium according to claim 9, comprising operations of:

selecting the relay node from the relay cluster according to a predetermined load balancing algorithm.

16. 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:

receiving a blockchain message from a blockchain node of a plurality of blockchain nodes in a blockchain relay communication network;

sending, the blockchain message to a relay node in a relay cluster of a plurality of relay clusters, wherein the relay node determines a target relay cluster of the plurality of relay clusters according to identification information included in the blockchain message, wherein the target relay cluster is connected to a target blockchain node in the blockchain relay communication network indicated by the blockchain message; and

transmitting, by the relay node, the blockchain message to the target blockchain node through the target relay cluster, wherein each blockchain node of the plurality of blockchain nodes is connected to at least one relay cluster of the plurality of relay clusters, and wherein each relay cluster of the plurality of relay clusters comprises a load balancer and at least one relay node connected to the load balancer.

17. The computer-implemented system according to claim 16,

selecting the relay node from the plurality of relay clusters according to a predetermined load balancing algorithm.

18. The computer-implemented system according to claim 16, wherein the load balancer maintains information about a persistent connection established between each blockchain node connected to the at least one relay cluster and each relay node of a plurality of relay nodes included in the relay cluster.

19. The computer-implemented system according to claim 18, comprising one or more operations of:

determining that the relay node in the relay cluster maintains a persistent connection with the blockchain node according to information maintained by the load balancer about the persistent connection.

20. The computer-implemented system according to claim 16, comprising one or more operations of:

establishing a communication channel between the blockchain node and the relay node in the relay cluster;

receiving the blockchain message from the blockchain node through the communication channel;

detecting a communication failure of the communication channel; and

determining, an alternative relay node different from the relay node in the relay cluster in response to a connection establishment request sent by the blockchain node.