CLAIMS

1. A message transmission method, applicable to a relay node in a blockchain relay communication network, the method comprising:

receiving (302) a digital certificate sent by each blockchain node~~,~~ of a plurality of blockchain nodes, the digital certificate comprising identity information of ~~the~~a corresponding blockchain node and network identifier information of a blockchain network to which the corresponding blockchain node belongs, wherein the identity information of the corresponding blockchain node comprises node identifier information and a node public key of the corresponding blockchain node of the plurality of blockchain nodes;

performing (304) signature verification for the digital certificate by using a public key of a certification authority ~~(~~, CA~~)~~, issuing the digital certificate~~,~~;

performing, by using the node public key comprised in the digital certificate, signature verification for the node identifier information comprised in the digital certificate, and associatively recording a mapping relationship between identity information of the corresponding blockchain node and corresponding network identifier information in a case that the signature verification succeeds;

determining~~,~~ (306), in a case that a blockchain message sent by any blockchain node is received, receiver identity information of the blockchain message and target network identifier information of the any blockchain node, and determining, according to the mapping relationship, a target blockchain node matching the target network identifier information and the receiver identity information; ~~and~~

establishing a persistent transmission channel with the target blockchain node, the persistent transmission channel being configured for transmitting the blockchain message between the relay node and the target blockchain node; and

transmitting (308) the blockchain message to the target blockchain node through the established persistent transmission channel.

2. The method according to claim 1, wherein the network identifier information of the blockchain network to which each blockchain node of the plurality of blockchain nodes belongs is generated by the CA based on a genesis block maintained by the corresponding blockchain node.

~~3. The method according to claim 1, wherein the identity information of each blockchain node comprises node identifier information and/or a node public key of the each blockchain node.~~

~~4. The method according to claim 3, further comprising:~~

~~in a case that the identity information comprises the node identifier information and the node public key, if the signature verification for the digital certificate succeeds, performing, by using the node public key comprised in the digital certificate, signature verification for the node identifier information comprised in the digital certificate.~~

~~5. The method according to claim 4, further comprising:~~

~~establishing a transmission channel with the corresponding blockchain node in a case that the signature verification for the node identifier information succeeds, the transmission channel is configured for transmitting a blockchain message between the relay node and the blockchain node.~~

3~~6~~. The method according to claim 1, further comprising:

sending a digital certificate of the relay node to the each blockchain node of the plurality of blockchain nodes,

wherein in a case that signature verification for the digital certificate of the relay node by the each blockchain node of the plurality of blockchain nodes by using the public key of the CA succeeds, the~~a~~ digital certificate of the each blockchain node of the plurality of blockchain nodes is sent to the relay node.

4~~7~~. The method according to claim 1, wherein the blockchain message comprises a set identifier of a target blockchain node set; and

the method further comprises: determining the target blockchain node set corresponding to the set identifier; and

the determining, according to the mapping relationship, a target blockchain node matching the target network identifier information and the receiver identity information comprises: determining, according to the mapping relationship, a target blockchain node matching the target network identifier information and the receiver identity information in the target blockchain node set.

5~~8~~. The method according to claim ~~7~~4, further comprising:

registering, according to a registration request submitted by the each blockchain node of the plurality of blockchain nodes, the each blockchain node of the plurality of blockchain nodes to a blockchain node set indicated by the registration request.; and/or

9. The method according to claim 7, wherein the digital certificate of the each blockchain node of the plurality of blockchain nodes comprises a set identifier of a blockchain node set to which the each blockchain node of the plurality of blockchain nodes belongs; and the method further comprises:

registering, in a case that the signature verification for the digital certificate succeeds, the each blockchain node of the plurality of blockchain nodes to the blockchain node set indicated by the set identifier comprised in the digital certificate respectively.

610. The method according to claim 1, wherein the blockchain message comprises at least one of the following:

a block synchronization message, a consensus message, and a transaction synchronization message.

11. A message transmission method, applicable to blockchain nodes, the method comprising: obtaining digital a certificate issued to the blockchain node by a certification authority (CA), the digital certificate comprising identity information of the corresponding blockchain node and network identifier information of a blockchain network to which the blockchain node belongs; and

sending the digital certificate to a relay node in a blockchain relay communication network, the relay node is configured to: perform, according to a public key of the CA, signature verification for the digital certificate sent by the blockchain node, and associatively record a mapping relationship between identity information of the blockchain node and corresponding network identifier information in a case that the signature verification succeeds; and determine, in a case that a blockchain message sent by any blockchain node is received, receiver identity information of the blockchain message and target network identifier information of the any blockchain node, and determine, according to the mapping relationship, a target blockchain node matching the target network identifier information and the receiver identity information, to transmit the blockchain message to the target blockchain node.

12. The method according to claim 11, wherein the network identifier information of the blockchain network to which each blockchain node belongs is generated by the CA based on a genesis block maintained by the corresponding blockchain node.

13. The method according to claim 11, wherein the identity information of each blockchain node comprises node identifier information and/or a node public key of the each blockchain node.

14. The method according to claim 13, wherein in a case that the identity information comprises the node identifier information and the node public key, if the signature verification for the digital certificate by the relay node succeeds, the relay node performs, by using the node public key comprised in the digital certificate, signature verification for the node identifier information comprised in the digital certificate.

15. The method according to claim 14, wherein in a case that the signature verification for the node identifier information succeeds, the relay node establishes a transmission channel with the blockchain node, the transmission channel is configured for transmitting a blockchain message between the relay node and the blockchain node.

16. The method according to claim 11, further comprising:

obtaining a digital certificate of the relay node, and performing signature verification for the digital certificate of the relay node by using the public key of the CA, to send the digital certificate of the blockchain node to the relay node in a case that the signature verification succeeds.

17. The method according to claim 11, wherein the blockchain message comprises a set identifier of a target blockchain node set; and the relay node is configured to: determine the target blockchain node set corresponding to the set identifier, and determine, according to the mapping relationship, a target blockchain node matching the target network identifier information and the receiver identity information in the target blockchain node set.

18. The method according to claim 17, further comprising:

submitting a registration request to the relay node, the registration request is used for instructing the relay node to register each blockchain node submitting the corresponding registration request to a blockchain node set indicated by the registration request.

19. The method according to claim 17, wherein the digital certificate of each blockchain node comprises a set identifier of a blockchain node set to which the each blockchain node belongs; and the relay node is configured to register, in a case that the signature verification for the digital certificate succeeds, the each blockchain node to the blockchain node set indicated by the set identifier comprised in the digital certificate.

20. The method according to claim 11, wherein the blockchain message comprises at least one of the following:

a block synchronization message, a consensus message, and a transaction synchronization message.

21. A message transmission apparatus, applicable to a relay node in a blockchain relay communication network, the apparatus comprising:

a receiving unit, configured to receive a digital certificate sent by a blockchain node, the digital certificate comprising identity information of the corresponding blockchain node and network identifier information of a blockchain network to which the blockchain node belongs;

a verification unit, configured to: perform signature verification for the digital certificate by using a public key of a certification authority (CA) issuing the digital certificate, and associatively record a mapping relationship between identity information of the blockchain node and corresponding network identifier information in a case that the signature verification succeeds;

a determining unit, configured to: determine, in a case that a blockchain message sent by any blockchain node is received, receiver identity information of the blockchain message and target network identifier information of the any blockchain node, and determine, according to the mapping relationship, a target blockchain node matching the target network identifier information and the receiver identity information; and

a transmission unit, configured to transmit the blockchain message to the target blockchain node.

22. A message transmission apparatus, applicable to a blockchain node, the apparatus comprising:

an obtaining unit, configured to obtain a digital certificate issued to the blockchain node by a certification authority (CA), the digital certificate comprising identity information of the

~~corresponding blockchain node and network identifier information of a blockchain network to which the blockchain node belongs; and~~

~~a sending unit, configured to: send the digital certificate to a relay node in a blockchain relay communication network, the relay node is configured to: perform, according to a public key of the CA, signature verification for the digital certificates sent by the blockchain nodes, and associatively record a mapping relationship between identity information of the blockchain node and corresponding network identifier information in a case that the signature verification succeeds; and determine, in a case that a blockchain message sent by any blockchain node is received, receiver identity information of the blockchain message and target network identifier information of the any blockchain node, and determine, according to the mapping relationship, a target blockchain node matching the target network identifier information and the receiver identity information, to transmit the blockchain message to the target blockchain node.~~

~~23. An electronic device, comprising:~~

~~a processor; and~~

~~a memory configured to store instructions executable by the processor, wherein~~

~~the processor executes the executable instructions to implement the method according to any one of claims 1 to 10.~~

~~24. A computer-readable storage medium, storing computer instructions, the instructions, when executed by a processor, implementing the steps of the method according to any one of claims 1 to 10.~~