

BLOCKCHAIN TRANSACTION PROCESSING METHOD, SYSTEM, MEDIUM, AND DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority of Chinese Patent Application No. 202311762228.X, entitled “method, system, medium, and device for processing blockchain transaction”, filed with the State Intellectual Property Office of P. R. China on December 19, 2023, the entire content of which is incorporated herein by reference.

FIELD OF THE DISCLOSURE

[0002] The present application generally relates to the technical field of blockchain and, more particularly, relates to a method, a system, a medium, and a device for processing blockchain transaction.

BACKGROUND

[0003] Personal-carbon-account related operations are characterized by high frequency, and participating nodes in consortium blockchains are relatively dispersed. Existing distributed consortium blockchain networks may be difficult to satisfy performance requirements.

[0004] Optimistic rollup is a Layer 2 (L2) network protocol; and such protocol is designed to scale throughput of Ethereum’s base layer. Th optimistic rollup may significantly improve processing speed by reducing computation on the Ethereum mainnet through processing transactions off-chain. Unlike other scaling solutions (e.g., sidechains), the optimistic rollup gains security from the mainnet (by publishing transaction results on-chain) or from the Plasma

chain (such chain also uses fraud proof to verify transactions on Ethereum but stores transaction data elsewhere). In existing public blockchain technologies, the L1 network and the L2 network are relatively separated; and the L2 observer network is determined by an L2 executor, which may result in unfair generation process. Furthermore, when the L2 executor encounters an error, efficient and reasonable changes cannot be made to an L2 node, which may result in reduced transaction processing efficiency.

[0005] Therefore, there is an urgent need for a method, a system, a medium, and a device for processing blockchain transaction to improve transaction processing efficiency.

BRIEF SUMMARY OF THE DISCLOSURE

[0006] The present application provides a method, a system, a medium, and a device for processing blockchain transaction, which are configured to improve transaction processing efficiency.

[0007] For the first aspect, embodiments of the present application provide a method for processing blockchain transaction, applied to a consortium blockchain system. The method includes:

[0008] based on rollup contract voting transactions initiated by all nodes in the consortium blockchain system, the consortium blockchain system being in a rollup mode; and after each Layer 2 network transaction indicated by a rollup contract is executed by a first node, packaging all Layer 2 network transactions into a plurality of Layer 2 network transaction batch-packets which is on-chained to the consortium blockchain system, where the first node is any node in the consortium blockchain system and determined to be an executor of a Layer 2 network through a mechanism of the rollup contract in the consortium blockchain system; and

[0009] for any Layer 2 network transaction batch-packet on-chained by the executor, when a second node determines a state corresponding to the Layer 2 network transaction batch-packet to be invalid, initiating a dispute resolution transaction for the Layer 2 network transaction batch-packet, where the second node is at least one node in the consortium blockchain system which is other than the first node and configured as an observer.

[0010] Through above-mentioned manner, the first node is existing node within the consortium blockchain system, not an executor arbitrarily designated by the operator; and the first node is the executor determined through the consensus mechanism, thereby ensuring the rationality of executor determination. The nodes other than the executor become observer nodes; and the observer nodes are also determined through the consensus mechanism of the consortium blockchain, thereby preventing the observers from being completely controlled by the executor. Furthermore, deep binding and high coupling between executors and observer nodes may make the Layer 2 rollup network more secure and controllable, thereby ultimately improving the transaction processing efficiency of the consortium blockchain system.

[0011] In a possible implementation manner, after initiating the dispute resolution transaction for the Layer 2 network transaction batch-packet, the method further includes:

[0012] after a quantity of dispute resolution transactions of the Layer 2 network transaction batch-packet satisfies a dispute triggering threshold of the rollup contract, stopping on-chain of the Layer 2 network transaction batch-packet initiated by the first node, and entering a dispute resolution mode.

[0013] In above-mentioned manner, not any observer node's dispute resolution transaction can trigger the dispute resolution mode, and the dispute resolution transaction must

satisfy the dispute triggering threshold of the roll-up contract, which prevents the observer nodes from maliciously triggering dispute resolutions and affecting transactions in normal rollup mode.

[0014] In a possible implementation manner, entering the dispute resolution mode may include:

[0015] receiving an update transaction initiated by at least one second node, where the state update transaction is configured to instruct updating a state corresponding to the Layer 2 network transaction batch-packet and states corresponding to other Layer 2 network transaction batch-packets on- chained after the Layer 2 network transaction batch-packet; and

[0016] after a quantity of update transactions for the Layer 2 network transaction batch-packet satisfies an update quantity threshold of the rollup contract, changing the state corresponding to the Layer 2 network transaction batch-packet on-chained and the states corresponding to the Layer 2 network transaction batch-packet on-chained after the Layer 2 network transaction batch-packet.

[0017] Through above-mentioned manner, based on the update transaction initiated by the second node, the Layer 2 transaction batch-packet on-chained may be updated; and there is no need to for the first node to re-upload subsequent Layer 2 transaction batch-packets, and the Layer 2 transaction batch-packet on-chained may be updated, which reduces the interaction process between the first node and blockchain nodes, improves dispute resolution efficiency, and allows the blockchain system to quickly restore to the rollup mode to continue processing transactions sent by clients, thereby improving processing efficiency of blockchain system transaction.

[0018] In a possible implementation manner, after changing the state corresponding to the Layer 2 network transaction batch-packet on-chained and the states corresponding to the Layer 2 network transaction batch-packet on-chained after the Layer 2 network transaction batch-packet, the method further includes:

[0019] after the first node successfully reconstructs the Layer 2 network transaction batch-packet, restoring the rollup mode through the rollup contract.

[0020] In another optional implementation manner, the method further includes:

[0021] after the first node fails to reconstruct the Layer 2 network transaction batch-packet, re-consensusing a third node as the executor, where the third node is any node in the consortium blockchain system other than the first node.

[0022] In above-mentioned manner, the first node failed to reconstruct the Layer 2 transaction batch-packet, which indicates that the first node may be malicious or that the transaction processing of the first node has encountered a fatal error. Therefore, reconstructing the Layer 2 transaction batch-packet may consume a significant amount of time. To ensure the transaction processing need of the client is satisfied, the third node is re-consensus as the executor.

[0023] In a possible implementation manner, before packaging all Layer 2 network transactions into the Layer 2 network transaction batch-packets, the method further includes:

[0024] initiating an appointment transaction request by the first node, where the appointment transaction request is configured to apply for being designated as an executor; and

[0025] after the mechanism of the rollup contract in the consortium blockchain system is satisfied, determining the first node as the executor and determining other nodes in the consortium blockchain system as observers.

[0026] Through above-mentioned manner, determination of the executor and observer nodes is implemented; and such process is completed based on the mechanism of the rollup contract in the consortium blockchain system, which may ensure fairness in the determination of the executors and observers and ensure that the observer nodes are not arbitrarily designated, thereby enhancing overall system security.

[0027] In another optional implementation manner, the Layer 2 network transaction batch-packet includes a first state root corresponding to each Layer 2 network transaction; and

[0028] the second node determines the state corresponding to the Layer 2 network transaction batch-packet to be invalid includes:

[0029] the second node determining a second state root based on each Layer 2 network transaction in the Layer 2 network transaction batch-packet, and if the first state root and the second state root are different, determining the state corresponding to the Layer 2 network transaction batch-packet to be invalid.

[0030] In a possible implementation manner, after the quantity of the update transactions for the Layer 2 network transaction batch-packet satisfies the update quantity threshold of the rollup contract, changing the Layer 2 network transaction batch-packet on-chained includes:

[0031] after the quantity of the update transactions for the Layer 2 network transaction batch-packet satisfies a first threshold of the rollup contract, and after a quantity of identical second state roots in the update transactions satisfies a second threshold, changing the first state root of the Layer 2 network transaction batch-packet on-chained to the second state root.

[0032] Through above-mentioned manner, no single observer node is allowed to initiate the stop operating transaction; instead, the first state root of the on-chain Layer 2 network transaction batch-packet is changed to the second state root only after the quantity of identical second state roots satisfies the second threshold, thereby preventing malicious attacks and ensuring stable operation of the system as possible.

[0033] For the second aspect, embodiments of the present application provide a system for processing blockchain transaction; and the system includes a first node and a second node; where:

[0034] the first node is configured to, based on that the consortium blockchain system is in a rollup mode, after each Layer 2 network transaction indicated by a rollup contract is executed, package all Layer 2 network transactions into a plurality of Layer 2 network transaction batch-packets which is on-chained to the consortium blockchain system, where the first node is any node in the consortium blockchain system and determined to be an executor of a Layer 2 network through a mechanism of the rollup contract in the consortium blockchain system; and

[0035] the second node is configured to, for any Layer 2 network transaction batch-packet on-chained by the executor, when a second node determines a state corresponding to the Layer 2 network transaction batch-packet to be invalid, initiate a dispute resolution transaction for the Layer 2 network transaction batch-packet, where the second node is at least one node in the consortium blockchain system which is other than the first node and configured as an observer.

[0036] For the third aspect, embodiments of the present application provide an apparatus for processing blockchain transaction; the apparatus is capable of executing above-mentioned transaction processing method; and the apparatus includes:

[0037] a processing module, configured to, based on that the rollup contract of the consortium blockchain system is in the rollup mode, after executing each Layer 2 network transaction indicated by the rollup contract, package all Layer 2 network transactions into the plurality of Layer 2 network transaction batch-packets and on-chain the plurality of Layer 2 network transaction batch-packets to the consortium blockchain system, where the first node is any node in the consortium blockchain system and determined to be the executor of the Layer 2 network through the consensus mechanism of the consortium blockchain system; and

[0038] a determination module, configured to, for any Layer 2 network transaction batch-packet on-chained by the executor, when the state corresponding to the Layer 2 network transaction batch-packet is determined to be invalid, initiate the dispute resolution transaction for the Layer 2 network transaction batch-packet, where the second node is at least one node in the consortium blockchain system which is other than the first node and configured as the observer.

[0039] In a possible implementation manner, the determination module is further configured to, after the quantity of dispute resolution transactions for the Layer 2 network transaction batch-packet satisfies the dispute triggering threshold of the rollup contract, stop the on-chain of the Layer 2 network transaction batch-packet initiated by the first node and enter the dispute resolution mode.

[0040] In a possible implementation manner, the transaction processing apparatus further includes a receiving module, configured to receive the update transaction initiated by at least one second node, where such state update transaction is configured to instruct updating of the state

corresponding to the Layer 2 network transaction batch-packet and the states corresponding to other Layer 2 network transaction batch-packets on-chained after the Layer 2 network transaction batch-packet; and

[0041] after the quantity of update transactions for the Layer 2 network transaction batch-packet satisfies the update quantity threshold of the roll-over contract, change the state corresponding to the Layer 2 network transaction batch-packet and the states corresponding to other Layer 2 network transaction batch-packets on-chained after the Layer 2 network transaction batch-packet.

[0042] In a possible implementation manner, an update module is further configured to, after updating the state corresponding to the Layer 2 network transaction batch-packet and the states corresponding to other Layer 2 network transaction batch-packets on-chained after the Layer 2 network transaction batch-packet, further include:

[0043] after the first node successfully reconstructs the Layer 2 network transaction batch-packet, restoring the rollup mode through the rollup contract.

[0044] In a possible implementation manner, the determining module is further configured to, after the first node fails to successfully reconstruct the Layer 2 network transaction batch-packet, re-consensus the third node as the executor, where the third node is any node in the consortium blockchain system other than the first node.

[0045] In a possible implementation manner, the determining module is further configured to initiate, by the first node, the appointment transaction request, where the appointment transaction request is configured to apply for being designated as the executor; and

[0046] after satisfying the mechanism of the contract rollup in the consortium blockchain system, determine the first node as the executor and other nodes in the consortium blockchain system as the observers.

[0047] In a possible implementation manner, the Layer 2 network transaction batch-packet includes the first state root corresponding to each Layer 2 network transaction.

[0048] The processing module is specifically configured to determine the second state roots based on each Layer network transaction in the Layer 2 network transaction batch-packet; and if the first state root and the second state root are different, determine the Layer 2 network transaction batch-packet to be invalid.

[0049] In a possible implementation manner, the update module is further configured to, after the quantity of update transactions for the Layer 2 network transaction batch-packet satisfies the first threshold of the rollup contract, and the quantity of update transactions with same second state root satisfies the second threshold, change the first state root of the Layer 2 network transaction batch-packet on-chained to the second state root.

[0050] For the fourth aspect, embodiments of the present application provide a computer-readable storage medium, where the computer-readable storage medium stores a computer program; and when the computer program is run, the computer program executes any methods in the first aspect mentioned above.

[0051] For the fifth aspect, embodiments of the present application provide a computing device, including: a memory, configured to store program instructions; and a processor, configured to call the program instructions stored in the memory and execute any designed methods in the first aspect mentioned above according to an obtained program.

[0052] For the sixth aspect, embodiments of the present application provide a computer program product; and when running on a processor, the computer program product executes any designed methods in the first aspect mentioned above.

[0053] The beneficial effects of the second to sixth aspects described above may be specifically referred to the beneficial effects achievable by any designs in the first aspect mentioned above, which may not be described in detail herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0054] FIG. 1 exemplarily illustrates a scenario architecture schematic provided in embodiments of the present application.

[0055] FIG. 2 exemplarily illustrates a flowchart of a method for processing blockchain transaction provided in embodiments of the present application.

[0056] FIG. 3 exemplarily illustrates a flowchart of entering a rollup mode provided in embodiments of the present application.

[0057] FIG. 4 exemplarily illustrates a schematic of a dispute resolution mode provided in embodiments of the present application.

[0058] FIG. 5 exemplarily illustrates a schematic of a re-consensus process provided in embodiments of the present application.

[0059] FIG. 6 exemplarily illustrates a flowchart of a transaction processing method provided in embodiments of the present application.

[0060] FIG. 7 exemplarily illustrates another flowchart of a transaction processing method provided in embodiments of the present application.

[0061] FIG. 8 exemplarily illustrates a schematic of a system for processing blockchain transaction provided in embodiments of the present application.

[0062] FIG. 9 exemplarily illustrates a schematic of an apparatus for processing blockchain transaction provided in embodiments of the present application.

DETAILED DESCRIPTION

[0063] To further illustrate the objectives, technical solutions, and advantages of the present application, the present application is further described in detail below with reference to accompanying drawings. Obviously, embodiments described are only some, and not all, of the present application. Based on embodiments in the present application, all other embodiments obtained by those skilled in the art without creative effort are within the protection scope of the present application.

[0064] In blockchain-based personal-carbon-account solutions, personal-carbon-account related operations are characterized by high frequency; nodes of each participating party in consortium blockchains are relatively dispersed; and existing distributed consortium blockchain networks may be difficult to satisfy performance requirements. On the other hand, from the perspective of supporting general business scenarios, existing consortium blockchain deployment models struggle to satisfy the demands of high-frequency transactions, which significantly limits innovation in blockchain business models; therefore, scaling may be explored from the perspective of Layer 2 network.

[0065] Optimistic rollup is a Layer 2 (L2) network protocol; and such protocol is designed to scale throughput of Ethereum's base layer. Th optimistic rollup may significantly

improve processing speed by reducing computation on the Ethereum mainnet through processing transactions off-chain. Unlike other scaling solutions (e.g., sidechains), the optimistic rollup gains security from the mainnet (by publishing transaction results on-chain) or from the Plasma chain (such chain also uses fraud proof to verify transactions on Ethereum but stores transaction data elsewhere).

[0066] Optimistic rollup is a method for scaling Ethereum and involves moving computation and state storage off-chain. Optimistic rollup executes transactions outside of Ethereum but publish transaction data to the mainnet as calldata. Optimistic rollup operators bundle the plurality of off-chain transactions together in bulk which are then submitted to Ethereum. Such method distributes fixed costs across the plurality of transactions in each batch-packet, thereby reducing costs for end clients.

[0067] FIG. 1 exemplarily illustrates a scenario architecture schematic provided in embodiments of the present application. As shown in FIG. 1, L1 is original blockchain network (Layer 1); L2 is a Layer 2 extension network or service (Layer 2); and an L2 executor, configured as an intermediary network, is configured to provide an L2 blockchain client with fast blockchain transaction functionality, including contract deployment, transaction request execution, information retrieval and the like. An L2 observer is a machine of an intermediary operator, which is customized by the operator and operated autonomously. Transactions are executed, and executed transaction data and results are packaged in batch-packets which are uploaded to the L1 blockchain network. The L2 observer is designated by the operator of the L2 executor operator and determine the validity of transaction execution results uploaded. When an invalid transaction occurs, a single L2 observer may initiate a challenge via the L1 smart contract; through the plurality of rounds of communication with the L1 executor, erroneous Layer 2

transaction batch-packet may be first identified, erroneous transaction may be identified from erroneous Layer 2 transaction batch-packet, and finally erroneous instruction of erroneous transaction may be determined; and the L1 smart contract may execute such instruction and determine such instruction to be invalid.

[0068] During such process, the L2 observer may continue to generate new Layer 2 transaction batch-packets; and when the smart contract determines that a previous Layer 2 transaction batch-packet is erroneous, all subsequent newly generated Layer 2 transaction batch-packets are determined to be erroneous. After the L2 executor corrects errors, the transactions in such Layer 2 transaction batch-packets are re-executed, and new Layer 2 transaction batch-packets are generated and packaged to on-chain. For example, if the Layer 2 transaction batch-packets packaged to on-chain by the L2 executor within a certain period include B1, B2, B3, B4, and B5, at a time moment T1, the L2 observer detects an error in the Layer 2 transaction batch-packet B1; and according to the smart contract, the transaction or instruction in the Layer 2 transaction batch-packet B1 is re-executed or corrected to create a Layer 2 transaction batch-packet B1' using another manner, and B1' is on-chained again. Subsequently, the data corresponding to the Layer 2 transaction batch-packets B2, B3, B4, and B5 may be also recalculated and then on-chained. During such process, even if the transaction requests corresponding to B2, B3, B4, and B5 are error-free, the transaction requests may be executed repeatedly, thereby wasting computational resources. Furthermore, the plurality of interactions between the executor and the observer may result in a relatively long update cycle for the consortium blockchain, thereby resulting in decrease in overall processing capacity of transaction requests.

[0069] In addition, the L1 network and the L2 network are relatively separated; and the L2 observer network is determined by an L2 executor, which may result in unfair generation process. Furthermore, when the L2 executor encounters an error, efficient and reasonable changes cannot be made to an L2 node, which may result in reduced transaction processing efficiency.

[0070] Based on the above, embodiments of the present application provide a method for processing blockchain transaction, configured to improve the transaction dispute resolution mechanism in the Layer 2 network of the consortium blockchain and enhance transaction processing efficiency.

[0071] FIG. 2 exemplarily illustrates a flowchart of a method for processing blockchain transaction provided in embodiments of the present application, applied to a consortium blockchain system. As shown in FIG. 2, the method may include:

[0072] step 201, based on rollup contract voting transactions initiated by all nodes in the consortium blockchain system, the consortium blockchain system enters a rollup mode; and after executing each Layer 2 network transaction indicated by a rollup contract, all Layer 2 network transactions may be packaged, by the first node, into a plurality of Layer 2 network transaction batch-packets which is on-chained to the consortium blockchain system, where the first node is any node in the consortium blockchain system and determined to be an executor of a Layer 2 network through a mechanism of the rollup contract in the consortium blockchain system.

[0073] Here, the rollup contract is deployed in the consortium blockchain system. Exemplarily, the rollup contract may be created and deployed by the first node; based on the consensus mechanism of the consortium blockchain system, other nodes may confirm the

validity of such rollup contract; subsequently, the rollup contract takes effect, and the blockchain system enters the rollup mode.

[0074] FIG. 3 exemplarily illustrates a flowchart of entering a rollup mode provided in embodiments of the present application. As shown in FIG. 3, the process may include:

[0075] step 301, the node A creates and deploys the rollup contract in the consortium blockchain system;

[0076] step 302, the nodes B, C, and D confirm the validity of the rollup contract; and

[0077] step 303, the rollup contract takes effect, and the consortium blockchain system enters the rollup mode.

[0078] It should be noted that the nodes A, B, C, and D are all nodes in the consortium blockchain system. The node A may be a node that wants to act as an executor; the node A creates the rollup contract and deploys the rollup contract in the consortium blockchain system; other nodes in the consortium blockchain confirm the validity of the rollup contract based on the consensus mechanism of the consortium blockchain; subsequently, the rollup contract takes effect, and the consortium blockchain system enters the rollup mode.

[0079] The node A becomes the first node and begins executing each Layer 2 network transaction instructed by the rollup contract, such as transfer transactions; and after executing the plurality of transactions, the transaction data and results may be packaged into Layer 2 network transaction batch-packets and on-chain to the consortium blockchain system.

[0080] At step 202, for any Layer 2 network transaction batch-packet on-chained by the executor, when the second node determines the state corresponding to the Layer 2 network transaction batch-packet to be invalid, a dispute resolution transaction may be initiated for the

Layer 2 network transaction batch-packet; and the second node is at least one node in the consortium blockchain system which is other than the first node and configured as an observer.

[0081] Continuing with above-mentioned example, after the node A becomes the first node configured as the executor, the nodes B, C, and D become the second nodes configured as observers; and when the second nodes determine the Layer 2 network transaction batch-packet to be invalid, the second nodes initiate the dispute resolution transaction for the Layer 2 network transaction batch-packet.

[0082] Exemplarily, at this point, the first node may no longer receive new transaction requests and only resolve disputes.

[0083] Through above-mentioned manner, the first node is existing node within the consortium blockchain system, not an executor arbitrarily designated by the operator; and the first node is the executor determined through the consensus mechanism, thereby ensuring the rationality of executor determination. The nodes other than the executor become observer nodes; and the observer nodes are also determined through the consensus mechanism of the consortium blockchain, thereby preventing the observers from being completely controlled by the executor. Furthermore, deep binding and high coupling between executors and observer nodes may make the Layer 2 rollup network more secure and controllable, thereby ultimately improving the transaction processing efficiency of the consortium blockchain system.

[0084] In a possible implementation manner, before packaging all Layer 2 network transactions into the Layer 2 network transaction batch-packets in above-mentioned step 201, the first node initiates an appointment transaction request; the appointment transaction request is configured to apply for being designated as an executor; and after satisfying the mechanism of

the rollup contract in the consortium blockchain, the first node is determined as the executor, and other nodes in the consortium blockchain system are configured as observers.

[0085] Exemplarily, after the first node initiates the appointment transaction request, the consent of other nodes is sought; and it's assumed that the consensus mechanism of the consortium blockchain is that after more than 2/3 of other nodes consent, the first node becomes the executor, and other nodes automatically become observers.

[0086] Through above-mentioned manner, determination of the executor and observer nodes is implemented; and such process is completed based on the mechanism of the rollup contract in the consortium blockchain system, which may ensure fairness in the determination of the executors and observers and ensure that the observer nodes are not arbitrarily designated, thereby enhancing overall system security.

[0087] After above-mentioned step 202, that is, after initiating the dispute resolution transaction for the Layer 2 network transaction batch-packet, when the quantity of dispute resolution transactions for the Layer 2 network transaction batch-packet satisfies a dispute triggering threshold of the rollup contract, on-chain of the Layer 2 network transaction batch-packet initiated by the first node is stopped, and a dispute resolution mode is entered.

[0088] In a possible implementation manner, the Layer 2 network transaction batch-packet includes the first state root corresponding to each Layer 2 network transaction; the first node packages each Layer 2 network transaction and the first state root corresponding to each Layer 2 network transaction into the Layer 2 network transaction batch-packet which is on-chained; the second node determines the second state root based on each Layer 2 network transaction in the Layer 2 network transaction batch-packet; and if the first state root and the

second state root are different, the Layer 2 network transaction batch-packet is determined to be invalid.

[0089] Exemplarily, any observer node may pull transaction data and results uploaded to the consortium blockchain system and verify the validity of the first state root of the Layer 2 network transaction batch-packet. The second state root of the Layer 2 network transaction batch-packet may be calculated based on the transaction data; and if the first state root and the second state root are different, the dispute resolution transaction is initiated, and the second state root is carried in the dispute resolution transaction.

[0090] When the plurality of observer nodes initiates dispute resolution transactions, and after the dispute triggering threshold of the rollup contract is satisfied, for example, the rollup contract specifies that the dispute triggering threshold is 2/3 of the observer nodes all initiating dispute resolution transactions, the dispute resolution mode is entered, and all second state roots are sent to the consortium blockchain system.

[0091] In above-mentioned manner, not any observer node's dispute resolution transaction can trigger the dispute resolution mode, and the dispute resolution transaction must satisfy the dispute triggering threshold of the roll-up contract, which prevents the observer nodes from maliciously triggering dispute resolutions and affecting transactions in normal rollup mode.

[0092] In a possible implementation manner, after entering the dispute resolution mode, an update transaction initiated by at least one second node is received; and such state update transaction is configured to instruct updating of the state corresponding to the Layer 2 network transaction batch-packet and the states corresponding to other Layer 2 network transaction batch-packets on-chained after the Layer 2 network transaction batch-packet.

[0093] After the quantity of update transactions for the Layer 2 network transaction batch-packets satisfies an update quantity threshold of the rollup contract, the states corresponding to the Layer 2 network transaction batch-packet on-chained and subsequent Layer 2 network transaction batch-packets which are on-chained after the Layer 2 network transaction batch-packet are updated.

[0094] After update transactions for the Layer 2 network transaction batch-packets satisfy the first threshold of the rollup contract, it further determines whether the quantity of identical second state roots in update transactions satisfies the second threshold, and the first state root of the Layer 2 network transaction batch-packet on-chained is changed to the second state root.

[0095] Still taking embodiments in FIG. 3 above as an example, FIG. 4 exemplarily illustrates a schematic of a dispute resolution mode provided in embodiments of the present application; and as shown in FIG. 4, the process may include following steps.

[0096] At step 401, the nodes B, C, and D send update transactions to the consortium blockchain system, and the update transactions carry the second state roots.

[0097] At step 402, the consortium blockchain system confirms that the quantity of update transactions satisfies the update quantity threshold of the rollup contract; for example, the update quantity threshold in the rollup contract is configured to $\frac{2}{3}$ of the quantity of observer nodes, which is same as the dispute triggering threshold. All nodes in step 401 send update transactions to the consortium blockchain system, which satisfies the update quantity threshold.

[0098] At step 403, the consortium blockchain system determines whether the second state roots are consistent; and if the second state roots are consistent, the state root in the layer 2

network transaction batch-packet on-chained is updated to the second state root. For example, if the second state roots sent by the nodes B, C, and D are same, the state root in the layer 2 network transaction batch-packet on-chained is directly updated to the second state root. If the second state roots sent by the node C and node D are same, the update quantity threshold of 2/3 is still satisfied, and the state root in the Layer 2 transaction batch-packet on-chained is directly updated to the second state root.

[0099] Through above-mentioned manner, based on the update transaction initiated by the second node, the Layer 2 transaction batch-packet on-chained may be updated; and there is no need to for the first node to re-upload subsequent Layer 2 transaction batch-packets, and the Layer 2 transaction batch-packet on-chained may be updated, which reduces the interaction process between the first node and blockchain nodes, improves dispute resolution efficiency, and allows the blockchain system to quickly restore to the rollup mode to continue processing transactions sent by clients, thereby improving processing efficiency of blockchain system transaction.

[00100] Exemplarily, after the consortium blockchain system updates the state root in the Layer 2 transaction batch-packet on-chained to the second state root, the first node may detect the change in the state root on the consortium blockchain. Therefore, the first node may reconstruct the Layer 2 transaction batch-packet, the result of reconstructing the Layer 2 transaction batch-packet is that the state root of the Layer 2 transaction batch-packet is consistent with the state root recorded in the consortium blockchain system.

[00101] An error occurring in the Layer 2 transaction batch-packet of the first node may be that an error occurs in the code logic for executing transactions in the first node; or may be that the first node is a malicious node and, during the reporting of the Layer 2 transaction batch-

packet, the state root of one of the Layer 2 transaction batch-packets is modified. Although the state roots of previous and following batch-packets of such Layer 2 transaction batch-packet are correct, a malicious second node may still modify the state roots of intermediate Layer 2 transaction batch-packets.

[00102] Exemplarily, after successfully reconstructing the Layer 2 transaction batch-packet, the first node may restore the rollup mode through the rollup contract.

[00103] On the other hand, if the first node fails to reconstruct the Layer 2 transaction batch-packet, the third node is re-consensus as the executor; and the third node may be any node in the consortium blockchain system other than the first node.

[00104] In above-mentioned manner, the first node failed to reconstruct the Layer 2 transaction batch-packet, which indicates that the first node may be malicious or that the transaction processing of the first node has encountered a fatal error. Therefore, reconstructing the Layer 2 transaction batch-packet may consume a significant amount of time. To ensure the transaction processing need of the client is satisfied, the third node is re-consensus as the executor.

[00105] FIG. 5 exemplarily illustrates a schematic of a re-consensus process provided in embodiments of the present application. As shown in FIG. 5, the re-consensus process may include following steps.

[00106] At step 501, the third node initiates the appointment transaction request.

[00107] At step 502, the nodes C and D agree to the appointment transaction request of the third node.

[00108] At step 503, the third node becomes the executor, and the nodes C and D automatically become the observers.

[00109] Through above-mentioned manner, the third node is re-determined as the executor, which avoids excessive time spent by the first node reconstructing the Layer 2 network transaction batch-packet, thereby improving the processing transactions efficiency of the blockchain system.

[00110] FIG. 6 exemplarily illustrates a flowchart of a transaction processing method provided in embodiments of the present application. As shown in FIG. 6, the method may include following steps.

[00111] At step 601, based on the rollup contract voting transactions initiated by all nodes in the consortium blockchain system, the consortium blockchain system is in the rollup mode.

[00112] At step 602, after executing each Layer 2 network transaction indicated by the rollup contract, the first node may package all Layer 2 network transactions into the plurality of Layer 2 network transaction batch-packets and on-chain the plurality of Layer 2 network transaction batch-packets to the consortium blockchain system.

[00113] At step 603, for any Layer 2 network transaction batch-packet on-chained by the executor, when the state corresponding to the Layer 2 network transaction batch-packet is determined to be invalid, the second node initiates the dispute resolution transaction for the Layer 2 network transaction batch-packet.

[00114] At step 604, the update transaction initiated by at least one second node is received; and such state update transaction is configured to instruct updating of the state corresponding to the Layer 2 network transaction batch-packet and the states corresponding to

other Layer 2 network transaction batch-packets on-chained after the Layer 2 network transaction batch-packet.

[00115] At step 605, after the quantity of update transactions for the Layer 2 network transaction batch-packet satisfies the update quantity threshold of the roll-over contract, the state corresponding to the Layer 2 network transaction batch-packet and the states corresponding to other Layer 2 network transaction batch-packets on-chained after the Layer 2 network transaction batch-packet are updated.

[00116] Above-mentioned process is described with reference to a complete embodiment hereinafter. FIG. 7 exemplarily illustrates another flowchart of a transaction processing method provided in embodiments of the present application. As shown in FIG. 7, the method may include following steps.

[00117] At step 701, the node A creates and deploys the rollup contract in the consortium blockchain system.

[00118] At step 702, the nodes B, C, and D confirm the validity of the rollup contract.

[00119] At step 703, the rollup contract takes effect, and the consortium blockchain system enters the rollup mode.

[00120] At step 704, the node A initiates the appointment transaction request

[00121] At step 705, the nodes B, C, and D agree to the appointment transaction request of the node A.

[00122] At step 706, the node A becomes the executor, and the nodes B, C, and D automatically become the observers.

[00123] At step 707, the node A packages all Layer 2 network transactions and the first state roots corresponding to all Layer 2 network transactions into the Layer 2 network transaction batch-packet which is on-chained.

[00124] At step 708, the nodes B, C, and D determine the second state roots based on all Layer network transactions in the Layer 2 network transaction batch-packet; and if the first states root and the second state roots are different, the Layer 2 network transaction batch-packet is determined to be invalid.

[00125] At step 709, the nodes B, C, and D initiate dispute resolution transactions for the Layer 2 network transaction batch-packet.

[00126] At step 710, after determining that the quantity of dispute resolution transactions for the Layer 2 network transaction batch-packet satisfies the dispute triggering threshold of the rollup contract, the consortium blockchain system stops the on-chain of the Layer 2 network transaction batch-packet initiated by the first node and enters the dispute resolution mode.

[00127] At step 711, the consortium blockchain system receives update transactions for the Layer 2 network transaction batch-packet initiated by the nodes B, C, and D.

[00128] At step 712, after the quantity of update transactions for the Layer 2 network transaction batch-packet satisfies the update quantity threshold of the rollup contract, the Layer 2 network transaction batch-packet on-chained is changed.

[00129] At step 713, the node A reconstructs the Layer 2 network transaction batch-packet.

[00130] At step 714, the consortium blockchain system resumes the rollup mode.

[00131] In above-mentioned manner, the executor of the L2 network is not defined by the operator itself but requires all consensus from L1 network nodes; and the observers are all other

L1 network nodes other than the L2 executor, and cannot be arbitrarily designated, thereby ensuring fairness among the observers. Moreover, no single observer node is allowed to initiate the stop operating transaction, thereby preventing malicious attacks and ensuring stable operation of the system as possible.

[00132] Based on same technical concept, embodiments of the present application further provide a system for processing blockchain transaction. FIG. 8 exemplarily illustrates a schematic of a system for processing blockchain transaction provided in embodiments of the present application. Such system may execute above-mentioned transaction processing method. As shown in FIG. 8, the system may include the first node and the second node.

[00133] The first node is configured to, based on that the rollup contract of the consortium blockchain system is in the rollup mode, after executing each Layer 2 network transaction indicated by the rollup contract, package all Layer 2 network transactions into the plurality of Layer 2 network transaction batch-packets and on-chain the plurality of Layer 2 network transaction batch-packets to the consortium blockchain system; and the first node is any node in the consortium blockchain system and determined to be the executor of the Layer 2 network through the consensus mechanism of the consortium blockchain system.

[00134] The second node is configured to, for any Layer 2 network transaction batch-packet on-chained by the executor, when the state corresponding to the Layer 2 network transaction batch-packet is determined to be invalid, initiate the dispute resolution transaction for the Layer 2 network transaction batch-packet; and the second node is at least one node in the consortium blockchain system which is other than the first node and configured as the observer.

[00135] Based on same technical concept, embodiments of the present application further provide an apparatus for processing blockchain transaction. FIG. 9 exemplarily illustrates a

schematic of an apparatus for processing blockchain transaction provided in embodiments of the present application. The apparatus may execute above-mentioned transaction processing method.

As shown in FIG. 9, the apparatus may include:

[00136] a processing module, configured to, based on that the rollup contract of the consortium blockchain system is in the rollup mode, after executing each Layer 2 network transaction indicated by the rollup contract, package all Layer 2 network transactions into the plurality of Layer 2 network transaction batch-packets and on-chain the plurality of Layer 2 network transaction batch-packets to the consortium blockchain system, where the first node is any node in the consortium blockchain system and determined to be the executor of the Layer 2 network through the consensus mechanism of the consortium blockchain system; and

[00137] a determination module, configured to, for any Layer 2 network transaction batch-packet on-chained by the executor, when the state corresponding to the Layer 2 network transaction batch-packet is determined to be invalid, initiate the dispute resolution transaction for the Layer 2 network transaction batch-packet, where the second node is at least one node in the consortium blockchain system which is other than the first node and configured as the observer.

[00138] In a possible implementation manner, the determination module is further configured to, after the quantity of dispute resolution transactions for the Layer 2 network transaction batch-packet satisfies the dispute triggering threshold of the rollup contract, stop the on-chain of the Layer 2 network transaction batch-packet initiated by the first node and enter the dispute resolution mode.

[00139] In a possible implementation manner, the transaction processing apparatus further includes a receiving module, configured to receive the update transaction initiated by at least one second node, where such state update transaction is configured to instruct updating of the state

corresponding to the Layer 2 network transaction batch-packet and the states corresponding to other Layer 2 network transaction batch-packets on-chained after the Layer 2 network transaction batch-packet; and

[00140] after the quantity of update transactions for the Layer 2 network transaction batch-packet satisfies the update quantity threshold of the roll-over contract, change the state corresponding to the Layer 2 network transaction batch-packet and the states corresponding to other Layer 2 network transaction batch-packets on-chained after the Layer 2 network transaction batch-packet.

[00141] In a possible implementation manner, an update module is further configured to, after updating the state corresponding to the Layer 2 network transaction batch-packet and the states corresponding to other Layer 2 network transaction batch-packets on-chained after the Layer 2 network transaction batch-packet, further include:

[00142] after the first node successfully reconstructs the Layer 2 network transaction batch-packet, restoring the rollup mode through the rollup contract.

[00143] In a possible implementation manner, the determining module is further configured to, after the first node fails to successfully reconstruct the Layer 2 network transaction batch-packet, re-consensus the third node as the executor, where the third node is any node in the consortium blockchain system other than the first node.

[00144] In a possible implementation manner, the determining module is further configured to initiate, by the first node, the appointment transaction request, where the appointment transaction request is configured to apply for being designated as the executor; and

[00145] after satisfying the mechanism of the contract rollup in the consortium blockchain system, determine the first node as the executor and other nodes in the consortium blockchain system as the observers.

[00146] In a possible implementation manner, the Layer 2 network transaction batch-packet includes the first state root corresponding to each Layer 2 network transaction.

[00147] The processing module is specifically configured to determine the second state roots based on each Layer network transaction in the Layer 2 network transaction batch-packet; and if the first state root and the second state root are different, determine the Layer 2 network transaction batch-packet to be invalid.

[00148] In a possible implementation manner, the update module is further configured to, after the quantity of update transactions for the Layer 2 network transaction batch-packet satisfies the first threshold of the rollup contract, and the quantity of update transactions with same second state root satisfies the second threshold, change the first state root of the Layer 2 network transaction batch-packet on-chained to the second state root.

[00149] Based on same technical concept, embodiments of the present disclosure further provide a computer program product; and when running on a processor, the computer program product implements methods shown above-mentioned embodiments.

[00150] Based on same technical concept, embodiments of the present disclosure further provide a computing device, including: a memory configured to store program instructions; and

[00151] a processor, configured to call the program instructions stored in the memory and execute methods shown above-mentioned embodiments according to obtained program.

[00152] Based on same technical concept, embodiments of the present disclosure further provide a computer-readable storage medium; and when running on a processor, the computer program product implements methods shown above-mentioned embodiments.

[00153] Those skilled in the art should understand that the embodiments of the present disclosure may be provided as methods, systems, or computer program products. Therefore, the present disclosure may adopt the form of a complete hardware embodiment, a complete software embodiment, or an embodiment combining software and hardware. Moreover, the present disclosure may adopt the form of a computer program product implemented on one or more computer-usable storage media (including but may not be limited to disk storage, CD-ROM, optical storage, and the like) containing computer-usable program codes.

[00154] The present disclosure is described with reference to flowcharts and/or block diagrams of methods, devices (systems), and computer program products according to the embodiments of the present disclosure. It may be understood that each process and/or block in the flowcharts and/or block diagrams, and the combination of processes and/or blocks in the flowcharts and/or block diagrams may be implemented by computer program instructions. Such computer program instructions may be provided to the processor of a general-purpose computer, a special-purpose computer, an embedded processor, or other programmable data processing apparatus, such that the instructions executed by the processor of the computer or other programmable data processing apparatus may implement the functions specified in one or more processes in the flowcharts and/or one or more blocks in the block diagrams.

[00155] Such computer program instructions may also be stored in a computer-readable memory that can direct a computer or other programmable data processing apparatus to work in a specific manner, such that the instructions stored in the computer-readable memory produce a

manufacturing article including the instruction device. The instruction device implements the functions specified in one or more processes in the flowcharts and/or one or more blocks in the block diagrams.

[00156] Such computer program instructions may also be loaded on a computer or other programmable data processing apparatus, such that a series of operation steps are executed on the computer or other programmable apparatus to produce computer-implemented processing. Therefore, the instructions executed by the processor of the computer or other programmable data processing apparatus may implement the functions specified in one or more processes in the flowcharts and/or one or more blocks in the block diagrams.

[00157] Obviously, those skilled in the art may make various changes and modifications to the present disclosure without departing from the spirit and scope of the present disclosure. In such way, if such modifications and variations of the present disclosure fall within the scope of the claims of the present disclosure and their equivalent technologies, the present disclosure may also be intended to include such modifications and variations.

WHAT IS CLAIMED IS:

1. A method for processing blockchain transaction, applied to a consortium blockchain system, comprising:

based on rollup contract voting transactions initiated by all nodes in the consortium blockchain system, the consortium blockchain system being in a rollup mode; and after each Layer 2 network transaction indicated by a rollup contract is executed by a first node, packaging all Layer 2 network transactions into a plurality of Layer 2 network transaction batch-packets which is on-chained to the consortium blockchain system, wherein the first node is any node in the consortium blockchain system and determined to be an executor of a Layer 2 network through a mechanism of the rollup contract in the consortium blockchain system; and

for any Layer 2 network transaction batch-packet on-chained by the executor, when a second node determines a state corresponding to the Layer 2 network transaction batch-packet to be invalid, initiating a dispute resolution transaction for the Layer 2 network transaction batch-packet, wherein the second node is at least one node in the consortium blockchain system which is other than the first node and configured as an observer.

2. The method according to claim 1, after initiating the dispute resolution transaction for the Layer 2 network transaction batch-packet, further including:

after a quantity of dispute resolution transactions of the Layer 2 network transaction batch-packet satisfies a dispute triggering threshold of the rollup contract, stopping on-chain of the Layer 2 network transaction batch-packet initiated by the first node, and entering a dispute resolution mode.

3. The method according to claim 2, wherein entering the dispute resolution mode includes:
receiving an update transaction initiated by at least one second node, wherein the state update transaction is configured to instruct updating a state corresponding to the Layer 2 network transaction batch-packet and states corresponding to other Layer 2 network transaction batch-packets on- chained after the Layer 2 network transaction batch-packet; and

after a quantity of update transactions for the Layer 2 network transaction batch-packet satisfies an update quantity threshold of the rollup contract, changing the state corresponding to the Layer 2 network transaction batch-packet on-chained and the states corresponding to the Layer 2 network transaction batch-packet on-chained after the Layer 2 network transaction batch-packet.

4. The method according to claim 3, after changing the state corresponding to the Layer 2 network transaction batch-packet on-chained and the states corresponding to the Layer 2 network transaction batch-packet on-chained after the Layer 2 network transaction batch-packet, further including:

after the first node successfully reconstructs the Layer 2 network transaction batch-packet, restoring the rollup mode through the rollup contract.

5. The method according to claim 3, further including:

after the first node fails to reconstruct the Layer 2 network transaction batch-packet, re-consensusing a third node as the executor, wherein the third node is any node in the consortium blockchain system other than the first node.

6. The method according to any one of claims 1-5, before packaging all Layer 2 network transactions into the plurality of Layer 2 network transaction batch-packets, further including:
- initiating an appointment transaction request by the first node, wherein the appointment transaction request is configured to apply for being designated as an executor; and
 - after the mechanism of the rollup contract in the consortium blockchain system is satisfied, determining the first node as the executor and determining other nodes in the consortium blockchain system as observers.
7. The method according to any one of claims 1-5, wherein:
- the Layer 2 network transaction batch-packet includes a first state root corresponding to each Layer 2 network transaction; and
 - the second node determines the state corresponding to the Layer 2 network transaction batch-packet to be invalid includes:
 - the second node determining a second state root based on each Layer 2 network transaction in the Layer 2 network transaction batch-packet, and if the first state root and the second state root are different, determining the state corresponding to the Layer 2 network transaction batch-packet to be invalid.
8. The method according to any one of claims 1-5, wherein after the quantity of the update transactions for the Layer 2 network transaction batch-packet satisfies the update quantity threshold of the rollup contract, changing the Layer 2 network transaction batch-packet on-chained includes:

after the quantity of the update transactions for the Layer 2 network transaction batch-packet satisfies a first threshold of the rollup contract, and after a quantity of identical second state roots in the update transactions satisfies a second threshold, changing the first state root of the Layer 2 network transaction batch-packet on-chained to the second state root.

9. A system for processing blockchain transaction, comprising:

a first node and a second node, wherein based on rollup contract voting transactions initiated by all nodes in a consortium blockchain system, the consortium blockchain system is in a rollup mode, wherein:

the first node is configured to, after each Layer 2 network transaction indicated by a rollup contract is executed, package all Layer 2 network transactions into a plurality of Layer 2 network transaction batch-packets which is on-chained to the consortium blockchain system, wherein the first node is any node in the consortium blockchain system and determined to be an executor of a Layer 2 network through a mechanism of the rollup contract in the consortium blockchain system; and

the second node is configured to, for any Layer 2 network transaction batch-packet on-chained by the executor, when a second node determines a state corresponding to the Layer 2 network transaction batch-packet to be invalid, initiate a dispute resolution transaction for the Layer 2 network transaction batch-packet, wherein the second node is at least one node in the consortium blockchain system which is other than the first node and configured as an observer.

10. A computer-readable storage medium, wherein the computer-readable storage medium stores a computer program; and when the computer program is run, the computer program executes the method in any one of claims 1 to 8.

11. A computing device, comprising:

a memory, configured to store program instructions; and

a processor, configured to call the program instructions stored in the memory and execute the method in any one of claims 1 to 8 according to an obtained program.