[0006] According to a second aspect of embodiments of the present disclosure, provided is a method of processing a transaction based on a dedicated blockchain node device, which is applied to a smart network card of the dedicated blockchain node device. The dedicated blockchain node device further includes a Central Processing Unit (CPU) and is any node of a blockchain network. The method includes: when the dedicated blockchain node device accepts a transaction through the smart network card, writing the accepted transaction into a network card cache; performing consensus interaction with other nodes of the blockchain network based on the transaction in the network card cache in a process that the dedicated blockchain node device participates in a blockchain consensus; and determining and sending a to-be-executed transaction list to the CPU based on a result of the consensus.

[0007] According to a third aspect of embodiments of the present disclosure, provided is another method of processing a transaction based on a dedicated blockchain node device, which is applied to a Central Processing unit (CPU) of the dedicated blockchain node device. The dedicated blockchain node device further includes a smart network card and is any node of a blockchain network. The method includes: executing, by the CPU, transaction based on a to-be-executed transaction list sent by the smart network card, and completing transaction chaining.

[0008] According to a fourth aspect of embodiments of the present disclosure, provided is an apparatus for processing a transaction based on a dedicated blockchain node device, which is applied to a smart network card of the dedicated blockchain node device. The dedicated blockchain node device further includes a Central Processing Unit (CPU) and is any node of a blockchain network. The apparatus includes: a caching module, configured to, when the dedicated blockchain node device accepts a transaction through the smart network card, write the accepted transaction into a network card cache; a consensus interacting module, configured to perform consensus interaction with other nodes of the blockchain network based on the transaction in the network card cache in a process that the dedicated blockchain node device participates in a blockchain consensus; and a sending module, configured to determine and send a to-be-executed transaction list to the CPU based on a result of the consensus.

[0009] According to a fifth aspect of embodiments of the present disclosure, provided is an apparatus for processing a transaction based on a dedicated blockchain node device, which is applied to a Central Processing unit (CPU) of the dedicated blockchain node device. The dedicated blockchain node device further includes a smart network card and is any node of a blockchain network. The apparatus includes: a chaining executing module, configured to execute transaction based on a to-be-executed transaction list sent by the smart network card

and complete transaction chaining.

[0010] In the technical solutions according to the embodiments of the present disclosure, the dedicated blockchain node device includes a CPU and a smart network card, the smart network card is a network card having a built-in processor or microprocessor and can perform data computation and processing. The smart network card can replace the CPU to actually participate in a blockchain consensus on behalf of the dedicated blockchain node device, and send a to-be-executed transaction list to the CPU for transaction execution and transaction chaining based on a result of the consensus.

[0011] According to the embodiments of the present disclosure, the following technical effects can be achieved by transferring operations such as blockchain consensus needing frequent network interaction with other nodes from the CPU to the smart network card:

[0012] 1. The smart network card is specifically in charge of blockchain consensus, while the CPU focuses on transaction execution and transaction chaining. In this case, the operation efficiency of the dedicated blockchain node device serving as a node can be improved, and the CPU can also execute more transactions within a unit time, thereby improving throughput.

[0013] 2. In a blockchain consensus process, the network traffic does not need to flow through the CPU but is received by the smart network card for direct processing and feedback. Thus, the CPU does not participate in the consensus process, so that the feedback delay of the dedicated blockchain node device in the consensus process is reduced.

[0014] It should be understood that the above general descriptions and the subsequent detailed descriptions are merely examples and illustrative, and are not intended to limit the embodiments of the present disclosure.

[0015] In addition, any of the embodiments of the present disclosure is not needed to achieve all effects above-mentioned.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] To describe the technical solutions in the embodiments of the present disclosure or in the existing technology more clearly, drawings needed in descriptions of the embodiments of the present disclosure or the existing technology will be briefly introduced below. It is clear that the drawings described below are merely some embodiments of the present disclosure and other drawings can also be obtained by those of ordinary skill in the art based on these drawings.

[0017] FIG. 1 is a structural schematic diagram of a dedicated blockchain node device according to embodiments of the present disclosure.

[0018] FIG. 2 is a structural schematic diagram of a blockchain system according to

time length between an acceptance time point and a current time point. The smart network card can compare the currently accepted transaction with the historically accepted transactions in the transaction identification pool.

[0096] Further, in an actual application, a transaction usually has a valid time length. If a transaction acceptance time is too long from now, the transaction will become invalid. It is meaningless to replay those historically accepted transactions that are too old. Therefore, the above-mentioned designated time length can be specifically set to be no less than a valid time length of a transaction.

[0097] In embodiments of the present disclosure, the smart network card can classify those identified replay transactions into a replay transaction set. The replay transaction set does not participate in the blockchain consensus, or the replay transaction set is not sent to the CPU. Therefore, the replay transaction can be filtered. In addition, the smart network card can also discard the replay transaction.

[0098] According to the method shown in FIG. 6, a dedicated blockchain node device includes a CPU and a smart network card, and the smart network card is a network card having a built-in processor or microprocessor and can perform data computing and processing. The smart network card can replace the CPU to perform replay transaction identification.

[0099] According to the embodiments of the present disclosure, the following technical effects can be achieved:

[00100] 1. The smart network card is specifically in charge of identifying a replay transaction to offload this part of operation burden for the CPU. In this case, the operation efficiency of the dedicated blockchain node device serving as a node is improved and the CPU can also execute more transactions within a unit time, thereby improving throughput.

[00101] 2. The replay transaction can be identified and filtered at the smart network card thus the replay transaction generally will not flow through the CPU, so that the replay transaction can be identified and filtered more rapidly.

[00102] FIG. 7 is a flowchart of a method of identifying a to-be-filtered transaction based on a dedicated blockchain node device according to embodiments of the present disclosure. The method includes the following steps:

[00103] At step S700, when the dedicated blockchain node device accepts a transaction through a smart network card, the smart network card determines whether the currently accepted transaction satisfies a predetermined filtering condition.

[00104] At step S702, if the smart network card determines that the currently accepted transaction satisfies the predetermined filtering condition, the smart network card determines the currently accepted transaction as a to-be-filtered transaction.

The smart network card can replace the CPU to perform to-be-filtered transaction identification.

[00113] According to the embodiments of the present disclosure, the following technical effects can be achieved:

[00114] 1. The smart network card is specifically in charge of identifying a to-be-filtered transaction to offload this part of operation burden for the CPU. In this case, the operation efficiency of the dedicated blockchain node device serving as a node is improved and the CPU can also execute more transactions within a unit time, thereby improving throughput.

[00115] 2. The to-be-filtered transaction can be identified and filtered at the smart network card and thus the to-be-filtered transaction generally will not flow through the CPU, so that the to-be-filtered transaction is identified and filtered more rapidly.

[00116] FIG. 8 is a structural schematic diagram of an apparatus for processing a transaction based on a dedicated blockchain node device according to embodiments of the present disclosure. The apparatus is applied to a smart network card of the dedicated blockchain node device, and the dedicated blockchain node device further includes a CPU and is any node of a blockchain network. The apparatus includes: a caching module 801, configured to, when the dedicated blockchain node device accepts a transaction through the smart network card, write the accepted transaction into a network card cache; a consensus interacting module 802, configured to perform consensus interaction with other nodes of the blockchain network based on the transaction in the network card cache in a process that the dedicated blockchain node device participates in a blockchain consensus; and a sending module 803, configured to determine and send a to-be-executed transaction list to the CPU based on a result of the consensus.

[00117] FIG. 9 is a structural schematic diagram of an apparatus for processing a transaction based on a dedicated blockchain node device according to embodiments of the present disclosure. The apparatus is applied to a CPU of the dedicated blockchain node device, and the dedicated blockchain node device further includes a smart network card and is any node of a blockchain network. The apparatus includes: a chaining executing module 901, configured to execute transaction based on a to-be-executed transaction list sent by the smart network card and complete transaction chaining.

[00118] FIG. 10 is a structural schematic diagram of an apparatus for synchronizing data based on a dedicated blockchain node device according to embodiments of the present disclosure. The apparatus is applied to a smart network card of the dedicated blockchain node device, and the dedicated blockchain node device further includes a CPU and is any node of a blockchain network. The apparatus includes: an inquiring module 1001, configured to inquire

other nodes about whether there is to-be-synchronized block data; a pulling module 1002, configured to pull the to-be-synchronized block data from other nodes if determining that there is the to-be-synchronized block data; and a providing module 1003, configured to provide the to-be-synchronized block data for the CPU.

[00119] FIG. 11 is a structural schematic diagram of an apparatus for synchronizing data based on a dedicated blockchain node device according to embodiments of the present disclosure. The apparatus is applied to a CPU of the dedicated blockchain node device, and the dedicated blockchain node device further includes a smart network card and is any node of a blockchain network. The apparatus includes: a synchronizing module 1101, configured to complete data synchronization based on to-be-synchronized block data.

[00120] FIG. 12 is a structural schematic diagram of an apparatus for transferring a transaction based on a dedicated blockchain node device according to embodiments of the present disclosure. The apparatus is applied to a smart network card of the dedicated blockchain node device, and the dedicated blockchain node device further includes a CPU and is any node of a blockchain network. The apparatus includes: a determining module 1201, configured to determine other to-be-transferred nodes when the dedicated blockchain node device accepts a transaction through the smart network card; and a transferring module 1202, configured to transfer the transaction to the to-be-transferred nodes.

[00121] FIG. 13 is a structural schematic diagram of an apparatus for identifying a replay transaction based on a dedicated blockchain node device according to embodiments of the present disclosure. The apparatus is applied to a smart network card of the dedicated blockchain node device, and the dedicated blockchain node device further includes a CPU and is any node of a blockchain network. The apparatus includes: an identifying module 1301, configured to, when the dedicated blockchain node device accepts a transaction through the smart network card, identify currently accepted transaction, including: comparing the currently accepted transaction with historically accepted transactions in a network card cache; and if a comparison result indicates that there is a historically accepted transaction same as the currently accepted transaction, determining the currently accepted transaction as a replay transaction.

[00122] FIG. 14 is a structural schematic diagram of an apparatus for identifying a to-be-filtered transaction based on a dedicated blockchain node device according to embodiments of the present disclosure. The apparatus is applied to a smart network card of the dedicated blockchain node device, and the dedicated blockchain node device further includes a CPU and is any node of a blockchain network. The apparatus includes: an identifying module 1401, configured to, when the dedicated blockchain node device accepts a

transaction through the smart network card, identify currently accepted transaction, including: determining whether the currently accepted transaction satisfies a predetermined filtering condition; and if determining that the currently accepted transaction satisfies the predetermined filtering condition, determining the currently accepted transaction as a to-be-filtered transaction.

[00123] Embodiments of the present disclosure further provide a computer device at least including a memory, a CPU, a smart network card, and computer programs that are stored on the memory and run on the smart network card. When executing the programs, the smart network card implements the functions of each method in the present disclosure.

[00124] FIG. 15 is a hardware structural schematic diagram of a more specific computer device according to embodiments of the present disclosure. The device can include: a processor 1510, a memory 1520, an input/output interface 1530, a communication interface 1540 and a bus 1550. The processor 1510, the memory 1520, the input/output interface 1530 and the communication interface 1540 realize communication connection with each other in the device through the bus 1550.

[00125] The processor 1510 can be implemented by a general central processing unit (CPU), a microprocessor, an application specific integrated circuit (ASIC), or one or more integrated circuits, or the like to execute relevant programs, so as to implement the technical solutions according to the embodiments of the present disclosure.

[00126] The memory 1520 can be implemented by a read only memory (ROM), a random access memory (RAM), a static storage device, a dynamic storage device, or the like. The memory 1520 can store an operating system and other application programs. When the technical solutions according to the embodiments of the present disclosure are implemented by software or firmware, relevant program codes stored in the memory 1520 are invoked and executed by the processor 1510.

[00127] The input/output interface 1530 is used to connect an inputting/outputting module, so as to realize information input and output. The inputting/outputting module can be configured as a component (not shown) in the device, or can be externally connected to the device to provide corresponding functions. The input device can include a keyboard, a mouse, a touch screen, a microphone, various sensors, and the like, and the output device can include a display, a speaker, a vibrator, an indicator light, and the like.

[00128] The communication interface 1540 is used to connect a communication module (not shown), so as to realize communication interaction between the device and other devices. The communication module can realize communication in a wired manner (such as a USB and a network cable) or in a wireless manner (such as a mobile network, WIFI and Bluetooth).

CLAIMS

1. A method of processing a transaction based on a dedicated blockchain node device, wherein the dedicated blockchain node device comprises a Central Processing Unit CPU and a smart network card and is any node of a blockchain network, and the method comprises:

when the dedicated blockchain node device accepts a transaction through the smart network card, writing, by the smart network card, the accepted transaction into a network card cache;

performing, by the smart network card, consensus interaction with other nodes of the blockchain network based on the transaction in the network card cache in a process that the dedicated blockchain node device participates in a blockchain consensus;

determining and sending, by the smart network card, a to-be-executed transaction list to the CPU based on a result of the consensus; and

executing, by the CPU, transaction based on the to-be-executed transaction list, and completing transaction chaining.

2. The method according to claim 1, wherein the dedicated blockchain node device accepts the transaction through the smart network card, the method further comprises:

sending, by the smart network card, the accepted transaction to the CPU; and

writing, by the CPU, the received transaction into a CPU cache;

wherein the to-be-executed transaction list comprises a transaction identifier of each to-be-executed transaction determined based on the present blockchain consensus.

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

in the process that the dedicated blockchain node device participates in the blockchain consensus, sending, by the smart network card, consensus configuration modification information to the CPU if receiving the consensus configuration modification information; and

modifying, by the CPU, a consensus configuration locally stored in the dedicated blockchain node device based on the consensus configuration modification information.

4. The method according to claim 1, further comprising:

sending, by the CPU, an execution result generated by executing transaction based on the to-be-executed transaction list to the smart network card; and

receiving, by the smart network card, the execution result as reference information of a

next blockchain consensus.

5. A dedicated blockchain node device, comprising a Central Processing Unit CPU and a smart network card, and the dedicated blockchain node device being any node of a blockchain network; wherein,

when the dedicated blockchain node device accepts a transaction through the smart network card, the smart network card writes the accepted transaction into a network card cache; the smart network card performs consensus interaction with other nodes of the blockchain network based on the transaction in the network card cache in a process that the dedicated blockchain node device participates in a blockchain consensus; the smart network card determines and sends a to-be-executed transaction list to the CPU based on a result of the consensus; and

the CPU executes transaction based on the to-be-executed transaction list and completes transaction chaining.

6. The dedicated blockchain node device according to claim 5, wherein in the process that the dedicated blockchain node device participates in the blockchain consensus, the smart network card sends consensus configuration modification information to the CPU if receiving the consensus configuration modification information; and

the CPU modifies a consensus configuration locally stored in the dedicated blockchain node device based on the consensus configuration modification information.

7. The dedicated blockchain node device according to claim 5, wherein the CPU, sends an execution result generated by executing transaction based on the to-be-executed transaction list to the smart network card; and

the smart network card receives the execution result as reference information of a next blockchain consensus.

8. A method of processing a transaction based on a dedicated blockchain node device, being applied to a smart network card of the dedicated blockchain node device, wherein the dedicated blockchain node device further comprises a Central Processing Unit CPU, and is any node of a blockchain network, and the method comprises:

when the dedicated blockchain node device accepts a transaction through the smart network card, writing the accepted transaction into a network card cache;

performing consensus interaction with other nodes of the blockchain network based on the transaction in the network card cache in a process that the dedicated blockchain node

device participates in a blockchain consensus; and

determining and sending a to-be-executed transaction list to the CPU based on a result of the consensus.

9. A method of processing a transaction based on a dedicated blockchain node device, being applied to a Central Processing Unit CPU of the dedicated blockchain node device, wherein the dedicated blockchain node device further comprises a smart network card, and is any node of a blockchain network, and the method comprises:

executing, by the CPU, transaction based on a to-be-executed transaction list sent by the smart network card, and completing transaction chaining.

10. An apparatus for processing a transaction based on a dedicated blockchain node device, being applied to a smart network card of the dedicated blockchain node device, wherein the dedicated blockchain node device further comprises a Central Processing Unit CPU and is any node of a blockchain network, and the apparatus comprises:

a caching module, configured to, when the dedicated blockchain node device accepts a transaction through the smart network card, write the accepted transaction into a network card cache;

a consensus interacting module, configured to perform consensus interaction with other nodes of the blockchain network based on the transaction in the network card cache in a process that the dedicated blockchain node device participates in a blockchain consensus; and

a sending module, configured to determine and send a to-be-executed transaction list to the CPU based on a result of the consensus.

11. An apparatus for processing a transaction based on a dedicated blockchain node device, being applied to a Central Processing Unit CPU of the dedicated blockchain node device, wherein the dedicated blockchain node device further comprises a smart network card and is any node of a blockchain network, and the apparatus comprises:

a chaining executing module, configured to execute transaction based on a to-be-executed transaction list sent by the smart network card and complete transaction chaining.

12. A blockchain system, comprising a blockchain network, wherein at least one node of the blockchain network is the dedicated blockchain node device according to any one of claims 5-7.