

CLAIMS

1. A blockchain integrated station, comprising a blockchain node device, the blockchain node device comprising a smart network card, a central processing unit, a smart contract processing chip, a memory, and a cryptographic accelerator card; wherein

the smart network card is configured to perform transaction consensus with other nodes in a blockchain network to which the blockchain node device belongs, and upload a transaction that passed the transaction consensus to the central processing unit;

the central processing unit is configured to receive the transaction uploaded by the smart network card and send the transaction for calling a smart contract to the smart contract processing chip;

the smart contract processing chip is configured to receive the transaction sent by the central processing unit and execute the smart contract called by the transaction and comprises a calculation module, an encryption and decryption module, and a negotiation module;

the encryption and decryption module is configured to: in a case that the transaction sent by the central processing unit is a ciphertext transaction, decrypt the ciphertext transaction by using a node private key of the blockchain node device and encrypt a contract status value involved in the smart contract called by the ciphertext transaction by using a service key, wherein the node private key corresponds to a node public key, and the transaction is encrypted and transmitted by using the node public key by a client device and the encrypted and transmitted transaction is decrypted by using the node private key by the blockchain node device, and wherein the service key is a symmetric key used to encrypt and store service data;

the calculation module is electrically connected to the central processing unit and the encryption and decryption module and is configured to receive a plaintext transaction sent by the central processing unit and call a corresponding smart contract, and is configured to receive a plaintext transaction content obtained after the encryption and decryption module decrypts the ciphertext transaction, call the corresponding smart contract, and return the contract status value to the encryption and decryption module for encryption;

the negotiation module is configured to generate negotiation information, and the negotiation information is used for generating a file deployment key and a service secret deployment key through negotiation;

the memory is configured to store blockchain data and status data;

the cryptographic accelerator card comprises a key management module and a signature module;

the key management module is configured to maintain a root of trust key; and

the signature module is electrically connected to the key management module, the negotiation module, and the smart network card, and is configured to read the root of trust key and sign the negotiation information, and send the signed negotiation information to a provider of the blockchain integrated station via the smart network card, so that the provider deploys a binary image file corresponding to the blockchain node device on the blockchain integrated station by using the file deployment key obtained through negotiation, wherein the binary image file encrypted by using the file deployment key is received by the smart contract processing chip from the provider and the encrypted binary image file is decrypted by the smart contract processing chip based on the file deployment key, and deploys the node private key and the service key on the smart contract processing chip through the service secret deployment key, wherein the node private key and the service key of the blockchain node are encrypted by using the service secret deployment key and are received by the smart contract processing chip from the provider, so that the smart contract processing chip decrypts the node private key and the service key by using the service secret deployment key and deploys the node private key and the service key locally.

2. The blockchain integrated station according to claim 1, wherein the smart network card comprises:

a storage module, configured to record a transaction filtering rule; and
a filtering module, electrically connected to the storage module and configured to read the transaction filtering rule recorded in the storage module, and perform filtering after parsing the received transaction based on the transaction filtering rule, so that a filtered transaction participates in the transaction consensus.

3. The blockchain integrated station according to claim 1, wherein

the smart contract processing chip comprises a plurality of calculation modules, and the plurality of calculation modules are configured to execute smart contracts called by different transactions in parallel.

4. The blockchain integrated station according to claim 1, wherein the smart contract processing chip is obtained by configuring an FPGA chip by using a predefined circuit logic configuration file.

5. The blockchain integrated station according to claim 4, wherein the blockchain node device further comprises a flash chip; the flash chip is electrically connected to the smart contract processing chip, and the flash chip is configured to store the predefined circuit logic configuration file.

6. The blockchain integrated station according to claim 1, further comprising an off-chain

computing node device, wherein the off-chain computing node device is configured to:

in response to an off-chain contract calling request initiated by the blockchain node device, execute an off-chain contract indicated by the off-chain contract calling request, and return an execution result of the off-chain contract to the blockchain node device; wherein

the off-chain contract is pre-deployed on the off-chain computing node device.

7. The blockchain integrated station according to claim 1, further comprising a cross-chain proxy server, wherein the cross-chain proxy server is configured to:

in response to an external data access request initiated by the blockchain node device, perform at least one of: accessing a target blockchain network or a remote server to send data to the target blockchain network or the remote server, or returning an access result to the blockchain node device.

8. The blockchain integrated station according to claim 1, further comprising a certificate authority device, wherein the certificate authority device is configured to:

in response to an authentication request initiated by the blockchain node device, verify the authentication request; and

in response to that the authentication request passes verification, send a digital certificate to the blockchain node device by using a root certificate, wherein the root certificate is generated based on a certificate authority service started by the certificate authority device.

9. The blockchain integrated station according to any one of the preceding claims, comprising one or more additional blockchain node devices different from the blockchain node device, each of the one or more additional blockchain node devices corresponding to a respective node in the blockchain network.

10. A blockchain network, comprising a plurality of blockchain nodes formed by the blockchain integrated station according to any one of claims 1 to 9.