SYSTEMS AND METHODS FOR INTERCEPTION OF SMART CONTRACTS

CROSS REFERENCE TO RELATED APPLICATIONS

[01] This application claims priority to U.S. Provisional Patent Application No. 62/396,293, filed on September 19, 2016, and U.S. Patent Application No. 15/707,571, filed on September 18, 2017, each of which are hereby incorporated by reference herein in their entireties.

BACKGROUND INFORMATION

[02] Distributed ledger systems provide a platform for the execution of smart contracts. Smart contracts typically include program instructions that may be executed in response to a transaction in the distributed ledger system addressed to the contract. Smart contracts may also represent legal contracts between users, with program functions of the smart contracts implementing terms, conditions, etc. of the legal contract.

[03] Properties of distributed ledger systems provide improved immutability of data, such as transactions and smart contracts of such systems, ensuring that such data may be written to the system but not tampered with. Implementing legal contracts and other functionality using smart contracts thus provides a highly reliable way to implement such functions.

[04] Unfortunately, problems exist with the execution of smart contracts in distributed ledger systems. For example, a legal contract represented by the smart contract may represent an illegal transaction in some jurisdictions. Additionally, the smart contract may include logical errors that cause it to execute a transaction different from that agreed to by parties to the legal contract. However, the immutability of the transactions, contracts, etc. provided by the distributed ledger system may be a barrier to actions to stop execution of such a contract.

[05] Thus, a need exists for systems and methods to provide improved intervention in the operation of smart contracts in a distributed ledger system.

SUMMARY

[05a] According to a first aspect of the present invention, there is provided a method of intervening in the operation of a smart contract in a distributed ledger system, the method comprising: launching, by a distributed node of the distributed ledger system, execution of the smart contract; upon launching execution of the smart contract, executing a judgment checking function to determine whether a judgment against the smart contract exists in a judgment database; in response to a judgment against the smart contract existing in the

judgment database, intervening in the operation of the smart contract to prevent execution of the smart contract by the distributed node; and in response to no judgment against the smart contract existing in the judgment database, continuing execution of the smart contract by the distributed node.

[05b] According to a second aspect of the present invention, there is provided a method of intervening in the operation of a smart contract in a distributed ledger system, the method comprising: determining, by a server system, a judgment of a validity of a complaint against the smart contract based on input received from one or more judge systems; in response to the judgment upholding the validity of the complaint against the smart contract, recording the judgment in a judgment database; receiving a request, from a judgment checking function, to determine whether the judgment against the smart contract exists in the judgment database in response to launching execution of the smart contract; and transmitting a response to the request indicating whether the judgment exists in the judgment database.

[05c] According to a third aspect of the present invention, there is provided a system for intervening in the operation of a smart contract in a distributed ledger system, the system configured to: launch execution of the smart contract; upon launching execution of the smart contract, execute a judgment checking function to determine whether a judgment against the smart contract exists in a judgment database; in response to a judgment against the smart contract existing in the judgment database, intervene in the operation of the smart contract to prevent the execution of the smart contract; and in response to no judgment against the smart contract existing in the judgment database, continue execution of the smart contract.

BRIEF DESCRIPTION OF THE DRAWINGS

[06] So that the features of the present invention can be understood, a number of drawings are described below. However, the appended drawings illustrate only particular embodiments of the invention and are therefore not to be considered limiting of its scope, for the invention may encompass other equally effective embodiments.

WHAT IS CLAIMED IS:

1. A method of intervening in the operation of a smart contract in a distributed ledger system, the method comprising:

launching, by a distributed node of the distributed ledger system, execution of the smart contract;

upon launching execution of the smart contract, executing a judgment checking function to determine whether a judgment against the smart contract exists in a judgment database;

in response to a judgment against the smart contract existing in the judgment database, intervening in the operation of the smart contract to prevent execution of the smart contract by the distributed node; and

in response to no judgment against the smart contract existing in the judgment database, continuing execution of the smart contract by the distributed node.

2. The method of claim 1, wherein the smart contract invokes execution of a second smart contract by the distributed node to execute the judgment checking function.

3. The method of claim 2, wherein the second smart contract performs a read of a data structure of the second smart contract storing the judgment database in a non-transitory storage medium of the distributed ledger system.

4. The method of claim 2, wherein the invoking of the second smart contract provides an output to the smart contract indicating whether the judgment against the smart contract exists in the judgment database.

5. The method of claim 1, wherein the executing of the judgment checking function is performed by a virtual machine of a distributed node of the distributed ledger system.

6. The method of claim 5, wherein the intervening in the operation of the smart contract includes at least one of: preventing execution of the smart contract by the virtual machine, or stopping execution of the smart contract by the virtual machine.

7. The method of claim 1, further comprising:

determining the judgment of a validity of a complaint against the smart contract based on input received from one or more judge systems;

in response to the judgment upholding the validity of the complaint against the smart contract, recording the judgment in the judgment database;

receiving a request, from the judgment checking function, to determine whether the judgment against the smart contract exists in the judgment database in response to launching execution of the smart contract; and

transmitting a response to the request indicating whether the judgment exists in the judgment database.

8. The method of claim 7, wherein recording the judgment in the judgment database includes generating a transaction addressed to a second smart contract of the distributed ledger system, the transaction containing an instruction to write the judgment and an identifier of the smart contract to a data structure of the second smart contract, and transmitting the transaction to a distributed node of the distributed ledger system.

9. A method of intervening in the operation of a smart contract in a distributed ledger system, the method comprising:

determining, by a server system, a judgment of a validity of a complaint against the smart contract based on input received from one or more judge systems;

in response to the judgment upholding the validity of the complaint against the smart contract, recording the judgment in a judgment database;

receiving a request, from a judgment checking function, to determine whether the judgment against the smart contract exists in the judgment database in response to launching execution of the smart contract; and

transmitting a response to the request indicating whether the judgment exists in the judgment database.

10. The method of claim 9, wherein recording the judgment in the judgment database includes generating a transaction addressed to a second smart contract of the distributed ledger system, the transaction containing an instruction to write the judgment and an identifier of the smart contract to a data structure of the second smart contract, and transmitting the transaction to a distributed node of the distributed ledger system.

11. The method of claim 9, further comprising receiving, by the server system from a complainant system, the complaint regarding the smart contract.

12. A system for intervening in the operation of a smart contract in a distributed ledger system, the system configured to:

launch execution of the smart contract;

upon launching execution of the smart contract, execute a judgment checking function to determine whether a judgment against the smart contract exists in a judgment database;

in response to a judgment against the smart contract existing in the judgment database, intervene in the operation of the smart contract to prevent the execution of the smart contract; and

in response to no judgment against the smart contract existing in the judgment database, continue execution of the smart contract.

13. The system of claim 12, wherein the smart contract invokes execution of a second smart contract by the distributed node to execute the judgment checking function.

14. The system of claim 13, wherein the second smart contract performs a read of a data structure of the second smart contract storing the judgment database in a non-transitory storage medium of the distributed ledger system.

15. The system of claim 12, further configured to:

determine the judgment of the validity of a complaint against the smart contract based on input received from one or more judge systems; and

in response to the judgment upholding the validity of the complaint against the smart contract, record the judgment in the judgment database;

receive a request, from the judgment checking function, to determine whether the judgment against the smart contract exists in the judgment database in response to launching execution of the smart contract; and

transmit a response to the request indicating that the judgment exists in the judgment database.