SYSTEMS AND METHODS FOR PROVIDING FINANCIAL DATA TO FINANCIAL INSTRUMENTS IN A DISTRIBUTED LEDGER SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Patent Application No. 62/315,919, filed on March 31, 2016, and U.S. Patent Application No. 15/473,127, filed on March 29, 2017, both of which are hereby incorporated by reference in their entireties.

BACKGROUND INFORMATION

[0002] Some types of distributed ledger systems enable a smart contract to be stored by the system for execution. Distributed applications and other configurations of these systems may build upon such smart contracts to provide various functionalities.

[0003] However, the use of smart contracts to provide functionalities has limitations. Smart contracts stored in distributed ledger systems do not themselves have direct access to data existing outside the distributed ledger system, which limits their usefulness in situations requiring such information. Smart contracts stored in distributed ledger systems are also not typically capable of acting in a fully autonomous manner, limiting their usefulness in scenarios in which it is desired that the smart contract take some action based on, e.g., outside information. Additionally, data stored in the distributed ledger system is typically publically visible, limiting the proprietary usefulness and security of smart contracts stored in distributed ledger systems relying on such data.

[0004] Furthermore, these limitations may be exacerbated in the financial field, where, for example, the closing of a financial instrument may depend upon a current price of some predefined financial equity or index etc.

[0005] Thus, a need exists for systems and methods to provide financial data to financial instruments in a distributed ledger system in an improved manner.

SUMMARY OF THE INVENTION

[0005a] According to a first aspect of the present invention, there is provided a method of providing financial data from outside of a distributed ledger system to a financial instrument smart contract executing in the distributed ledger system, the distributed ledger system not providing any direct communication between smart contracts executing in the distributed ledger system and data sources external to the distributed ledger system, the financial instrument smart contract including program instructions configured to perform a financial transaction, the financial transaction requiring specific financial data to close, the method

comprising: receiving, by an oracle smart contract during execution of program instructions of the oracle smart contract by the distributed ledger system, a first transaction from the financial instrument smart contract, the first transaction including a request for delivery of the specific financial data to the financial instrument smart contract, the request including the registration data having an identification of financial data to be delivered and an identification of a schedule on which to deliver the financial data; storing, by the oracle smart contract as a result of execution of the program instructions of the oracle smart contract by the distributed ledger system, the received registration data, including the identification of the specific financial data and the identification of the schedule, in a registration data structure of the oracle smart contract in a new ledger structure of the distributed ledger system; monitoring, by an oracle server system outside of the distributed ledger system, creation of ledger structures by the distributed ledger system to detect the new ledger structure; in response to detecting the new ledger structure of the distributed ledger system being created, retrieving, by an oracle server system, the registration data from the new ledger structure; in response to a trigger condition based on the schedule occurring, performing, by the oracle server system, at least one of: retrieving the requested financial data from a financial data system, or calculating the requested financial data; generating, by the oracle server system, a second transaction including the financial data; and transmitting, by the oracle server system, the generated transaction to at least one distributed node of the distributed ledger system at a time according to the schedule.

[0005b] According to a second aspect of the present invention, there is provided a system for providing financial data to a financial instrument smart contract in a distributed ledger system, the system comprising: at least one processor; at least one non-transitory machine-readable storage medium having program instructions, which when executed by the at least one processor cause a method for providing financial data from outside of a distributed ledger system to the financial instrument smart contract executing in the distributed ledger system to be performed, the distributed ledger system not providing any direct communication between smart contracts executing in the distributed ledger system and data sources external to the distributed ledger system, the financial instrument smart contract including program instructions configured to perform a financial transaction, the financial transaction requiring specific financial data to close, the method including: receiving, by an oracle smart contract during execution of program instructions of the oracle smart contract by the distributed ledger system, a first transaction from the financial instrument smart contract, the first transaction

including a request for delivery of the specific financial data to the financial instrument smart contract, the request including registration data having an identification of financial data to be delivered and an identification of a schedule on which to deliver the financial data; storing, by the oracle smart contract as a result of execution of the program instructions of the oracle smart contract by the distributed ledger system, the received registration data, including the identification of the specific financial data and the identification of the schedule, in a registration data structure of the oracle smart contract in a new ledger structure of the distributed ledger system; monitoring, by an oracle server system outside of the distributed ledger system, creation of ledger structures by the distributed ledger system to detect the new ledger structure; in response to detecting the new ledger structure of the distributed ledger system being created, retrieving, by an oracle server system, the registration data from the new ledger structure, the retrieving including invoking a read function of the oracle smart contract to read the registration data from the registration data structure of the oracle smart contract; in response to a trigger condition based on the schedule occurring, performing, by the oracle server system, at least one of: retrieving the requested financial data from a financial data system, or calculating the requested financial data; generating, by the oracle server system, a second transaction including the financial data; and transmitting, by the oracle server system, the generated transaction to at least one distributed node of the distributed ledger system at a time according to the schedule.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] 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.

[0007] FIG. 1 is a schematic diagram depicting an embodiment of a system for providing financial data to a financial instrument contract in a distributed ledger system.

CLAIMS

1. A method of providing financial data from outside of a distributed ledger system to a financial instrument smart contract executing in the distributed ledger system, the distributed ledger system not providing any direct communication between smart contracts executing in the distributed ledger system and data sources external to the distributed ledger system, the financial instrument smart contract including program instructions configured to perform a financial transaction, the financial transaction requiring specific financial data to close, the method comprising:

receiving, by an oracle smart contract during execution of program instructions of the oracle smart contract by the distributed ledger system, a first transaction from the financial instrument smart contract, the first transaction including a request for delivery of the specific financial data to the financial instrument smart contract, the request including registration data having an identification of financial data to be delivered and an identification of a schedule on which to deliver the financial data;

storing, by the oracle smart contract as a result of execution of the program instructions of the oracle smart contract by the distributed ledger system, the received registration data, including the identification of the specific financial data and the identification of the schedule, in a registration data structure of the oracle smart contract in a new ledger structure of the distributed ledger system;

monitoring, by an oracle server system outside of the distributed ledger system, creation of ledger structures by the distributed ledger system to detect the new ledger structure;

in response to detecting the new ledger structure of the distributed ledger system being created, retrieving, by an oracle server system, the registration data from the new ledger structure, the retrieving including invoking a read function of the oracle smart contract to read the registration data from the registration data structure of the oracle smart contract;

in response to a trigger condition based on the schedule occurring, performing, by the oracle server system, at least one of: retrieving the requested financial data from a financial data system, or calculating the requested financial data;

generating, by the oracle server system, a second transaction including the financial data; and

transmitting, by the oracle server system, the generated transaction to at least one distributed node of the distributed ledger system at a time according to the schedule.

2. The method of claim 1, further comprising:

monitoring, by the oracle server system, ledger structures created by the distributed ledger system.

3. The method of claim 2, wherein the distributed ledger system is a blockchain system, and the ledger structure is a block of the blockchain system.

4. The method of claim 2, further comprising:

decrypting, by the oracle server system, the retrieved registration data;

storing the decrypted registration data in a database of the oracle server system; and

configuring the oracle server system to deliver the requested financial data on the requested schedule.

5. The method of claim 1, wherein the second transaction is addressed to the financial instrument contract.

6. The method of claim 1, wherein the second transaction is addressed to the oracle smart contract, the method further comprising at least one of:

calling, by the oracle smart contract in response to receiving the second transaction containing the requested financial data, a function of the financial instrument smart contract to pass the requested financial data from the oracle smart contract to the financial instrument smart contract; or

generating and transmitting by the oracle smart contract a third transaction addressed to the financial instrument smart contract to deliver the financial data to the financial instrument smart contract.

7. The method of claim 5, further comprising:

generating, by the oracle server system, a new address in the distributed ledger system; and

determining, by the oracle server system, a passcode for the financial data to be delivered,

wherein the transaction addressed to the financial instrument smart contract is generated and transmitted by the oracle server system using the new address, the transaction further including the passcode.

8. The method of claim 1, wherein the identification of the financial data includes an identification of at least one of: an equity, a financial index, a commodity future, or interest rate.

9. The method of claim 1, further comprising determining, by the oracle smart contract, whether the transaction from the financial instrument smart contract contains a payment for delivery of the financial data.

10. The method of claim 1, further comprising:

determining at least one value based on the financial data; and

executing at least one function of the financial instrument smart contract based on the determined at least one value;

wherein the determining and the executing are performed by at least one of: the financial instrument smart contract, the oracle smart contract, or an oracle server system, and

the at least one function of the financial instrument includes at least one of: closing at least a portion of a financial instrument represented by the financial instrument smart contract, or making a payment required by the financial instrument.

11. A system for providing financial data to a financial instrument smart contract in a distributed ledger system, the system comprising:

at least one processor;

at least one non-transitory machine-readable storage medium having program instructions, which when executed by the at least one processor cause a method for providing

financial data from outside of a distributed ledger system to the financial instrument smart contract executing in the distributed ledger system to be performed, the distributed ledger system not providing any direct communication between smart contracts executing in the distributed ledger system and data sources external to the distributed ledger system, the financial instrument smart contract including program instructions configured to perform a financial transaction, the financial transaction requiring specific financial data to close, the method including:

receiving, by an oracle smart contract during execution of program instructions of the oracle smart contract by the distributed ledger system, a first transaction from the financial instrument smart contract, the first transaction including a request for delivery of the specific financial data to the financial instrument smart contract, the request including registration data having an identification of financial data to be delivered and an identification of a schedule on which to deliver the financial data;

storing, by the oracle smart contract as a result of execution of the program instructions of the oracle smart contract by the distributed ledger system, the received registration data, including the identification of the specific financial data and the identification of the schedule, in a registration data structure of the oracle smart contract in a new ledger structure of the distributed ledger system;

monitoring, by an oracle server system outside of the distributed ledger system, creation of ledger structures by the distributed ledger system to detect the new ledger structure;

in response to detecting the new ledger structure of the distributed ledger system being created, retrieving, by an oracle server system, the registration data from the new ledger structure, the retrieving including invoking a read function of the oracle smart contract to read the registration data from the registration data structure of the oracle smart contract;

in response to a trigger condition based on the schedule occurring, performing, by the oracle server system, at least one of: retrieving the requested financial data from a financial data system, or calculating the requested financial data;

generating, by the oracle server system, a second transaction including the financial data; and

transmitting, by the oracle server system, the generated transaction to at least one distributed node of the distributed ledger system at a time according to the schedule.

12. The system of claim 11, wherein the second transaction is addressed to the oracle smart contract, the method further comprising at least one of:

calling, by the oracle contract in response to receiving the second transaction containing the requested financial data, a function of the financial instrument smart contract to pass the requested financial data from the oracle smart contract to the financial instrument smart contract; or

generating and transmitting by the oracle smart contract a third transaction addressed to the financial instrument smart contract to deliver the financial data to the financial instrument smart contract.

13. The system of claim 11, the method further comprising:

generating, by the oracle server system, a new address in the distributed ledger system; and

determining, by the oracle server system, a passcode for the financial data to be delivered,

wherein the transaction is addressed to the financial instrument smart contract, is generated and transmitted by the oracle server system using the new address, and further includes the passcode.

14. The system of claim 11, wherein the distributed ledger system is a blockchain system.

15. The system of claim 11, the method further comprising:

determining at least one value based on the delivered financial data; and

executing at least one function of the financial instrument smart contract based on the determined at least one value,

wherein the determining and the executing are performed by at least one of: the financial instrument smart contract, the oracle smart contract, or the oracle server system, and

the at least one function of the financial instrument includes at least one of: closing at least a portion of a financial instrument represented by the financial instrument smart contract, or making a payment required by the financial instrument.