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(54) **SYSTEM AND METHOD FOR IMPLEMENTING AN INTERBANK INFORMATION NETWORK**

(71) Applicant: **JPMorgan Chase Bank, N.A.**, New York, NY (US)

(72) Inventors: **John Corwin HUNTER**, Lithia, FL (US); **Palka S. PATEL**, West Hartford, CT (US); **Luciane SANT'ANNA**, Brandon, FL (US); **Leticia Pui Sze LIM**, New York, NY (US); **Tiffany Ashley WAN**, Brooklyn, NY (US); **Elizabeth POLANCO AQUINO**, Brooklyn, NY (US); **Samer FALAH**, Staten Island, NY (US); **Sudhir UPADHYAY**, Edison, NJ (US); **Tulasi MOVVA**, Trumbull, CT (US); **Suresh SHETTY**, Karnataka (IN)

(73) Assignee: **JPMorgan Chase Bank, N.A.**, New York, NY (US)

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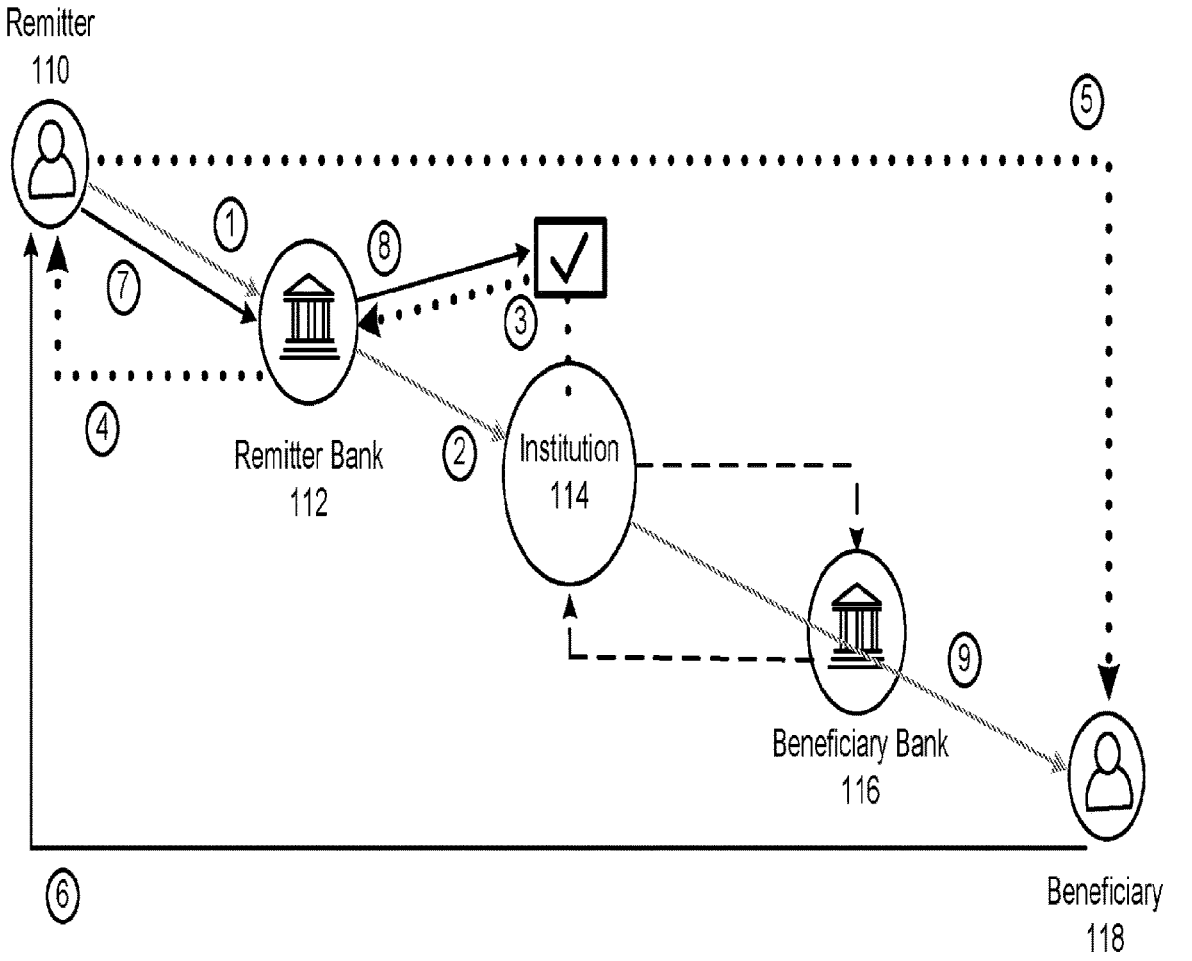
CPC ..... ***G06Q 20/027*** (2013.01); ***H04L 41/12*** (2013.01); ***H04L 67/12*** (2013.01)

(57) **ABSTRACT**

The invention relates to creating a secure, decentralized, cloud-based network or physical/virtual infrastructure that enables the payments industry to redefine payment processing and information sharing. The innovative network addresses key pain points by reducing payment delays and touch points, realizing faster and comprehensive payment tracking, real-time sanctions, AML and fraud management tools.



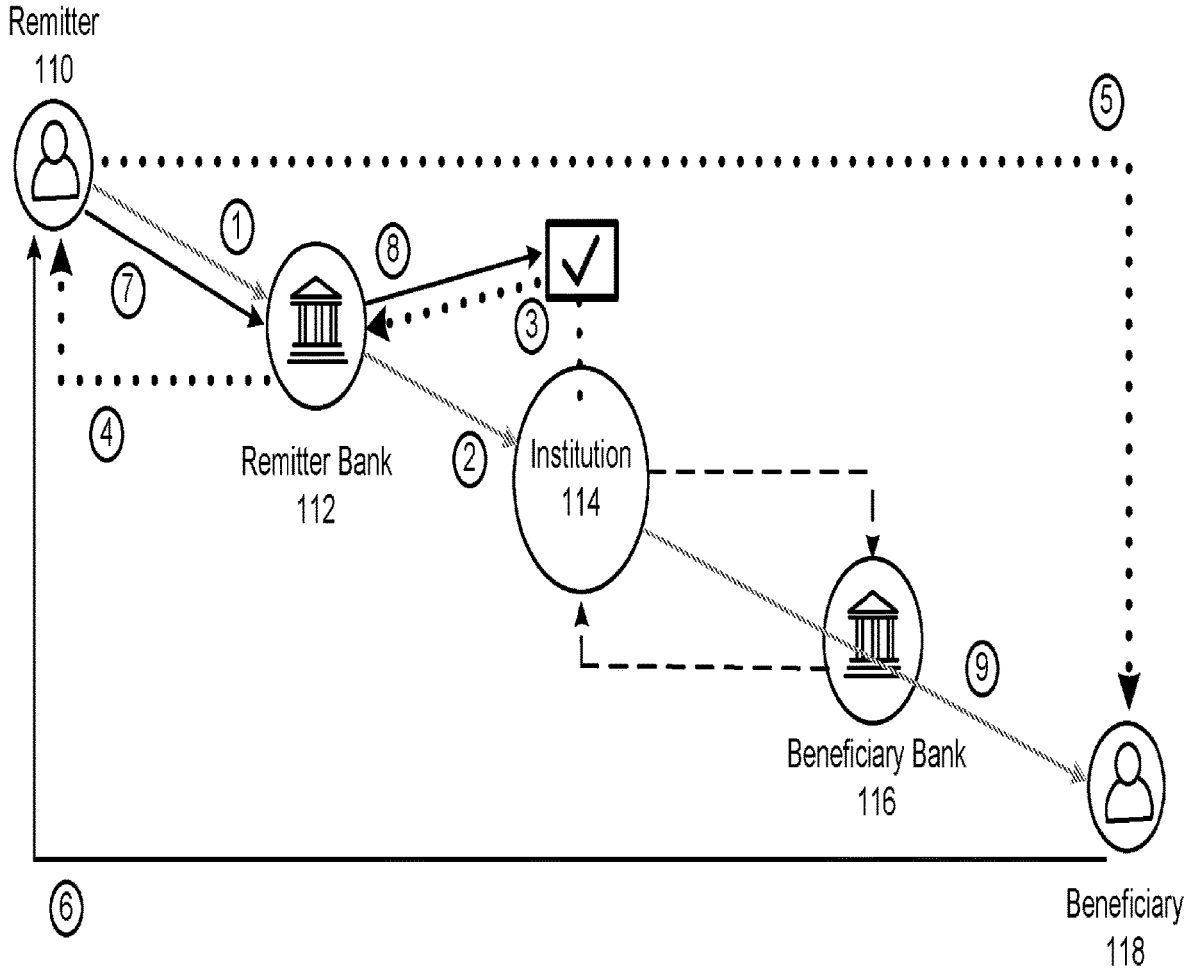

Remitter
110
Remitter Bank
112
Institution
114
Beneficiary Bank
116
Beneficiary
118
1
2
3
4
5
6
7
8
9

Figure 1

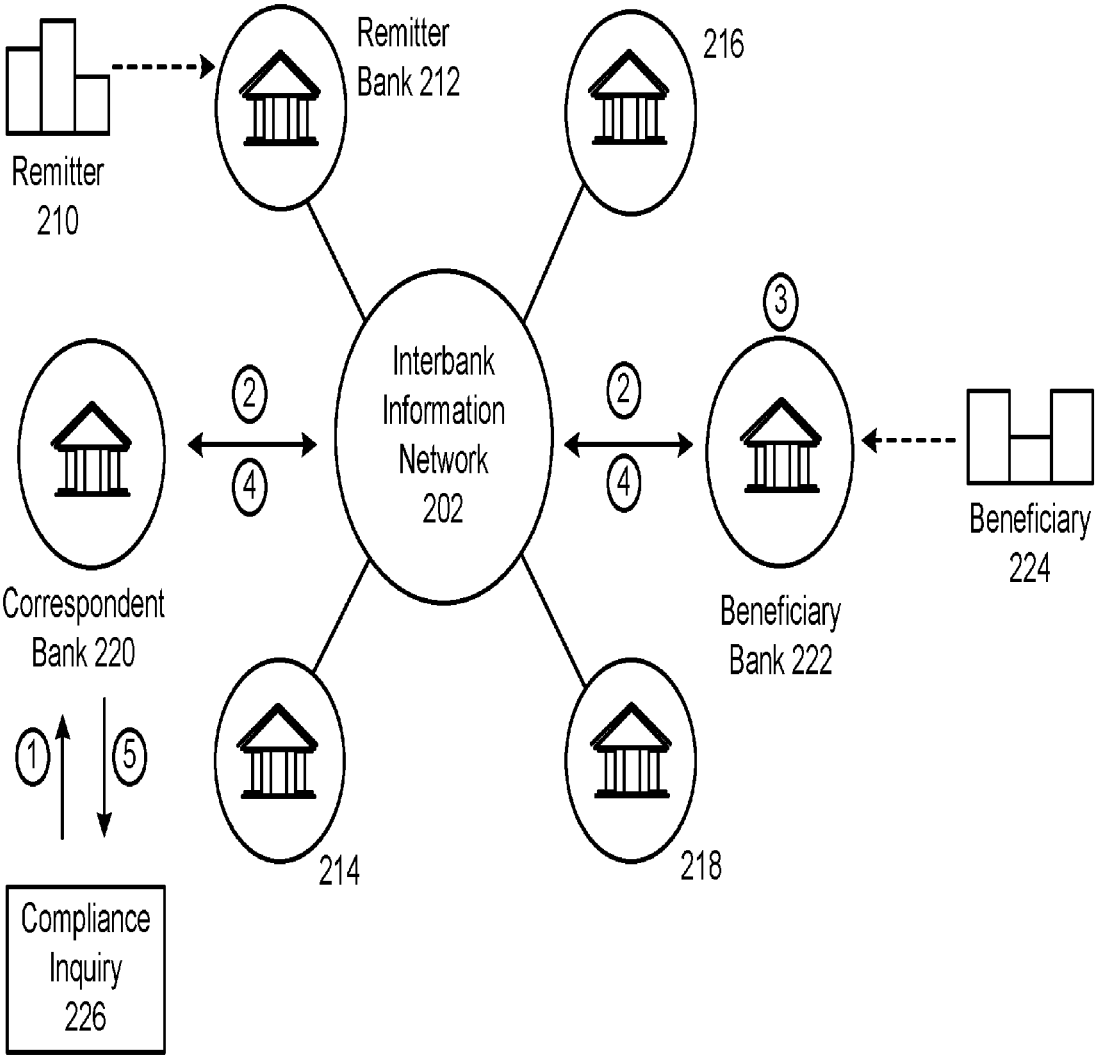

Remitter
210
Remitter
Bank 212
216
Interbank
Information
Network
202
2
4
2
4
3
Correspondent
Bank 220
Beneficiary
Bank 222
Beneficiary
224
1
5
214
218
Compliance
Inquiry
226

Figure 2

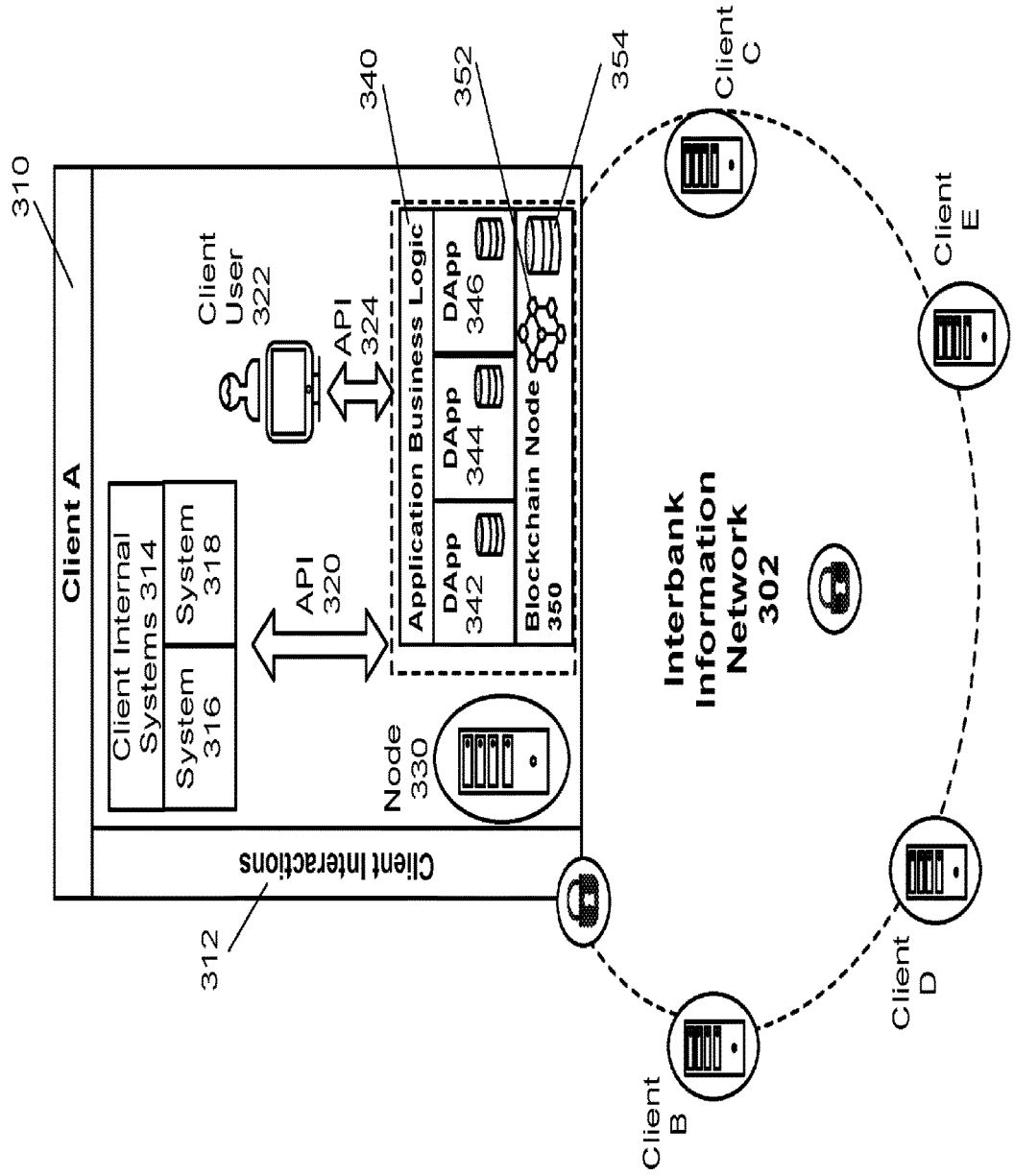

310
Client A
Client Internal Systems 314
System 316
System 318
API 320
Client User 322
API 324
340
352
354
Application Business Logic
DApp 342
DApp 344
DApp 346
Blockchain Node 350
Node 330
Client Interactions
312
Interbank Information Network 302
Client B
Client C
Client D
Client E

Figure 3

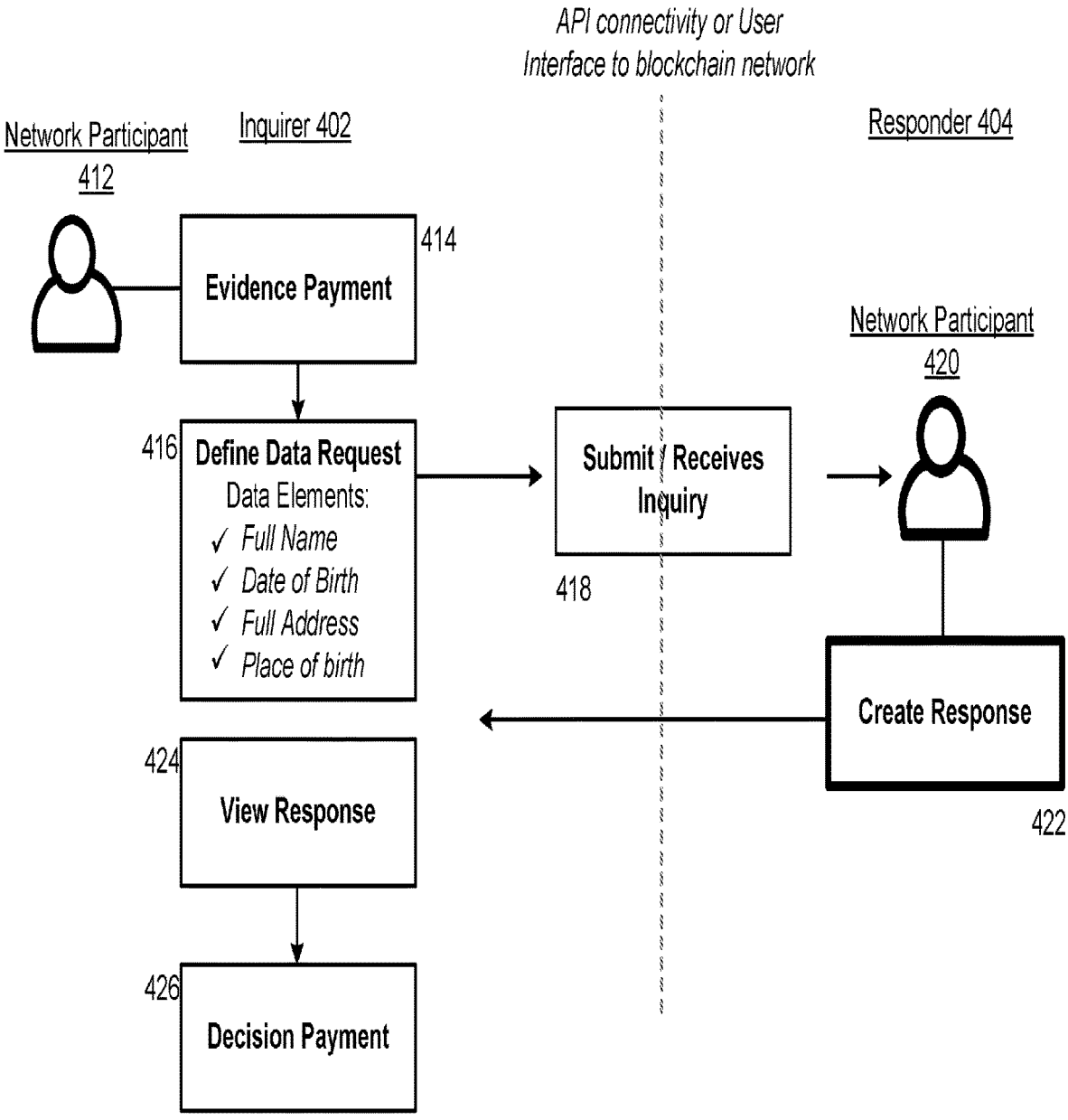

API connectivity or User Interface to blockchain network
Network Participant 412
Inquirer 402
Responder 404
414
Evidence Payment
Network Participant 420
416
Define Data Request
Data Elements:
✓ Full Name
✓ Date of Birth
✓ Full Address
✓ Place of birth
Submit / Receives Inquiry
418
Create Response
422
424
View Response
426
Decision Payment

Figure 4

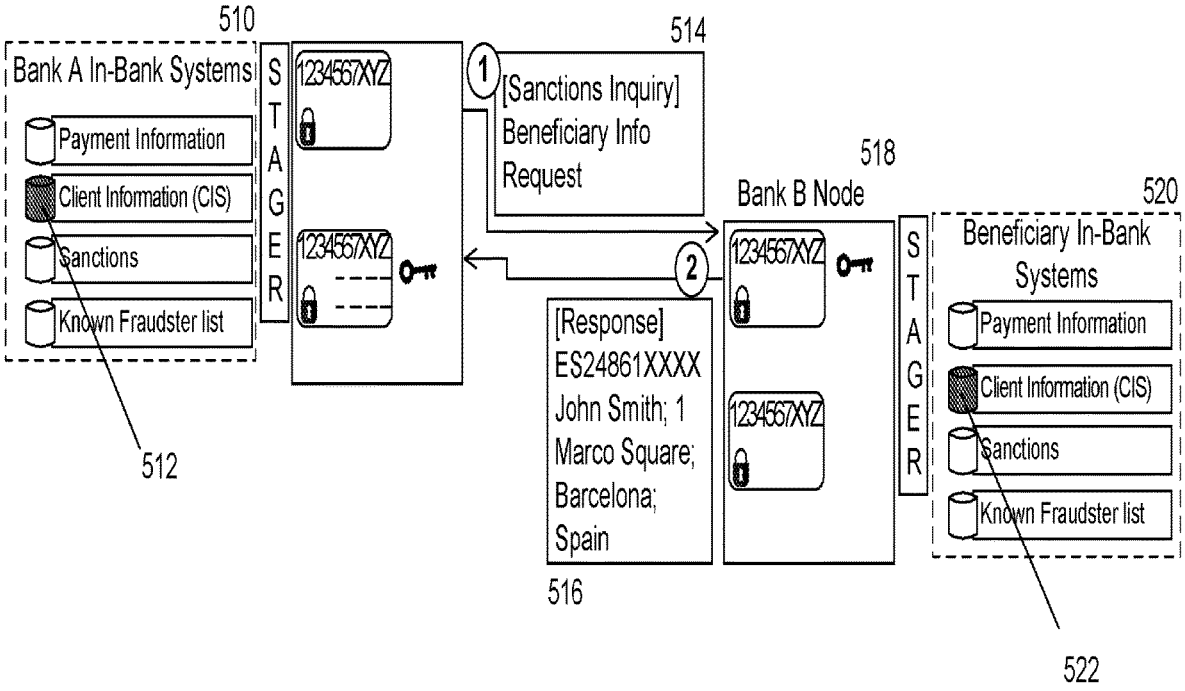

510
Bank A In-Bank Systems
Payment Information
Client Information (CIS)
Sanctions
Known Fraudster list
512
STAGER
1234567XYZ
1234567XYZ
1
514
[Sanctions Inquiry]
Beneficiary Info
Request
2
[Response]
ES24861XXXX
John Smith; 1
Marco Square;
Barcelona;
Spain
516
518
Bank B Node
1234567XYZ
1234567XYZ
STAGER
520
Beneficiary In-Bank
Systems
Payment Information
Client Information (CIS)
Sanctions
Known Fraudster list
522

Figure 5

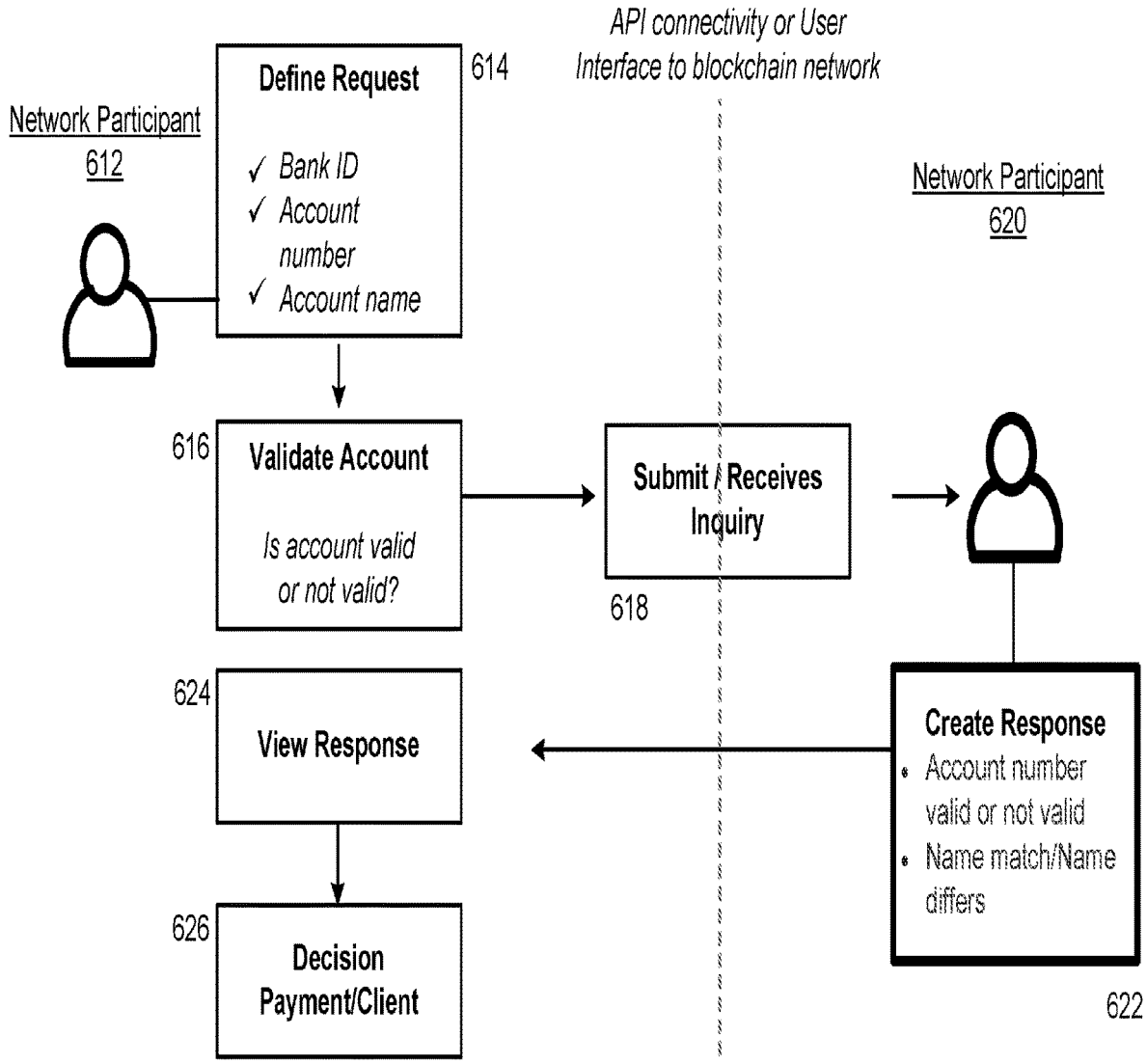

API connectivity or User Interface to blockchain network
Network Participant 612
Define Request
614
✓ Bank ID
✓ Account number
✓ Account name
Network Participant 620
616
Validate Account
Is account valid or not valid?
Submit / Receives Inquiry
618
624
View Response
Create Response
• Account number valid or not valid
• Name match/Name differs
622
626
Decision Payment/Client

Figure 6

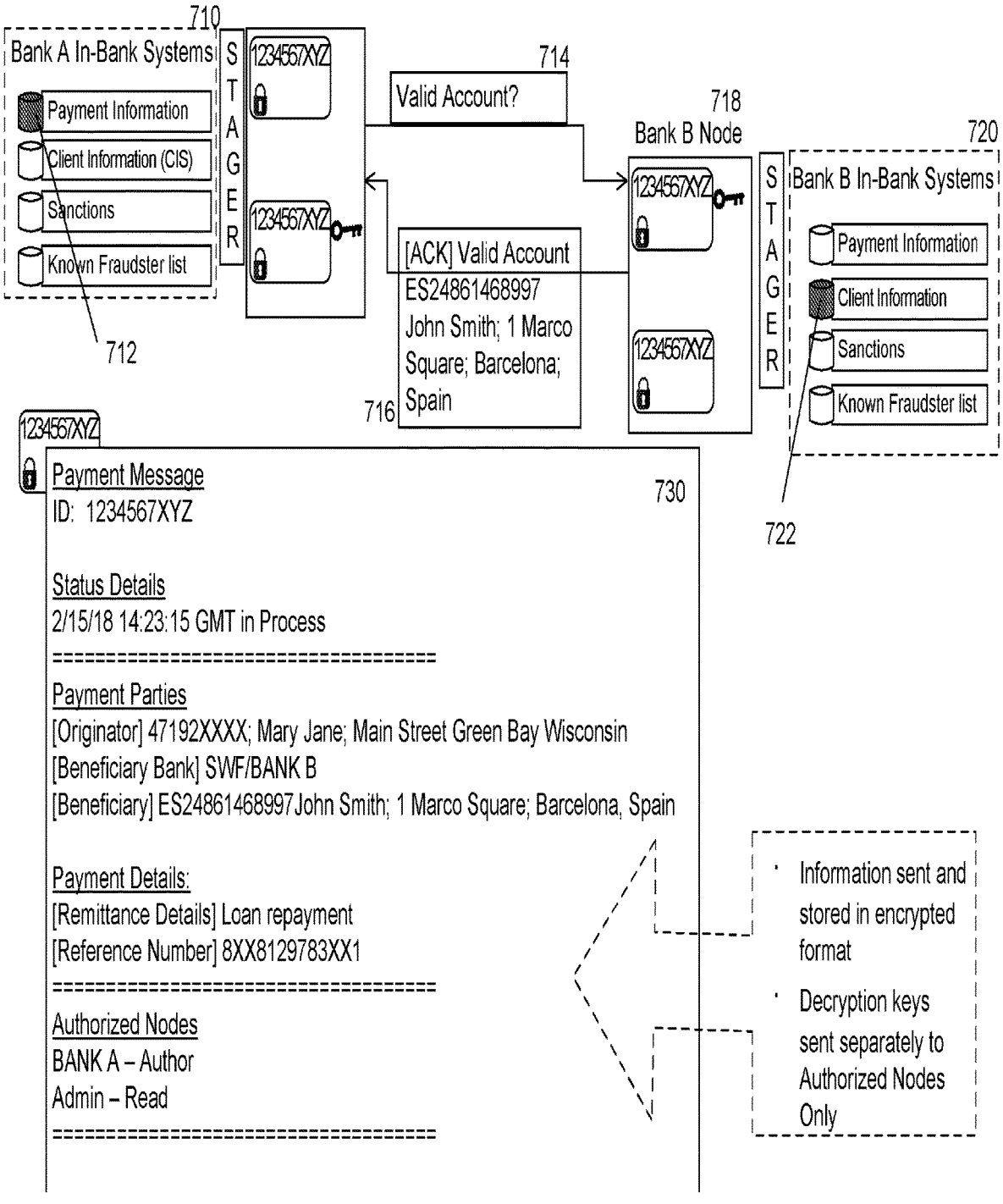

710
Bank A In-Bank Systems
Payment Information
Client Information (CIS)
Sanctions
Known Fraudster list
STAGER
1234567XYZ
1234567XYZ
712
714
Valid Account?
[ACK] Valid Account
ES24861468997
John Smith; 1 Marco Square; Barcelona; Spain
716
718
Bank B Node
1234567XYZ
1234567XYZ
STAGER
720
Bank B In-Bank Systems
Payment Information
Client Information
Sanctions
Known Fraudster list
722
1234567XYZ
Payment Message
ID: 1234567XYZ
730
Status Details
2/15/18 14:23:15 GMT in Process
==========
Payment Parties
[Originator] 47192XXXX; Mary Jane; Main Street Green Bay Wisconsin
[Beneficiary Bank] SWF/BANK B
[Beneficiary] ES24861468997John Smith; 1 Marco Square; Barcelona, Spain
Payment Details:
[Remittance Details] Loan repayment
[Reference Number] 8XX8129783XX1
==========
Authorized Nodes
BANK A – Author
Admin – Read
==========
Information sent and stored in encrypted format
Decryption keys sent separately to Authorized Nodes Only

Figure 7

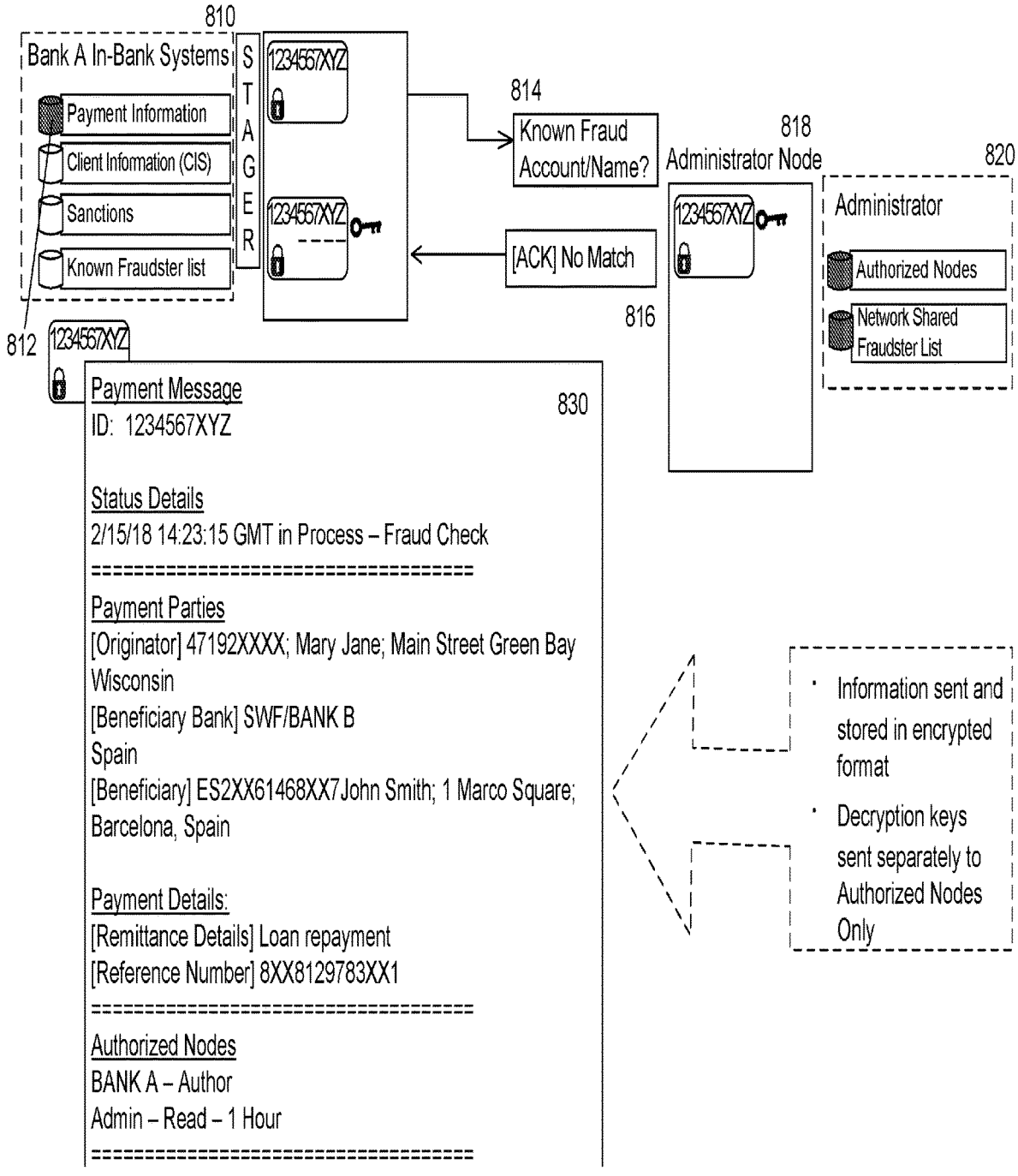

810
Bank A In-Bank Systems
Payment Information
Client Information (CIS)
Sanctions
Known Fraudster list
STAGER
1234567XYZ
1234567XYZ
814
Known Fraud Account/Name?
[ACK] No Match
818
Administrator Node
816
1234567XYZ
820
Administrator
Authorized Nodes
Network Shared Fraudster List
812
1234567XYZ
Payment Message
ID: 1234567XYZ
830
Status Details
2/15/18 14:23:15 GMT in Process – Fraud Check
==========
Payment Parties
[Originator] 47192XXXX; Mary Jane; Main Street Green Bay Wisconsin
[Beneficiary Bank] SWF/BANK B
Spain
[Beneficiary] ES2XX61468XX7John Smith; 1 Marco Square; Barcelona, Spain
Payment Details:
[Remittance Details] Loan repayment
[Reference Number] 8XX8129783XX1
==========
Authorized Nodes
BANK A – Author
Admin – Read – 1 Hour
==========
Information sent and stored in encrypted format
Decryption keys sent separately to Authorized Nodes Only

Figure 8

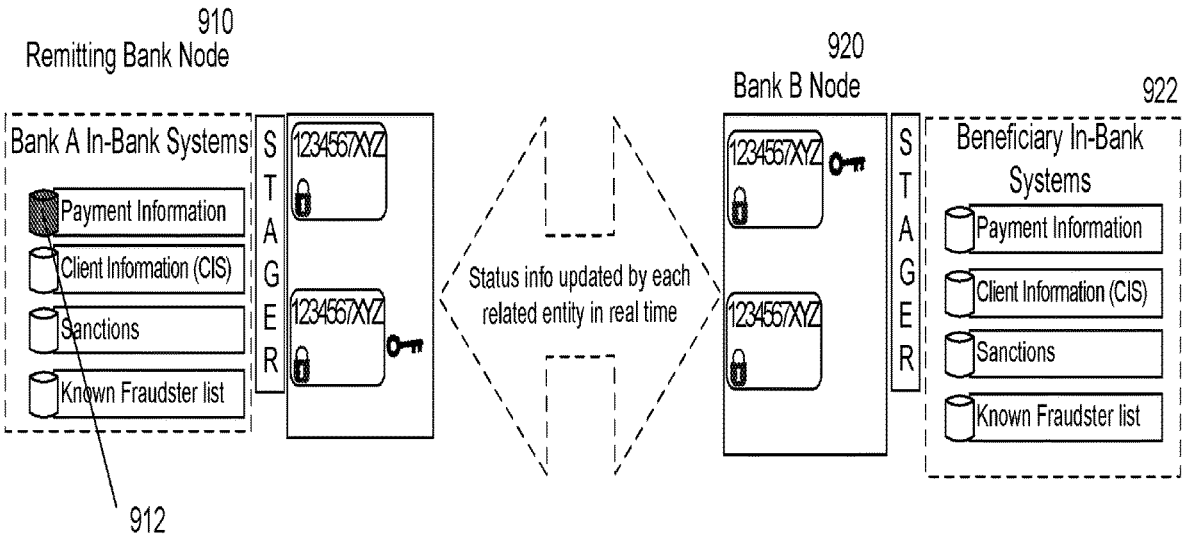

910
Remitting Bank Node
Bank A In-Bank Systems
Payment Information
Client Information (CIS)
Sanctions
Known Fraudster list
912
STAGER
1234567XYZ
1234567XYZ
Status info updated by each related entity in real time
920
Bank B Node
1234567XYZ
1234567XYZ
STAGER
922
Beneficiary In-Bank Systems
Payment Information
Client Information (CIS)
Sanctions
Known Fraudster list

Figure 9

# SYSTEM AND METHOD FOR IMPLEMENTING AN INTERBANK INFORMATION NETWORK

## CROSS REFERENCE TO RELATED APPLICATIONS

**[0001]** This is a Continuation of U.S. application Ser. No. 16/015,709, filed Jun. 22, 2018, which claims priority to U.S. Provisional Application No. 62/523,429, filed Jun. 22, 2017, the contents of each of which are incorporated herein in their entirety.

## FIELD OF THE INVENTION

**[0002]** The invention relates generally to a system and method for implementing an Interbank Information Network (IIN).

## BACKGROUND OF THE INVENTION

**[0003]** Generally, banks require detailed information to perform a full validation for a transaction. When a payment comes in, the payment gets tracked for a variety of different reasons like sanctions, fraud, incorrect amount information, etc. If an issue is detected, current systems require operators and/or client service representatives to manually complete a payment validation. The current process involves multiple participants, intermediaries and usually takes several days to complete. There is no mechanisms for banks to exchange information efficiently and securely for transaction validation and/or other functions.

**[0004]** These and other drawbacks currently exist.

## SUMMARY OF THE INVENTION

**[0005]** According to one embodiment, the invention relates to an interbank information network that provides a secure and decentralized network. The system comprises: a first bank node communicatively coupled to a first in-bank system; the first bank node comprises: a client internal system that communicates with application business logic via an application programing interface (API); and a blockchain node that supports a permissioned shared ledger and a private database that contains transactional, customer and personally identifiable information (PII); a second bank node communicatively coupled to a second in-bank system; and an interbank information network that establishes a direct communication channel between the first node and the second node.

**[0006]** Another embodiment of the present invention is directed to a method that implements an interbank information network architecture that provides a secure and decentralized network. The method comprises the steps of: provisioning a first bank node communicatively coupled to a first in-bank system; the first bank node comprises: a client internal system that communicates with application business logic via an application programing interface (API); and a blockchain node that supports a permissioned shared ledger and a private database that contains transactional, customer and personally identifiable information (PII); provisioning a second bank node communicatively coupled to a second in-bank system; and establishing, an interbank information network, a direct communication channel between the first node and the second node.

**[0007]** The system may include a specially programmed computer system comprising one or more computer processors, mobile devices, electronic storage devices, and networks.

**[0008]** The computer implemented system, method and medium described herein provide unique advantages to account holding customers, according to various embodiments of the invention. An embodiment of the present invention is directed to creating a secure and decentralized network that enables the payments industry to redefine payment processing and information sharing. The innovative Interbank Information Network aligns with value proposition expected from distributed ledger technology in correspondent banking The Interbank Information Network further simplifies operation processing, real-time compliance monitoring, enhanced risk tolerance, and improved client services. The network mitigates operational pain points (e.g., slow, manual, opaque, costly) to drive and increase operational efficiency (e.g., payment validation, fraud control, routing, client service/investigations, reconciliation, messaging, reporting, etc.). These and other advantages will be described more fully in the following detailed description.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0009]** In order to facilitate a fuller understanding of the present invention, reference is now made to the attached drawings. The drawings should not be construed as limiting the present invention, but are intended only to illustrate different aspects and embodiments of the invention.

**[0010]** FIG. **1** is an exemplary diagram that illustrates a current inquiry process.

**[0011]** FIG. **2** illustrates a schematic diagram of an Interbank Information Network, according to an embodiment of the present invention.

**[0012]** FIG. **3** is an exemplary diagram that illustrates a logical view of a node of an Interbank Information Network, according to an embodiment of the present invention.

**[0013]** FIG. **4** is an exemplary flow diagram of an inquiry process, according to an embodiment of the present invention.

**[0014]** FIG. **5** is an exemplary diagram that illustrates sanctions inquiry and information gathering process, according to an embodiment of the present invention.

**[0015]** FIG. **6** is an exemplary flow diagram of an account validation process, according to an embodiment of the present invention.

**[0016]** FIG. **7** is an exemplary illustration of a validation use case, according to an embodiment of the present invention.

**[0017]** FIG. **8** is an exemplary illustration of a fraud check use case, according to an embodiment of the present invention.

**[0018]** FIG. **9** is an exemplary payment tracking, according to an embodiment of the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

**[0019]** The following description is intended to convey an understanding of the present invention by providing specific embodiments and details. It is understood, however, that the present invention is not limited to these specific embodiments and details, which are exemplary only. It is further

understood that one possessing ordinary skill in the art, in light of known systems and methods, would appreciate the use of the invention for its intended purposes and benefits in any number of alternative embodiments, depending upon specific design and other needs.

**[0020]** FIG. **1** is an exemplary diagram that illustrates a current inquiry process. As shown in FIG. **1**, there are multiple steps that are required to obtain customer-related information when there is an inquiry, such as a payment related compliance inquiry. FIG. **1** illustrates an interaction and exchange of data between and among Remitter **110**, Remitter Bank **112**, Institution **114**, Beneficiary Bank **116** and Beneficiary **118**. Interactions may include data request, data exchange and data remittance. As shown in FIG. **1**, Institution **114** may have a payment review process that triggers a compliance action. Data may be requested from Remitter Bank **112** and Remitter Bank **112** may then request data from Remitter **110**. Remitter **110** and Beneficiary **118** may communicate to obtain Personally Identifiable Information (PII), this process is currently a manual process and may take two to **16** days to complete. Remitter **110** sends data to Remitter Bank **112** and Remitter Bank **112** may then send data to Institution **114**. Institution **114** may receive information and make a determination to proceed, further investigate or hold. In addition, each interaction may follow a different non-standard message format and channel with possible translation and/or communication failure points. Because PII is communicated across various individuals and systems, delays are experienced between communications.

**[0021]** With the current banking model, no single bank can facilitate global transfers, requiring money to flow through multiple banks to reach the final beneficiary The current process is opaque, inefficient, and costly. The disjointed flow requires payment related inquiries (e.g., status, fraud, compliance) to back-track the flow of funds to the remitter. Multiple parties result in redundancy as each bank replicates risk management, liquidity management, clearing/settlement, and messaging.

**[0022]** Banks that process payments are required to perform screening against sanction lists in real-time. For potential issues, the current process involves a manual review which may involve querying one or more entities. For example, a current process may involve a remitting bank sending a request to a remitter, who then contacts the beneficiary for additional information. The beneficiary returns the requested information, which is then received by the remitter and sent to the remitter bank. The process may also occur across borders and countries, which adds further complexities.

**[0023]** An embodiment of the present invention is directed to an Interbank Information Network (IIN) where information may be shared through a network that complements existing functions. Sample uses may include fraud (e.g., known fraudster), validation (e.g., account number, name, currency (CCY) and status validation), sanctions (e.g., account details, name, address, date of birth (DOB), entity), tracking (e.g., track and trace payment status), clearing, settlement, advising, fraud monitoring, anti-money laundering, FX market, liquidity lending, node operating risk rating, etc.

**[0024]** An embodiment of the present invention is directed to creating a secure and decentralized network that facilitates and improves information sharing, payment processing, value exchange and other actions. The network may represent a cloud-based network, a physical or virtual infrastructure as well as other flexible network hosting system. The Interbank Information Network simplifies operation processing, real-time compliance monitoring, enhanced risk tolerance, and improved client services. The network mitigates operational pain points (e.g., slow, manual, opaque, costly) to drive and increase operational efficiency (e.g., payment validation, fraud control, routing, client service/investigations, reconciliation, messaging, reporting, etc.); leverages solutions to benefit other global funds transfer that join the distributed ledger technology; and performs concurrent processing for increased throughput. The network manages anti-money laundering (AML) risk prior to processing payment; provides shared "information cloud" to support Straight Through Processing (STP), AML and Office of Foreign Asset Control (OFAC) investigation requests; mitigates the need for re-screening with OFAC Smart Check; and reduces the expense of compliance processing through offering a shared utility model. With enhanced real-time controls in place, the bank may more rapidly expand and take greater risks as client flows may be managed tightly and risky clients may be identified and dealt with timely. The network realizes reduced delays from documentation requirements and enhanced transparency of full end-to-end payment processing from clients.

**[0025]** In addition, Interbank Clearing and Settlement functions optimize treasury liquidity usage and monitoring, improve client services and defend global funds transfer portfolio. Corresponding banking clearing and settlement occurs in different channels and at different times with multiple hops with non-partners creating lack of final settlement visibility interbank. Distributed ledger technology (DLT) network preserves payment atomicity. Real-time visibility of settlement allows improved liquidity visibility that drives better liquidity management. Interbank Clearing and Settlement functions provide predictability, reduce delays from extended hops through reduced global funds transfer intermediaries, realize potential for 24/7 real-time payments, and cheaper deducted fees through reduced intermediaries. First to market provides positioning for additional foreign exchange (FX) revenue corridors. Banks may define how charging options exist in the new infrastructure of an embodiment of the present invention. The network further provides an opportunity for banks to capture an operator fee for processing.

**[0026]** The following descriptions provide different configurations and features according to exemplary embodiments. While certain nomenclature and types of applications/hardware are described, other names and application/hardware usage is possible and the nomenclature provided is done so by way of non-limiting examples only. Further, while particular embodiments are described, it should be appreciated that the features and functions of each embodiment may be combined in any combination as is within the capability of one of ordinary skill in the art. The figures provide additional exemplary details regarding the present invention. It should also be appreciated that these exemplary embodiments are provided as non-limiting examples only.

**[0027]** Various exemplary methods are provided by way of example herein. These methods are exemplary as there are a variety of ways to carry out methods according to the present disclosure. The methods depicted and described can be executed or otherwise performed by one or a combination of various systems and modules. Each block shown in the

methods represents one or more processes, decisions, methods or subroutines carried out in the exemplary method, and these processes, decisions, methods or subroutines are not necessarily carried out in the specific order outlined in the methods, nor is each of them required.

**[0028]** FIG. **2** illustrates a schematic diagram of an Interbank Information Network, according to an embodiment of the present invention. Existing payment processing functions may be enhanced through the Interbank Information Network that ensures fully validated and formatted payments are entering the payments infrastructure. FIG. **2** illustrates an enhanced collaborative process with numerous benefits to participants within the Interbank Information Network. FIG. **2** illustrates a compliance process with a global network, according to an embodiment of the present invention. As shown in FIG. **2**, Interbank Information Network **202** may include various nodes, such as Remitter Bank **212**, Node **214**, Node **216**, Node **218**, Corresponding Bank **220** and Beneficiary Bank **222**. In this example, Remitter **210** may make a request to Remitter Bank **212** which then communicates to Beneficiary Bank **212** on behalf of Beneficiary **224**, through Network **212**. Nodes may represent a bank, financial institution, a corporate entity, a regulator, government entity and/or other participant of Network **202**. For example, a government entity may access payment audit data and perform other monitoring and supervisory tasks. Different counterparties in a transaction (e.g., nodes including debit nodes, credit nodes as well as regulators) may have access to transaction-level information. Encryption and/or decryption may be performed on each node. In addition, a node may represent an administrator node.

**[0029]** According to an embodiment of the present invention, a bank, third party, regulator or other entity may serve as an administrator node. This node may manage and monitor shared pieces of data that may need to exist across a network platform. According to another example, a regulator may ping (or message) each bank when an audit or other inquiry is needed as opposed to accessing the network. An administrator node may control permissions associated with the network. For example, the administrator node may maintain a whitelist of nodes that can exchange information and perform other actions.

**[0030]** As shown in FIG. **2**, an embodiment of the present invention may facilitate the exchange of payment related details and inquiries between two or more participants as to relates to a payment or potential payment and a compliance inquiry. A payment review process may trigger a compliance inquiry, as shown by **226** through Correspondent Bank **220**. Correspondent Bank **220** may request data from Beneficiary Bank **222**. Network **202** may validate the request per agreed terms and further maintain encrypted, time-stamped records for permissioned parties. The inquiry response may be routed back to Corresponding Bank **220** through Network **202** using secure permission based protocols. Beneficiary Bank **222** may receive requests, access bank's encrypted data and respond to inquiries, e.g., name, date-of-birth, etc. Other data attributes may include account status, name, address details, name matching conditions, currency, account open date, account activity factors, etc. Network **202** enables a peer to peer exchange of information, thereby expediting the time to process queries and settlement payments. In addition, Network **202** facilitates the exchange of information between a participant processing a payment or potential payment and another network participant that is servicing an account under query. Correspondent Bank **220** may receive information and make a determination to proceed, further investigate or hold. The network illustrated in FIG. **2** provides various benefits relating to customer experience, security, automated integration, verified information, information exchange associated with underlying transaction. For example, an embodiment of the present invention reduces inquiry turn-around times, payment delays and client engagement. The system further provides enhanced security of personal information across a secure encrypted network; systematic data exchange that eliminates manual processes and reduced costs; leverages institutionally sourced and validated customer and customer information and exchange of information and communication about in-process transactions.

**[0031]** The network of FIG. **2** provides real-time access to data to integrate into banking systems/operations in order to improve efficiency (e.g., drive STP, reduce errors, delays); platform and infrastructure that provides back-office services to participants and services to enable the trust of counter-parties or systems without in-house due-diligence demands. Moreover, the network provides peer-to-peer movement, streamlined messaging, liquidity management, active risk/compliance management and shared utilize functions.

**[0032]** The network of FIG. **2** further creates a global distributed network that allows for a seamless, interconnected flow of money eliminating the need for multiple banks. Blockchain enables creation of a global interconnected network without the need for multiple intermediaries, while enhancing transparency of the end to end flow. Information may be encrypted and shared privately among two or more participants within a network of nodes. In addition, shared utility functions move redundant processes (e.g., sanctions, compliance, validations, etc.) to the network level, enabling faster execution at lower costs. The real-time interconnected network enables informed, real-time risk management.

**[0033]** FIG. **3** is an exemplary diagram that illustrates a logical view of a node of an Interbank Information Network, according to an embodiment of the present invention. As shown in FIG. **3**, Network **302** may include various nodes, representing banks, financial institutions and other entities. Node **310** represents Client A. Client A may represent a bank, for example. Node **310** may include a client interactions system **312**. Client environment may include Client Internal Systems **314** with client business systems represented by **316** and **318**. These systems may communicate to Application Business Logic **340** via API **320** as well as Client User **322** through API **324**. Application Business Logic **340** may communicate with decentralized applications (e.g., payments compliance inquiry, etc.) and corresponding databases represented by **342**, **344** and **346**. Blockchain Node **350** may support a permissioned shared ledger **352** and private database **354**, which may contain transactional, customer and PI data. For example, each node may retain a full copy of information on the ledger to which they are privy.

**[0034]** An embodiment of the present invention implements ledger posting on the Interbank Information Network. Additional details of shared ledger posting are provided in commonly owned and currently pending application U.S. patent application Ser. No. 15/797,602 (Attorney Docket No. 72167.001337), filed Oct. 30, 2017, which claims

priority to U.S. Provisional Application 62/414,398, filed Oct. 28, 2016, the contents of which are incorporated by reference herein in their entirety.

**[0035]** The network and IIN platform may be accessed through a secure web-interface or through a secure API integration into banking applications or services. The network may apply a two-way SSL for web-interface and API with independent web-application deployment for each participant that may include access to web-interface restricted to white-listed IP addresses only for approved and onboarded participants as well as approved participants and users will leverage log-in credentials to access UI and certificates/keys for API. Node access keys may be secured in a key-vault that is accessible per the process as defined by the network operating model.

**[0036]** As shown in FIG. **3**, a network participant, such as Client A, may secure a connection to Network **302** and applications via a web-interface or API. Client A may access enrolled business applications to inquire/request information. Blockchain node **350** may validate, check permissions and obtain consensus. Blockchain node **350** may record and publish inquiry activity (e.g., hash) onto the public ledger **352**, which may then be replicated on each node. Blockchain node **350** may deliver private inquiry details to permissioned participants' secure private store. A receiving network participant, such as Client B, may respond by securing a connection to network **302** and applications via a web-interface or API to review the request and action accordingly. A corresponding blockchain node may then deliver private inquiry details to permissioned participants' secure private store. Network participant, such as Client A, may then receive the inquiry response and action accordingly.

**[0037]** The Interbank Information Network represents a technology platform designed to increase the efficiency of payment related processes and queries by providing an alternative communication channel to exchange payment and customer related information in a peer to peer model through a blockchain based platform. The platform enables any network participant to communicate and exchange queries and information directly with any other network participant on the network utilizing the network connectivity and application models. For example, Participant A may communicate to send/receive queries/data with Participant B and/or Participant C. Participant B may communicate to send/receive queries/data with Participant A and/or Participant C. Participant C may communicate to send/receive queries/data with Participant A and/or Participant B.

**[0038]** According to an embodiment of the present invention, the Interbank Information Network may leverage a core blockchain based technology to achieve security, resiliency, consensus and immutability. Each client technology asset may be deployed in its own virtual private network and server infrastructure. For example, a single hosting model may utilize a dedicated private third-party infrastructure established for network participants. The nodes may be hosted by a third party hosting provider at a data center. The IIN platform may support a variety of hosting models based on a participant's preference (e.g., on-premise, third party, public-cloud, private-cloud, etc.).

**[0039]** FIG. **3** may further represent a cloud-based network or physical/virtual infrastructure where each bank represents a node in the network. According to an exemplary application, the network may be layered on a blockchain platform. Each bank node may be connected through an API or secure integration layer to that bank's particular node representation in the network. With the blockchain platform, each bank node may share information privately, without an intermediary or data management provider. Accordingly, each bank node may connect directly and therefore receive and/or access data from another bank node to perform validation, fraud, sanction, tracking, etc. The blockchain platform enables a bank node to send encrypted information directly to a particular bank node. The network verifies messages from a bank node to another bank node. An embodiment of the present invention is directed to securely sharing sensitive information between bank nodes. FIGS. **2** and **3** illustrate an exemplary node configuration. Other node configurations may be implemented to address various scenarios, applications and situations.

**[0040]** According to the various embodiments of the present invention, exemplary use cases may include validation and fraud; sanctions inquiries and payment tracking. For example, the innovative network provides valid account acknowledgement with beneficiary name/address validations/enrichment reduces payment delays and returns as well as complete, valid name, address. The innovative network provides proactive validation against network wide fraudster list. The network reduces fraud payments by leveraging network wide fraudster lists shared in real-time. The innovative network provides fast and efficient sanctions inquiry information leveraging a bank's client information system (CIS) or other system that contains client information. For example, each node may maintain a corresponding sanction list (or other information). According to another embodiment, the network may maintain a single sanction list that may be accessed by any node in the network. According to yet another example, each node may maintain a portion of the sanction list. Other variations may be implemented. The network further reduces payment delays and achieves faster clearing of false positives. The network enables automated inquiry resolution by leveraging standardized messaging and data model for key data elements. The innovative network provides real time access to payment stages across related banks and further provides proactive management of payment tracking inquiries.

**[0041]** Information may be shared in parallel to existing external messaging and settlement networks to ensure in-bank reconciliation. Each node may be responsible for in-bank user access to node functions. The network maintains a list of nodes that may participate in network. Information may be populated in various ways by banks, via transaction reference data (e.g., enhanced real-time control validation data, etc.); non-transaction reference data (e.g., fraud attach list, account reference, etc.) and/or other means.

**[0042]** An embodiment of the present invention may process and share different classifications of data. For example, the network of an embodiment of the present invention may receive data based on a pull request or push request. A pull request may include a request for information to a bank node. A push request may include a situation where a node maintains preemptive populated data that is provided in anticipation of a request. Another classification of data may include whether a node is sharing content or an acknowledgement. For example, a bank node may request an account number. A responding node may provide the content, e.g., account number. An acknowledgement may involve a bank node requesting confirmation or acknowledgement of an account number.

**[0043]** FIG. **4** is an exemplary flow diagram of an inquiry process, according to an embodiment of the present invention. FIG. **4** illustrates an exemplary interaction between an inquirer and a responder. Communication may be provided by API connectivity or user interface to a blockchain network. Network Participant **412** may submit an evidence of payment at **414**. Data elements may be defined, at step **416**. Data elements may include full name, date of birth, full address, place of birth, etc. The inquiry may be submitted and received by Network Participant **420**, at step **418**. Network Participant **420** may then create a response, at step **422**. Network Participant **412** may then view the response, at step **424** and then render a decision at **426**.

**[0044]** FIG. **5** is an exemplary diagram that illustrates sanctions inquiry and information gathering process, according to an embodiment of the present invention. As shown in FIG. **5**, Bank A **510** may send a private message such as a sanctions inquiry may be shared. Bank A may maintain various applications, systems and/or databases, including a customer information application **512**. The message may include a request for beneficiary information, as shown by **514**. A receiving node, Bank B Node **518**, may receive the request and perform the requested process. For example, a stager of Bank B Node may modify the request and represent the request as a smart contract. The stager may represent an API or secure communication layer. The smart contract captures business logic and initiates the specific request accordingly. In this example, the stager of a receiving node may receive the inquiry and then retrieve the requested information using client information application **522** maintained by Beneficiary System **520**. As shown in FIG. **5**, a private message may be sent from a Bank B Node **518** to Bank A **510**. The response, as shown by **516**, may include an account holder's name, address, etc. FIG. **5** illustrates a secure process for receiving and responding to a sanctions inquiry in accordance with an embodiment of the present invention.

**[0045]** FIG. **6** is an exemplary flow diagram of an account validation process, according to an embodiment of the present invention. FIG. **6** illustrates an exemplary interaction between an inquirer and a responder. Communication may be provided by API connectivity or user interface to a blockchain network. Network Participant **612** may submit a request at step **614**. The request may be an account validation, e.g., whether an account is valid or not, as shown by **616**. The inquiry may be submitted and received, at step **618**. Network Participant **620** may then create a response, at step **622**. The response may include whether the account number is valid or not and whether the name is a match or the name differs in what respect. Network Participant **612** may then view the response, at step **624** and then render a decision at **626**.

**[0046]** FIG. **7** is an exemplary illustration of a validation use case, according to an embodiment of the present invention. Bank A **710** through payment information application **712** may request account validation from another bank, represented by Bank B Node **718**. Upon receiving request **714**, Bank B Node **718** may access client information application **722** and generate a response as shown by **716**. An exemplary detailed payment message is shown at **730**. The information is sent and stored in an encrypted format. Decryption keys may be sent separately to Authorized Nodes.

**[0047]** FIG. **8** is an exemplary illustration of a fraud check use case, according to an embodiment of the present invention. As shown in FIG. **8**, an embodiment of the present invention is directed to fraud check, beneficiary account validation and address enrichment within the Interbank Information Network of an embodiment of the present invention. In the exemplary fraud use case, information is sent and stored in an encrypted format. Decryption keys may be sent separately to Authorized Nodes. Bank A **810** through payment information application **812** may request fraud information from an administrator node, represented by **818**. Upon receiving request **814**, Administrator **818** may access authorized nodes and network shared fraudster list and generate a response as shown by **816**. An exemplary detailed payment message is shown at **830**.

**[0048]** FIG. **9** is an exemplary payment tracking, according to an embodiment of the present invention. As shown in FIG. **9**, status information may be updated by each related entity in real-time. Bank A **910** through payment information application **912** may request status information from another bank, represented by Bank B **920**. Upon receiving a request, Beneficiary Bank **922** may provide a status response in real time.

**[0049]** Additional applications may include validation, optimization, liquidity, foreign exchange (FX), tokens, invoicing, service level agreement (SLA) tracking and agreements and intraday reporting. For validation, an embodiment of the present invention may determine whether an account is real, open or closed; determine how long an account has existed; name and account match; perform integration with early warning services (EWS) and other directories for low value payments; integration with eWallets, payment risk score service, etc.

**[0050]** According to an exemplary illustration, a corporate entity may connect to a number of e-wallet applications. For example, a corporate entity may initiate a payment from an online payment system in the US to mobile payment application in China. The Interbank Information Network of an embodiment of the present invention may facilitate payment between the online payment system and the mobile payment application.

**[0051]** For optimization, an embodiment of the present invention may perform optimized payment routing; Financial Action Task Force (FATF) enrichment, integration with a workflow case management tool, and consideration of factoring and future dated payment.

**[0052]** For liquidity, an embodiment of the present invention may be applied to Nostro account management by client and by account; Nostro account visibility and optimization, and shadow balances on chain for liquidity management. A Nostro account generally refers to an account that a bank holds in a foreign currency in another bank.

**[0053]** For foreign trades, an embodiment of the present invention may provide visibility into current bank rates for a transaction, FX contracts with markets, intelligent FX routing and FX netting.

**[0054]** For tokens, an embodiment of the present invention may issue tokens to track use of value added services (VAS) or apps; issue tokens to bill and collect revenue for use of VAS and apps and further create a mechanism, e.g., corporate coin solution, that allows corporates to track payments across their subsidiaries and accounts.

**[0055]** The foregoing examples show the various embodiments of the invention in one physical configuration; how-

ever, it is to be appreciated that the various components may be located at distant portions of a distributed network, such as a local area network, a wide area network, a telecommunications network, an intranet and/or the Internet. Thus, it should be appreciated that the components of the various embodiments may be combined into one or more devices, collocated on a particular node of a distributed network, or distributed at various locations in a network, for example. As will be appreciated by those skilled in the art, the components of the various embodiments may be arranged at any location or locations within a distributed network without affecting the operation of the respective system.

**[0056]** As described above, the various embodiments of the present invention support a number of communication devices and components, each of which may include at least one programmed processor and at least one memory or storage device. The memory may store a set of instructions. The instructions may be either permanently or temporarily stored in the memory or memories of the processor. The set of instructions may include various instructions that perform a particular task or tasks, such as those tasks described above. Such a set of instructions for performing a particular task may be characterized as a program, software program, software application, app, or software.

**[0057]** It is appreciated that in order to practice the methods of the embodiments as described above, it is not necessary that the processors and/or the memories be physically located in the same geographical place. That is, each of the processors and the memories used in exemplary embodiments of the invention may be located in geographically distinct locations and connected so as to communicate in any suitable manner. Additionally, it is appreciated that each of the processor and/or the memory may be composed of different physical pieces of equipment. Accordingly, it is not necessary that the processor be one single piece of equipment in one location and that the memory be another single piece of equipment in another location. That is, it is contemplated that the processor may be two or more pieces of equipment in two or more different physical locations. The two distinct pieces of equipment may be connected in any suitable manner Additionally, the memory may include two or more portions of memory in two or more physical locations.

**[0058]** As described above, a set of instructions is used in the processing of various embodiments of the invention. The servers may include software or computer programs stored in the memory (e.g., non-transitory computer readable medium containing program code instructions executed by the processor) for executing the methods described herein. The set of instructions may be in the form of a program or software or app. The software may be in the form of system software or application software, for example. The software might also be in the form of a collection of separate programs, a program module within a larger program, or a portion of a program module, for example. The software used might also include modular programming in the form of object oriented programming The software tells the processor what to do with the data being processed.

**[0059]** Further, it is appreciated that the instructions or set of instructions used in the implementation and operation of the invention may be in a suitable form such that the processor may read the instructions. For example, the instructions that form a program may be in the form of a suitable programming language, which is converted to machine language or object code to allow the processor or processors to read the instructions. That is, written lines of programming code or source code, in a particular programming language, are converted to machine language using a compiler, assembler or interpreter. The machine language is binary coded machine instructions that are specific to a particular type of processor, i.e., to a particular type of computer, for example. Any suitable programming language may be used in accordance with the various embodiments of the invention. For example, the programming language used may include assembly language, Ada, APL, Basic, C, C++, COBOL, dBase, Forth, Fortran, Java, Modula-2, Pascal, Prolog, REXX, Visual Basic, and/or JavaScript. Further, it is not necessary that a single type of instructions or single programming language be utilized in conjunction with the operation of the system and method of the invention. Rather, any number of different programming languages may be utilized as is necessary or desirable.

**[0060]** Also, the instructions and/or data used in the practice of various embodiments of the invention may utilize any compression or encryption technique or algorithm, as may be desired. An encryption module might be used to encrypt data. Further, files or other data may be decrypted using a suitable decryption module, for example.

**[0061]** In the system and method of exemplary embodiments of the invention, a variety of "user interfaces" may be utilized to allow a user to interface with the mobile devices **120**, **130** or other personal computing device. As used herein, a user interface may include any hardware, software, or combination of hardware and software used by the processor that allows a user to interact with the processor of the communication device. A user interface may be in the form of a dialogue screen provided by an app, for example. A user interface may also include any of touch screen, keyboard, voice reader, voice recognizer, dialogue screen, menu box, list, checkbox, toggle switch, a pushbutton, a virtual environment (e.g., Virtual Machine (VM)/cloud), or any other device that allows a user to receive information regarding the operation of the processor as it processes a set of instructions and/or provide the processor with information. Accordingly, the user interface may be any system that provides communication between a user and a processor. The information provided by the user to the processor through the user interface may be in the form of a command, a selection of data, or some other input, for example.

**[0062]** The software, hardware and services described herein may be provided utilizing one or more cloud service models, such as Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS), and Infrastructure-as-a-Service (IaaS), and/or using one or more deployment models such as public cloud, private cloud, hybrid cloud, and/or community cloud models.

**[0063]** Although, the examples above have been described primarily as using a software application ("app") downloaded onto the customer's mobile device, other embodiments of the invention can be implemented using similar technologies, such as transmission of data that is displayed using an existing web browser on the customer's mobile device.

**[0064]** Although the embodiments of the present invention have been described herein in the context of a particular implementation in a particular environment for a particular purpose, those skilled in the art will recognize that its usefulness is not limited thereto and that the embodiments of

the present invention can be beneficially implemented in other related environments for similar purposes.

What is claimed is:

**1**. A method for implementing a blockchain-based interbank clearing and settlement network that securely optimizes interbank communications, the method comprising:

providing an interbank blockchain network that comprises a permissioned shared distributed ledger that stores confidential banking data, a first blockchain node and a second blockchain node;

deploying the first blockchain node within a first virtual private network (VPN) that comprises a first bank server infrastructure of the first blockchain node;

deploying the second blockchain node within a second virtual private network (VPN) that comprises a second bank server infrastructure of the second blockchain node;

receiving, in real-time, by the first blockchain node, a payment request to send a payment amount, from a remitter account that belongs to the first bank server infrastructure, to a beneficiary account that belongs to the second bank server infrastructure;

utilizing, by the first blockchain node, the first bank server infrastructure to validate, in real-time, the remitter account and the payment amount of the payment request;

generating, by the first blockchain node, a first validation request to validate the beneficiary account;

hashing, by the first blockchain node, the first validation request;

publishing, in real-time, by the first blockchain node, the hashed first validation request to the permissioned shared distributed ledger;

determining, by the second blockchain node, that the hashed first validation request pertains to the beneficiary account and that the beneficiary account belongs to the second bank server infrastructure of the second blockchain node;

establishing, by the second blockchain node, a direct communication channel to the first blockchain node from the second blockchain node;

utilizing, by the second blockchain node, the second bank server infrastructure to validate the beneficiary account;

generating, by the second blockchain node, a validation response based on the utilizing by the second blockchain node;

encrypting, by the second blockchain node, the validation response; and

separately transmitting, in real-time, by the second blockchain node, via the direct communication channel, the encrypted validation response and a corresponding public key certificate to the first blockchain node.

**2**. The method of claim **1**, further comprising:

replicating, over the direct communication channel, by the second blockchain node, the first validation request that is published by the first blockchain node.

**3**. The method of claim **1**, wherein the generating the validation response comprises:

performing, by the second blockchain node, at least one from among a fraud check, payment tracking, a sanction search, and validation processing.

**4**. The method of claim **1**, wherein the generating the validation response comprises:

leveraging, by the second blockchain node, at least one from among a network-wide fraudster list and a sanction list.

**5**. The method of claim **4**, wherein the sanction list comprises a plurality of portions, and wherein each blockchain node within the interbank blockchain network comprises a respectively corresponding portion from among the plurality of portions.

**6**. The method of claim **1**, further comprising:

prior to receiving a second validation request by the second blockchain node, pushing, from the second blockchain node, to the first blockchain node, a preemptive response that has been populated with data that pertains to the second validation request.

**7**. The method of claim **1**, further comprising:

based on the validation response, confirming, by the first blockchain node, that the beneficiary account has been verified by the second blockchain node; and

forwarding, by the first blockchain node, the payment from the remitter account to the beneficiary account.

**8**. The method of claim **1**, wherein an administrator blockchain node controls interbank blockchain network access and permissions.

**9**. A system for implementing a blockchain-based interbank clearing and settlement network that securely optimizes interbank communications, the system comprising:

a processor; and

memory storing instructions that, when executed by the processor, cause the processor to perform operations comprising:

providing an interbank blockchain network that comprises a permissioned shared distributed ledger that stores confidential banking data, a first blockchain node and a second blockchain node;

deploying the first blockchain node within a first virtual private network (VPN) that comprises a first bank server infrastructure of the first blockchain node;

deploying the second blockchain node within a second virtual private network (VPN) that comprises a second bank server infrastructure of the second blockchain node;

receiving, in real-time, by the first blockchain node, a payment request to send a payment amount, from a remitter account that belongs to the first bank server infrastructure, to a beneficiary account that belongs to the second bank server infrastructure;

utilizing, by the first blockchain node, the first bank server infrastructure to validate, in real-time, the remitter account and the payment amount of the payment request;

generating, by the first blockchain node, a first validation request to validate the beneficiary account;

hashing, by the first blockchain node, the first validation request;

publishing, in real-time, by the first blockchain node, the hashed first validation request to the permissioned shared distributed ledger;

determining, by the second blockchain node, that the hashed first validation request pertains to the beneficiary account and that the beneficiary account belongs to the second bank server infrastructure of the second blockchain node;

establishing, by the second blockchain node, a direct communication channel to the first blockchain node from the second blockchain node;

utilizing, by the second blockchain node, the second bank server infrastructure to validate the beneficiary account;

generating, by the second blockchain node, a validation response based on the utilizing by the second blockchain node;

encrypting, by the second blockchain node, the validation response; and

separately transmitting, in real-time, by the second blockchain node, via the direct communication channel, the encrypted validation response and a corresponding public key certificate to the first blockchain node.

**10**. The system of claim **9**, wherein when executed, the instructions cause the processor to perform further operations comprising:

replicating, over the direct communication channel, by the second blockchain node, the first validation request that is published by the first blockchain node.

**11**. The system of claim **9**, wherein when the instructions are executed by the processor, the generating the validation response comprises:

performing, by the second blockchain node, at least one from among a fraud check, payment tracking, a sanction search, and validation processing.

**12**. The system of claim **9**, wherein when the instructions are executed by the processor, the generating the validation response comprises:

leveraging, by the second blockchain node, at least one from among a network-wide fraudster list and a sanction list.

**13**. The system of claim **12**, wherein when the instructions are executed by the processor, the sanction list comprises a plurality of portions, and wherein each blockchain node within the interbank blockchain network comprises a respectively corresponding portion from among the plurality of portions.

**14**. The system of claim **9**, wherein when executed, the instructions cause the processor to perform further operations comprising:

prior to receiving a second validation request by the second blockchain node, pushing, from the second blockchain node, to the first blockchain node, a preemptive response that has been populated with data that pertains to the second validation request.

**15**. The system of claim **9**, wherein when executed, the instructions cause the processor to perform further operations comprising:

based on the validation response, confirming, by the first blockchain node, that the beneficiary account has been verified by the second blockchain node; and

forwarding, by the first blockchain node, the payment from the remitter account to the beneficiary account.

**16**. The system of claim **9**, wherein when the instructions are executed by the processor, an administrator blockchain node controls interbank blockchain network access and permissions.

**17**. A non-transitory computer-readable medium for implementing a blockchain-based interbank clearing and settlement network that securely optimizes interbank communications, the computer-readable medium storing instructions that, when executed by a processor, cause the processor to perform operations comprising:

providing an interbank blockchain network that comprises a permissioned shared distributed ledger that stores confidential banking data, a first blockchain node and a second blockchain node;

deploying the first blockchain node within a first virtual private network (VPN) that comprises a first bank server infrastructure of the first blockchain node;

deploying the second blockchain node within a second virtual private network (VPN) that comprises a second bank server infrastructure of the second blockchain node;

receiving, in real-time, by the first blockchain node, a payment request to send a payment amount, from a remitter account that belongs to the first bank server infrastructure, to a beneficiary account that belongs to the second bank server infrastructure;

utilizing, by the first blockchain node, the first bank server infrastructure to validate, in real-time, the remitter account and the payment amount of the payment request;

generating, by the first blockchain node, a first validation request to validate the beneficiary account;

hashing, by the first blockchain node, the first validation request;

publishing, in real-time, by the first blockchain node, the hashed first validation request to the permissioned shared distributed ledger;

determining, by the second blockchain node, that the hashed first validation request pertains to the beneficiary account and that the beneficiary account belongs to the second bank server infrastructure of the second blockchain node;

establishing, by the second blockchain node, a direct communication channel to the first blockchain node from the second blockchain node;

utilizing, by the second blockchain node, the second bank server infrastructure to validate the beneficiary account;

generating, by the second blockchain node, a validation response based on the utilizing by the second blockchain node;

encrypting, by the second blockchain node, the validation response; and

separately transmitting, in real-time, by the second blockchain node, via the direct communication channel, the encrypted validation response and a corresponding public key certificate to the first blockchain node.

**18**. The computer-readable medium of claim **17**, wherein when the instructions are executed by the processor, the generating the validation response comprises:

leveraging, by the second blockchain node, a sanction list that comprises a plurality of portions, and

wherein each blockchain node within the interbank blockchain network comprises a respectively corresponding portion from among the plurality of portions.

**19**. The computer-readable medium of claim **17**, wherein when executed, the instructions cause the processor to perform further operations comprising:

prior to receiving a second validation request by the second blockchain node, pushing, from the second blockchain node, to the first blockchain node, a pre-

emptive response that has been populated with data that pertains to the second validation request.

**20**. The computer-readable medium of claim **17**, wherein when executed, the instructions cause the processor to perform further operations comprising:

based on the validation response, confirming, by the first blockchain node, that the beneficiary account has been verified by the second blockchain node; and

forwarding, by the first blockchain node, the payment from the remitter account to the beneficiary account.

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