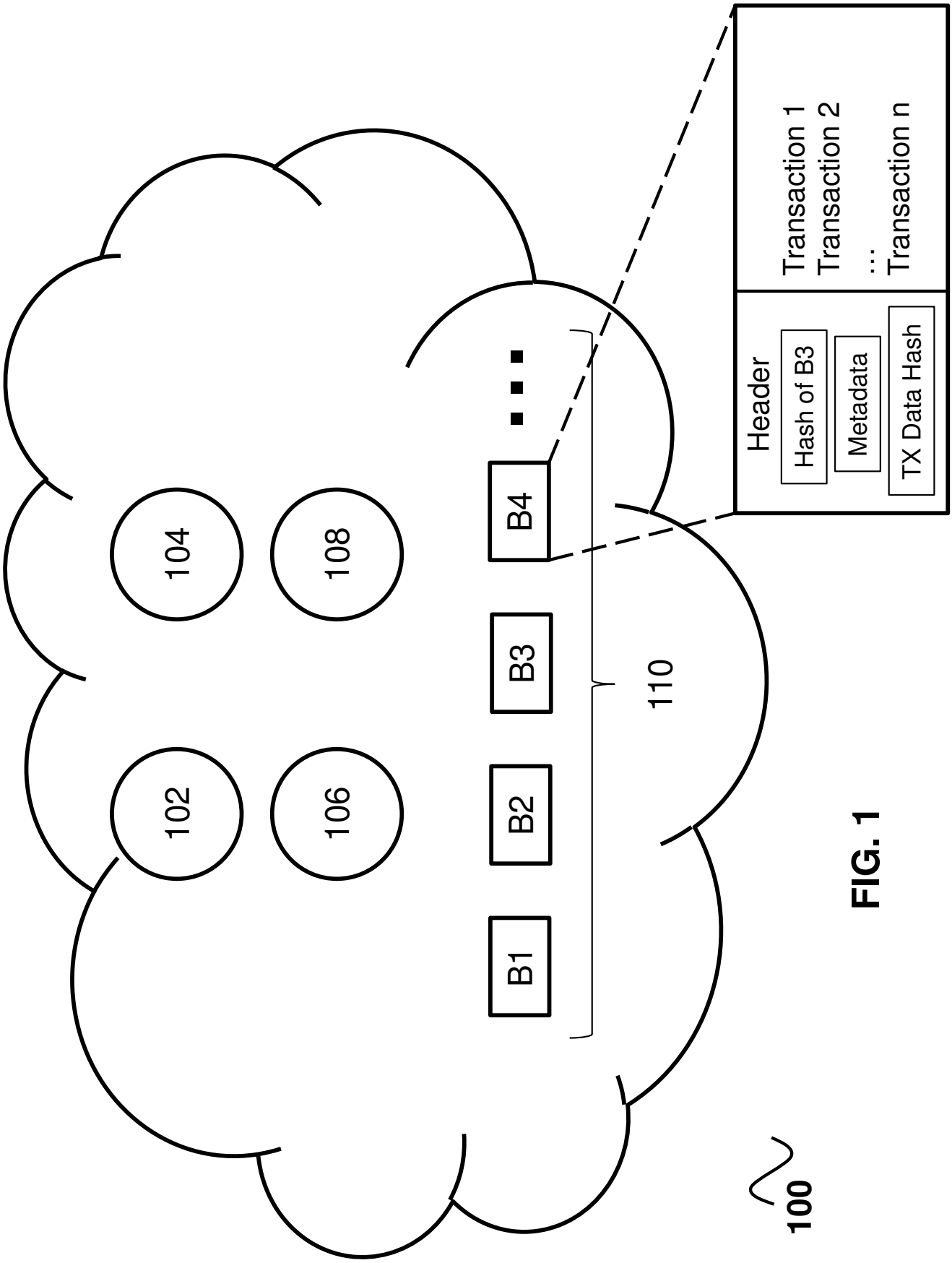

100
102
104
106
108
110
B1
B2
B3
B4
Header
Hash of B3
Metadata
TX Data Hash
Transaction 1
Transaction 2
...
Transaction n

FIG. 1

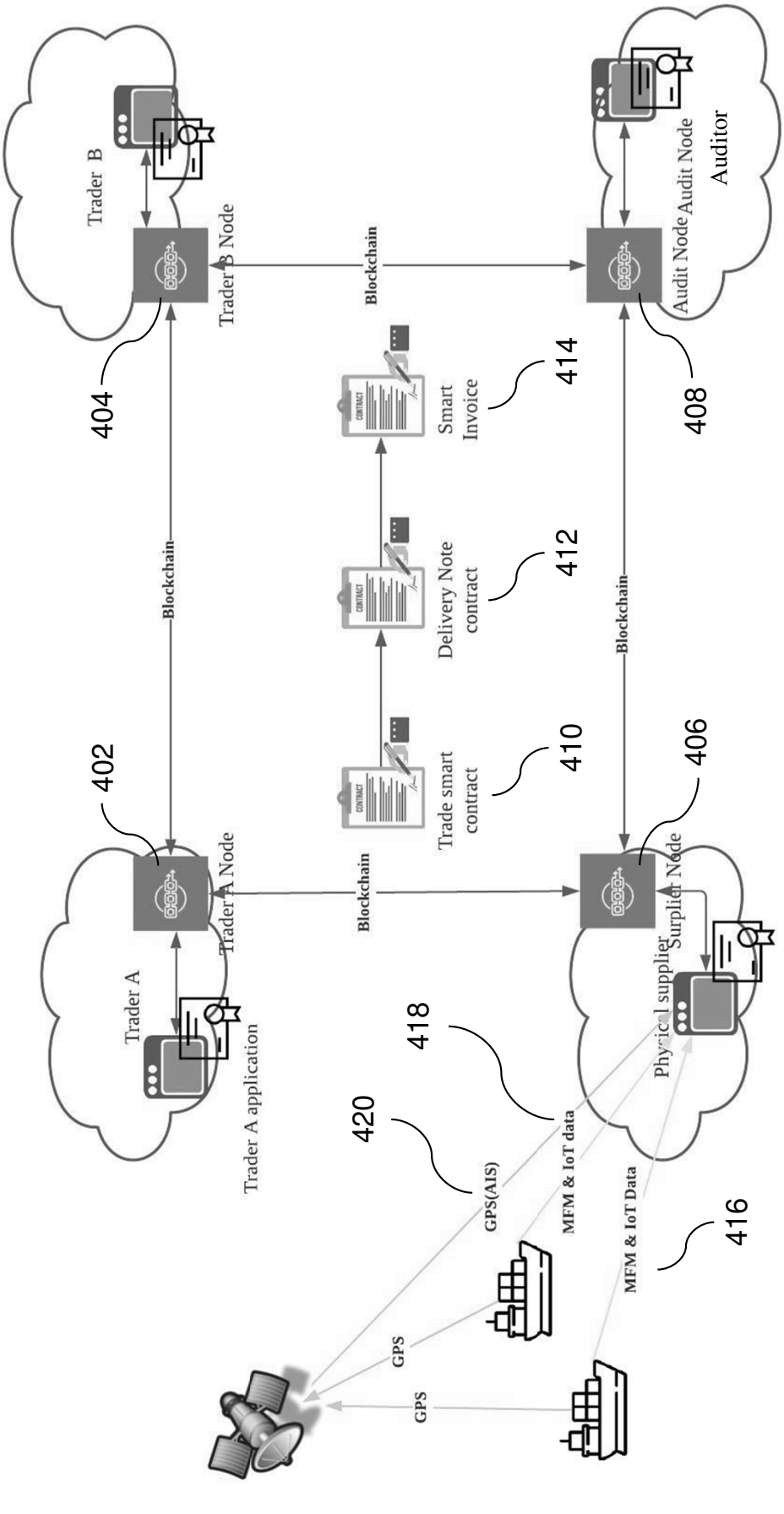

Trader B
Trader B Node
Audit Node
Auditor
Blockchain
404
408
414
Smart Invoice
412
Delivery Note contract
410
Trade smart contract
402
406
Trader A
Trader A application
Trader A Node
Physical supplier
Supplier Node
418
420
GPS(AIS)
MFM & IoT data
GPS
MFM & IoT Data
416
400

FIG. 4

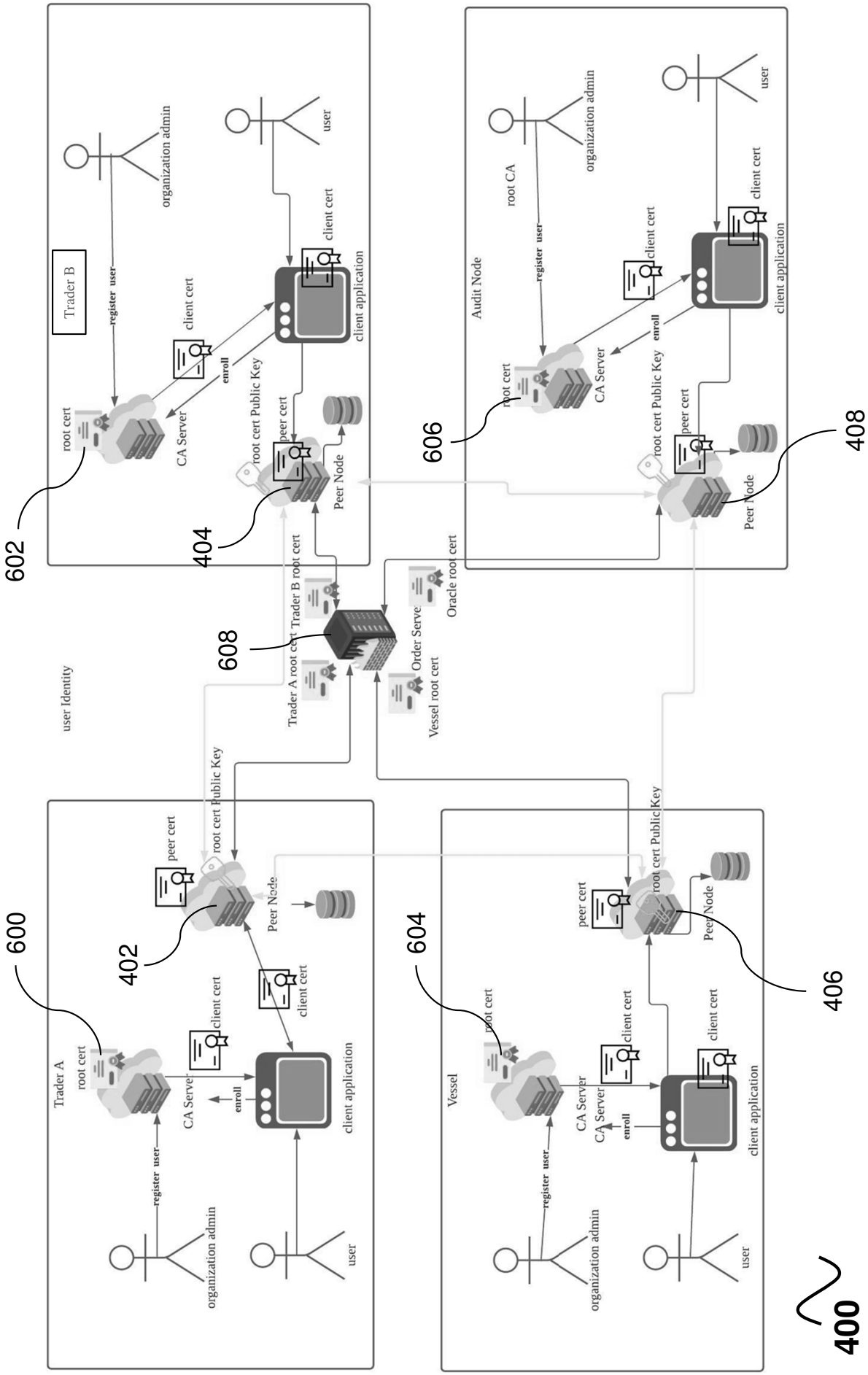

Trader B
organization admin
user
register user
client cert
enroll
CA Server
root cert
client application
root cert Public Key
peer cert
Peer Node
602
404
Audit Node
root CA
606
408
user identity
Trader A root cert
Trader B root cert
Order Server
Oracle root cert
Vessel root cert
608
Trader A
600
402
Vessel
604
406
400

FIG. 6A

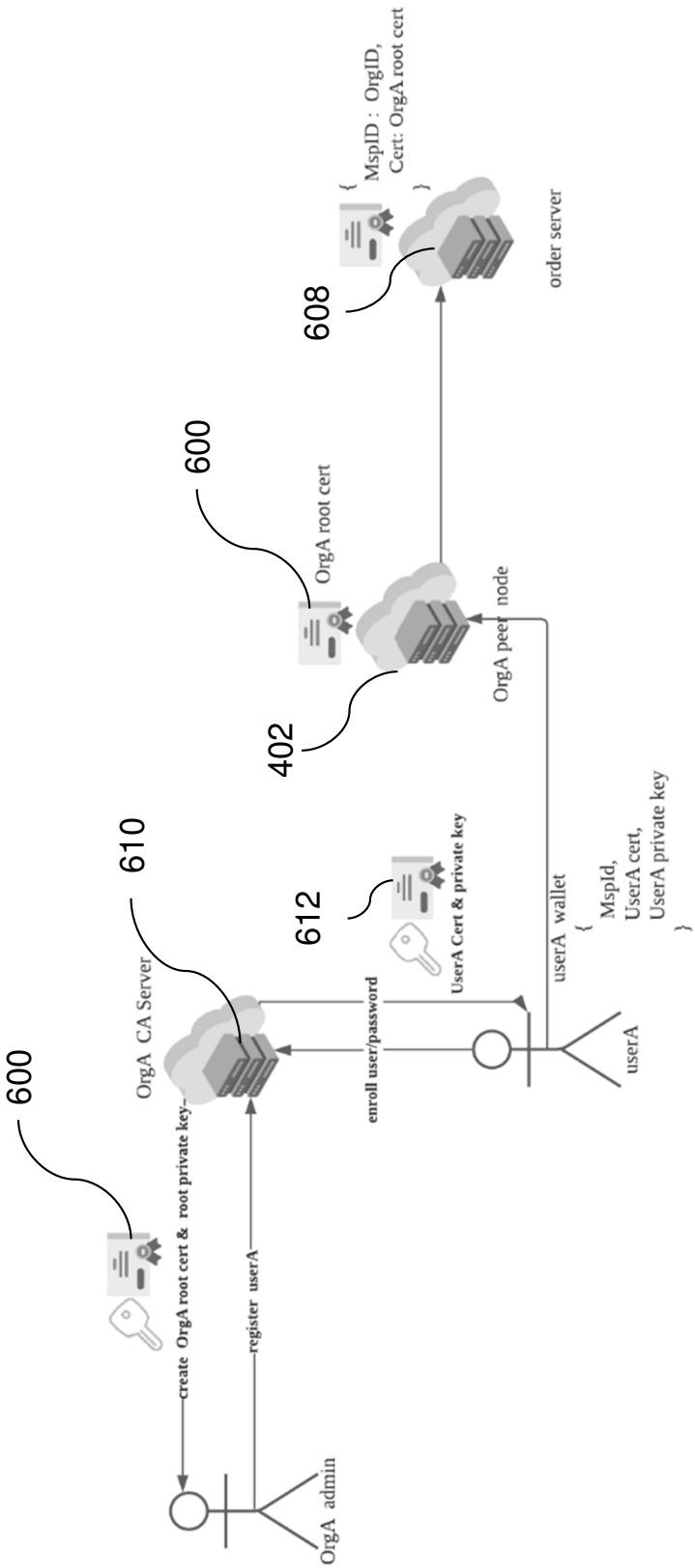

600
OrgA admin
create OrgA root cert & root private key
register userA
OrgA CA Server
610
enroll user/password
612
UserA Cert & private key
userA wallet
{
MspId,
UserA cert,
UserA private key
}
userA
OrgA peer node
402
600
OrgA root cert
608
{
MspID : OrgID,
Cert: OrgA root cert
}
order server

FIG. 6B

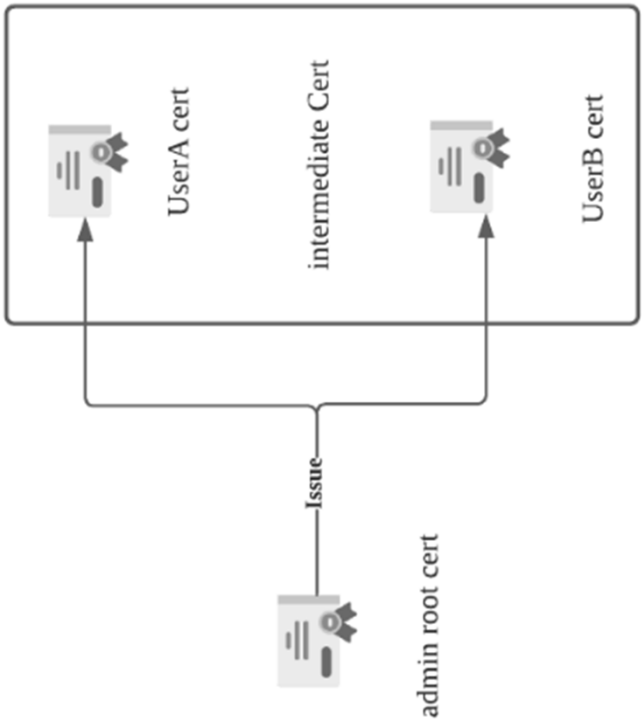

UserA cert
intermediate Cert
UserB cert
Issue
admin root cert

FIG. 6C

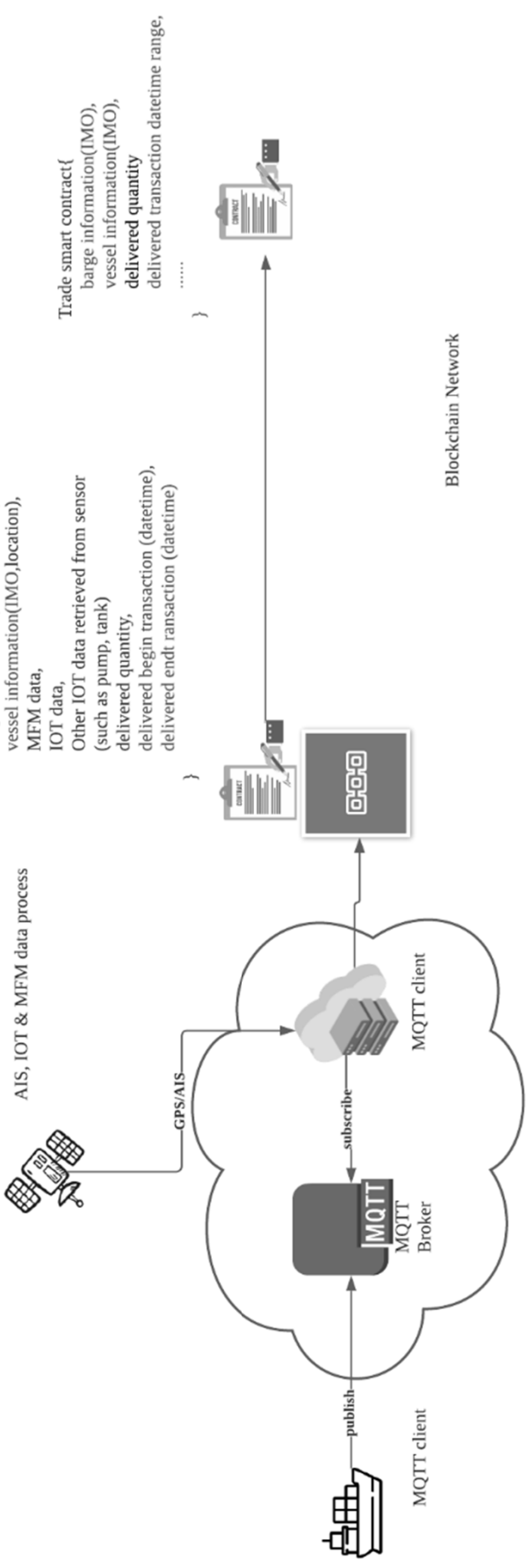

Delivery Note contract{
barge information(IMO,location,),
vessel information(IMO,location),
MFM data,
IOT data,
Other IOT data retrieved from sensor
(such as pump, tank)
delivered quantity,
delivered begin transaction (datetime),
delivered endt ransaction (datetime)
}
Trade smart contract{
barge information(IMO),
vessel information(IMO),
delivered quantity
delivered transaction datetime range,
.....
}
Blockchain Network
AIS, IOT & MFM data process
GPS/AIS
subscribe
MQTT client
MQTT
MQTT
Broker
publish
MQTT client

FIG. 10