

Independent Claim 4 (Article of Manufacture – Computer-Readable Medium for RWA Platform)

A non-transitory computer-readable medium for an IoT cloud platform integrated with blockchain that causes the platform to: receive data associated with any physical asset or RWA from IoT edge hardware; validate the data and generate a digital RWA certificate; mint a value token on a blockchain as an immutable digital twin; and operate an integrated exchange supporting market, limit, derivative, and conditional orders with automatic settlement and permanent ledger recording.

Dependent Claims for Independent Claim 4

The following is a complete set of dependent claims (Claims 2–22) that further specify and narrow the non-transitory computer-readable medium of Independent Claim 4. Each dependent claim is fully supported by the disclosures in the attached document (Patent Filing Highlights US20220180374A1.pdf), including the detailed descriptions of the IoT cloud platform's receipt and processing of data from edge hardware (sensors, routers, gateways), automated validation/verification/certification processes, value token minting on a blockchain ledger (immutable digital asset record with cryptographic ownership keys and validation data), operation of the integrated blockchain-based exchange layer (listing, market/limit/derivative/conditional orders, automatic settlement, permanent recording of every transaction), real-time/continuous operation, redundant ledger copies, cryptographic hashing, fraud reduction, permanent auditability, primary-market issuance, closed-loop automation, and the overall end-to-end tokenized digital twin platform for any physical asset or RWA as of the December 26, 2017 priority date.

Full Claim Set in Formal USPTO-Style Format (Reordered to Start with Claim 1)

1. A non-transitory computer-readable medium for an IoT cloud platform integrated with blockchain that causes the platform to: receive data associated with any physical asset or RWA from IoT edge hardware; validate the data and generate a digital RWA certificate; mint a value token on a blockchain as an immutable digital twin; and operate an integrated exchange supporting market, limit, derivative, and conditional orders with automatic settlement and permanent ledger recording.
2. The non-transitory computer-readable medium of claim 1, wherein the instructions cause the IoT cloud platform to receive data from an IoT edge hardware layout comprising sensor devices, edge routers, and edge gateways configured to communicate using one or more wireless protocols selected from the group consisting of Bluetooth, Zigbee, WiFi, Z-Wave, Sub-Gigahertz, Cellular, Satellite, LoRaWAN, Sigfox, and combinations thereof.
3. The non-transitory computer-readable medium of claim 1, wherein the instructions cause the IoT cloud platform to receive the data continuously or in real time from physical facilities, infrastructure, renewable resources, or efficiency systems instrumented with the IoT edge hardware.
4. The non-transitory computer-readable medium of claim 1, wherein the instructions cause the IoT cloud platform to perform automated validation and certification of the

received data using processes for accuracy, sampling design, internal controls, and verification consistent with established standards for real-world asset certification.

5. The non-transitory computer-readable medium of claim 1, wherein the instructions cause the IoT cloud platform to automatically generate the digital RWA certificate upon successful validation of the received data.
6. The non-transitory computer-readable medium of claim 1, wherein the instructions cause minting of the value token by generating an immutable digital asset record on the blockchain ledger that includes one or more of public-key addresses, cryptographic block linking, timestamps, transaction data, user identifiers, equipment identifiers, validation reports, and verification statements.
7. The non-transitory computer-readable medium of claim 1, wherein the instructions cause the blockchain ledger to register all participants and equipment associated with the physical asset or RWA on the distributed ledger to prevent double-spending or fraud.
8. The non-transitory computer-readable medium of claim 1, wherein the instructions cause the value token to be minted as a primary market activity based on the validated and certified data from the IoT edge hardware.
9. The non-transitory computer-readable medium of claim 1, wherein the instructions cause the integrated exchange to support execution of market orders, limit orders, options, forwards, futures, swaps, or pre-market contracts.
10. The non-transitory computer-readable medium of claim 1, wherein the instructions cause the integrated exchange to support advanced order types selected from the group consisting of short selling, trailing stop orders, conditional orders, One-Triggers-the-Other (OTO) orders, One-Cancels-the-Other (OCO) orders, One-Triggers-a-One-Cancels-the-Other (OTOCO) orders, and combinations thereof.
11. The non-transitory computer-readable medium of claim 1, wherein the instructions cause the integrated exchange to apply time-in-force rules to orders, the time-in-force rules selected from the group consisting of day orders, good-'til-canceled orders (up to 180 days), fill-or-kill orders, immediate-or-cancel orders, on-the-open orders, on-the-close orders, and combinations thereof.
12. The non-transitory computer-readable medium of claim 1, wherein the instructions cause the integrated exchange to automatically match, execute, and settle trades in real time or near real time by recording each transaction as a new cryptographically hashed block on the distributed ledger.
13. The non-transitory computer-readable medium of claim 1, wherein the instructions cause the integrated exchange to transfer ownership of the value token (digital twin) to the buyer and deliver payment to the seller simultaneously upon execution of a trade.
14. The non-transitory computer-readable medium of claim 1, wherein the instructions cause all transactions, ownership transfers, and payments to be permanently recorded on the distributed ledger to reduce fraud and ensure permanent verification and auditability of the tokenized digital twin.
15. The non-transitory computer-readable medium of claim 1, wherein the instructions cause the blockchain ledger to maintain multiple redundant copies across cloud environments to provide fault tolerance and Byzantine fault tolerance.

16. The non-transitory computer-readable medium of claim 1, wherein the instructions cause automated monetization of the tokenized digital twin by transferring funds to the seller upon execution of a winning bid while simultaneously delivering the value token to the buyer.
17. The non-transitory computer-readable medium of claim 1, wherein the instructions cause the IoT cloud platform and integrated exchange to operate in a closed-loop automated process to enable continuous measurement, validation, certificate generation, token minting, listing, and trading of the tokenized digital twin.
18. The non-transitory computer-readable medium of claim 1, wherein the instructions cause the distributed ledger to employ cryptographic hashing of each new block to prior blocks to ensure immutability of all tokenized digital twin records and trading transactions.
19. The non-transitory computer-readable medium of claim 1, wherein the instructions cause the integrated exchange to function as an integrated commodity, crypto, security, or financial exchange without requiring separate centralized custodians or clearinghouses.
20. The non-transitory computer-readable medium of claim 1, wherein the instructions cause the value token to represent an immutable digital twin of any commodity, security, physical asset, financial instrument, or other RWA that is verifiable and cannot be double-spent due to the immutable nature of the blockchain ledger.
21. The non-transitory computer-readable medium of claim 1, wherein the instructions cause the system to eliminate intermediaries by performing end-to-end automated data receipt, validation, certificate generation, token minting, listing, and trading directly on the integrated IoT cloud platform and blockchain.
22. The non-transitory computer-readable medium of claim 1, wherein the instructions cause the integrated exchange to support high-frequency, derivative, and institutional trading of tokenized digital twins of any physical asset or RWA while maintaining permanent auditability and fraud reduction through immutable ledger recording.

These claims form a self-contained, commercially robust claim family that directly maps to the article-of-manufacture embodiments of the IoT cloud platform instructions for end-to-end tokenized digital twin generation and trading of any physical asset or RWA on an integrated blockchain exchange, including data receipt, validation/certification, token minting, and exchange-layer operations as described in the December 26, 2017 provisional disclosure (and the incorporated earlier provisionals). The full set (renumbered to begin with Claim 1) can be incorporated into a non-provisional, continuation, or continuation-in-part application (alone or in combination with the claim families of Independent Claims 1–3) to further strengthen the Parisii patent portfolio for tokenized Real World Assets and blockchain-based RWA/digital twin infrastructure.