Oracle Blockchain and AI/ML Enabled Government Acquisition Solution in a FedRAMP Certified Government Cloud

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Our mission is to help people see data in new ways, discover insights, unlock endless possibilities.
A Modern Acquisition Solution Platform

Procurement Lifecycle Apps

REST Connector
Integration Cloud or SOA Suite

Blockchain Platform
(Distributed Ledger, Cloud BaaS or on-prem Enterprise Edition)

Users, Roles, Groups

Analytics/ML & Anomaly Detection

Oracle DB or ADW

Privacy

Consensus

Integration Orchestration

Distributed Ledger

Smart Contracts

Blockchain App Builder

Custom Development, Accelerators, Templates

SAP, JDE, etc.

On Premises

Cloud ERP

Cloud SCM

Cloud HCM

Cloud CX

Oracle Cloud Infrastructure (OCI – FedRAMP Certified) or On-Premises/Hybrid/Multi-Cloud Infrastructure

IDCS, LDAP/AD

DASHBOARDS & REPORTS

Oracle DB or ADW

Custom Development, Accelerators, Templates

Events

Custom

EBS, PeopleSoft...
Business Challenges Blockchain Solves

Blockchain enables rapid development of new and/or significant optimization of existing business & organizational networks via consensus-based trusted transactions maintaining single source of truth between parties without intermediaries.

Common challenges it can address

• High reconciliation cost and operations impact of siloed data across divisional or company boundaries
• Lack of verifiability, risk of human errors or fraud among your partners or ecosystem participants
• Cost, risk, and delays from intermediaries the business operations depends on
• Lack of real-time visibility among suppliers, distributors, or customers due to batch data updates
• Poor traceability or lack of audit trail for regulatory compliance or internal best practices

Fractured Data Siloes in Many Enterprise Ecosystems

Point-to-point data flow via spreadsheets, EDI, or B2B file transfer

Supplier Records
Manufacturer Records
Distributor/Retailer Records
Certification Agency / Regulator
Logistics / Shipper
Bank / Insurance

...inefficient, expensive, vulnerable

Enterprise blockchain replaces vulnerable data sharing with

A trusted, Distributed Ledger with real-time updates, providing...

Supplier
Manufacturer
Certification Agency / Regulator
Logistics / Shipper
Distributor / Retailer
Bank / Insurer

Permissioned
Interoperable, Resilient, Scalable

...single source of truth with non-repudiation, consensus, traceability, immutability
How Blockchain Adds Unique Value

Tamper-evident data
- Records written to the blockchain cannot be changed or deleted without detection
- Non-repudiation of participants secured by digital signatures
- Enhances trust in decentralized single source of truth

Smart contracts automation
- Business logic to validate reconcile, persist, or settle trusted transactions
- Multi-org signatures (endorsements) attached to on-chain transactions
- Codifies rules, agreed terms and practices across organizations, enables tracking of agreements, SLAs, etc.

Shared and transparent
- Distributed ledger enables single shared source of truth distributed across all nodes
- Enables transparency, reduces delays and cost of 3rd party intermediaries
- Provides built-in audit trail of multi-party transactions

Consensus based
- Multiple orgs can post updates on the ledger, that are time-ordered across the network
- Updates to distributed ledger are made after consensus among network peers
- Protects against fraud among participants and maintains trust the ledger

Confidentiality & privacy
- Only authorized members can join and be given fine-grained access view or update the data
- Blockchain stores auditable historic records separating out private data for specific members
Security and Integrity Benefits of Using Blockchain for Procurement

Confidentiality
Preventing unauthorized access to data on blockchain

- TLS data encryption in-transit & block volume encryption at-rest
- Permissioned blockchain with authorized members & signature verification for all messages
- Ledger/channel isolation
- Policy-based access control
- Fine-grained access control

Integrity of Identity and Data
Authenticity of the reporting organization & thwarting recording of invalid results

- All messages are signed by participant’s private key and signatures are verified
- Separation of duties:
  - Peer nodes store the ledger copies, execute smart contracts to update ledger, commit ledger transactions & blocks
  - Ordering service nodes verify peers’ signed transactions, sequence them into blocks, then sign the blocks
- Multi-signature endorsement policies define how many and which orgs must execute the smart contract and provide signed response

Immutability/Tamper-proofing
Preventing post-factum changes to data and signatures on blockchain

- Verifiable, linked chain of blocks using cryptographic hashes
- Tampering with any block or deletion is easily checked via blockchain verification utility
- DLT-based with automatically replicated copies of the ledger across all nodes in the blockchain channel
- Nodes deployed across admin domains, data centers, agencies, etc.
Oracle Blockchain Platform

Reduce complexity and cost of sharing data across business processes, app-specific siloes and/or organizational boundaries by using distributed ledger as a single source of truth.

Use OBP to quickly provision and integrate app siloes via production-ready trusted business & government networks – in Cloud or on-Premises

- Dynamically configure and operate a blockchain network with HA, dynamic scalability, integrated security, and built-in monitoring
- Automate data exchange with Smart Contracts built with low-code Blockchain App Builder
- Rapidly integrate Oracle & 3rd party apps via REST APIs & OIC enterprise adapters to post updates and conduct trusted transactions
- Transparently enable ADW integration & live analytics via OAC on blockchain transactions

Oracle Blockchain Platform
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Low-Code Blockchain App Builder to Generate Smart Contracts and APIs
Concerns with Current Test Submission Processes

- Ad-hoc processes and tools relying on fragile file transfer
  - No built-in tracking, risk of human errors, missed transfers
  - Risk & concerns about identity fraud or data tampering/manipulation
  - Inconsistent treatment of PHI/PII
- Becomes even more important when testing outside the lab

Permissioned Blockchain as a Fully-Managed Service

- Blockchain nodes are lab-dedicated or shared for “at-anywhere” reporters
- PKI signed msgs for non-repudiation and integrity of the results
- HHS and test reporters have local ledger copies for verification
- Distributed ledger architecture enhanced w/ on-demand chain validation
- Data pump streams results to Oracle DB for integration & analytics, with HHS Protect pulling data from Oracle DB over secure connection

HHS Blockchain Status & Plans

- Live reporting from Abbott, Ellume, Cue, BD... with HHS c-ATO authorization
- Shared infrastructure reporting via Waters.hhs.gov for NIH RADx participants
- More at-home/PoC test manufacturers onboarding to Waters
- Implemented CDC node for integration to CDC ReportStream for State distribution
The Multivariate State Estimation Technique (MSET) is a nonlinear, nonparametric machine learning method that was originally developed at the USDOE's Argonne National Laboratory in the 1990's for prognostic anomaly detection in nuclear plants, NASA, commercial aviation, and business-critical industrial applications.

Oracle was the first company (starting in 2002) to pull MSET-type ML prognostics into enterprise servers, engineered systems, and cloud containers.

Oracle MSET2 inherits and improves the value proposition for real-time prognostics for IoT optimal predictive maintenance of critical assets.
OCI Anomaly Detection provides developers with custom-trained, business-specific anomaly detection models that can indicate critical incidents deviating from the norm.

Detect anomalies at the earliest time with least number of false alarms using Oracle’s heavily patented (150+ patents) MSET2 algorithm.
Benefits for Blockchain and AI/ML-Powered Acquisition Solution

- **Blockchain-enabled secure acquisition processes** provides immutability and tamper proof ledger of all transactions. This includes integrity of data and identity management of participants with continuous auditing to assure blockchain integrity.

- Purchasers have **transparent access** to ordering and performance SLAs to enable secure efficient auditing of the supply chain so that there is certainty in purchasing, supplier management, procurement conditions, etc.

- Blockchain built-in audit trail simplifies and automates most of the auditing in all phases of the acquisition lifecycle, eliminating paperwork and reducing reconciliation effort.

- **Single source of truth** assists stake holders in Contract Planning, Solicitation, Evaluation, Award, and the Post Award stages of the contract life-cycle.

- **Smart contracts** help stakeholders to avoid discrepancies that occur in today’s siloed information systems.

- Provides **visibility across government and vendor stakeholders in real-time** and speeds up interactions within the acquisition process.

- Minimize disputes over information discrepancies between systems.

- AI/ML automates anomaly detection, forecasting, and pattern recognition for risk analysis and mitigation.
Getting Started

Learn

http://oracle.com/blockchain
http://developer.oracle.com/blockchain
https://www.oracle.com/artificial-intelligence/anomaly-detection/

Additional Resources

Oracle Blockchain Blog & News:
blogs.oracle.com/blockchain
oracle.com/blockchain/news-and-opinion.html

Oracle Blockchain Videos:
Youtube: Oracle blockchain channel

App Builder Documentation:

Try OBP in Oracle Cloud Free Tier
https://www.oracle.com/blockchain/cloud-platform/

Once OBP Cloud instance has been provisioned, bring up the Console and navigate to Developer Tools tab to download the Blockchain App Builder.

Download OBP Enterprise
Thank You!
OCI Anomaly Detection differentiators

Automatic data preprocessing
- Imputes missing values based on ML based estimates
- Patented resampling automatically works with differing time interval signals
- Un-quantizes signal values to help build best model for quantized signal monitoring

Developer focused AI service that automates data science
- Automatic best model creation for the data without needing data scientists
- Model output includes overall model accuracy, specific signal accuracy and signal specific statistics for developers to decide if the model is effective for the business use case

Automate business workflows for immediate action using anomaly score
- Estimated value for each identified anomaly helps to assess severity of the anomaly occurrence
- Aggregated score of anomaly over time provides whether the anomalies are becoming severe overtime
- Signal specific anomaly score helps to assess relative severity of anomalies across signals
Early Warning Advantage/Greater Accuracy

By creating a dynamic band around each sensor value in real time and correlating it to other sensor values, MSET-2 is able to give an Early Warning.

MSET-2 Monitors and correlates all sensors simultaneously.

Earlier notification; could be days, weeks, or months earlier than a threshold trip . . .

FAPs and MAPs (also called Type-I and Type-II in the Statistical Process Control Literature) are both ultra-low and are independently configurable.

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Why Blockchain/Distributed Ledger Technology (DLT)

• Single source of truth with shared & transparent data access by HHS, CDC, States, etc.
• Enables trusted updates from authorized members with validation and non-repudiation
• Supports real-time posting of results through smart contract APIs
• PKI-based message signing among peer nodes replaces intermediaries
• Creates trust through durable, tamper-evident history that’s cryptographically verifiable
Functional Architecture Overview

Abbott Labs Reporting
Oracle DB
Oracle Analytics
HHS Protect
Public Data Hub
HHSGOV Tenancy in Oracle Government Cloud

IAM

API Gateway
Authorizer

FedRAMP rated Oracle Gov Cloud
Enterprise-grade blockchain network with multiple channels
Shared ingestion/validation front-end with OAuth2 token-based access control
Flexible API model handling common formats
Scalability and extensibility for future needs

At-Anywhere Testing Manufacturers & Sites
1. Ellume via LifePoint (live)
2. Quidel via Safe Health
3. Cue Health
4. BD Veritor via ImageMover
5. Quidel & Abbott via Primary Health
6. ...

CSV
HIS
FHIREXTRACT

ReportStream

HHSGOV Tenancy in Oracle Government Cloud