

DGX Technical Whitepaper

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DGX SOVEREIGN LAYER-1 TECHNICAL WHITEPAPER

A Byzantine Fault Tolerant, Post-Quantum Blockchain for Physical Bullion & In-Ground Reserves

Abstract

The digitization of physical commodities has historically been bottlenecked by trust deficits, slow settlement networks, and centralized smart contracts deployed on general-purpose consumer blockchains. This paper introduces the **DGX Sovereign Layer-1 Network**, a custom-built distributed ledger utilizing **Proof-of-Gold Byzantine Fault Tolerance (PoG-QBFT)** consensus, **NIST FIPS 204 Dilithium-3** post-quantum cryptography, and **Hardware Quantum Random Number Generation (QRNG)** for real-time vault telemetry. We describe the mechanics of our in-ground reserve tokenization, forward production streaming amortization, and atomic Delivery-versus-Payment (DvP) settlement protocol.

1. Proof-of-Gold Byzantine Fault Tolerance (PoG-QBFT)

DGX utilizes a consensus mechanism where validator voting power is weighted by a combination of bonded validator stake and verified physical gold reserves held in accredited depositories. * **Round Finality:** 1-second deterministic finality. * **Fault Tolerance:** Up to $\frac{(N-1)}{3}$ malicious nodes. * **Gas Economics:** Gas fees are denominated in fractional gold milligrams (Au-mg) and stablecoins, creating predictable transaction costs for institutional treasury desks.

2. Post-Quantum Cryptographic Architecture

To ensure sovereign multi-decade permanence: * **Digital Signatures:** Crystals-Dilithium (Dilithium-3) provides lattice-based post-quantum security resistant to quantum computer attacks. * **Key Encapsulation:** Kyber-768 for secure inter-node P2P transport. * **Auditing Beacons:** Real-time vault audits are stamped using physical QRNG entropy beacons derived from quantum optical vacuum fluctuations.

3. In-Ground Reserve Tokenization & NI 43-101 Standard

DGX allows certified mining operators to register in-ground Proven & Probable (P&P) reserves: $\text{Coverage Ratio} = \frac{\text{Proven Reserves (oz)}}{\text{Committed Streaming Volume (oz)}} \geq 2.50$

$\text{Net Present Value (NPV)} = \sum_{t=1}^T \frac{\text{Deliveries}_t \times (P_{\text{stream}} - P_{\text{stream}})}{(1 + r)^t}$

Where P_{stream} is the contractually locked delivery price (\$750/oz), and r is the discount rate reflecting mining operational risk.