

The Always-Encrypted Photonic Processor

Current Milestones & Future Strategic Roadmap

Project Anchor — FluidCluster.pt

FluidCluster Engineering & Cryptography Core

Vanguard Computing & Mathematical Sovereignty Initiative

September 2026

Progress & Horizons

Latest Engineering Milestones

The Strategic Vision (The Future Pipeline)

The Architectural Roadmap Summary

What We Have Achieved So Far

Project Anchor has successfully transitioned away from hardware-bound isolation to pure mathematical sovereignty.

Completed Foundations

- ▶ **Dismantled the Silicon Trojan Horse:** Completed a rigorous technical audit exposing the architectural vulnerabilities of the Circle Arc PoA/TEE ecosystem.
- ▶ **Mathematical Formulation:** Formulated and formalized the Lattice-based Learning With Errors (LWE) engine for blind multilateral accounting.
- ▶ **Smart Contract Core Deployment:** Developed the initial Solidity blueprint for the PhotonicNettingEngine running natively over ciphertext using Zama fhEVM primitives.
- ▶ **Knowledge Repository Expansion:** Synthesized a comprehensive technical gallery of 1,400+ comparative documents mapping out 15 years of Ethereum evolutions to fhEVM limits.

Phase 1: Overcoming the FHE Noise Bottleneck

The immediate horizon focuses on scaling execution without physical memory cleartext exposure.

Simulating Gaussian Noise

- ▶ Developing algorithmic Python models to simulate discrete Gaussian noise accumulation ($e \sim \chi$).
- ▶ Optimizing the exact threshold boundaries before ciphertext entropy degradation ($e \geq \frac{q}{4}$).

The Photonic Co-Processor

- ▶ Mapping hardware requirements for Mach-Zehnder Interferometer (MZI) meshes.
- ▶ Moving TFHE bootstrapping/blind rotations from silicon clock constraints to light-phase modulation.

Phase 2: Decentralized Open Account Networks

Moving from local simulations to a full-scale macro-economic clearing topology.

Netting Engine Integration

- ▶ Hardening the PhotonicNettingEngine with zero-knowledge (ZK) verification layers to prove matrix closures ($\sum \mathbf{E}_i = 0$).
- ▶ Constructing automated multi-asset E-Barter circuit paths to systematically settle values without fiat intermediation.
- ▶ Designing custom PCIe driver frameworks to pass raw LWE polynomials seamlessly between the host operating system and optical hardware.

FluidCluster Execution Timeline



The Ultimate Milestone

Total elimination of execution side-channels, creating a post-fiat, zero-MEV financial layer run completely by the physics of light.