

Automated Confidential M&A Integration

Mechanism Design & Stable Coalition Incentives via fhEVM Platforms

Regulatory Sandbox ZLT#13 — DL 150/2019 Compliance

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The M&A Coordination Game

Modeling Corporate Mergers as Cooperative Games

Let $N = \{1, 2, \dots, n\}$ be the set of negotiating enterprises. A sub-coalition $S \subseteq N$ represents a targeted subset of firms evaluating a structural merger.

- **Characteristic Value** $v(S)$: The maximum economic synergy that the subset S can extract unconditionally.
- **The Core Strategy Profile**: The total synergistic payout vector $\mathbf{x} = (x_1, \dots, x_n)$ must satisfy group rationality:

$$\sum_{i \in N} x_i = v(N)$$

The Incentive Deadlock in Modern M&A

Why Mergers Fail Early

Firms overstate individual market volumes or hoard supply chains strategically to claim a larger share x_i of the post-merger payout.

- **The Antitrust Trap:** Legal protections prevent disclosure of operational realities prior to closing (Gun-Jumping laws).
- **Strategic Sabotage:** If calculations occur in the open, rivals can map overlaps or steal alpha if negotiations break down.

Computational Blindness as an Enforcement Engine

FluidCluster 2.0 eliminates strategic posture play by executing characteristic valuation calculations completely inside the cipher domain.

- **Cipher Ingestion:** All negotiating entities parse local databases via edge SDKs, injecting encrypted market vectors directly to an fhEVM contract.
- **Blind Synergy Extraction:** The network contract evaluates joint market density and revenue scaling coefficients blindly:

$$\mathcal{E}(v(S)) = f\left(\mathcal{E}(\mathbf{D}_1), \mathcal{E}(\mathbf{D}_2), \dots, \mathcal{E}(\mathbf{D}_s)\right)$$

- Zero raw telemetry data or pricing tiers are leaked during state changes.

Enforcing Payout Equity via Shapley Values

Guaranteed Fairness Through Mathematical Certainty

To stabilize the alliance, the consolidation app dynamically derives and enforces each firm's unalterable Shapley value contribution within the cipher layer.

$$\phi_i(v) = \sum_{S \subseteq N \setminus \{i\}} \frac{|S|!(|N| - |S| - 1)!}{|N|!} [\mathcal{E}(v(S \cup \{i\})) - \mathcal{E}(v(S))]$$

- **Blind Impartiality:** The marginal delta contribution is processed entirely on-chain via FHE primitives.
- **Shapley Tokens:** The platform mints cryptographic settlement tokens mapping equity ratios precisely to $\phi_i(v)$, blocking bad-faith renegotiation.

Ensuring Core Stability Against Defection

Mathematical Coalition Enforcement

An M&A structure is in the **Core** of the game if no independent sub-coalition has an incentive to defect and form an isolated entity.

$$\forall S \subseteq N, \quad \sum_{i \in S} x_i \geq \mathcal{E}(v(S))$$

- **Automated Boundary Audit:** The fhEVM contract runs blind linear programming evaluations across the combined data blocks.
- **The Clearance Switch:** If a defection vector is profitable, the system flags a silent warning state and rolls back execution cleanly.

Sovereign Workflow & Technical Execution Matrix

Execution Step	Cryptographic Tool	Systemic Impact
Data Pipeline	Edge-side Open SDKs	Extracts and structures asset data into standardized tables locally.
Synergy Parsing	Zama fhEVM Core Primitives	Executes homomorphic intersection maps across joint customer blocks.
Acceleration	Photonic PIC Systems [fluidcluster.pt]	Uses light-wave matrix-vector operations to remove encryption latency.
Stability Verification	On-Chain Shapley Oracle	Verifies Core stability and issues encrypted ownership keys.

Commercial Protections

- Complete mitigation of strategic espionage threats.
- Compliance verification under Portuguese Decree-Law no. 150/2019 parameters.
- Drastic compression of deal timelines from months to days.

Alliance Scalability

- Allows blind, multi-firm roll-ups across thousands of fragmented entities simultaneously.
- Cryptographically stable cap tables backed by mathematical certainty.