

New Model, Old Galaxy: Rebuilding Third Conflict's Game Feel

A Technical Post-Mortem on Engine Modernization and Multi-Agent AI Orchestration

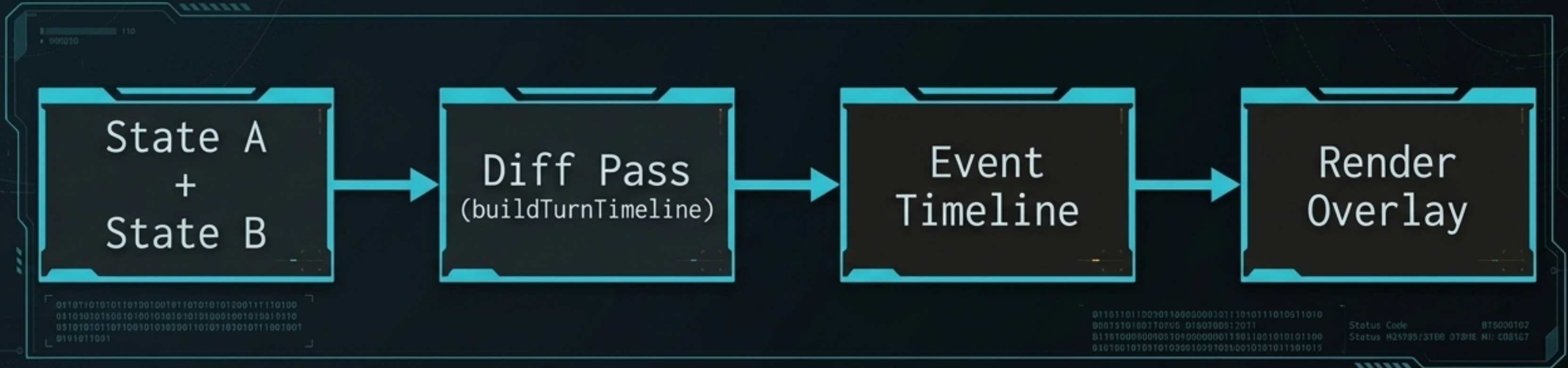
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Inherited Architecture: Claims vs. Reality

Roadmap Claim	Codebase Reality
- Turn resolution is fully implemented.	- Invisible, atomic state swaps with zero UI feedback.
- GOAP AI planner, veterancy, and supply lines are ready.	- Fully tested but completely disconnected (zero callers).
- Procedural music system is fully functional.	- Placebo UI: settings slider adjusted the volume of nothing.

BASELINE ACTION >> 3 exploration agents verified roadmap against code. Establishing strict 'verify, don't assume' protocol

Turn Playback: Pure-Function Resolution



The Logic

Swap the real game state immediately to protect autosave and logic integrity, then sequence a presentation overlay on top.

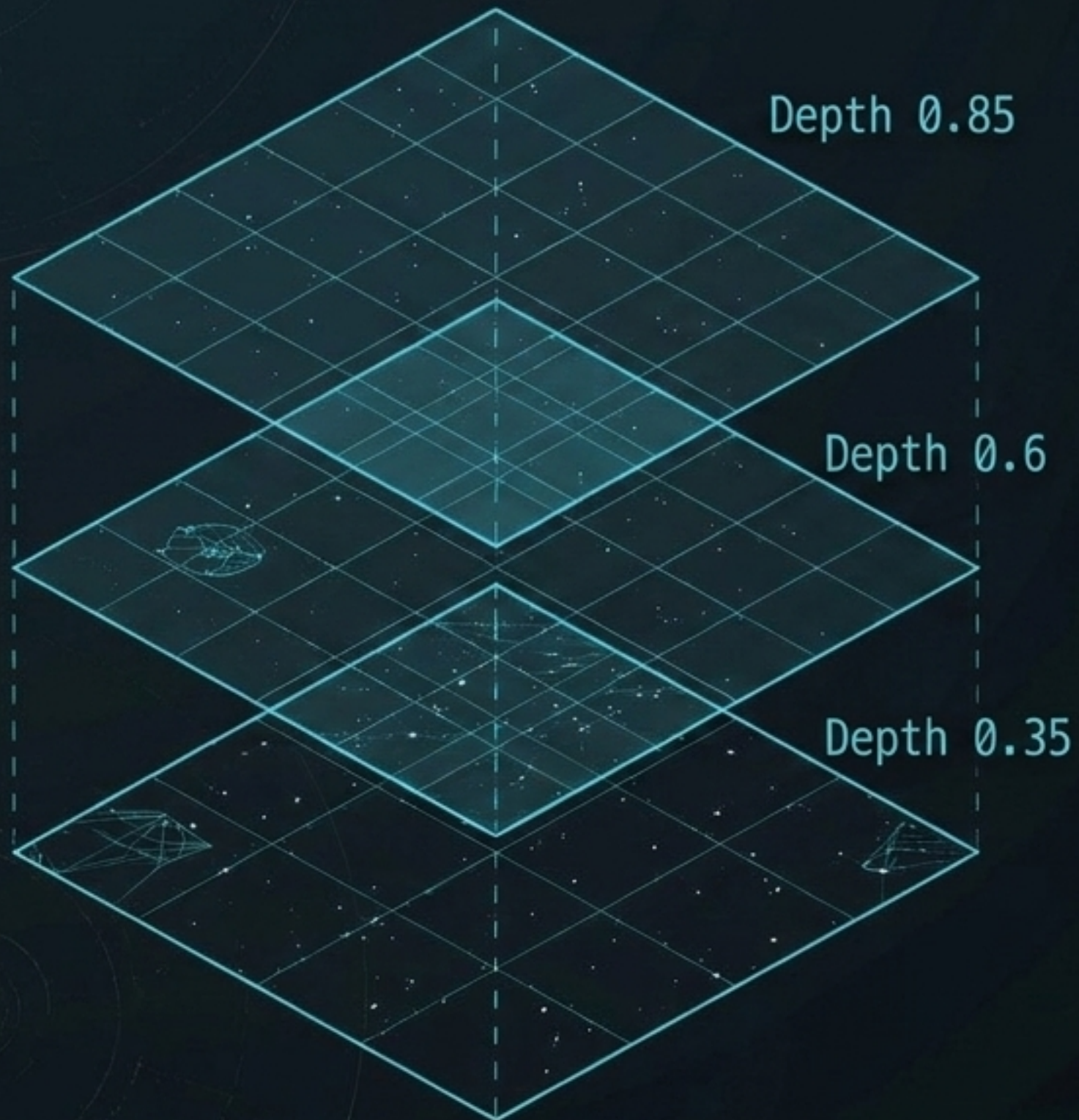
The Engine Mechanism

Pure function mathematically
diffs previous and next
states by fleet ID to
sequence departures,
battles, and milestones.

Constraint Enforcement

System operates on a strictly enforced turn playback budget of exactly 3.5 seconds. Skippable, pure visual layer with zero risk to state integrity.

Graphics Optimization: Parallax Depth Math

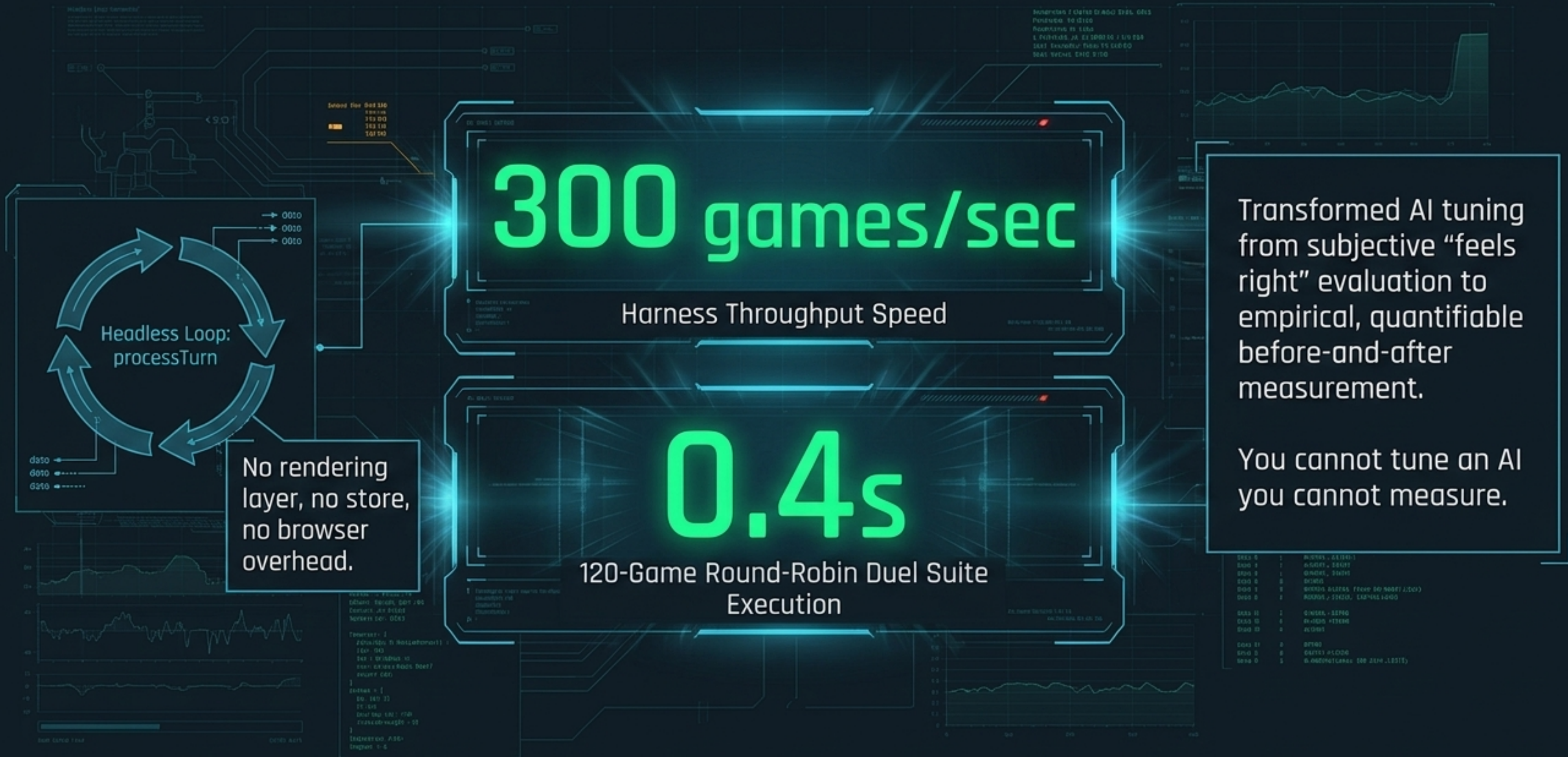


$$\text{scale} = \text{zoom}^{(\text{depth} - 1)}$$

- Composes a secondary transform to the world container to simulate depth relative to camera zoom and pan.
- Replaced 500 individually animated star sprites with a pooled radial texture system strictly capped at 1,000 particles.

Frame times maintained < 8ms target.

Empirical Testing: Headless Self-Play Harness



Goal-Oriented Action Planning (GOAP) Integration



The Implementation

Orchestration executed in parallel using exactly 7 named agents.

Two-Phase Integration

- 1. Refactor: Extract StrategyProfile without altering behavior. Zero test regressions.
- 2. Rewire: Connect GOAP logic.

Dynamic Modulation

PersonalityWeights evolve turn-over-turn, dynamically adjusting hard boundaries (e.g. aggressive goal actively lowers required advantage thresholds before attacking).

Architectural Warning: The Difficulty Inversion



The Flaw

Early behavior-based difficulty logic capped simultaneous attacks for the 'Easy' AI.

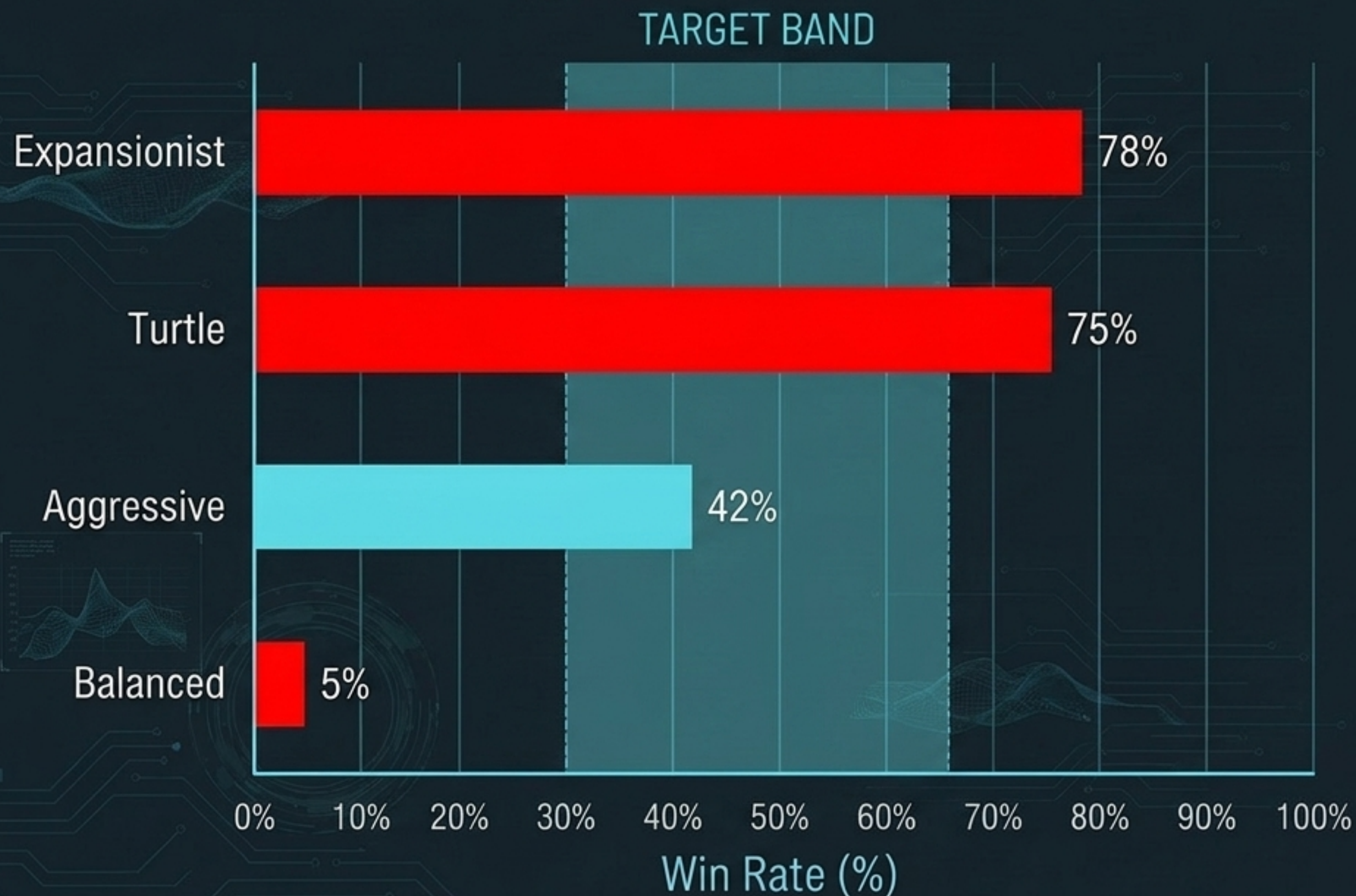
The Inversion

Mirror match data revealed 'Easy' consistently beat 'Hard'. The intended handicap inadvertently optimized the AI.

The Fix

Implemented 'offensiveForceScale' multiplier. Forces lower difficulties to launch undersized fleets, ensuring the handicap actually weakens the opponent.

Honest Balance Tuning: Reporting the Miss



9 balance tuning rounds completed.

The Diagnosis

Structural engine flaw. The duel meta excessively rewards extreme force concentration (Turtle/Expansionist) over generalist approaches.

Follow-up work documented. Data not massaged.

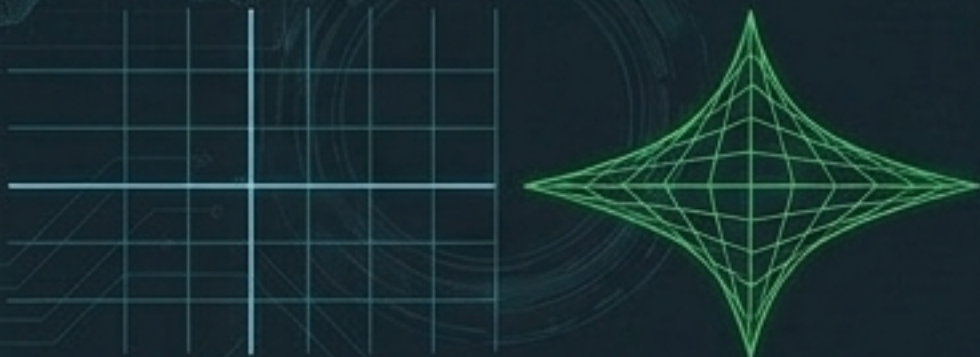
Parallel QA: Autonomous Bug Hunt Findings

Methodology: Read-only agents executed independent parallel sweeps separate from active feature workstreams.

Yield: ~25 verified bug fixes surfaced.

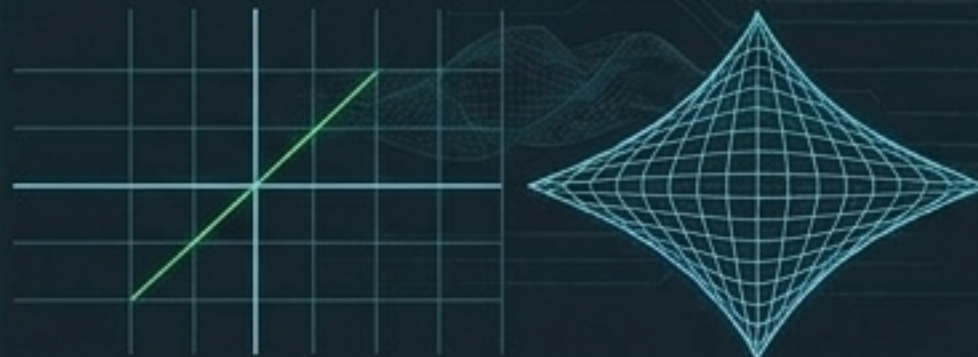
STORE SYSTEM SCAN

- Caught unhandled async rejections silently freezing UI (React error boundaries ignore async chains).



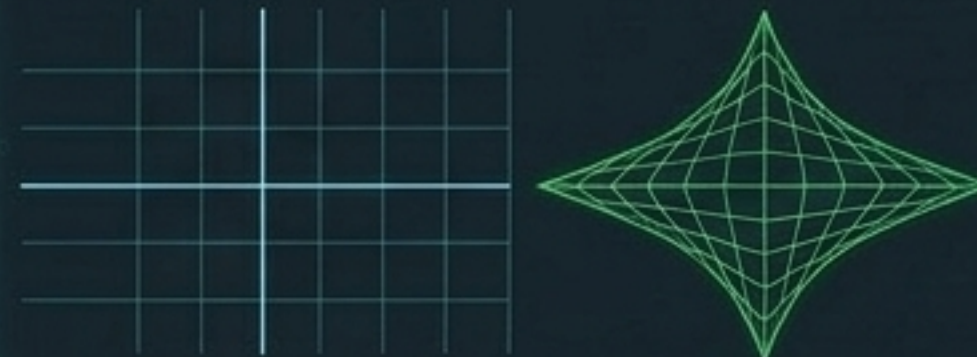
RENDERING SYSTEM SCAN

- Identified $O(N^2)$ per-frame visibility scans. Replaced with $O(1)$ map lookups.



ENGINE SYSTEM SCAN

- Found stale XP leaking to green conscripted units due to uncleared per-unit depletion paths.



Project Impact: By The Numbers

TESTS PASSING

924 → 1,145

→ NET INCREASE

FILES CHANGED

87

ATOMIC COMMITS TO MAIN

2

(Engine Pass + Presentation Pass)

CONSOLE ERRORS

0

PRISTINE HEALTH

Fast verification loops and honest measurement systems are absolute prerequisites for effective AI-assisted architecture overhauls.