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RADIANT Change Report - January 10, 2026

Report Period: Last 24 Hours (January 9-10, 2026) **Generated:** January 10, 2026 05:48 UTC-08:00 **Versions Covered:** v5.0.3 → v5.2.0 → v5.2.1 → v5.2.2

Executive Summary

| Metric | Value |
|-----------------------|----------------|
| Releases | 4 versions |
| Files Changed | 66 files |
| Lines Added | ~22,466 |
| Lines Removed | ~200 |
| New Services | 5 |
| New Migrations | 4 |
| Documentation Updates | 4 major guides |

Version Releases

v5.2.2 - Orchestration Methods Scientific Implementation

New Features SE Probes (ICML 2024) | Attribute | Detail | |——|——| | Service | SEProbesService in orchestration-methods.service.ts || Algorithm | Logprob-based entropy estimation via OpenAI API | | Formula | Per-token Shannon entropy: $H = -\sum p * \log(p)$ || Performance | 300x faster than sampling-based methods || Parameters | probe_layers, threshold, fast_mode, sample_count |

Kernel Entropy (NeurIPS 2024) | Attribute | Detail | |-----|-----| | Service | KernelEntropyService in `orchestration-methods.service.ts` | | Algorithm | Embedding KDE using `text-embedding-3-small` | | Bandwidth | Silverman estimation: `h = median_dist / sqrt(2 * ln(n+1))` | | Kernels | RBF, linear, polynomial | | Parameters | `kernel, bandwidth, sample_count` |

Pareto Routing - Multi-objective optimization across quality/latency/cost - Pareto frontier calculation with configurable weights - Budget constraint enforcement

C3PO Cascade (NeurIPS 2024) - Self-supervised difficulty prediction - Tiered model cascade (efficient → standard → powerful) - Confidence-based escalation

AutoMix POMDP (Nov 2025) - POMDP belief-state model selection - -greedy exploration (default =0.1) - Self-verification for quality assurance

System vs User Methods Protection

- Added `isSystemMethod` field to API responses
- System methods: Only parameters and enabled status editable
- Admin UI shows “System” badge for protected methods
- API validation prevents editing system method definitions

Documentation Created: `ORCHESTRATION-REFERENCE.md` Complete reference document (2,326 lines) documenting all system orchestration capabilities.

System Methods (70+) by Category:

| Category | Count | Key Methods |
|---------------------|-------|---|
| Generation | 3 | GENERATE_RESPONSE, GENERATE_WITH_COT, REFINE_RESPONSE |
| Evaluation | 8 | CRITIQUE_RESPONSE, JUDGE_RESPONSES, POLL_JUDGE, G_EVAL, PAIRWISE_PREFER, SELF_REFLECT, COMPARE_ANALYSIS |
| Synthesis | 6 | SYNTHESIZE_RESPONSES, BUILD_CONSENSUS, MOA_LAYERS, MULTI_SOURCE_SYNTH, LLM_BLENDER, TOKEN_AUCTION |
| Verification | 8 | VERIFY_FACTS, PROCESS_REWARD, SELFCHECK_GPT, CITE_VERIFY, NATURAL_LOGIC, UNIFACT, EIGENSCORE, REQUERY_CHECK |

| Category | Count | Key Methods |
|----------------------|-------|---|
| Debate | 6 | GENERATE_CHALLENGE, DEFEND_POSITION, SPARSE_DEBATE, ARG_MAPPING, HAH_DELPHI, RECONCILE_WEIGHTED |
| Aggregation | 4 | MAJORITY_VOTE, WEIGHTED_AGGREGATE, SELF_CONSISTENCY, GEDI_VOTE |
| Reasoning | 3 | DECOMPOSE_PROBLEM, LOGIC_LM, LLM_MODULO |
| Routing | 7 | DETECT_TASK_TYPE, SELECT_BEST_MODEL, ROUTELLM, FRUGAL CASCADE, PARETO_ROUTE, C3PO_CASCADE, AUTOMIX, AFLOW_MCTS |
| Uncertainty | 6 | SEMANTIC_ENTROPY, SE_PROBES, KERNEL_ENTROPY, CALIBRATED_CONF, CONSISTENCY_UQ, CONFORMAL_PRED |
| Hallucination | 3 | MULTI_HALLUC, METAQQA, FACTUAL_GROUND |
| Human-in-Loop | 3 | HTL REVIEW, TIERED_EVAL, ACTIVE_SAMPLE |
| Collaboration | 1 | ECON_NASH |
| Neural | 1 | CATO_NEURAL |

System Workflows (49) by Category:

| Category | Count | Workflows |
|--|-------|--|
| Adversarial & Validation | 2 | ARE (Red Team Attack), LM_VS_LM (Cross-Examination) |
| Debate & Deliberation | 3 | SOD (AI Debate), MDA (Multi-Agent Debate), ReConcile (Round Table Consensus) |
| Judge & Critic | 3 | LAAJE (AI Judge), RLAIF (Constitutional Critic), IREF (Critique-Revise Loop) |
| Ensemble & Aggregation | 3 | SCMR (Majority Vote), CWMA (Weighted Ensemble), SMoE (Mixture Router) |
| Reflection & Self-Improvement | 3 | ISFR (Self-Refine Loop), VRL (Reflexion Agent), LATS (Tree Search Reasoning) |

| Category | Count | Workflows |
|--|-------|---|
| Verification & Fact-Checking | 2 | CoVe (Chain of Verification), SelfRAG (Retrieval-Augmented Verification) |
| Multi-Agent Collaboration | 2 | LLM_MAS (Agent Team), MAPR (Peer Review Pipeline) |
| Reasoning Enhancement | 9 | CoT, ZeroShotCoT, ToT, GoT, ReAct, L2M, PS, MCP, PoT |
| Model Routing Strategies | 4 | SINGLE, ENSEMBLE, CASCADE, SPECIALIST |
| Domain-Specific Orchestration | 4 | DOMAIN_INJECT, MULTI_EXPERT, CHALLENGER_CONSENSUS, CROSS_DOMAIN |
| Cognitive Frameworks | 14 | FIRST_PRINCIPLES, ANALOGICAL, SYSTEMS, SOCRATIC, TRIZ, DESIGN_THINKING, SCIENTIFIC, LATERAL, ABDUCTIVE, COUNTERFACTUAL, DIALECTICAL, MORPHOLOGICAL, PREMORTEM, FERMI |

Documentation Structure for Each Method/Workflow: - UI Name (user-friendly display) - Scientific Name (academic/formal name) - Code identifier - Detailed description - All parameters with types, defaults, and descriptions - Inputs/Outputs specification - Research references (where applicable) - Accuracy improvements (where applicable) - Best use cases and problem indicators

Source Migration Files: - 066_orchestration_patterns_registry.sql - Base workflow definitions - 157_orchestration_methods_part1.sql - Generation, Evaluation, Synthesis methods - 157_orchestration_methods_part2.sql - Verification, Debate, Aggregation, Reasoning methods - 157_orchestration_methods_part3.sql - Routing, Uncertainty, Hallucination, HITL, Collaboration, Neural methods

Files Modified

- packages/infrastructure/lambda/shared/services/orchestration-methods.service.ts
- packages/infrastructure/lambda/admin/orchestration-methods.ts
- apps/admin-dashboard/app/(dashboard)/orchestration/methods/page.tsx
- docs/THINKTANK-ADMIN-GUIDE.md
- docs/STRATEGIC-VISION-MARKETING.md
- .windsurf/workflows/auto-build.md

v5.2.1 - Production Hardening: Resilience Integration

P0: Circuit Breaker Integration **ResilientProviderService** (`lambda/shared/services/resilient-provider.service.ts`)
| Feature | Description | |———|———| | Wrapper | Ready-to-use for all external AI provider calls || Combines | CircuitBreaker + Retry + Timeout in single call || Monitoring | Provider health via `getAllProviderHealth()` || Logging | Auto-logging of state changes and failures |

Integration Points: | Service | Calls Protected | |———|———| | `model-router.service.ts` | Bedrock, LiteLLM, direct provider calls (Groq, Perplexity, xAI, Together) || `embedding.service.ts` | OpenAI, Bedrock, Cohere embedding calls (single + batch) || `translation-middleware.service.ts` | Qwen 2.5 7B SageMaker translation calls || `inference-components.service.ts` | SageMaker inference component lifecycle || `formal-reasoning.service.ts` | Lambda executor, SageMaker neural-symbolic (LTN, DeepProbLog) |

P0: Silent Failure Fixes

- Fixed 10+ empty catch blocks in `advanced-agi.service.ts`
- Affected areas: Strategy selection, transfer learning, prediction, action selection, rule extraction, hybrid reasoning, proposal generation
- All now log proper error context with `logger.warn()`

P1: React ErrorBoundary **ErrorBoundary** (`apps/admin-dashboard/components/error-boundary.tsx`)
| Component | Purpose | |———|———| | `PageErrorBoundary` | Full-page error handling || `SectionErrorBoundary` | Graceful section-level fallbacks || Error reporting | /api/admin/errors/report in production || Dev mode | Shows stack traces || Prod mode | User-friendly message |

P1: Billing Idempotency **IdempotencyService** (`lambda/shared/services/idempotency.service.ts`)
| Feature | Detail | |———|———| | Purpose | Prevents duplicate charges on retry || TTL | 24 hours for idempotency keys || Status tracking | pending → completed/failed || Helpers | `extractIdempotencyKey()`, `generateIdempotencyKey()` |

Migration: V2026_01_10_002__idempotency_keys.sql - `idempotency_keys` table with RLS - Cleanup function for expired records

New Files

- `packages/infrastructure/lambda/shared/services/resilient-provider.service.ts`
- `packages/infrastructure/lambda/shared/services/idempotency.service.ts`
- `packages/infrastructure/migrations/V2026_01_10_002__idempotency_keys.sql`
- `apps/admin-dashboard/components/error-boundary.tsx`

v5.2.0 - Production Hardening (PROMPT-39)

Phase 1: Resilience Layer **CircuitBreaker** (`packages/shared/src/utils/resilience.ts`)
| Feature | Configuration | |———|———| | Purpose | Prevents cascading failures when AI providers are down || States | CLOSED → OPEN → HALF_OPEN || Threshold | 5 failures in 30 seconds || Recovery | Opens circuit for 60 seconds || Patterns | Retry with exponential backoff, timeout wrappers, bulkhead |

Python Resilience (packages/flyte/utils/resilience.py) | Feature | Detail | |——|——
-| | Library | Tenacity-based retry decorators | | Decorator | @with_retry(max_attempts=3) ||
Circuit Breaker | Implementation for Python Flyte tasks | | Timeouts | 5s connect, 60s read (never
infinite) |

Phase 2: Observability & Error Handling Silent Failure Fixes (consciousness-engine.service.ts)

- Empty catch blocks now log full error traces with correlation IDs - Memory retrieval and drive computation failures properly logged - Fallback logic clearly marked with _fallback module tags

Environment Validator (packages/shared/src/config/validator.ts) | Feature | Detail | |——|——| | Timing | Validates on Lambda cold start | | Failure | Throws CriticalConfigurationError immediately | | Core Requirements | LITELLM_PROXY_URL, DB_SECRET_ARN, DB_CLUSTER_ARN |

Phase 3: Rate Limiting RateLimiterService (lambda/shared/services/rate-limiter.service.ts)

| Feature | Configuration | |——|——| | Algorithm | Token bucket with Redis storage | | Default | 100 requests/minute per tenant | | Fallback | In-memory when Redis unavailable | | Overrides | Per-tenant with expiration | | Middleware | withRateLimit for Lambda handlers | | Response | 429 with Retry-After headers |

Environment Variables: | Variable | Default | Description | |——|——|——| | RATE_LIMIT_ENABLED | true | Enable/disable rate limiting | | RATE_LIMIT_REQUESTS_PER_MINUTE | 100 | Default rate limit | | RATE_LIMIT_WINDOW_SECONDS | 60 | Rate limit window |

Phase 4: Testing Foundation EconomicGovernor Tests (_tests__/economic-governor.service.test.ts)

- Full test coverage for model selection logic - Tests for all governor modes (off, performance, balanced, cost_saver) - Error handling and edge case coverage - Batch processing and singleton pattern tests

New Files

- packages/shared/src/utils/resilience.ts - TypeScript resilience utilities
 - packages/shared/src/config/validator.ts - Environment validation
 - packages/flyte/utils/resilience.py - Python resilience utilities
 - packages/infrastructure/lambda/shared/services/rate-limiter.service.ts
 - packages/infrastructure/_tests__/economic-governor.service.test.ts
-

v5.0.3 - Grimoire Schema Compliance

Index Row Size Crash Prevention

| Change | Detail |
|------------|---|
| Added | SHA-256 hash column (<code>heuristic_hash</code>) |
| Replaced | TEXT-based unique constraint with hash-based |
| Reason | Prevents PostgreSQL B-Tree index size limit errors |
| Compliance | SHA-256 for SOC2/Veracode scanner compatibility |

Vector Index Performance Upgrade

| From | To |
|-----------------------|---|
| IVFFlat | HNSW |
| Pre-training required | No pre-training |
| Parameters | <code>m=16, ef_construction=64</code> |
| Benefit | Better recall, superior for dynamic inserts |

Maintenance Security Enhancement

- System tenant ID now configurable via `SYSTEM_MAINTENANCE_TENANT_ID`
- Production warning logged if using default system tenant
- Improves audit trail clarity

Migration: `V2026_01_10_001_fix_heuristics_schema.sql`

Database Migrations

| Migration | Purpose |
|--|-------------------------------------|
| <code>V2026_01_08_001_hybrid_protocols.sql</code> | Hybrid protocol support |
| <code>V2026_01_09_001_v5_grimoire_governor.sql</code> | Grimoire & Economic Governor tables |
| <code>V2026_01_10_001_fix_heuristics_schema.sql</code> | Index fixes, HNSW migration |
| <code>V2026_01_10_002_idempotency_keys.sql</code> | Billing idempotency support |

Documentation Updates

| Document | Changes |
|--|--|
| <code>THINKTANK-ADMIN-GUIDE.md</code> | Section 34.3 (System vs User Methods), 34.5 (Method Parameters), 34.6 (User Templates) |
| <code>RADIANT-ADMIN-GUIDE.md</code> | Section 10.4 (Orchestration Methods), parameter inheritance model |
| <code>STRATEGIC-VISION-MARKETING.md</code> | Updated orchestration section, 20 scientific algorithms |
| <code>ORCHESTRATION-REFERENCE.md</code> | New 2,326-line complete reference |

New Services Summary

| Service | Purpose | Location |
|---------------------------------|--|--|
| ResilientProviderService | Circuit breaker wrapper for all AI providers | lambda/shared/services/resilient-provider |
| IdempotencyService | Prevents duplicate billing charges | lambda/shared/services/idempotency.service |
| RateLimiterService | Token bucket rate limiting | lambda/shared/services/rate-limiter.servic |
| SEProbesService | Fast uncertainty estimation | orchestration-methods.service.ts |
| KernelEntropyService | Embedding-based uncertainty | orchestration-methods.service.ts |

Architecture Improvements

Resilience Pattern

EXTERNAL AI PROVIDER CALL

```
ResilientProviderService.callWithResilience()
  CircuitBreaker (5 failures → 60s open)
  Retry (exponential backoff, 3 attempts)
  Timeout (configurable per-provider)
  Health Monitoring (getAllProviderHealth())
```

Error Handling Improvement

```
BEFORE: try { ... } catch (e) { } // Silent failure
AFTER: try { ... } catch (e) { logger.warn('Context', { error: e, correlationId }); }
```

Risk Mitigations

| Risk | Mitigation |
|------------------------------------|---|
| Cascading Provider Failures | CircuitBreaker with automatic recovery |
| Duplicate Billing | IdempotencyService with 24h TTL |
| Rate Abuse | Token bucket rate limiting with 429 responses |
| Silent Failures | All catch blocks now log with context |
| Config Errors | Environment validator on cold start |
| UI Crashes | React ErrorBoundary with graceful fallbacks |
| Index Crashes | SHA-256 hash for large text constraints |
| Vector Search Performance | HNSW indexing upgrade |

Testing Coverage Added

| Test Suite | Coverage |
|--|---|
| <code>economic-governor.service.test.ts</code> | Model selection, all governor modes, error handling, batch processing |

Files Changed Summary

New Files (14): - packages/shared/src/utils/resilience.ts - packages/shared/src/config/validator.ts
- packages/flyte/utils/resilience.py - packages/infrastructure/lambda/shared/services/rate-limiter.ts
- packages/infrastructure/lambda/shared/services/resilient-provider.service.ts -
packages/infrastructure/lambda/shared/services/idempotency.service.ts - packages/infrastructure/migrations/V2026_01_08_001__hybrid_protocols.sql -
packages/infrastructure/migrations/V2026_01_09_001__v5_grimoire_governor.sql -
packages/infrastructure/migrations/V2026_01_10_001__fix_heuristics_schema.sql
- packages/infrastructure/migrations/V2026_01_10_002__idempotency_keys.sql -
apps/admin-dashboard/components/error-boundary.tsx - docs/ORCHESTRATION-REFERENCE.md
- docs/CHANGE-REPORT-2026-01-10.md

Modified Services (10): - model-router.service.ts - Resilience integration - embedding.service.ts -
- Resilience integration - translation-middleware.service.ts - Resilience integration -
inference-components.service.ts - Resilience integration - formal-reasoning.service.ts -
Resilience integration - advanced-agi.service.ts - Silent failure fixes - consciousness-engine.service.ts -
- Silent failure fixes - orchestration-methods.service.ts - New scientific implementations -
orchestration-methods.ts (admin) - System method protection - methods/page.tsx - System badge UI

Report generated automatically from CHANGELOG.md and git history