AI SDLC — Feature Vector Decomposition

Version: 1.0.0 **Date**: 2026-02-19 **Derived From**: AISDLC_IMPLEMENTATION_REQUIREMENTS.md (v3.1.0) **Method**: Asset Graph Model §6.4 (Task Planning as Trajectory Optimisation)

Purpose

Decompose INT-AISDLC-001 (AI SDLC Methodology Implementation) into feature vectors that trace trajectories through the asset graph. This is the prerequisite for design — per the methodology, features are identified before architecture is drawn.

Feature Vectors

REQ-F-ENGINE-001: Asset Graph Engine

The core graph topology, iteration function, and convergence/promotion mechanism.

Satisfies: REQ-GRAPH-001, REQ-GRAPH-002, REQ-GRAPH-003, REQ-ITER-001, REQ-ITER-002

Trajectory: |req⟩ → |design⟩ → |code⟩ ↔ |tests⟩

What converges: - Asset type registry with typed interfaces and Markov criteria - Admissible transition registry (directed, cyclic, extensible) - `iterate(Asset<Tn>, Context[], Evaluators) → Asset<Tn.k+1>` - `stable()` convergence check with configurable ε per evaluator - Promotion: candidate → Markov object when all evaluators pass

Dependencies: None — this is the foundation.

REQ-F-EVAL-001: Evaluator Framework

The three evaluator types and their composition per edge.

Satisfies: REQ-EVAL-001, REQ-EVAL-002, REQ-EVAL-003

Trajectory: |req⟩ → |design⟩ → |code⟩ ↔ |tests⟩

What converges: - Human evaluator interface (judgment, approval/rejection) - Agent(intent, context) evaluator interface (LLM-based delta computation) - Deterministic Test evaluator interface (pass/fail) - Evaluator composition registry: edge type → set of evaluators - Human accountability: AI assists, human decides

Dependencies: REQ-F-ENGINE-001.|design⟩ (evaluators plug into the iteration engine)

REQ-F-CTX-001: Context Management

Context[] as constraint surface, hierarchy, and spec reproducibility.

Satisfies: REQ-CTX-001, REQ-CTX-002, REQ-INTENT-004

Trajectory: |req⟩ → |design⟩ → |code⟩ ↔ |tests⟩

What converges: - Context store: ADRs, data models, templates, policy, graph topology, prior implementations - Hierarchical composition: global → org → team → project (later overrides earlier) - Context version control - Spec canonical serialisation (deterministic, content-addressable hash) - Spec immutability: evolution produces new versions, not mutations

Dependencies: REQ-F-ENGINE-001.|design⟩ (context feeds into iterate())

REQ-F-TRACE-001: Feature Vector Traceability

Intent capture, REQ keys, trajectories, dependencies, and task planning.

Satisfies: REQ-INTENT-001, REQ-INTENT-002, REQ-FEAT-001, REQ-FEAT-002, REQ-FEAT-003

Trajectory: |req⟩ → |design⟩ → |code⟩ ↔ |tests⟩

What converges: - Intent capture (INT-* format, structured, persisted) - Intent + Context[] → Spec composition - REQ key format and propagation across all graph assets - Bidirectional navigation (intent → runtime, runtime → intent) - Cross-feature dependency tracking - Task graph generation from feature decomposition + dependency compression

Dependencies: REQ-F-ENGINE-001.|code⟩ (needs graph engine), REQ-F-CTX-001.|design⟩ (needs context model)

REQ-F-EDGE-001: Edge Parameterisations

TDD, BDD, ADR, and code tagging configurations for common graph edges.

Satisfies: REQ-EDGE-001, REQ-EDGE-002, REQ-EDGE-003, REQ-EDGE-004

Trajectory: |req⟩ → |design⟩ → |code⟩ ↔ |tests⟩

What converges: - TDD co-evolution pattern (RED/GREEN/REFACTOR/COMMIT) at Code ↔ Tests edges - BDD Given/When/Then at Design → Test Cases and Design → UAT Tests edges - ADR generation at Requirements → Design edge - Code tagging: `Implements: REQ-*` / `Validates: REQ-*` (platform-agnostic tag format) - All parameterisations are evaluator configurations, not separate engines

Dependencies: REQ-F-EVAL-001.lcode⟩ (edge params configure evaluators)

REQ-F-LIFE-001: Full Lifecycle Closure

CI/CD, telemetry, homeostasis, feedback loop, and eco-intent generation.

Satisfies: REQ-LIFE-001, REQ-LIFE-002, REQ-LIFE-003, REQ-INTENT-003

Trajectory: |req⟩ → |design⟩ → |code⟩ ↔ |tests⟩ → |uat⟩

What converges: - CI/CD as graph edge (Code → CI/CD → Running System) - Telemetry tagged with REQ keys - Homeostasis: is running system within constraint bounds? - Deviation → new INT-* intent → back into the graph - Eco-intent: automatic intent generation from ecosystem changes

Dependencies: REQ-F-ENGINE-001.lcode⟩, REQ-F-TRACE-001.lcode⟩ (needs graph + REQ key propagation)

REQ-F-TOOL-001: Developer Tooling

Plugin architecture, workspace, commands, release, test gap analysis, hooks, scaffolding, snapshots.

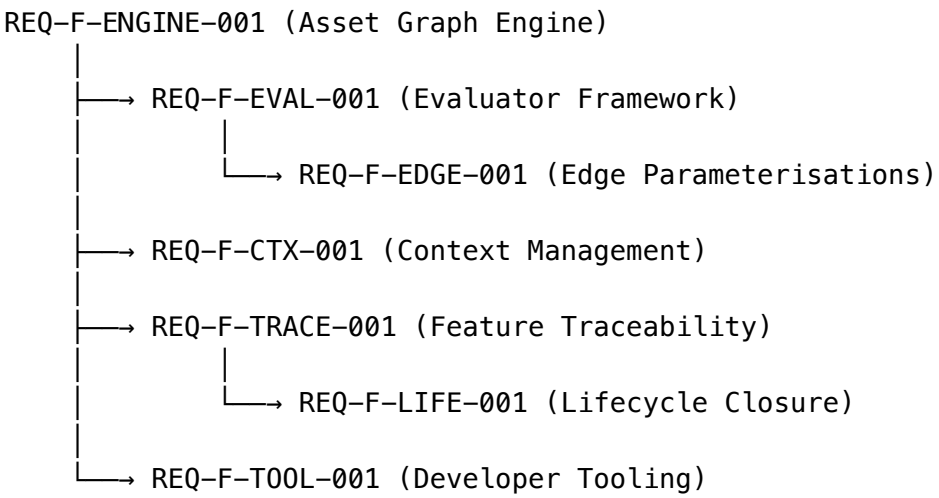
Satisfies: REQ-TOOL-001, REQ-TOOL-002, REQ-TOOL-003, REQ-TOOL-004, REQ-TOOL-005, REQ-TOOL-006, REQ-TOOL-007, REQ-TOOL-008

Trajectory: |req⟩ → |design⟩ → |code⟩ ↔ |tests⟩

What converges: - Plugin architecture: installable, discoverable, versioned methodology delivery - Developer workspace: task tracking, context preservation, git-integrated - Workflow commands: task CRUD, checkpoint/restore, status/coverage - Release management: semver, changelog, REQ key coverage in release notes - Test gap analysis: REQ keys vs tests, uncovered trajectories - Methodology hooks: commit/transition/session triggers, REQ tag validation - Project scaffolding: graph config, context dirs, workspace templates - Context snapshot: immutable session capture for recovery

Dependencies: REQ-F-ENGINE-001.ldesign⟩ (tooling wraps the engine), REQ-F-TRACE-001.ldesign⟩ (tooling uses REQ keys)

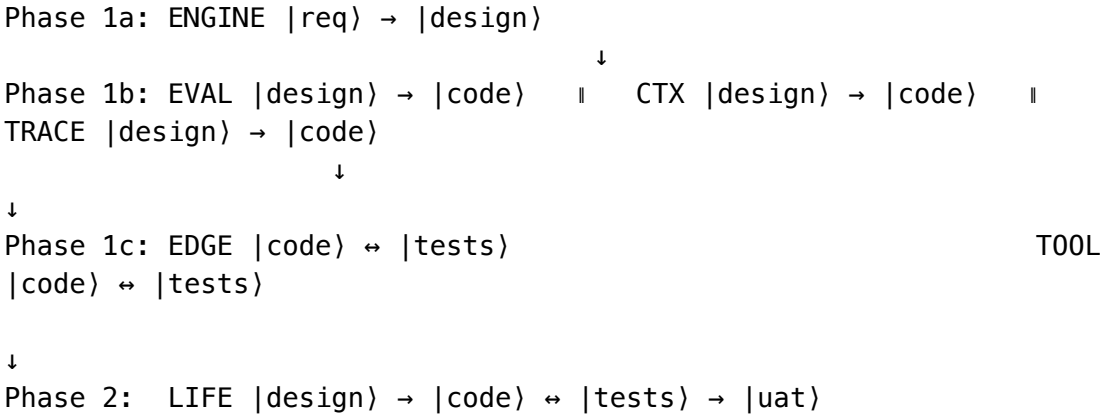
Dependency Graph



Parallel work (zero inner product — independent once ENGINE.ldesign⟩ converges): - REQ-F-EVAL-001 ⫴ REQ-F-CTX-001 ⫴ REQ-F-TRACE-001

Sequential constraints: - ENGINE.ldesign⟩ < EVAL.lcode⟩ (evaluators need engine interface) - ENGINE.ldesign⟩ < CTX.lcode⟩ (context needs engine interface) - EVAL.lcode⟩ < EDGE.lcode⟩ (edge params configure evaluators) - TRACE.lcode⟩ < LIFE.lcode⟩ (lifecycle needs REQ key propagation) - ENGINE.ldesign⟩ + TRACE.ldesign⟩ < TOOL.lcode⟩ (tooling wraps both)

Task Graph (Compressed)



ENGINE design is the critical path. Once it converges, three features parallelise.

Coverage Check

Implementation Requirement	Feature Vector
REQ-INTENT-001	REQ-F-TRACE-001

Implementation Requirement	Feature Vector
REQ-INTENT-002	REQ-F-TRACE-001
REQ-INTENT-003	REQ-F-LIFE-001
REQ-INTENT-004	REQ-F-CTX-001
REQ-GRAPH-001	REQ-F-ENGINE-001
REQ-GRAPH-002	REQ-F-ENGINE-001
REQ-GRAPH-003	REQ-F-ENGINE-001
REQ-ITER-001	REQ-F-ENGINE-001
REQ-ITER-002	REQ-F-ENGINE-001
REQ-EVAL-001	REQ-F-EVAL-001
REQ-EVAL-002	REQ-F-EVAL-001
REQ-EVAL-003	REQ-F-EVAL-001
REQ-CTX-001	REQ-F-CTX-001
REQ-CTX-002	REQ-F-CTX-001
REQ-FEAT-001	REQ-F-TRACE-001
REQ-FEAT-002	REQ-F-TRACE-001
REQ-FEAT-003	REQ-F-TRACE-001
REQ-LIFE-001	REQ-F-LIFE-001
REQ-LIFE-002	REQ-F-LIFE-001
REQ-LIFE-003	REQ-F-LIFE-001
REQ-EDGE-001	REQ-F-EDGE-001
REQ-EDGE-002	REQ-F-EDGE-001
REQ-EDGE-003	REQ-F-EDGE-001
REQ-EDGE-004	REQ-F-EDGE-001
REQ-TOOL-001	REQ-F-TOOL-001
REQ-TOOL-002	REQ-F-TOOL-001
REQ-TOOL-003	REQ-F-TOOL-001
REQ-TOOL-004	REQ-F-TOOL-001

Implementation Requirement	Feature Vector
REQ-TOOL-005	REQ-F-TOOL-001
REQ-TOOL-006	REQ-F-TOOL-001
REQ-TOOL-007	REQ-F-TOOL-001
REQ-TOOL-008	REQ-F-TOOL-001

32/32 requirements covered. No orphans.

Summary

Feature Vector	Impl Reqs	Phase	Dependencies
REQ-F-ENGINE-001	5	1a	None
REQ-F-EVAL-001	3	1b	ENGINE
REQ-F-CTX-001	3	1b	ENGINE
REQ-F-TRACE-001	5	1b	ENGINE, CTX
REQ-F-EDGE-001	4	1c	EVAL
REQ-F-LIFE-001	4	2	ENGINE, TRACE
REQ-F-TOOL-001	8	1c	ENGINE, TRACE
Total	**32**		

7 feature vectors. 32 implementation requirements. Full coverage. Critical path: ENGINE design.