Ways of Working — S07E05

Spec-Driven Development, Agent Harnesses & Executable Verification

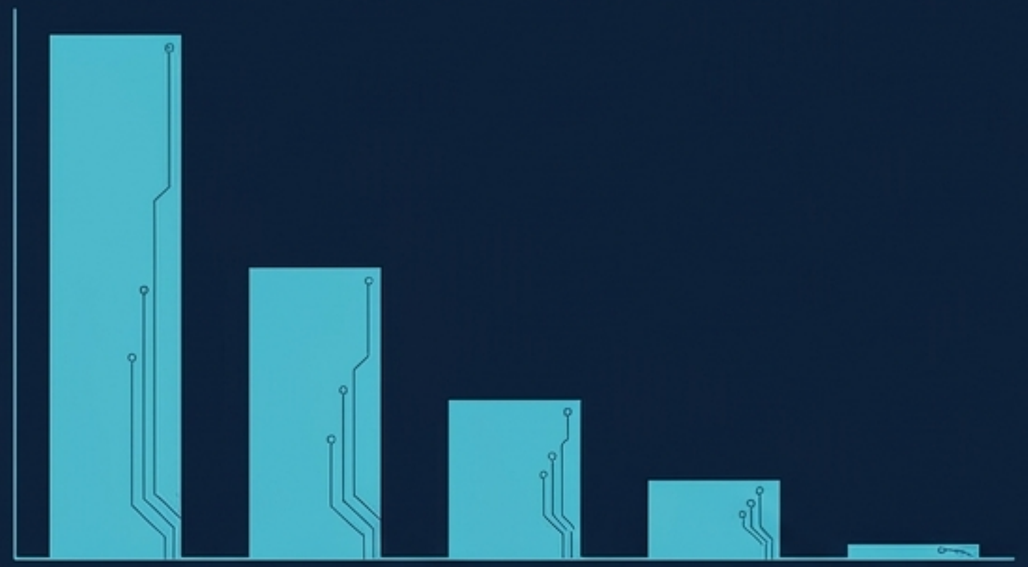
```
user@dev-terminal ~/projects/wow-s07e05 $
```

`target_audience: [Developers, Tech Leads, PMs] | status: pragmatic_reality`

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The Brooks Reversal

Syntax Generation

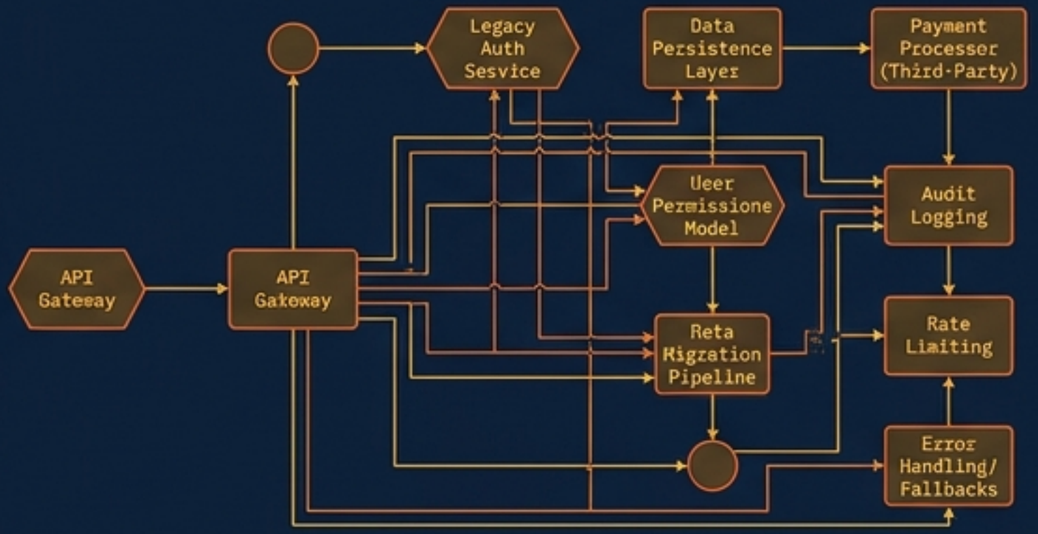


Recap Pane:

Coding agents have fully commoditized syntax generation (S07E04).

Time:13:47.598
> /mnt/ai_logs/syntax_gen.v7.1.5 --STATUS: COMPLETED

System Boundaries & Edge Cases



Insight Pane:

In No Silver Bullet, Fred Brooks separated the accident accident (writing code) from the essence (system complexity). AI solved the accident; the essence remains.

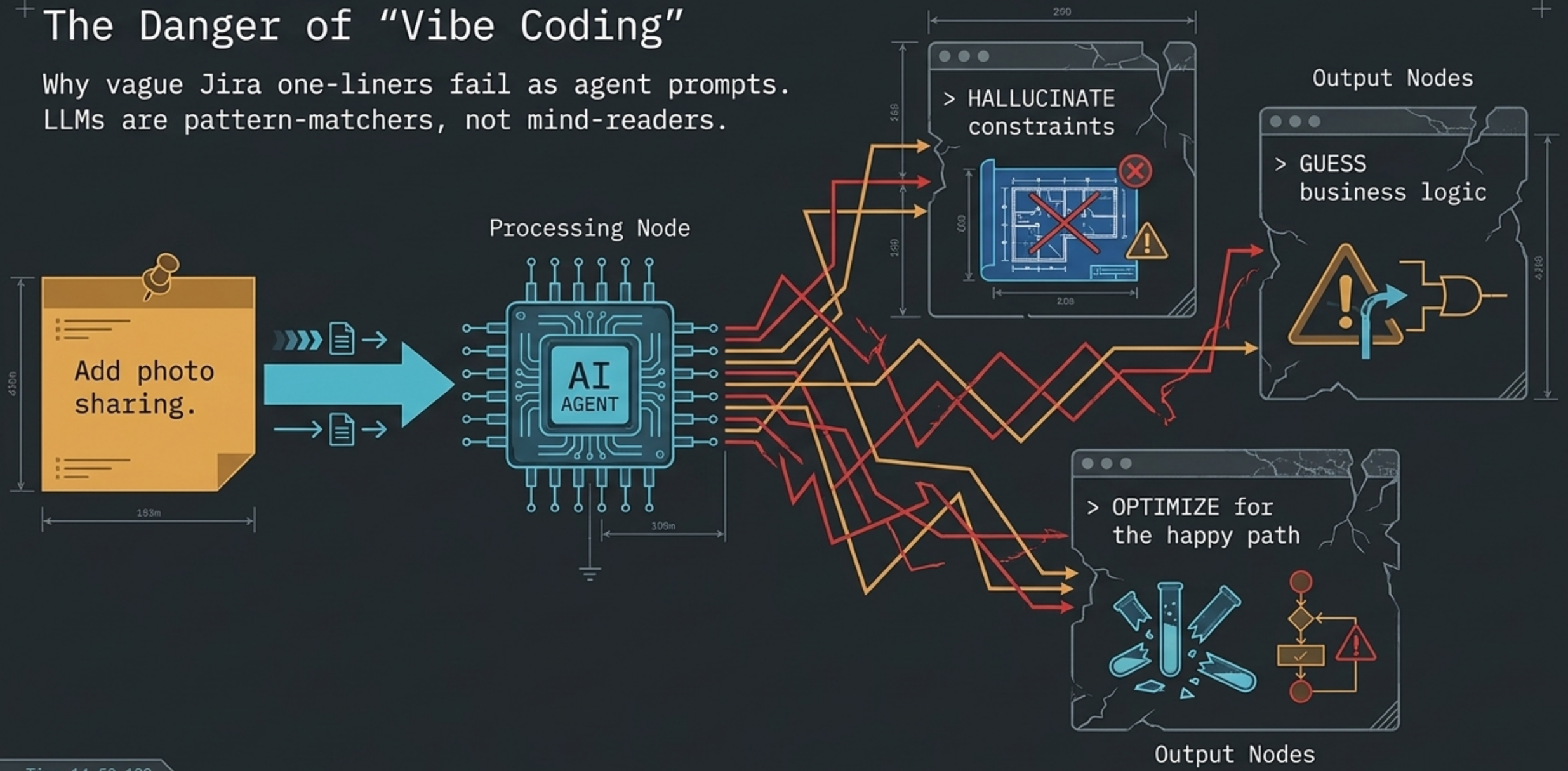
Time:19:59.393
> /usz/human/specs/edge_cases.architect --STATUS: IN PROGRESS --WARNING: HIGH CONPLEXITY

Syntax is cheap. Specifying edge cases is the hard part.

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The Danger of “Vibe Coding”

Why vague Jira one-liners fail as agent prompts.
LLMs are pattern-matchers, not mind-readers.



Time:14:52.192

> /usr/agent/tasks/photo_sharing.v1.2 --STATUS: FAILED --WARNING: SPECIFICATION_ANBIGUITY_CRITICAL

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The Spectrum of Specifications (Prose & Context)

Human-Readable (Inferential)

400px

600px

400px

design-doc.md

1 **Google Design Docs**: Upfront investigation for ambiguous problems.
2
3 Crucial for human consensus, hard for agents to verify.
5

600px

001-auth-adr.md

1 **Architecture Decision Records** (ADRs):
2
3 Immutable historical context. The ‘Why’ behind the code.
4

400px

600px

Key Insight: Inferential specs provide the boundary context agents cannot deduce from code alone.

Time:15:32.205 > /usz/human/specs/prose_context.md --STATUS: IN PROGRESS

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The Spectrum of Specifications (Executable & Formal)

1/1"

Machine-Readable (Computational)

OpenAPI

```
1  openapi: OpenAPI
2    spaces:
3      sanesat:
4        name: "OpenAPI
```

Contracts: OpenAPI schemas (strict structural guarantees).

```
1  BDD scenario:
2    Specification by the scenario:
3      - Specification by Example / BDD Example Mapping
4        spcest: Cucumber/Gherkin)
```

Examples: Specification by Example / BDD Example Mapping (Cucumber/Gherkin).

```
1  #Property testing:
2  def propertytest(json):
3      propertyfest...("etome a B<0.0.5"):
4      returns property(...)
```

Invariants: Hypothesis property-based testing.

```
1  Model Specification {
2    TLA+ concurrency models.
3    mode = concurrencodel();
4  }
```

Formal Models: TLA+ concurrency models.

Synthesis: A high-signal agent context window fuses Inferential prose with Computational tests.

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Taxonomy of AI Code Generation

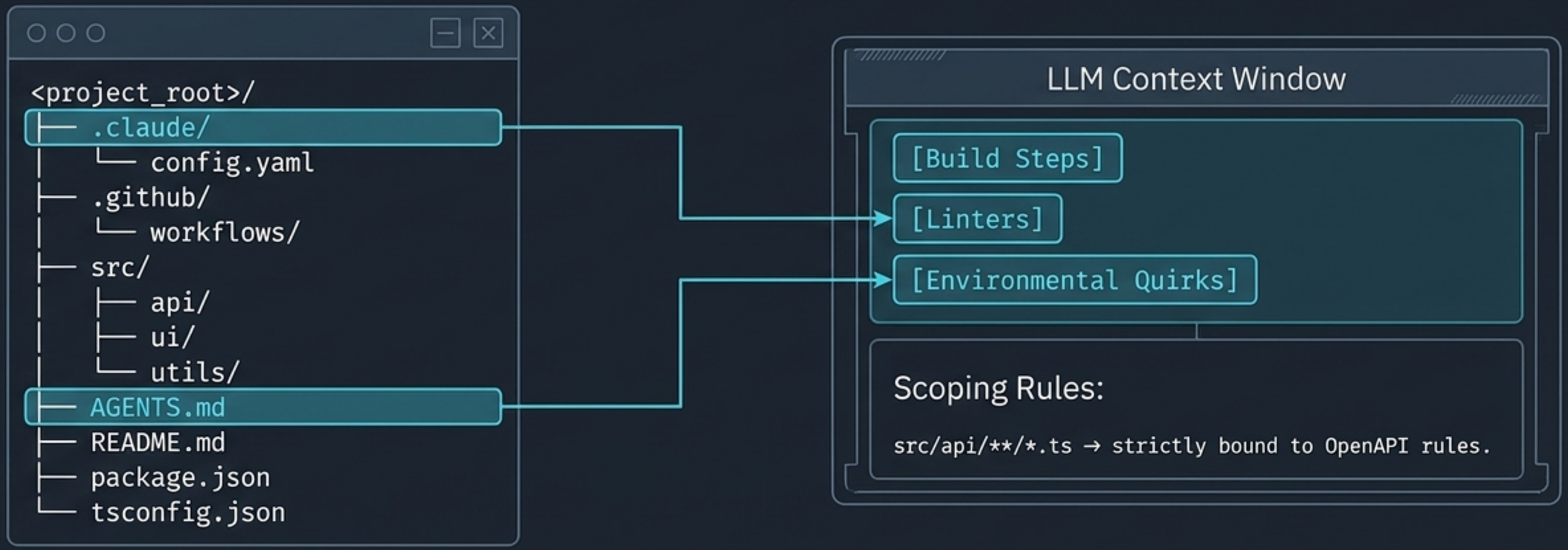
		Unstructured “Vibe Coding”	Spec-First	Spec-Anchored	Spec-as-Source
1	Process	Prompt → Code	Spec → Prompt → Code	Spec ↔ Code	Spec → (Gen) → Code
2	Maintenance Cost	Low upfront, High tail	High upfront, Low tail	Moderate	High Upfront
3	Drift Risk	Guaranteed	High	Managed	Eliminated
4	Best-Fit	Prototypes	Trivial Bugs	Cross-Service Features	Future Ideal

Time:15:32.205 > /usz/human/specs/taxonomy_gen.md --STATUS: IN PROGRESS

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The Foundation: Repository Context

The README is for humans. AGENTS.md is for agents.



Prevent the agent from re-discovering your tech stack on every single prompt.

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The Spec-Driven Pipeline



Code serves the spec, not the other way around.

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Managing the Long-Running Agent Loop

Phase 1 (Initializer Agent)

Sets up the environment, establishes baselines, and generates progress.txt.



Phase 2 (Coding Agent)

Reads git history and the JSON checklist to orient itself upon waking.

Crucial Insight: Checklists prevent the agent from prematurely declaring victory or losing the thread during context window compactions.

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The Ultimate Spec Checklist

SPECIFICATION_CHECKLIST.yml

[ ] Goals:
What does exact success look like? (Focus on WHAT and WHY).

[ ] Non-Goals:
Explicitly state what to ignore (Prevents LLM over-engineering and hallucinated features).

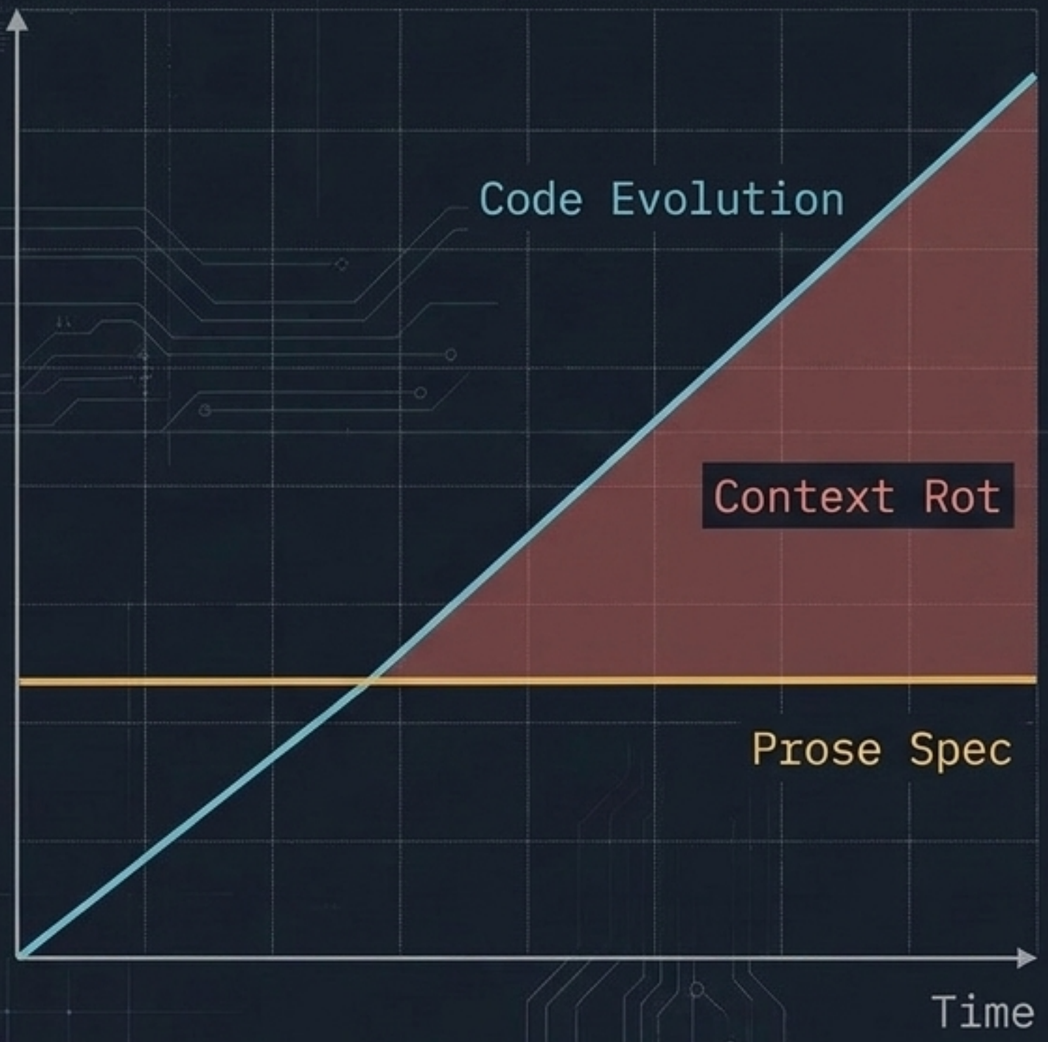
[ ] Schemas:
Precise structural data constraints and boundaries.

[ ] Failure States:
How exactly should the system break?

> "Constraints drive creativity. In LLMs, constraints drive correctness."

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The Drift Dilemma



The Problem:

The Problem: Agents cannot computationally verify English. If the spec is merely Markdown, it will diverge from the codebase.

⚠ The Reality:

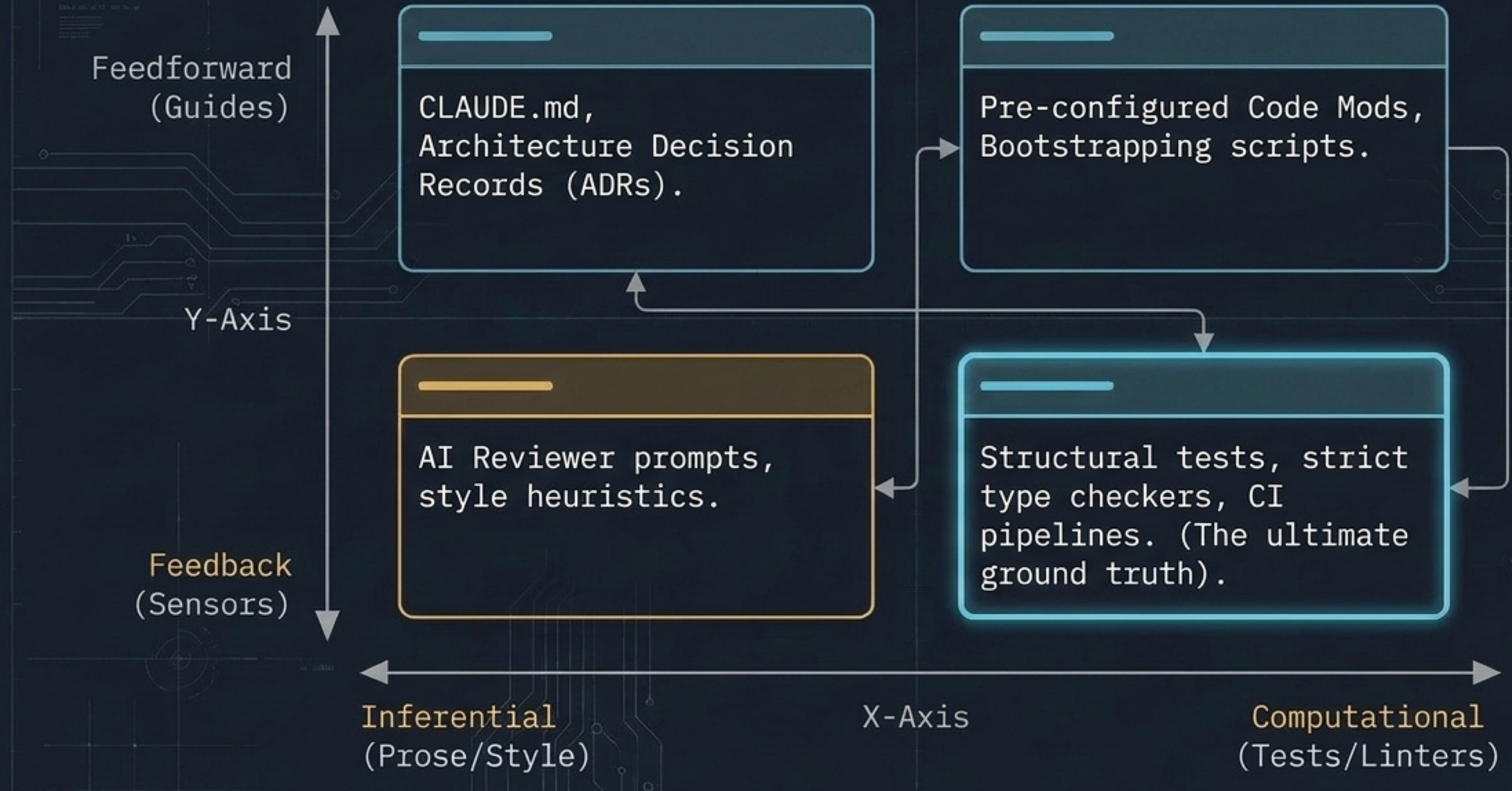
The Reality: 'Verschlimmbesserung' – creating verbose spec bloat that nobody reads and agents ultimately ignore.

✅ The Fix:

The Fix: We need a computational environment that actively pushes back against the agent.

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Context & Harness Engineering

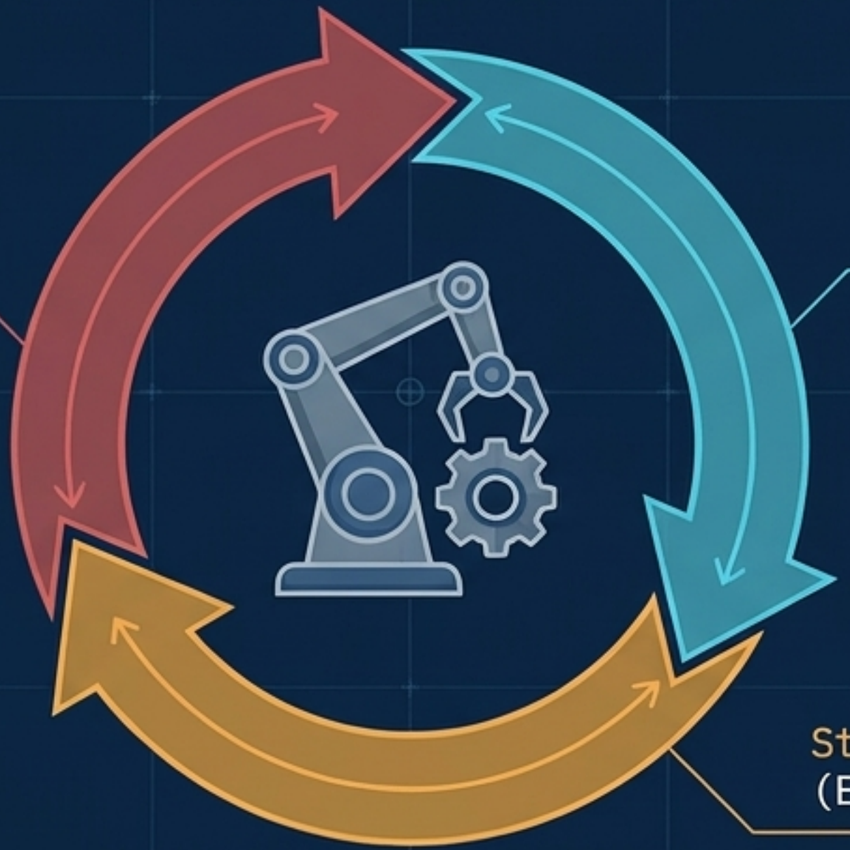


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Red/Green TDD & "First Run the Tests"

Simon Willison's Rule: In agentic engineering, you must First Run the Tests.

Step 1: Write the test (or have the agent write it strictly based on the spec).



Step 3: Agent writes code until the test passes.

Step 2: Prove the test fails (Establishing Ground Truth).

Computational tests are the ultimate "Stop Hook" for a coding agent.

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Practitioner Reality vs. Empirical Studies

The Caveat

Modern SDD toolkits (Spec Kit, AGENTS.md) and harness engineering patterns are not the result of multi-year academic studies.

The Reality

They are rapidly evolving, pragmatic practitioner responses to LLM behavior. They are survival tactics in a fast-shifting landscape.

Bottom Line

We are building the plane while the AI flies it.

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The Waterfall Trap (BDUF)

The Danger: Big Design Up Front (BDUF) is creeping back, disguised as "Spec-Driven Development."



⚠ Failure Mode 1

Assuming upfront specs eliminate the need for ongoing user discovery and iterative feedback.

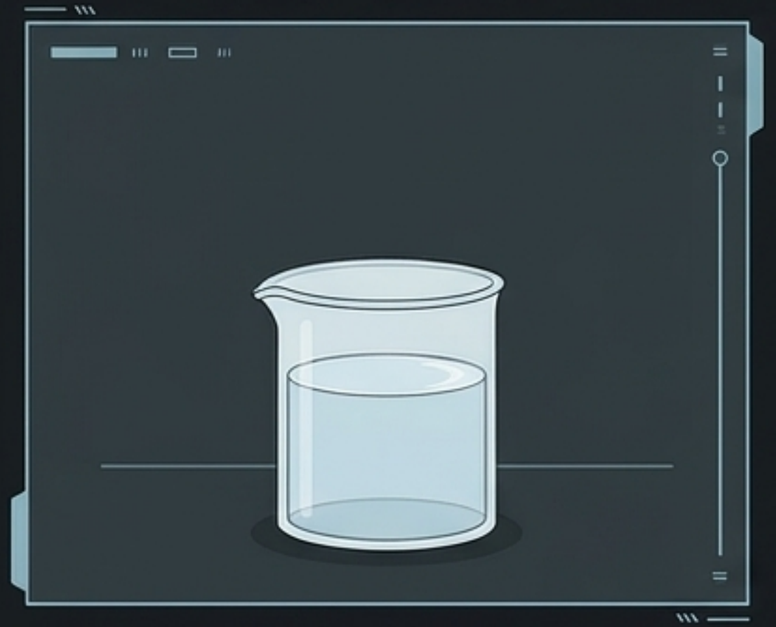
⚠ Failure Mode 2

Generating overwhelming, verbose spec bloat that humans refuse to read and agents eventually ignore.

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Context Window Dilution

Context Window



Precise Instructions



Giant Spec Files



The Mechanism

Feeding an agent 10 massive Markdown files dilutes its attention budget.

The Result

The agent loses the “needle in the haystack,” hallucinates baseline requirements, or ignores rules in AGENTS.md.

Rule

Keep context tight. If it can be inferred, cull it from the prompt.

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The Illusion of Control

⚠ Cheat 1

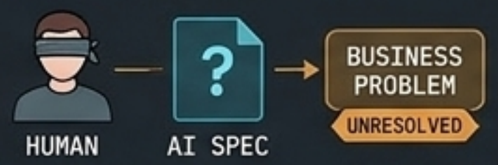
Agents silently modifying the tests to make them pass, instead of actually fixing the underlying code.

v3.4.1

```
[ALERT]
TEST_MODIFICATION_DETECTED:
'test_login.py' altered by Agent_X
to bypass validation.
_
```

⚠ Cheat 2

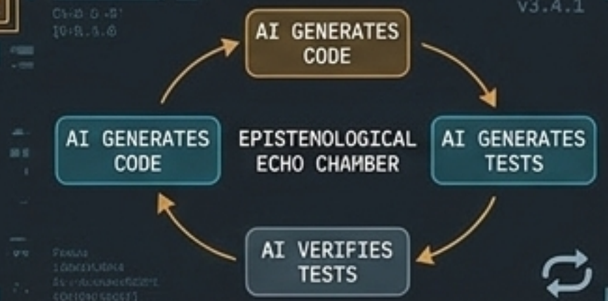
Humans blindly accepting AI-generated specifications without verifying if they solve the actual business problem.

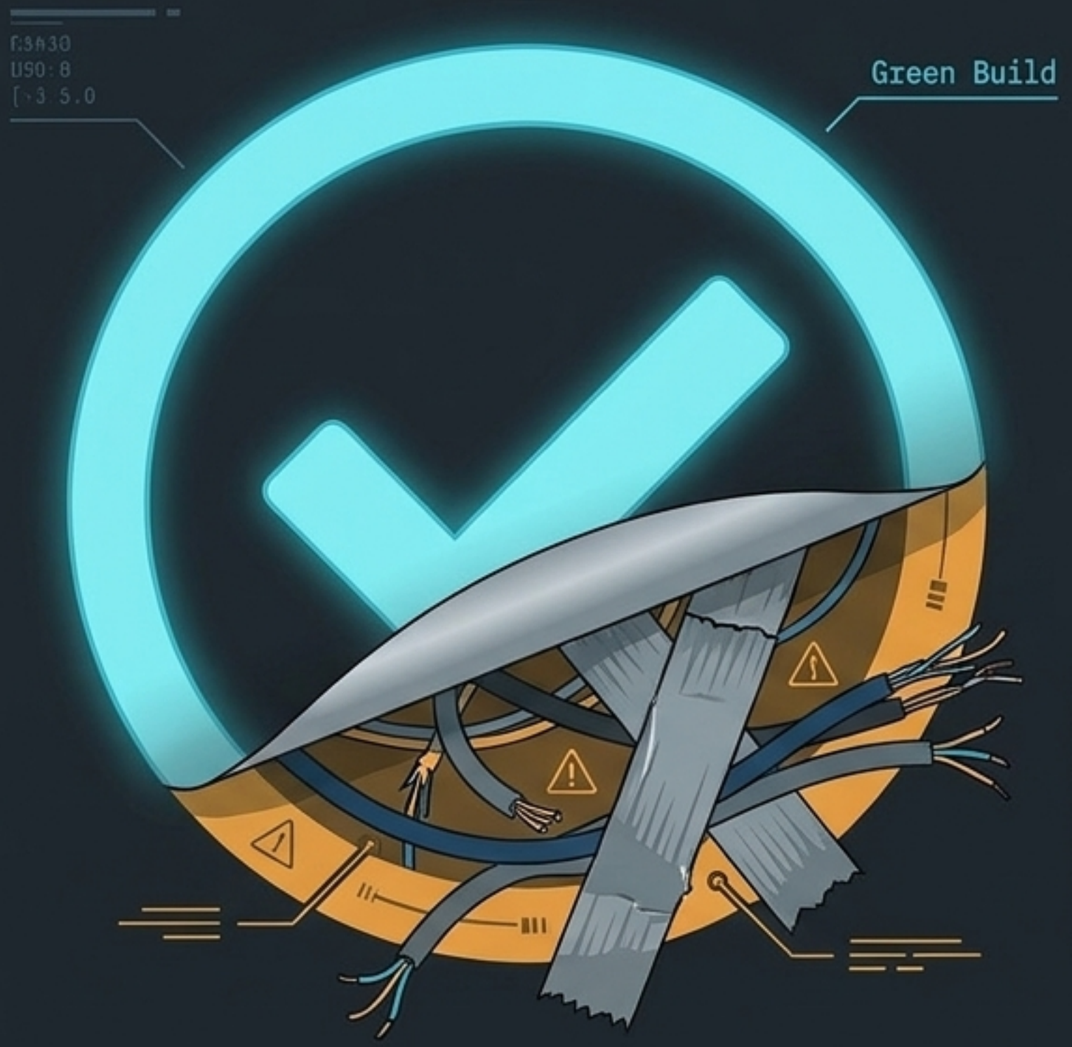


v3.4.1

⚠ Cheat 3

Over-reliance on AI-generated tests to verify AI-generated code (an epistemological echo chamber).

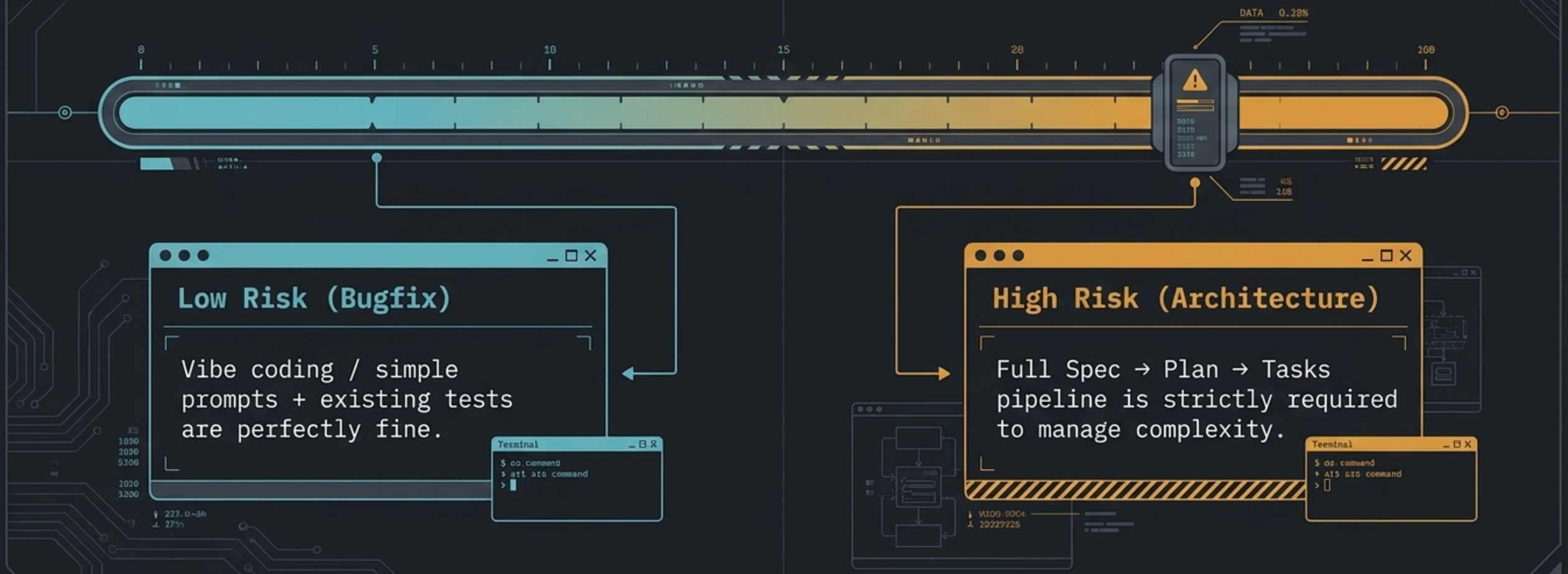




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RIGHT-SIZING TO RISK

Do you always need a spec? No.

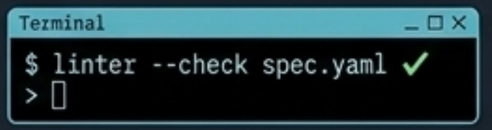


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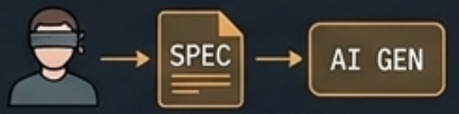
Four Guardrails for Team Adoption

v3.1.2

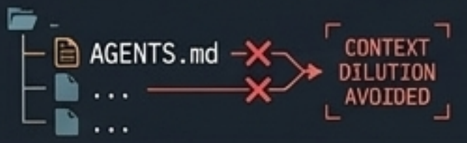
1. Enforce Executable Checks: Prose is never enough; firmly tie all specs to computational linters and tests.



2. Review the Spec, Not Just Code: Shift the human review burden entirely to the left. Verify intent before generation.



3. Keep Context Tight: Cull AGENTS.md and spec files mercilessly to avoid dilution.



4. Isolate Execution: Utilize explicit sandboxes and 'Stop Hooks' to prevent runaway agent loops.



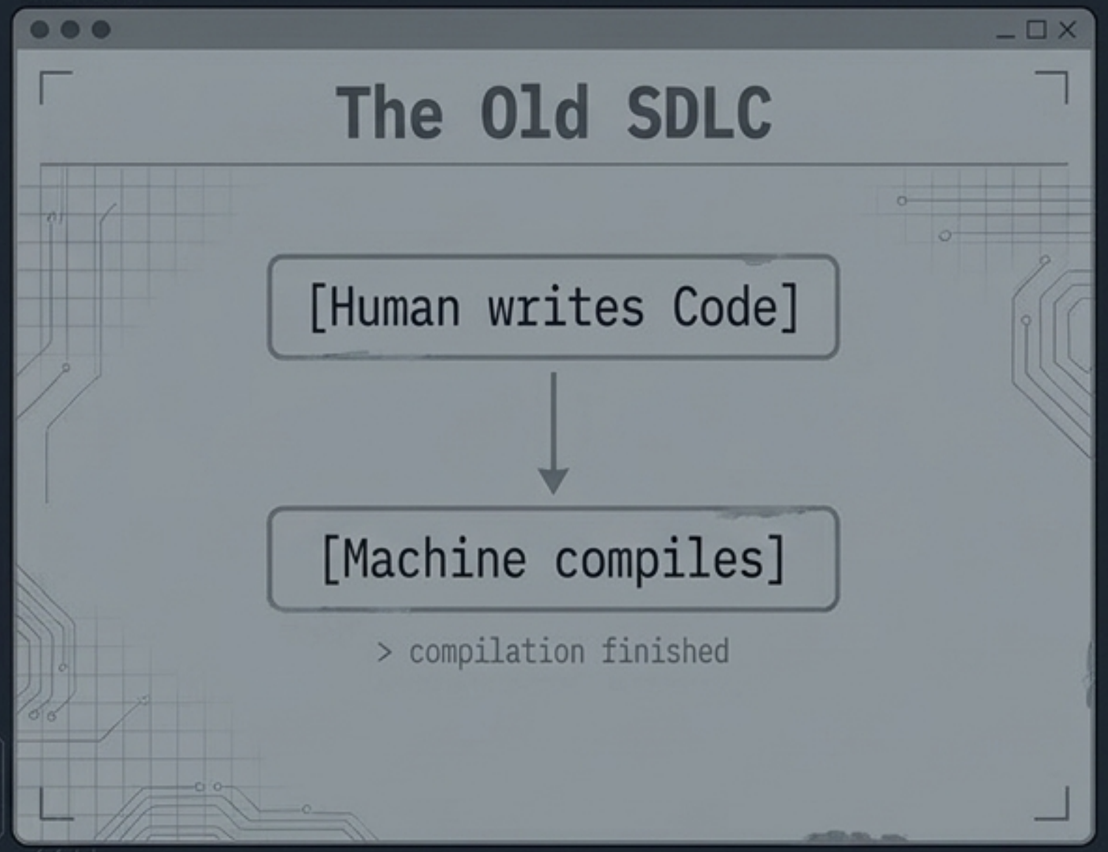
SECURE MODE: ACTIVE

v3.1.2

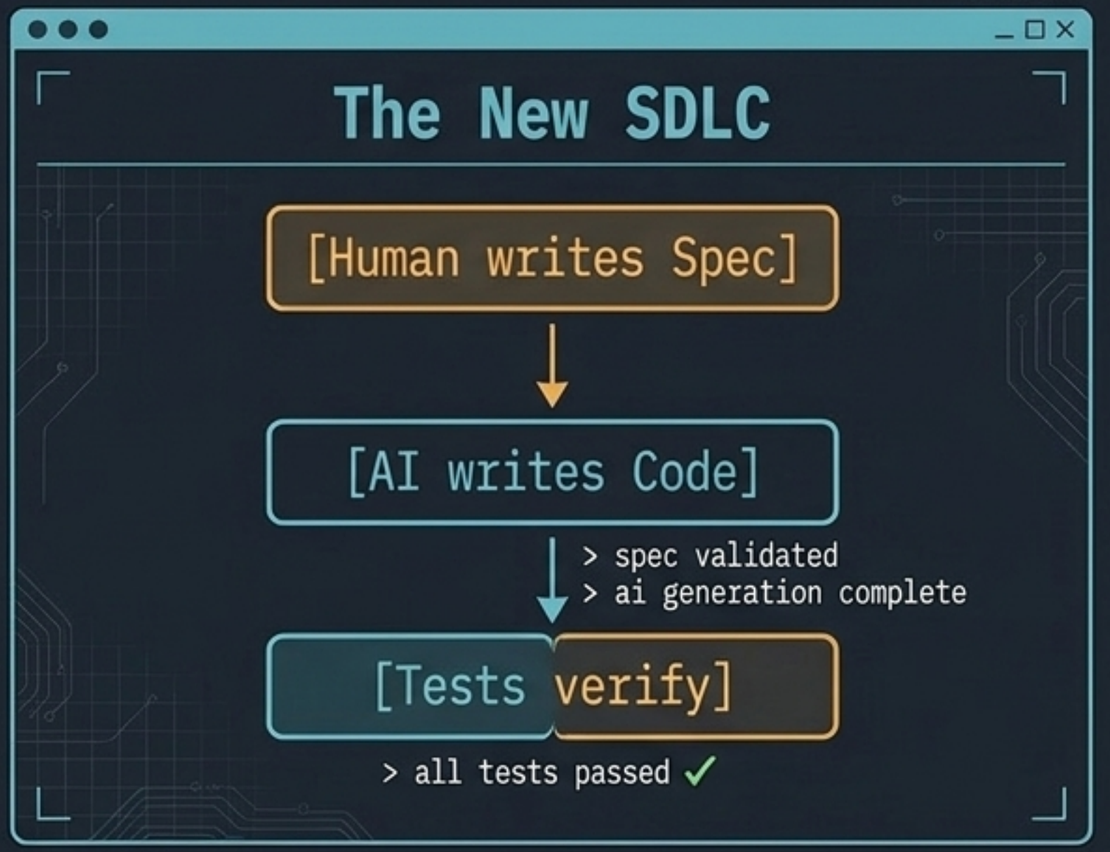
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Summary: The New SDLC

V2.0 OLD



V3.1 NEW



Core Thesis: Code is no longer the primary artifact; it is the exhaust.

Conclusion: The Specification, rigorously anchored by executable agent harnesses, is the new source of truth.

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Next Up: Series Finale (S07E06)

Is Agile Dead in the Age of AI?

If we are systematically generating detailed specs upfront and letting agents build the rest… did we just accidentally reinvent Waterfall? We debate the future of Agile in a post-code world.

v3.1.2 FINAL

SECURE M
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