### **Technical Design Specification: Implementation Plan for Design & Coding Agents**

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**1. Architectural Overview** This document provides the high-level implementation plan for the next two major components of the autonomous pipeline: the **Design Specification Agent** and the **Coding Agent**. These agents will be implemented as new, distinct LangGraph graphs, initially invoked by the human-in-the-loop via the Supervisor UI, with the eventual goal of being orchestrated by the Master PM Agent.

**2. Module 1: The Design Specification Agent**

* **Purpose:** To consume research\_synthesis.json and produce design\_spec.md.
* **Input:** A structured JSON object conforming to the schema in TDS v5.0.
* **Output:** A Markdown file containing a formal technical design specification.
* **Implementation Details:**
  + A new graph, build\_design\_agent\_graph(), will be added to agent\_core\_v3.py.
  + This graph will contain nodes for parse\_synthesis\_json and generate\_design\_spec.
  + A new prompt, create\_design\_spec\_prompt, will be added to prompts.yaml. This prompt will instruct the LLM to act as a systems architect and convert the JSON's conceptual keys (e.g., system\_components, key\_architectural\_principles) into a formal specification outlining required code changes.

**3. Module 2: The Coding Agent**

* **Purpose:** To consume design\_spec.md and modify the project's source files.
* **Input:** A design\_spec.md file.
* **Output:** Modified .py and .yaml files (or, more safely, diff patches for review).
* **Implementation Details:**
  + This will be a highly complex graph, build\_coding\_agent\_graph(), likely requiring its own internal Plan -> Execute -> Test loop.
  + **Tooling is Critical:** This agent MUST be equipped with a robust set of tools, including:
    - read\_file(file\_path)
    - write\_file(file\_path, content)
    - run\_tests()
    - execute\_shell\_command(command) (e.g., for running a linter or type checker).
  + **Prompting:** Will require a sophisticated execute\_coding\_task\_prompt that instructs the agent to break down the design spec into a series of file modifications and to verify its work after each change.

**4. Integration Plan** Initially, new buttons will be added to the supervisor.py UI to allow for the manual, sequential invocation of these new agents (e.g., "Generate Design Spec from Synthesis," "Implement Code from Design Spec"). This will allow for iterative development and testing before they are fully automated under the Master PM Agent.