# **Technical Research Report: A Symmetrical A2A Communication Protocol**

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1. Abstract

This document proposes a critical and symmetrical enhancement to the agentic R&D pipeline, standardizing the communication protocol between all agents. The current v4 architecture specifies that the Research Agent produces a research\_synthesis.json for the Design Agent, but the Design Agent then produces only a human-readable design\_spec.md for the subsequent Coding Agent. This creates a "last-mile" interpretation bottleneck. This report corrects this architectural asymmetry by proposing that the Design Agent, in parallel with its Markdown output, must also produce a structured design\_synthesis.json artifact. This new artifact will contain a precise, machine-readable "work order" detailing the specific files, classes, and functions to be modified, created, or deleted. This ensures every agent in the pipeline receives a clean, unambiguous API contract from its predecessor, dramatically increasing the reliability and efficiency of the future Coding Agent and completing the vision of a fully automated, end-to-end development workflow.

2. Research: The Recurring Bottleneck of Unstructured Handoffs

The core principle that led to the creation of the research\_synthesis.json artifact (as documented in TRR v20.0) was that agents should not force their downstream counterparts to parse unstructured natural language. The v4 implementation of the Design Agent, which only outputs a .md file, violates this core principle.

Just as a human-readable research report is a poor input for a Design Agent, a human-readable design specification is a poor input for a Coding Agent. A Coding Agent consuming design\_spec.md would face significant challenges:

* Ambiguity: Phrases like "add a new function to handle saving" are clear to humans but lack the precision required for automated code modification.
* High cognitive load: The agent would need to read the entire document, parse the intent, and then formulate a complex plan of file edits, increasing the chance of logical errors.
* Brittleness: Minor changes in the Markdown formatting could break the agent's parsing logic.

3. The Symmetrical Solution: The design\_synthesis.json Artifact

To solve this, we extend the principle of structured A2A communication to the entire pipeline. The Design Agent's responsibilities will be expanded: in addition to creating the human-readable design\_spec.md, it must distill that specification into a machine-readable design\_synthesis.json.

This artifact will serve as the primary, high-priority instruction for the Coding Agent. It will not contain the 'why' of the design, but the explicit 'what' and 'where' of the implementation. The Coding Agent will use this JSON as its checklist of tasks and can refer to the design\_spec.md for broader context if needed.

This architectural enhancement ensures a consistent, robust, and symmetrical flow of information, where each agent transition is mediated by a clear and verifiable structured data artifact, paving the way for a reliable autonomous coding implementation.