



```
graph LR; A[Requirement Analysis] --> B[Architecture]; B --> C[Circuit Design]; C --> D[Schematic Entry]; D --> E[Pre-Layout Simulation]; E --> F[Layout Design]; F --> G[Post-Layout Simulation]; G --> H[PCB Fabrication]; H --> I[Bare Board Testing]; I --> J[Board Assembly]; J --> K[Board Bring-up]; K --> L[Functional Testing]; L --> M[EMC Testing];
```

AI-Powered Hardware Ideation and Simulation Assistant

A RAG-Based Prototyping Copilot

Udhav Sharma • Rounak Singh • Himanshu Patil • Riya Wagh

Problem Statement



Hardware prototyping requires **specialized knowledge** and **multiple disconnected tools**

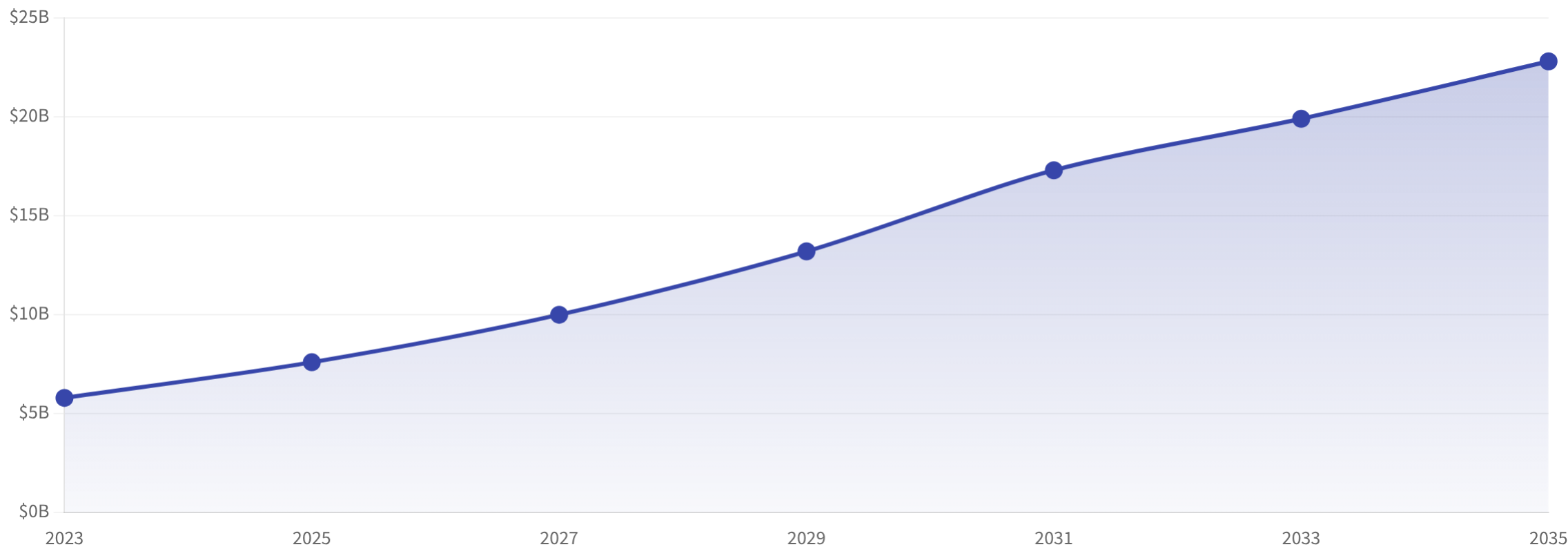


Iteration cycles are **slow** and **error-prone**, limiting innovation



No integrated solution exists that combines **ideation**, **design**, and **simulation** in one platform

Electronic Prototyping Market Growth



\$5.8B

2023 Market Size

14.6%

CAGR (2025-2035)

\$22.8B

2035 Projected Size

The electronic prototyping market is experiencing **rapid growth**, creating significant opportunities for AI-powered solutions

Solution Vision



AI-powered copilot that transforms hardware ideas into functional prototypes



From component selection to working simulation in minutes, not weeks

Before AI vs With AI

Before AI



Manual circuit design with multiple disconnected tools



Long iteration cycles (days to weeks)



Frequent errors requiring manual debugging



Manual code writing for each component

VS

With AI



AI-assisted design with intelligent suggestions



Instant iteration (minutes)

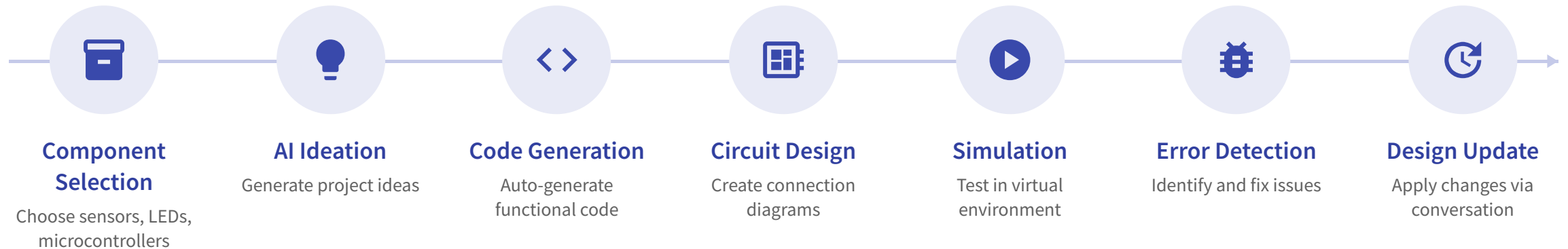


Automatic error detection and fixes



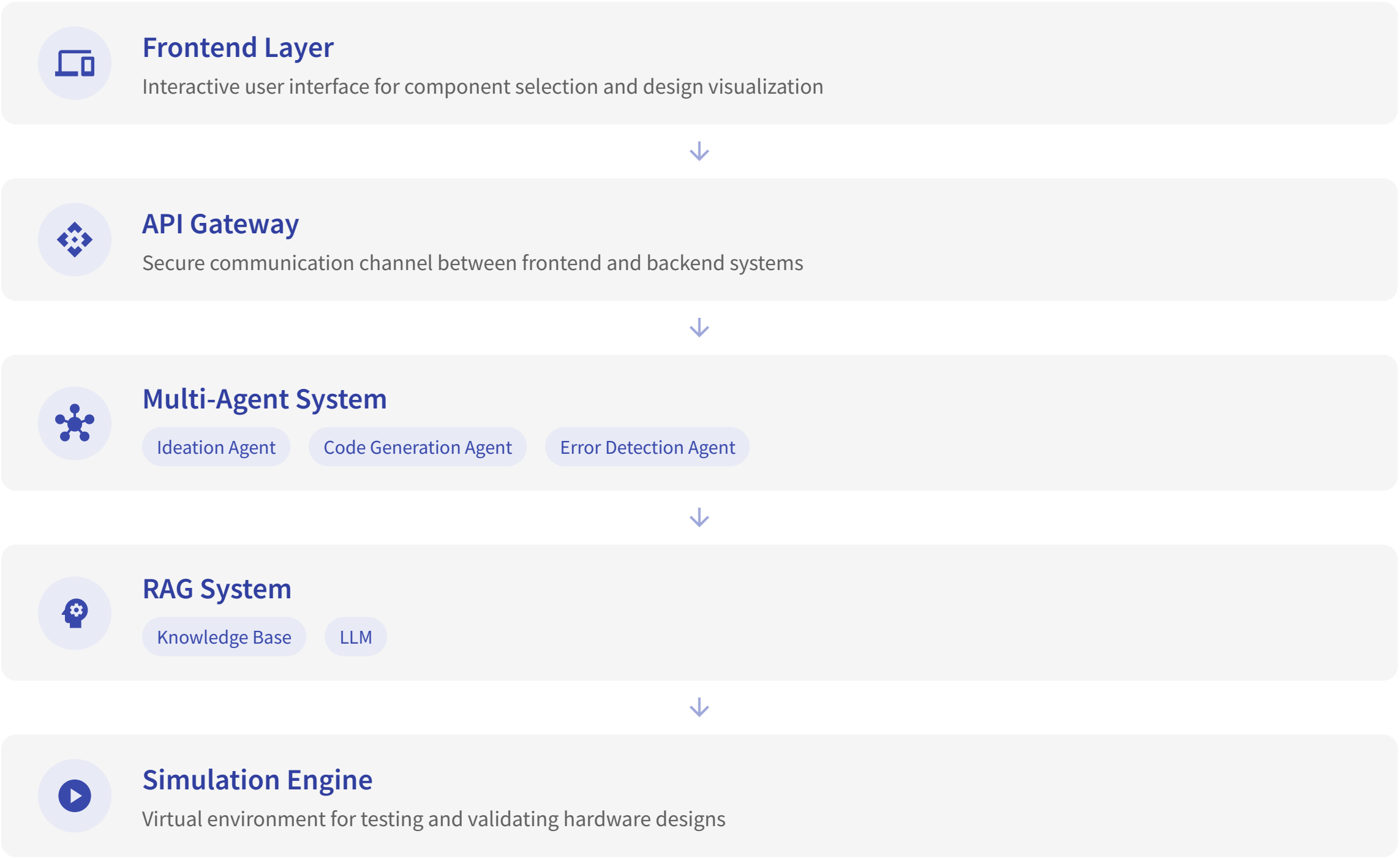
Automatic code generation for all components

System Workflow






Streamlined workflow powered by **RAG** + **multi-agent AI** architecture

Architecture Overview



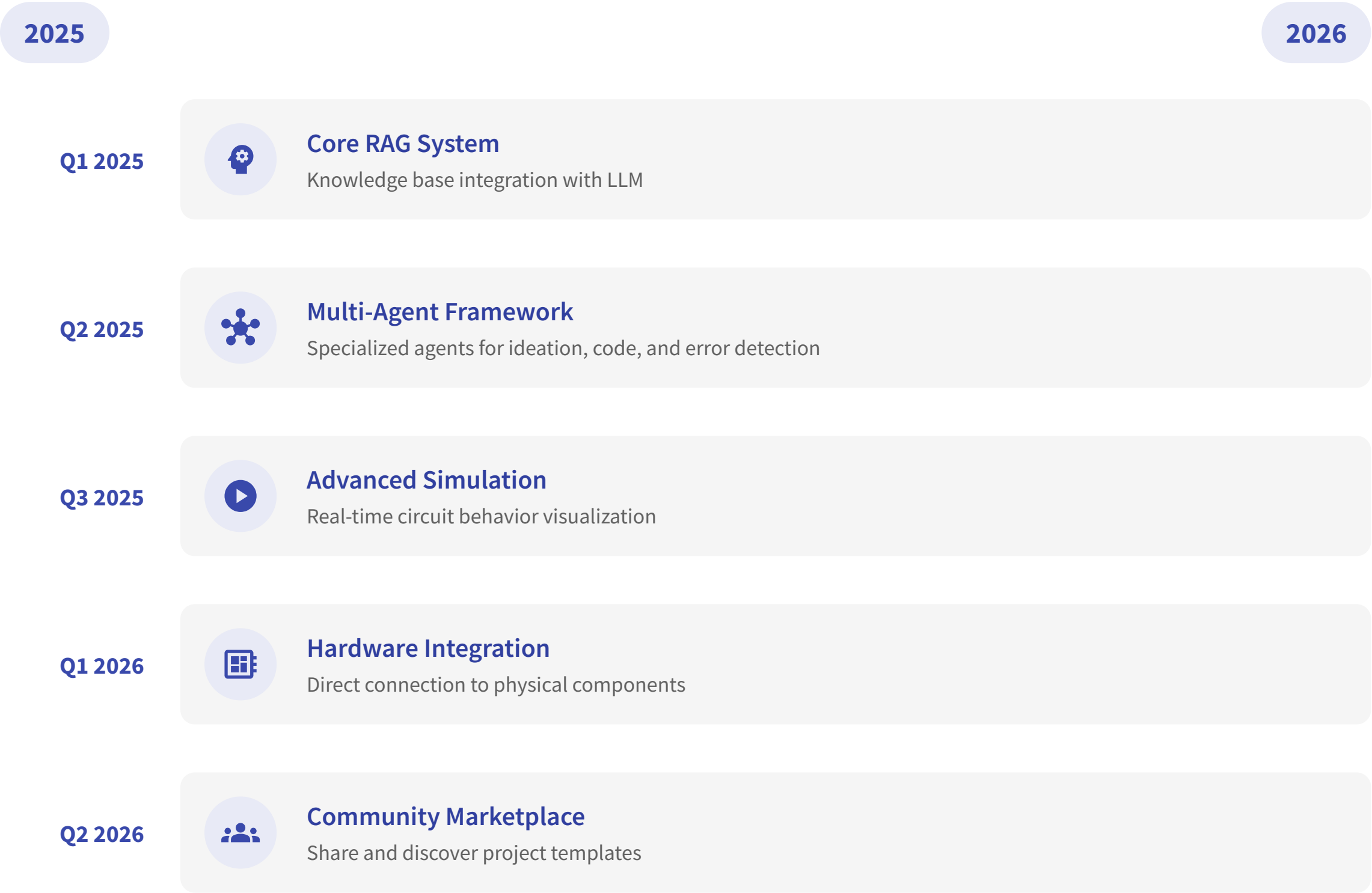
RAG + multi-agent architecture enables seamless integration of ideation, design, and simulation

Comparison Table

Solution	AI Ideation	Auto Code Gen	Error Detection	Simulation	Educational Focus
 Traditional Tools	✗	✗	✗	✗	✗
 Existing Simulators	✗	✗	✗	✓	✗
 Our Solution	✓	✓	✓	✓	✓

Only solution combining **AI ideation** + **multi-agent workflow** + **educational focus**

Roadmap Extensions



Strategic development focused on **user experience** and **scalability**

Only solution combining AI ideation + multi-agent workflow + educational focus



AI Ideation



Multi-Agent
Workflow



Educational Focus