Operationalizing Agentic AI in Trusted Engineering Workflows

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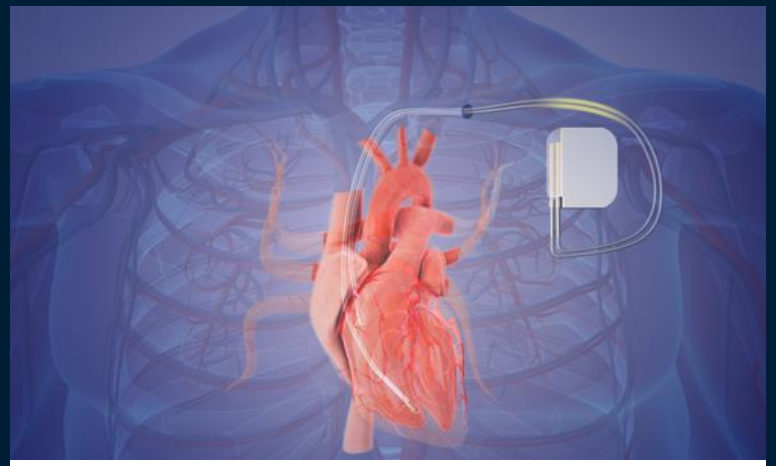
What we will explore

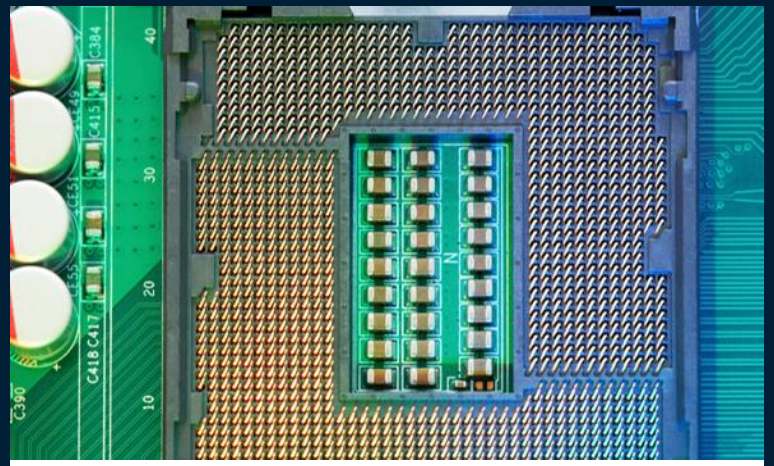
- Why engineering AI needs a trusted system context
- How agentic AI operationalizes an MBSE methodology
- Demo and adoption principles

AI in engineering is not new. What is changing is its role.



Medtronic

Detecting heart disorders in implantable cardiac monitors



Princeton University

Creating wireless chip designs

Eaton

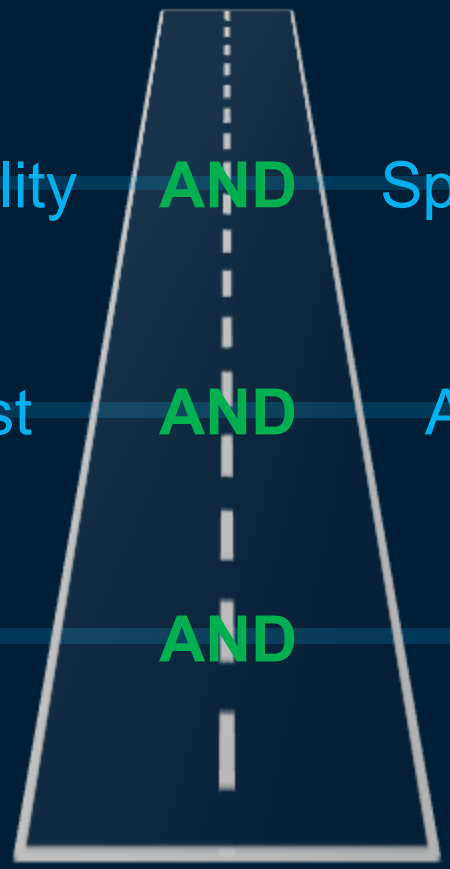
Advancing solar power systems performance

Real-world systems need verifiable engineering

In engineering, useful AI must produce outcomes that can be inspected, tested, and traced

AI value in engineering requires a trusted foundation

Trusted engineering tools + **GenAI**



Quality **AND** Speed

Trust **AND** Autonomy

Systems **AND** AI-driven software

The evolution of computing eras

2024

2026

The age of
Functions
Specialized algorithms for engineers

Initial value driven by performance and ease of use: specialized algorithms accessible for engineers and scientists

The age of
Apps
Integrated workflows and reusable systems

Focus expanded to integrated workflows and graphical interfaces enabling reusable, shareable solutions with system-level thinking

The age of
GenAI chat
AI assists engineers (copilot model)

AI assists developers by generating code suggestions and explanations while humans control intent and validation

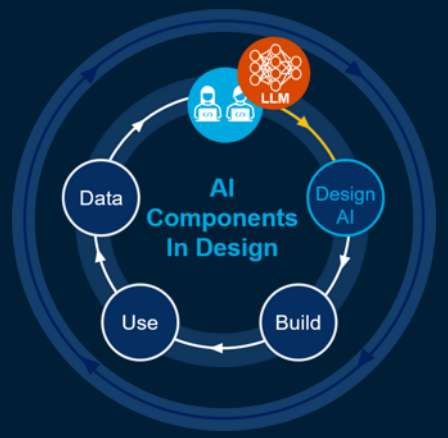
Copilot era

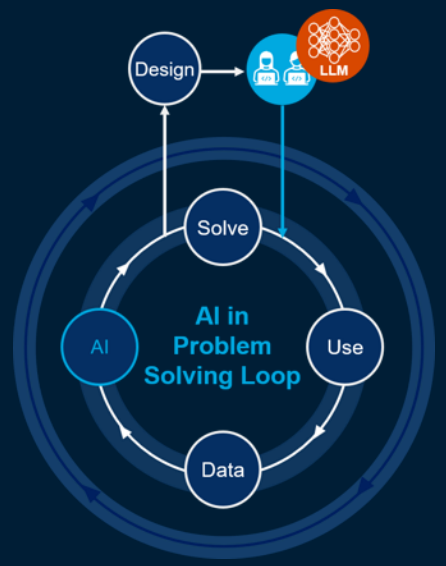
The age of
Agentic-AI
AI executes workflows and iterates

AI agents autonomously read requirements, generate code, execute workflows, and iterate for scalable expertise delivery

GenAI meets where you are

Two pathways to AI-augmented Model-Based Design





Integrated AI

- Embedded in the engineering environment
- Grounded assistance
- Minimal setup

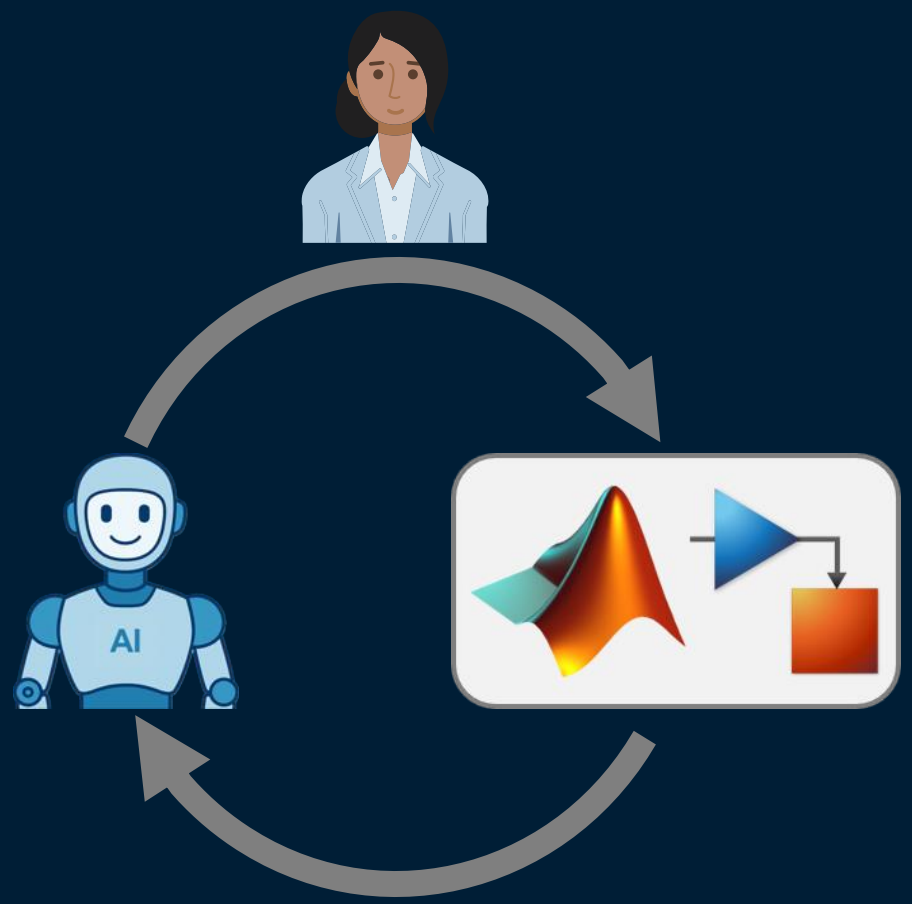
Agentic AI

- Connects external agents to engineering workflows
- Executes through tools and skills
- Flexible agent and LLM infrastructure

Simulink Agentic Toolkit

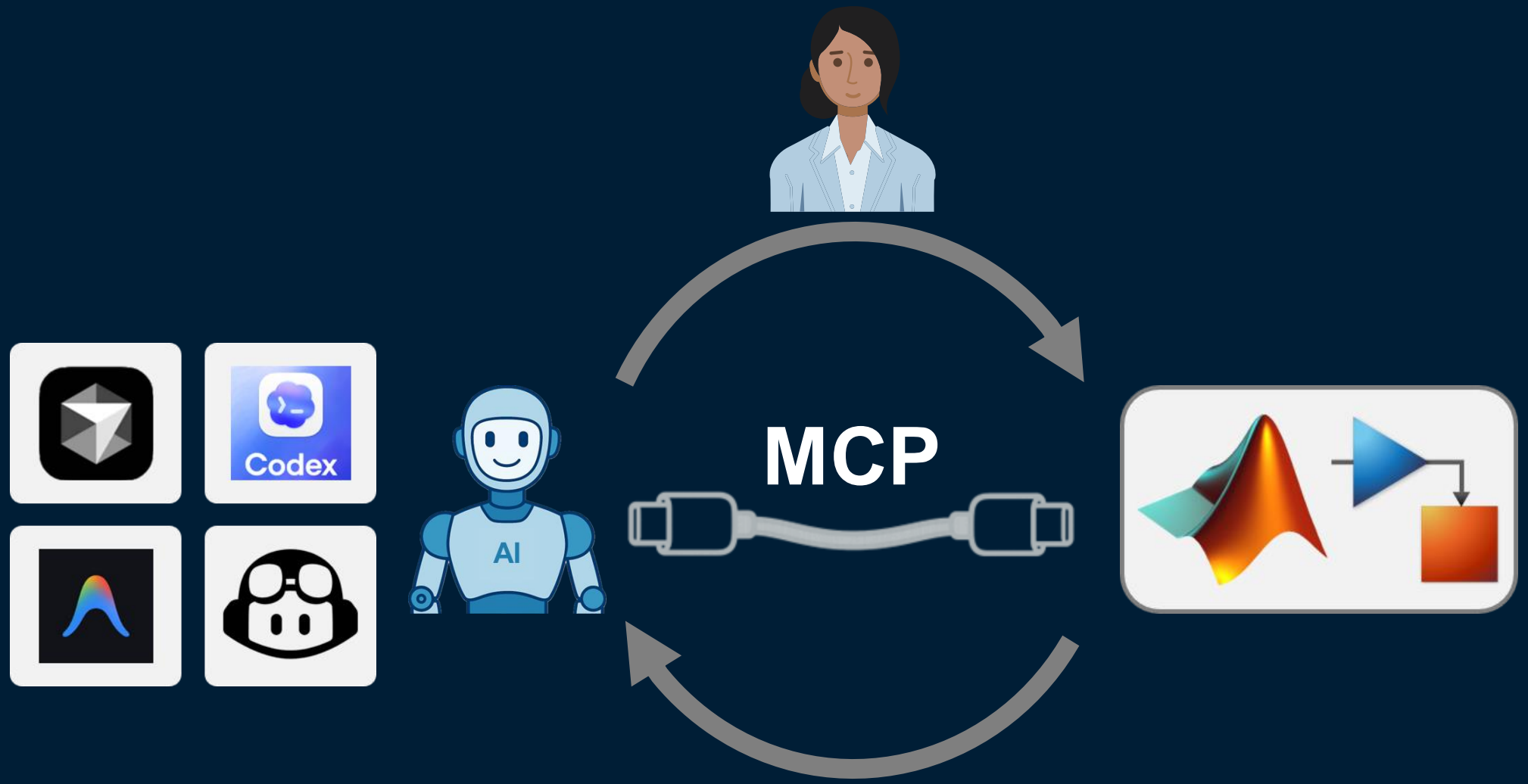
Enable your AI agents to work effectively with Simulink and Model-Based Design

- **Execution**
  AI executes engineering tasks, not just suggestions
- **Orchestration**
  Workflows become structured, repeatable, and scalable
- **Iteration**
  Systems evolve through continuous iteration



AI becomes part of the engineering loop

MCP enables agentic workflows



Connecting external AI to MATLAB

External AI Agent

- Orchestrates workflows across tools

connects via

MCP

connection layer

- Standard interface to MATLAB
- Enables integration with different agents

MATLAB

- Executes engineering tasks
- Uses models and domain knowledge

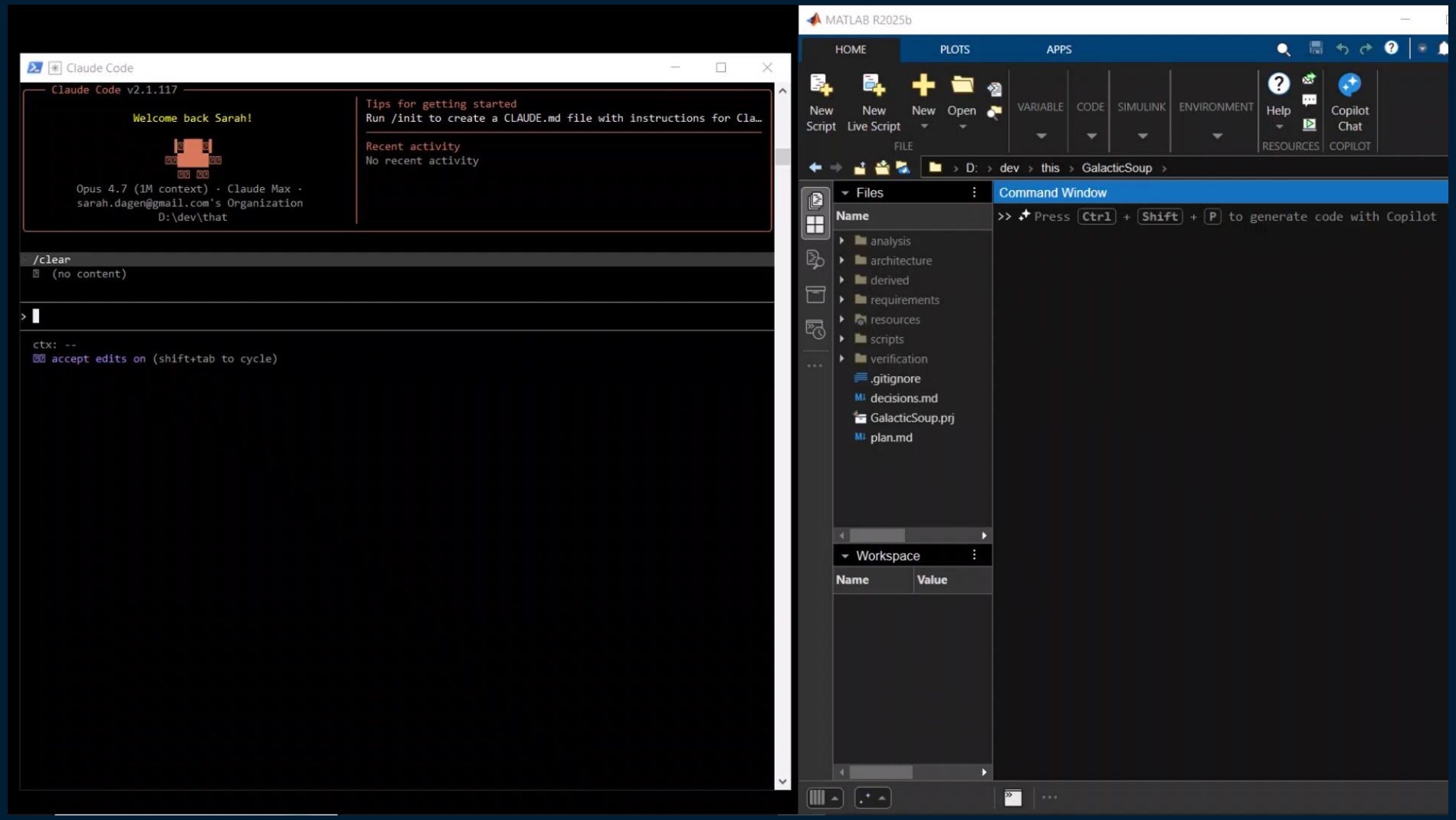
provides

Agentic Toolkit

Skills & plugins

Decouples agent from execution environment

Demo: from stakeholder needs to traceable architecture



Model-Based Systems Engineering

Managing system complexity with MBSE

MBSE replaces or augments document-centered workflows with models, connecting what you already do in Simulink into a system-level picture

See the whole system	Single source of truth	Traceability across the lifecycle	Earlier system-level validation
• Capture architecture, interfaces, and interactions beyond individual Simulink models • Avoid integration surprises later	• Requirements, architecture, and design all connected • Reduces inconsistencies and misalignment	• Requirement → architecture → behavior → test • Faster impact analysis and change management	• Simulate system behavior in context (not just component behavior) • Catch issues when they're cheap to fix

Methodology-based workflow orchestration

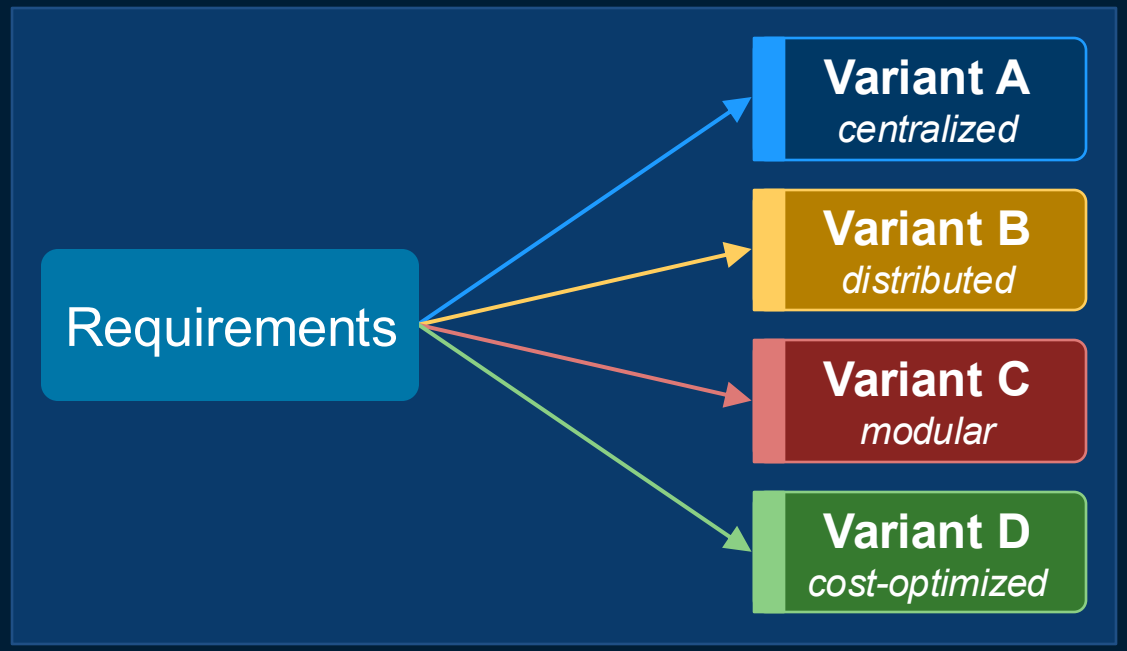
A staged approach that turns intent into traceable architecture

R **Requirements**	F **Functional**	L **Logical**	P **Physical**
Stakeholder needs and system requirements, with traceability links	What the system does — abstract functions and their interfaces	How functions are grouped into logical components	Concrete implementation: parts, properties, mass and cost roll-ups

The value is not faster artifact generation. It is faster, traceable exploration before commitment

Why this matters

Where agentic AI creates early value



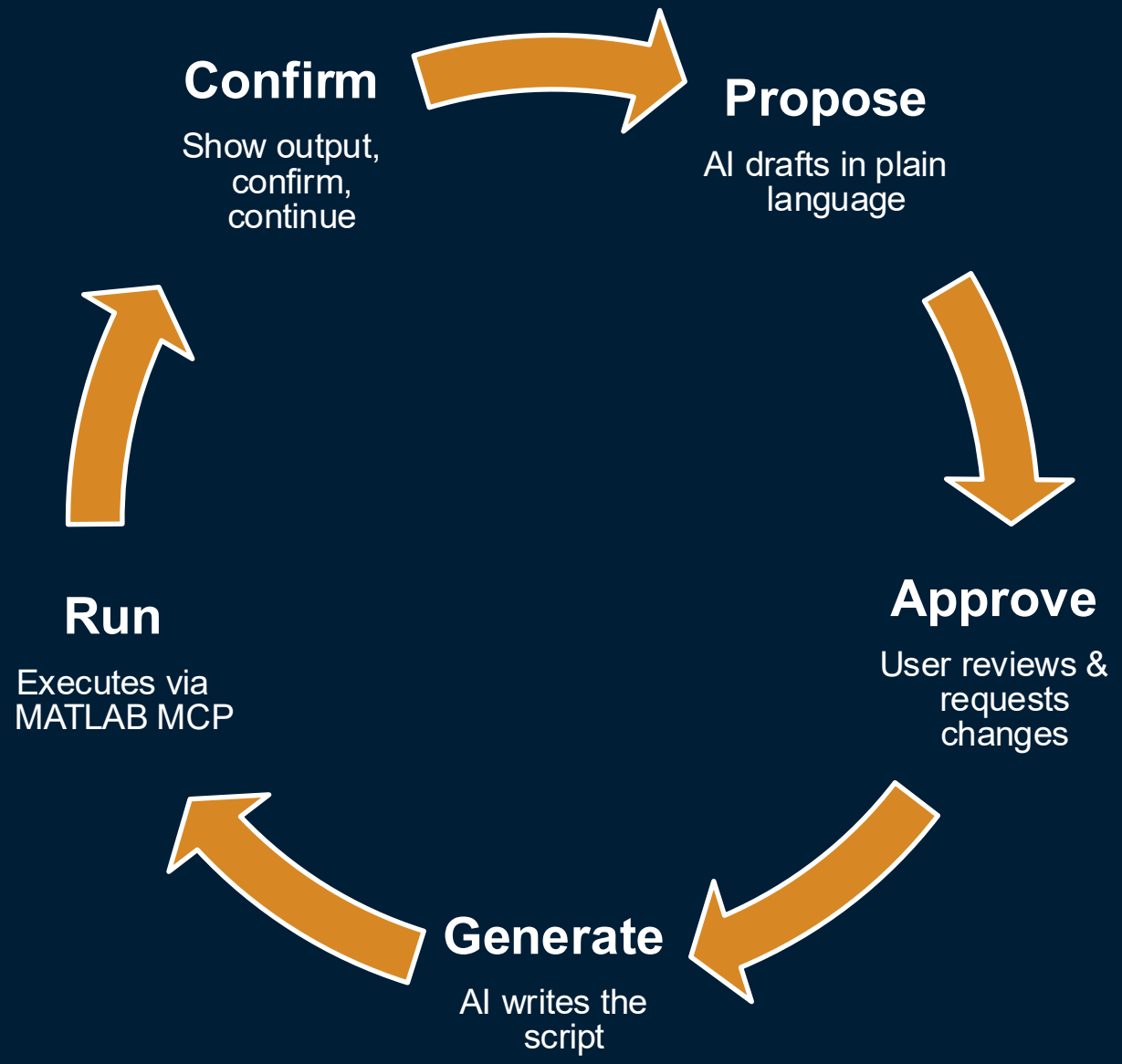
- **Explore architectural alternatives**
  One requirements set → multiple design options
- **Expose requirement ambiguities earlier**
  Questions emerge before design reviews
- **Reduce the cost of decisions**
  Evaluate alternatives before committing

How it's built

Five skills, one repeating loop

SKILLS

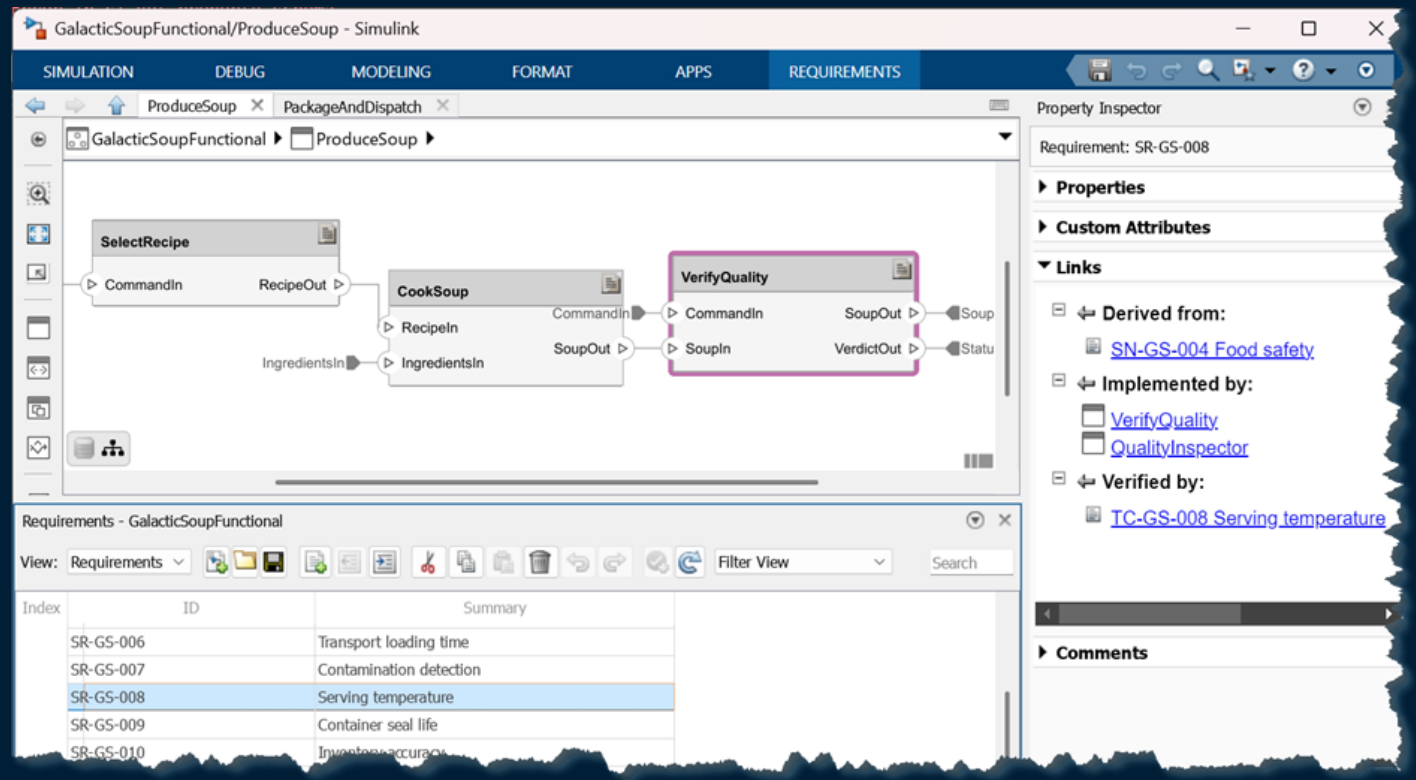
`mbse-workflow`	Guided end-to-end RFLP workflow
`matlab-project`	Project structure, APIs, integrity checks
`system-composer`	System Composer API reference
`mbse-architecture`	F/L/P, interfaces, stereotypes, allocations
`simulink-requirements`	Requirements Toolbox API reference



Traceability

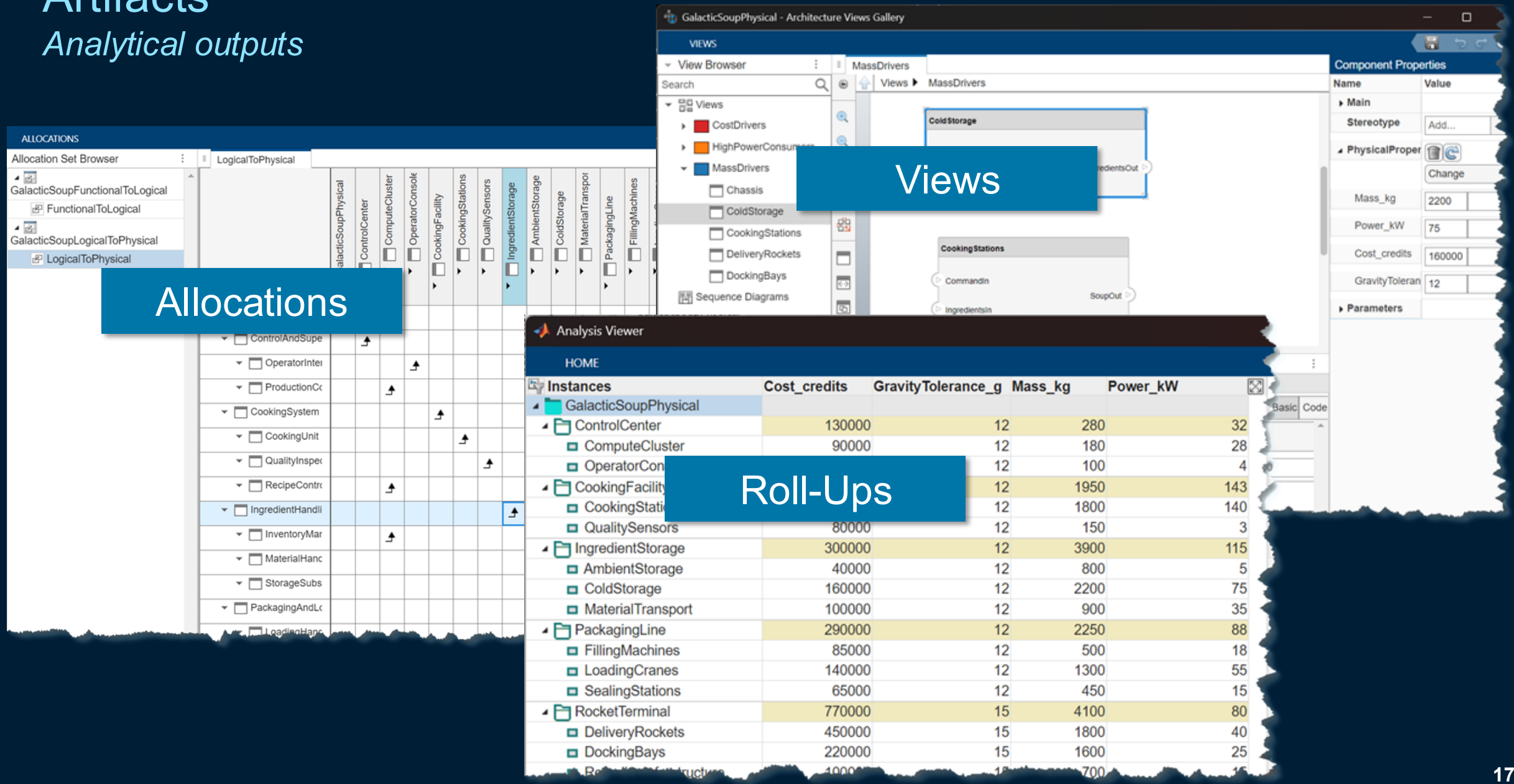
Stakeholder needs in, traceable system architectures out

	C	D
1	Description	Rationale
2	System shall cook at least 8 distinct recipes selectable at runtime.	Eight recipes gives menu variety while staying within ingredien
3	System shall sustain total throughput of at least 200 bowls/hour.	200 bowls/hour matches expected peak order rate aggregated
4	System shall achieve average automation level of at least 0.8 across components.	0.8 automation lets the 5-operator crew cover a 24/7 facility wit
5	System shall require at most 5 concurrent operators at peak load.	Facility berthing and life support are sized for a 5-person crew
6	System shall generate a shipping manifest per batch including destination.	Manifest is required for customs, transport routing, and recipie
7	System shall load packaged soup onto transport within 10 minutes of packaging.	10-minute window keeps loading pipeline aligned with the 200



Artifacts

Analytical outputs



Bootstrap with scripts – Maintain in place

Phase 1

Bootstrap

Script-driven generation

Agent writes & runs scripts that create the project, requirements, architectures, and allocations from scratch.

Fast, but every run is a full rebuild.

Transition

Steady state

Project takes shape

Architectures are reviewed, refined, and committed.

Re-running the bootstrap workflow now would clobber real work and pollute the git history.

Phase 2

Maintenance

In-situ edits via skills

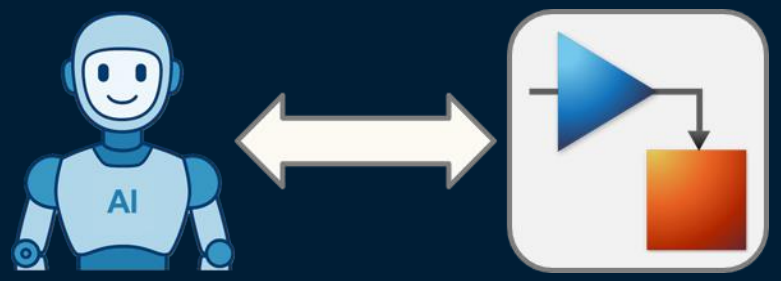
Use the skills' in-place editing APIs: add a requirement, link it to this component, regenerate just the allocation matrix.

Surgical changes, clean diffs.

Where this pays off

Faster initial artifacts · Controlled evolution · Methodology compliance by design

Key takeaways



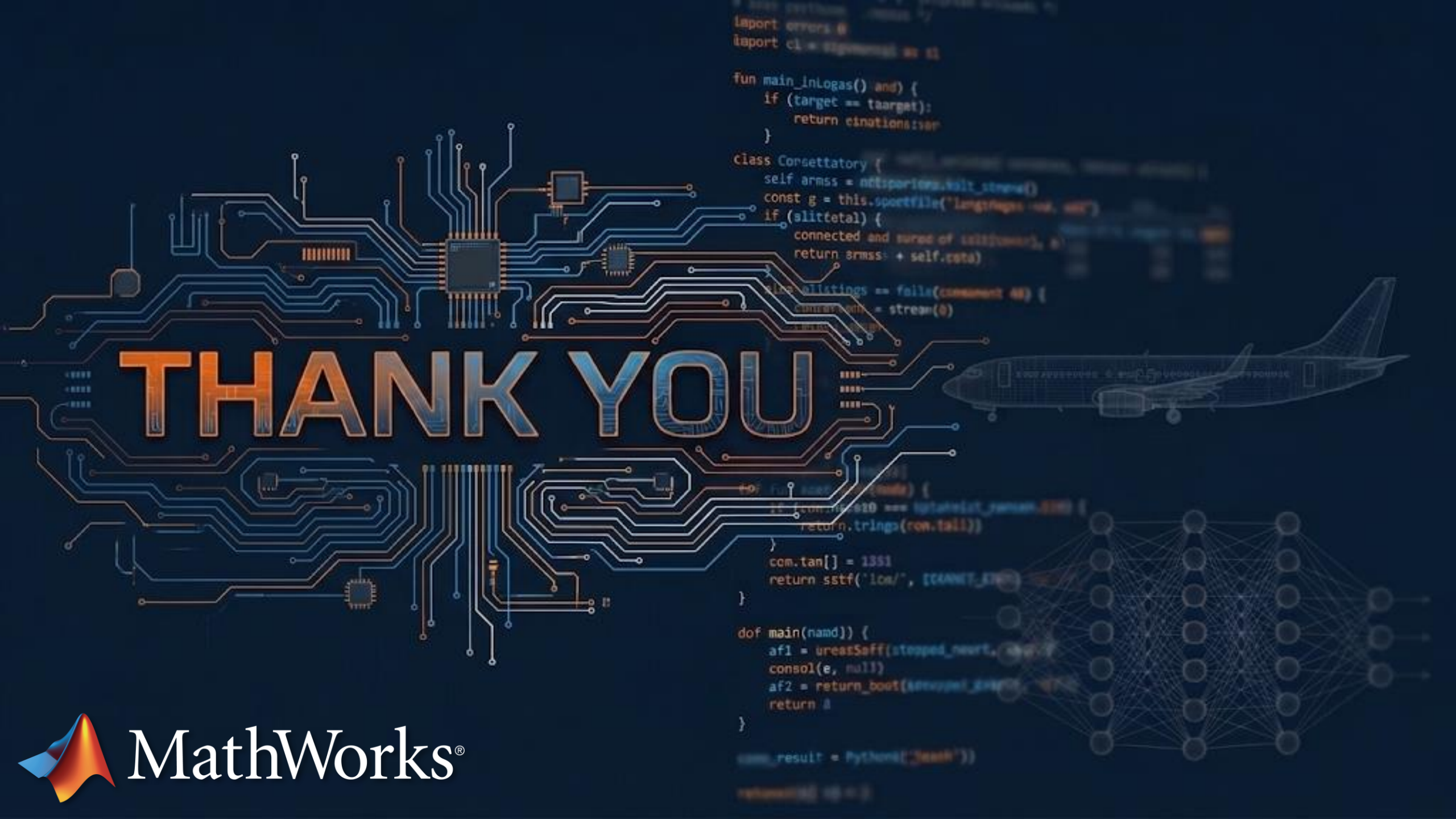
Agentic AI earns trust when it:

- Operates inside a defined engineering method
- Uses proven tools and domain-specific skills
- Keeps humans at approval and decision points
- Produces testable, traceable, reviewable artifacts
- Accelerates exploration without replacing engineering judgment

Automate the workflow. Preserve engineering authority.

Continue exploring: agentic AI for MBSE

- Model-Based Systems Engineering and Agentic AI
  - Augments systems engineers by automating modeling tasks, analyzing system architectures, and supporting informed decisions
- Trade Studies with Agentic-AI-powered MBSE
  - Automatically explores design alternatives, performs trade-off analysis, and supports data-driven engineering decisions
- MBSE with Agentic AI on GitHub
  - The most up-to-date MBSE skills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