



# *A National Security AI Platform*

## *Driving accelerated science with AI*

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**Peer-Timo Bremer**

Director – AI Innovation Incubator

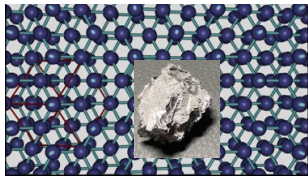
Group Leader – Center for Applied Scientific Computing

# AI represents a disruptive advancement in science, engineering, and operations capabilities

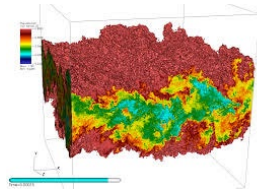
Strong AI reasoning capabilities



Powerful scientific assets boosted by AI



Discover new materials



Design complex systems



Manufacture critical parts



Deploy high-consequence systems

Integrated capability for rapid delivery of national security and scientific solutions

AI creates both opportunities and threats for **US national security** and **economic competitiveness**

# Given exponential growth there is the potential for a lasting benefit or structural disadvantage

- **National security capabilities:** agile response, cyber-physical security, space programs, misinformation, drones, etc.
- **Science and engineering advances:** fusion energy, advanced manufacturing, biosecurity, medical, material science, etc.
- **Global adversaries are investing heavily in winning this race:** 100ks GPUs, 1000s of staff
  - US is leading in commercial AI but defense is less clear

**The national labs and DOE in general are ideally suited to exploit the opportunities and guard against the risks**

The Genesis Mission will deliver US AI-driven innovation overmatch for national security, science, and energy organized around two concepts

## The National S&T Challenges

The Applications are defined by Lighthouse Challenges – high-impact technical problems aligned to urgent national priorities – where AI accelerates progress. Using the Platform’s model, data, computing, and automation capabilities, teams develop innovative solutions while also strengthening and extending the Platform itself.

*Delivered by the Lighthouse Challenges Pillar through Platform application.*

## The Platform

The Platform supports AI-driven experimentation, analysis, discovery, design, and manufacturing. It unifies access to AI, computing resources, scientific data, and automated facilities, allowing application of unprecedented capabilities that will accelerate R&D in energy systems, scientific discovery, and national security Applications.

*Delivered by the Infrastructure, Data, and Models Pillars.*

Close industry partnerships, delivered by the *Partnerships Pillar*, will enable rapid platform development and ensure meaningful application impact

# Lighthouse Challenges will address a big problem, with ambitious but plausible goals, that require a large team for high impact

## National Security

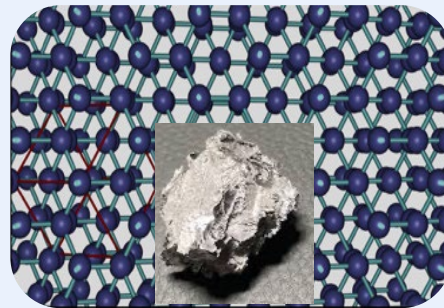
Ensure the safety and reliability of the U.S. nuclear stockpile and accelerate the development of defense-ready materials



Accelerate national security response

## Critical materials

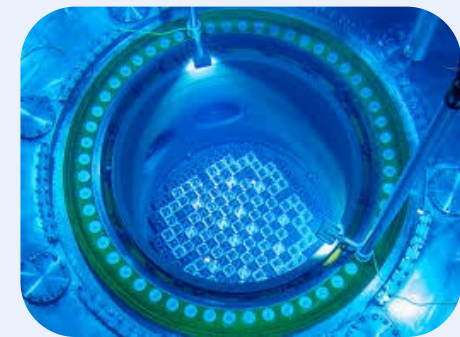
Secure leadership in material sourcing by developing innovative alternatives for rare elements



Magnets for high-consequence applications

## Energy Dominance

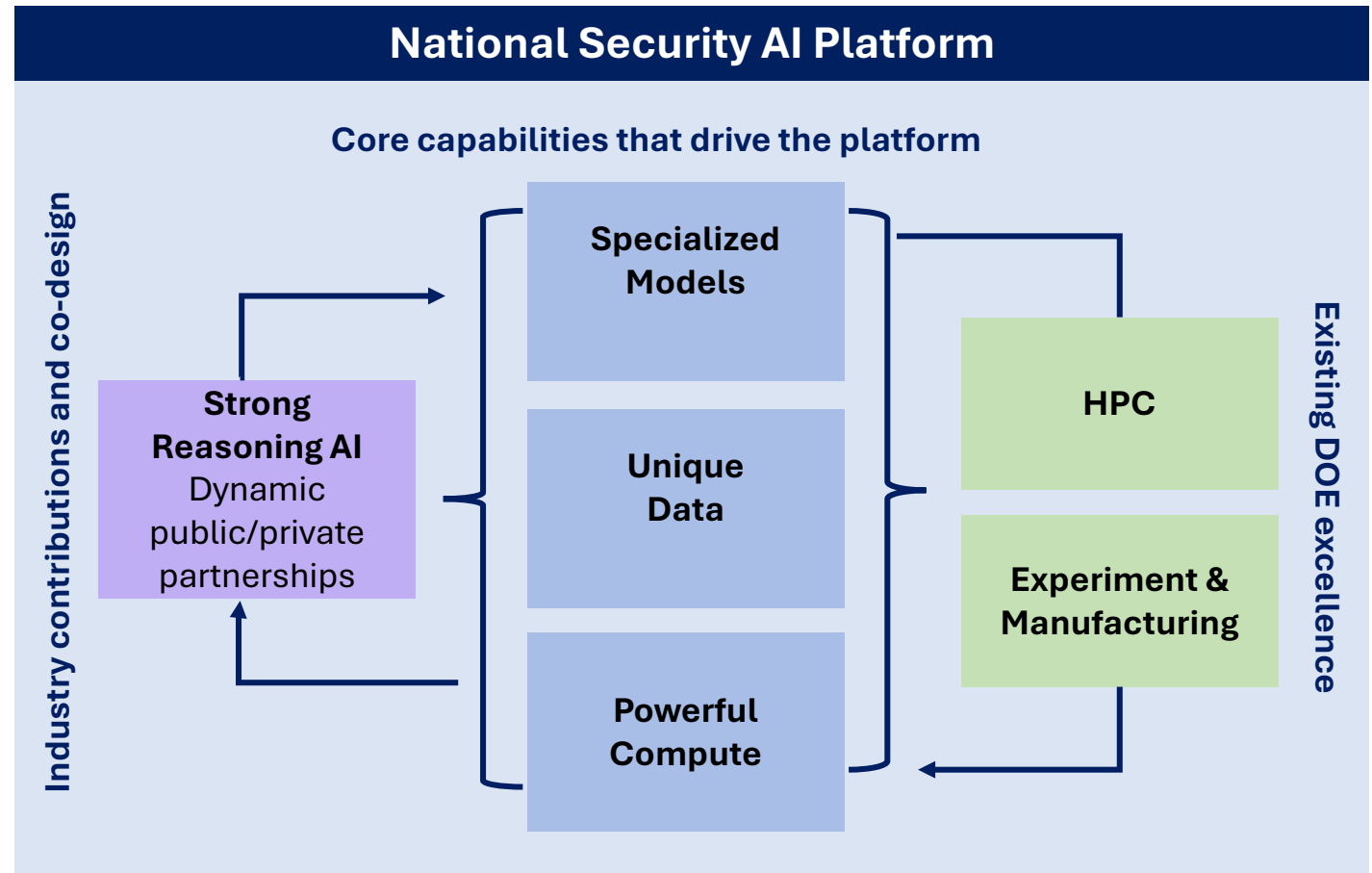
Establish energy dominance through AI-designed and AI-operated nuclear reactors



Nuclear-powered data centers behind the meter

# A National Security AI Platform will accelerate innovation and production across missions

- A singular, integrated AI engine
- Built to harness high-performance computing, precision experimentation, and high-consequence production
- Designed for AI-driven discovery and rapid, novel mission solutions



# The technical efforts are organized into five Pillars



## Lighthouse Initiatives

Engages with projects addressing high-impact national challenges—such as energy security and advanced materials—that are accelerated by the Platform. Serves as a living portfolio that evolves as missions and technologies change.



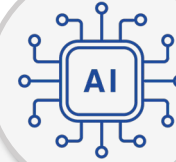
## Infrastructure

Provides the hardware and software foundation for the Platform to support large-scale AI training and inference, data management, and scalable agentic workflows. Ensures the security of models, data, and systems, as well as interoperability across DOE facilities and production agencies.

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## Data

Organizes, curates, and prepares scientific and engineering data from experiments, simulations, and observations for AI use. Ensures high-quality, reliable data to accelerate discovery and problem-solving.



## Models

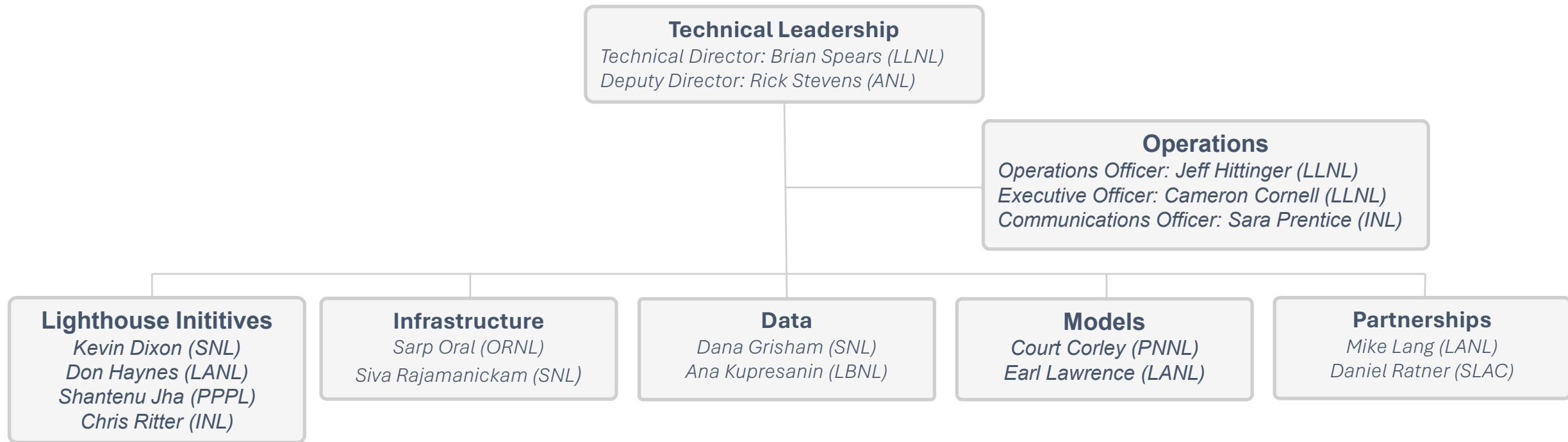
Develops an AI ecosystem of agents and models that combines frontier industry capability with DOE-specific expertise to discover and implement novel solutions to the nation's open science and security challenges.



## Partnerships

Builds collaborations across government, industry, and academia to advance AI innovation. Leverages shared expertise and resources to deliver real-world impact at national scale.

# Genesis Mission Technical Leadership Team



# We must not do this alone

DOE starts where industry stops

## Industry AI

ANTHROPIC

OpenAI

Meta



NVIDIA

Microsoft

AMD

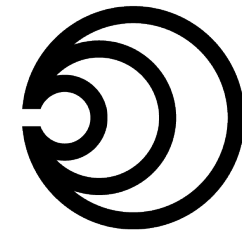
Deep AI reasoning

Specialized frontier AI models

Connections to science systems

Advanced science systems

## DOE science



Genesis Platform

**Need** rapid scientific data loops to solve the data shortage and improve models

The US must build this bridge

**Need** frontier reasoning models to accelerate science and production loops

# Industry is partnering with DOE and starting to contribute significant resources to the Genesis Platform

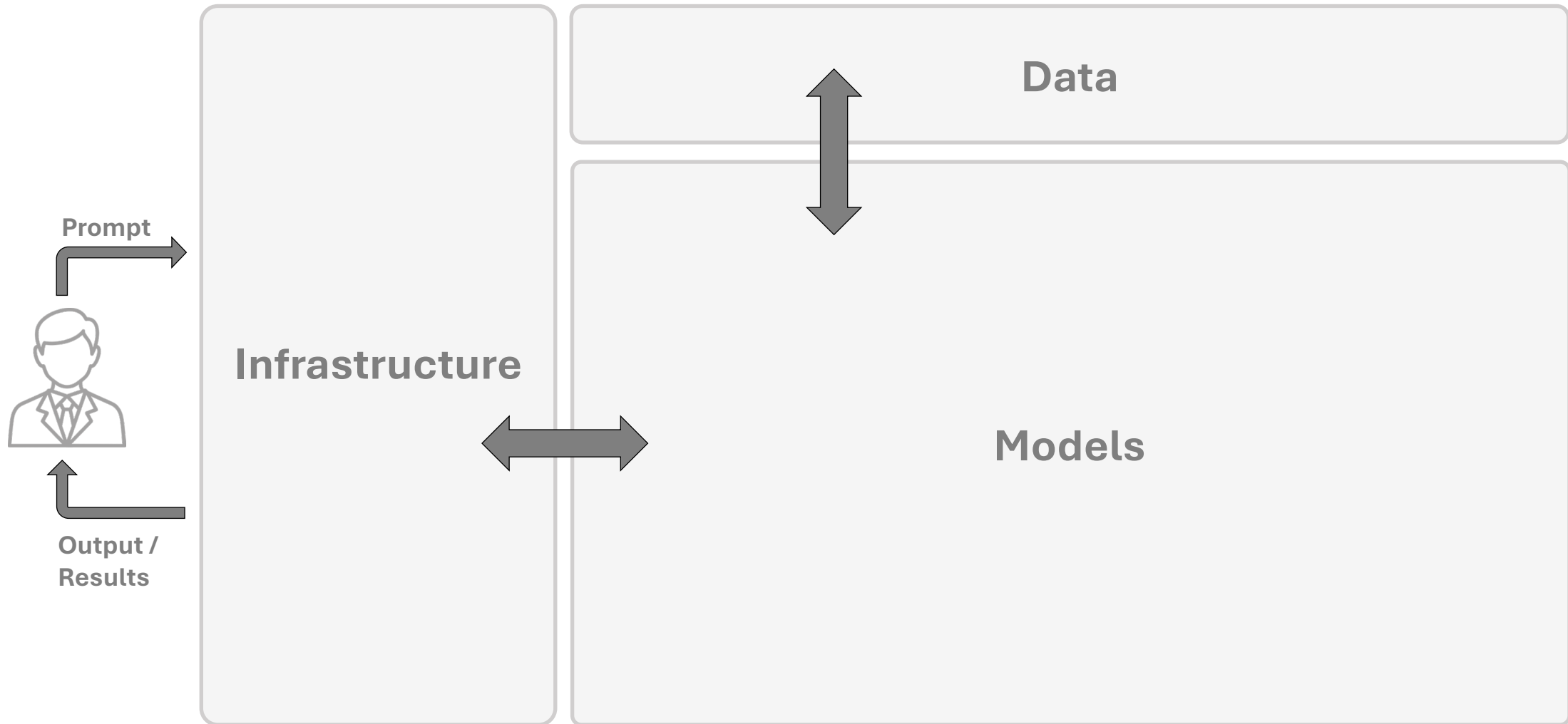
## Industry AI



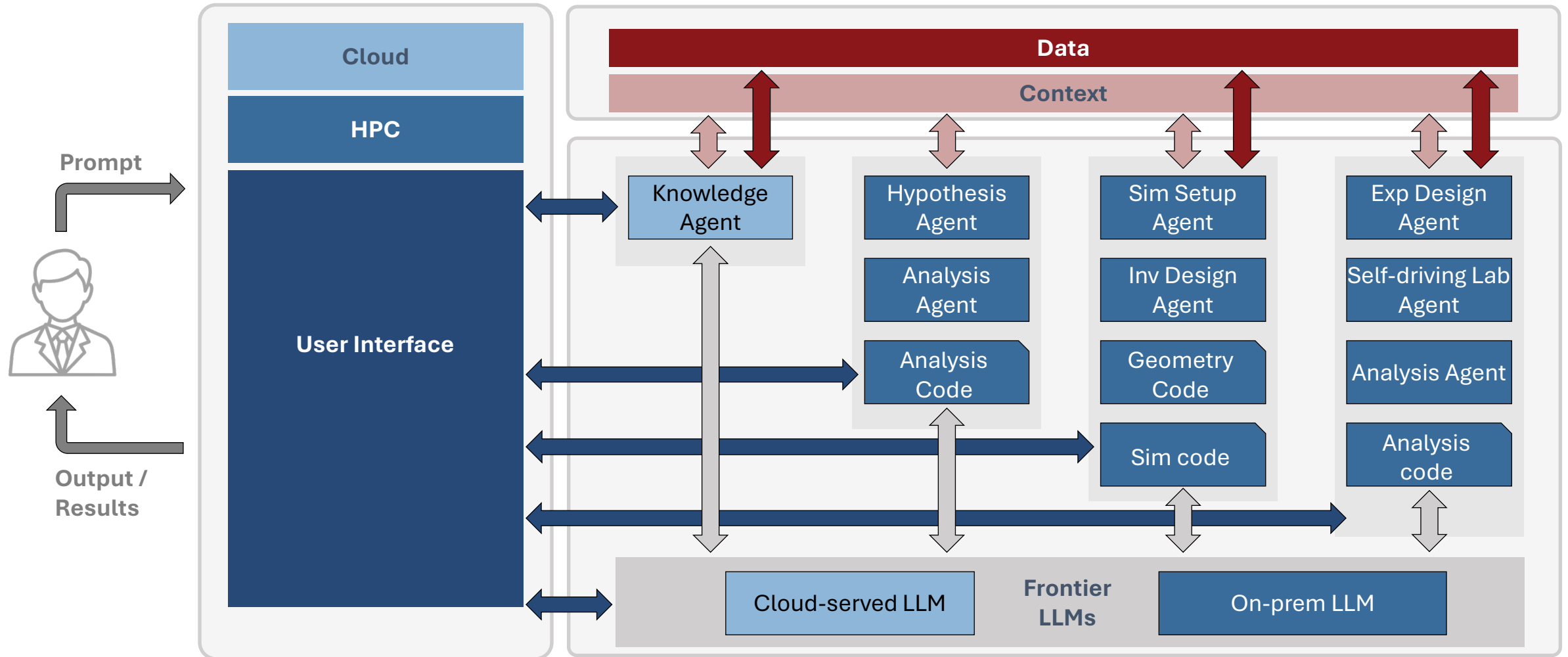
## Contributions

1. Frontier model tokens
2. Cloud credits
3. Engineering FTE
4. Custom solutions
5. Hardware

# The pillars are building the interacting components that will drive the Platform



# Each Pillar provides a collection of subcomponents that interoperate to enable new workflows



# The Platform is the first thing that will be able hold the whole mission in frame

AI tools now provide “context” that links science, engineering, and operational ideas from concept to execution

## What the Platform does

- Runs closed, self-reinforcing loops that **compress discovery and engineering cycles**.
- **Generates hypotheses and designs** through teams of domain-aware agents.
- **Simulates, verifies, and quantifies uncertainty** using scalable scientific models and HPC workflows.
- **Prepares and executes experiments and production** processes, capturing multi-modal results in real time.
- **Learns and iterates by curating new data**, updating models and policies, and replanning the next cycle.

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## What it is made of (integrated, not piecemeal)

- **Agentic workflow fabric:** interconnected workflows with hundreds of specialized agents spanning science, operations, and engineering tasks.
- **Orchestration layer:** planning agents that assemble teams of agents and adapt plans as conditions change.
- **Hardware and systems:** hybrid cloud and on-prem compute with AI-ready plants and facilities
- **Model foundations:** hundreds of specialized scientific models plus a model discovery engine for composing them.
- **Data foundations:** the world’s largest and most capable scientific AI data lake
- **Interfaces to partners and tools:** standard connectors to frontier models, scientific codes, robotic lab tools, facility control systems, and secure collaboration environments.

# Minimum Viable Product

## FY 26 Automation

- Run multi-100 agent AI workflows
  - Execute hybrid cloud/HPC workloads
  - Demonstrate automated, agent-driven access of Genesis model and agent library
  - Manage a mature pub/sub process for connections to science and manufacturing resources and facilities
  - Execute pre- and post-training workloads
  - Deliver multi-day on-task agent workflow executions
  - Establish the Genesis Data Lake and provide automated agent read and write
  - Wrap the entire process in a mature UX and architecture that enables internal and partner tooling
  - Deliver Platform MVP
  - Define LHP pressures on Platform and show initial Platform execution against LHP
  - Cyber and security review of architecture and processes and risk acceptance
- Deliver MVP
  - Lighthouse definition and study



## FY 27 Closed-loop Autonomy

- Multi-agent workflows, multi-day workflows can self-steer
  - Closed workflow loops can execute several to many times
  - Autonomous Platform loop operation delivers lighthouse problem advances
  - Platform builds and begins to use digital twins of facilities
  - Closed-loop operations delivers measurable improvements in pace and productivity at scale for first time
- Harden MVP
  - Platform advances LHP
  - New Platform capabilities, Operational scaling

# Initial Operating Capability

## FY 28 Facility- and Plant-scale Self-improvement

- Strong, DOE-specific self-improving learning
  - AI-wrapped facilities
    - Agents drive facilities
    - Digital twins provide virtual reasoning and operations
    - Facility outputs feed AI and AI improvement
  - Model-driven system engineering for facility- and complex-level planning and execution
  - Rapid AI- and mission-specific data expansion
  - Doubling of scientific and mission productivity
  - Expansion of scale [better define this]
  - Experiment and production optimization to reduce the number of experiments and build-test cycles while maximizing learning
- Platform loops improve Platform
  - Platform drives facility-scale science, engineering, and production

# The Genesis Mission will build a superior AI ecosystem driven by lighthouses and realized through partnerships

- The Platform:

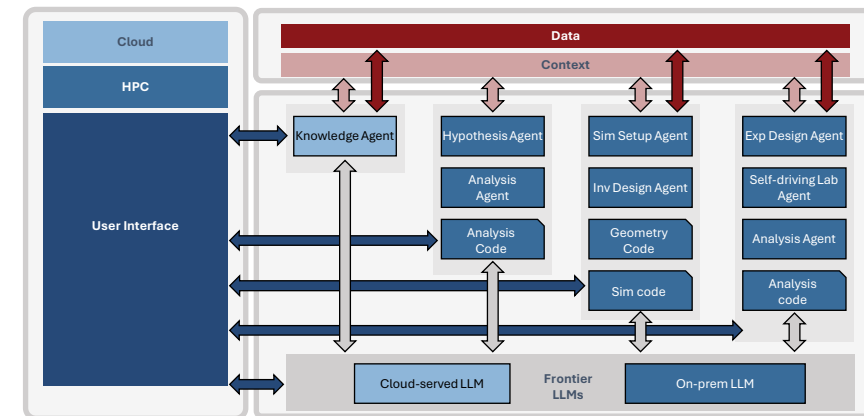
- A state-of-the-art AI toolbox and full-scale engine to accelerate your application without you having to build it

- Lighthouse Problems

- Grand challenge applications that connects applications and coordinates needs for maximal impact

- Public-Private Partnerships

- Billions of dollars of frontier contributions to the Platform in support of science and national security
- A view over the horizon to enable a leap forward in solution technology



**Through Genesis the DOE and its partners will deliver a lasting techno-economic advantage for the nation**

Thank you