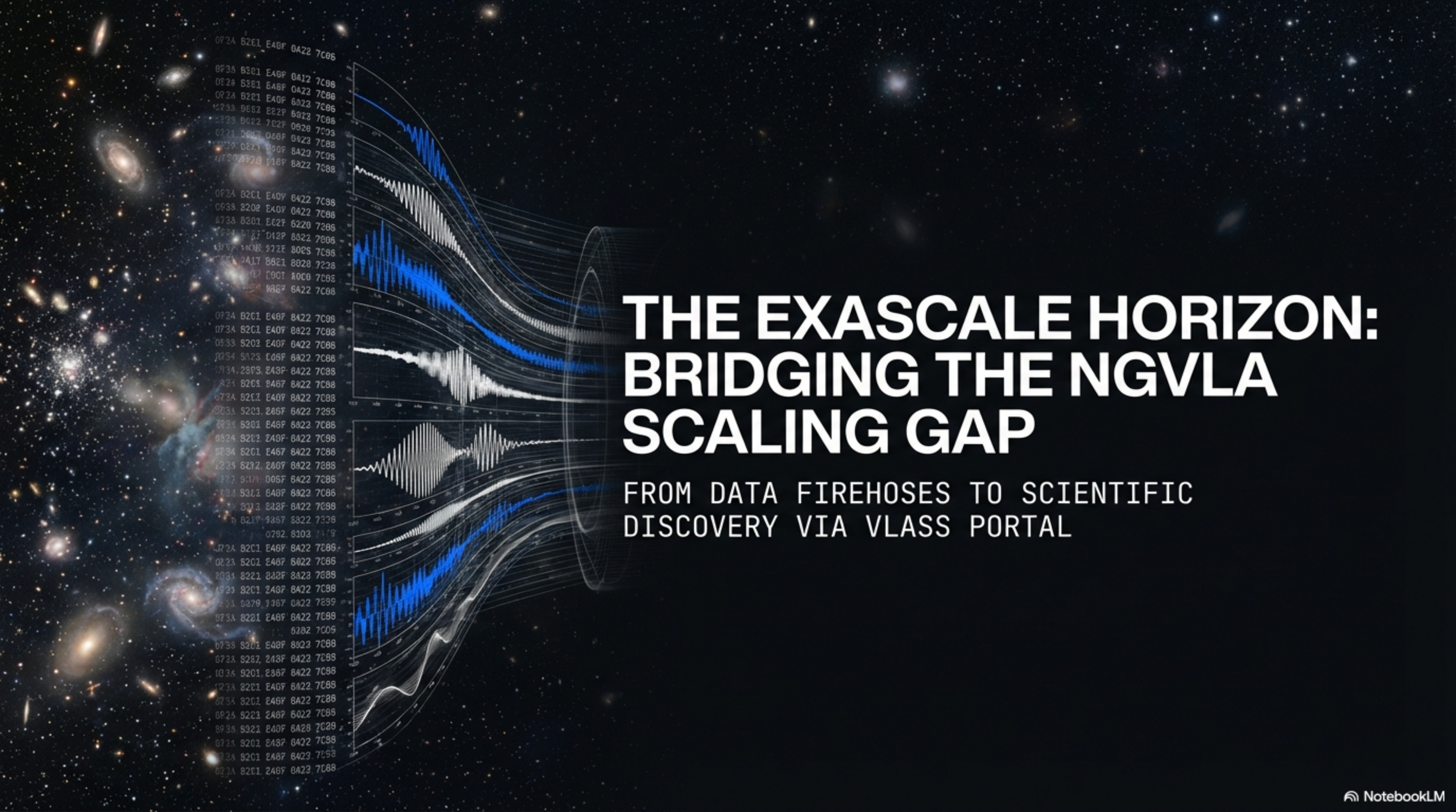

THE EXASCALE HORIZON: BRIDGING THE NGVLA SCALING GAP
FROM DATA FIREHOSES TO SCIENTIFIC DISCOVERY VIA VLASS PORTAL

The Next Generation of Radio Astronomy

INSTRUMENT: 244 Antennas (18m) + 19 Short-Baseline (6m)
COVERAGE: 1.2–116 GHz
BASELINE: ~1,000 km
SENSITIVITY: 10x ALMA/VLA
STATUS: The most data-intensive radio telescope ever built.

240 PB

PER YEAR ARCHIVE GROWTH

STORAGE RATE:
20 PB / MONTH

PEAK DATA RATE:
128 GB / SEC

SINGLE OBSERVATION:
~109 TB / 4 HOURS

Comparison: The entire VLASS Epoch 1 archive is only 100 TB. We generate that in hours.

Hitting the 60 PFLOPS Wall

Legacy ALMA

ngVLA

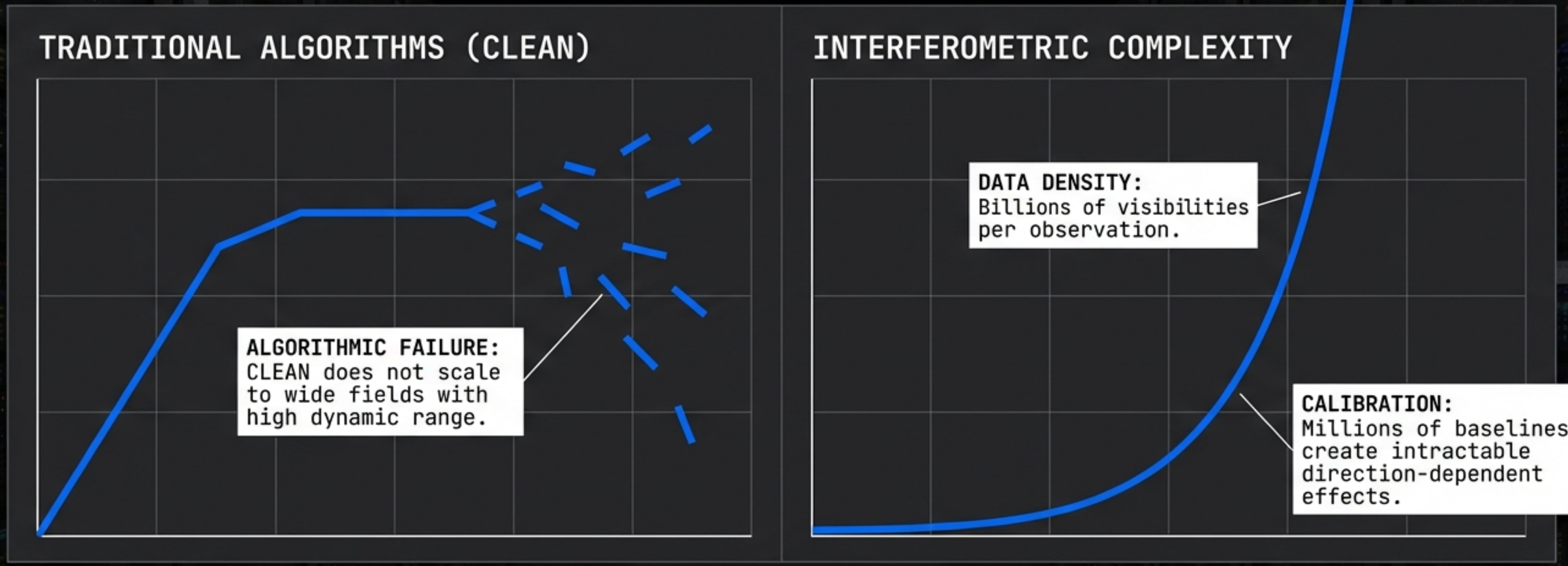
REQUIREMENT: 60 PFLOPS SUSTAINED COMPUTE

COMPLEXITY: 10,000x Legacy ALMA Levels

SCALING: 100x Current ALMA Wideband Upgrade

IMPACT: A single image cube requires **thousands of GPU cores** running for **days**.

The Exascale Scaling Gap



Standard pipelines will not scale.
We cannot simply “add more hardware” to old code.

The Workflow is Broken

- **TRANSFER:** Impossible to download **100 TB** to a local machine.
- **INSPECTION:** Impossible to load a **Petabyte** into a local Jupyter notebook.
- **INTERACTION:** Manual parameter tweaking is obsolete.
- **REALITY:** The data is too heavy to move.

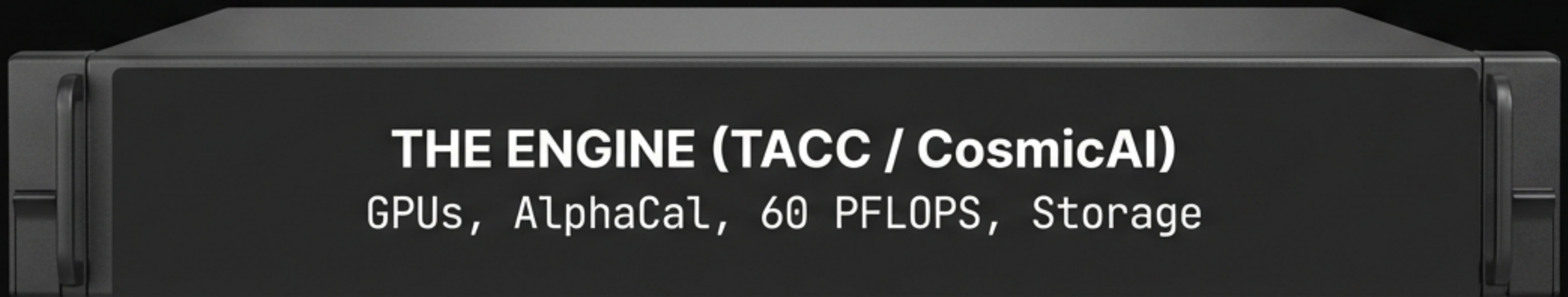
The Missing Layer in the Stack

CosmicAI is building the math and the compute. Who is building the interface?

THE ASTRONOMER

Audit, Visualize, Discover

?



THE ENGINE (TACC / CosmicAI)

GPUs, AlphaCal, 60 PFLOPS, Storage

Scientific Editorial

VLASS Portal: The Operational Interface

DEFINITION: The MLOps + UX Layer for the CosmicAI Platform.

VALUE: Moving from “downloading data” to “commanding infrastructure”.

Three Pillars Delivered (Status: Complete)

A web-native scientific operations platform, built on Angular + NestJS.

SPEED:
SSR First Paint
<1s

VISUALIZATION:
Aladin Viewer
+ Permalinks

REPRODUCIBILITY:
Community
Notebook Posts

Docking into the TACC Platform

The portal manages the workflow; TACC manages the compute.

The AI-Assisted Loop

A web-native scientific operations platform, built on Angular + NestJS.

BROWSE
Search Science Ready Data Products

LAUNCH
Trigger AlphaCal & Anomaly Detection

VISUALIZE
Instant In-Browser Review

AUDIT
Explainable AI & Human Verification

Alignment: Cosmic Horizons 2026

JULY 13–16, 2026

The Virginia Guest House, Charlottesville

THEME: EXPLORABLE UNIVERSE

Matches our Large Data Exploration & AI Trustworthiness.

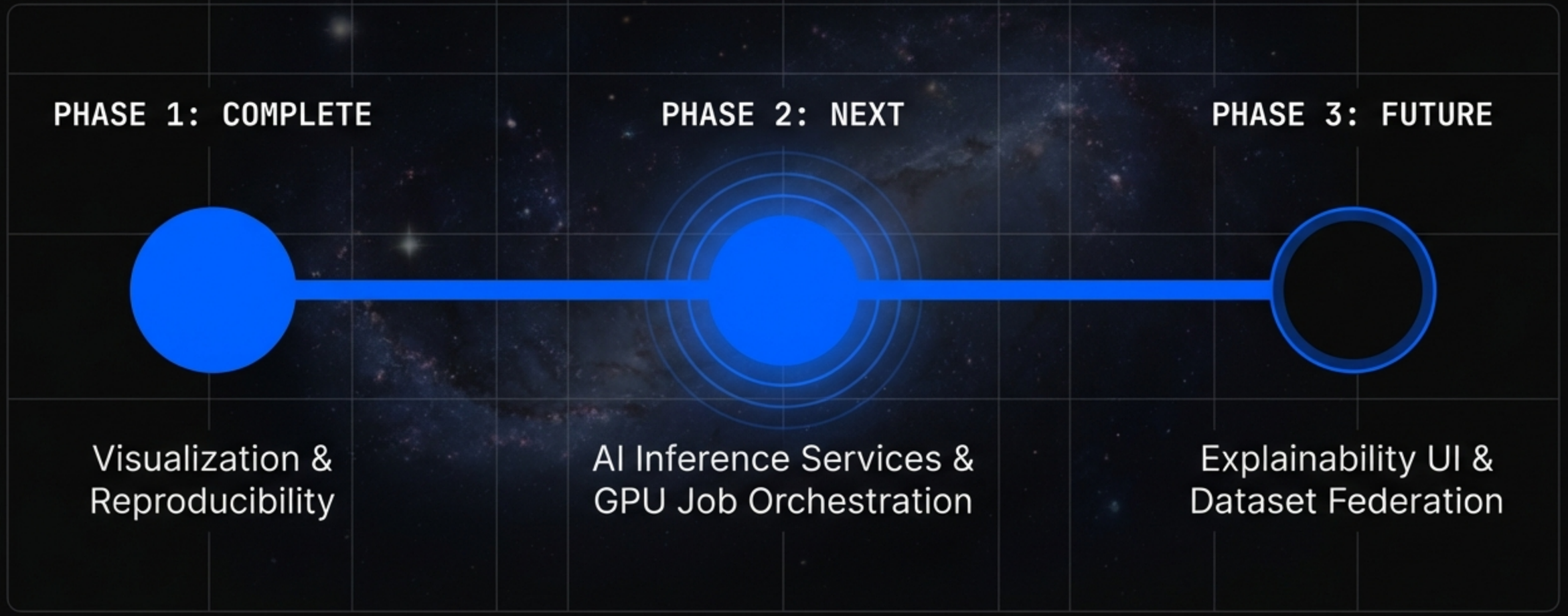
THEME: OBSERVABLE UNIVERSE

Matches our Data Processing Efficiency.

The portal answers the prompt of the 'Advancing AI Infrastructure' session.

Future Roadmap & Integration

From engineering project to National Research Infrastructure.



Completing the CosmicAI Ecosystem

Algorithms

+

Compute

+

Portal

=

Discovery

Algorithms need an Interface.
Supercomputers need an Operator.
Science needs a Portal.

Building the Control Plane for Discovery

github.com/JeffreySanford/vlass-portal

Ready for the Exascale Era