VLASS Portal Marketing Visuals

VLASS Portal: Visual Summary & Infographics Reference

Document Purpose

This document provides **detailed specifications and Mermaid diagrams** for creating professional marketing visuals and infographics for VLASS Portal. It complements the main marketing overview and is suitable for conversion to PDF or graphic design workflows.

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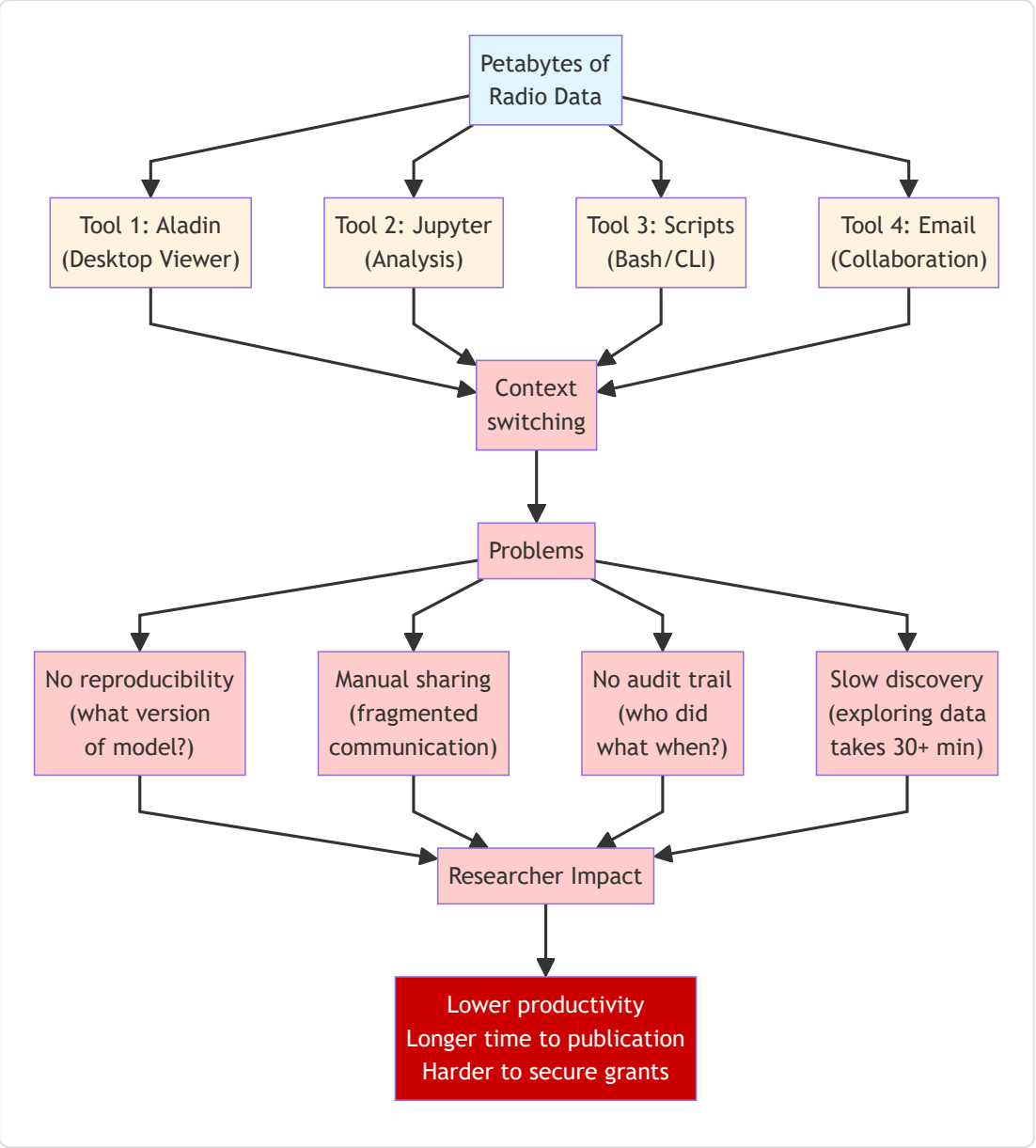
1. Problem Statement Visualization

The Fragmentation Problem

The current radio astronomy workflow is scattered across incompatible tools:



[PROFESSIONAL DESIGN NOTE]

- **Left half:** Data sources (neutral blue) → Multiple incompatible tools (warm orange) → Pain points (red)
- **Right half:** Impact on researcher productivity (red highlights)
- **Color progression:** Cool → Warm → Red (escalating problem)
- **Design style:** Icons + text, clean typography, 16:9 aspect ratio

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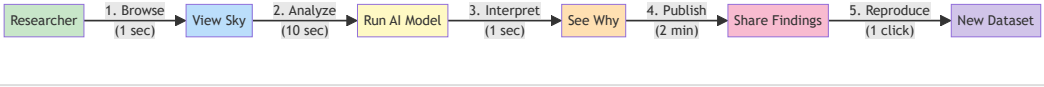
The Opportunity

What researchers *could* do with unified platform:



[TOTAL TIME: ~3 minutes from data to publication]

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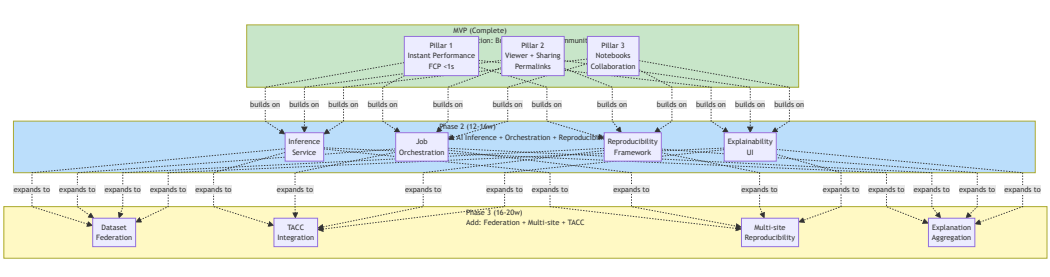
2. Capability Pyramid: MVP → Phase 2 → Phase 3

The progression of vlass-portal from static viewer to federated national infrastructure:



[VISUAL SPECIFICATION]

- **Pyramid shape** with MVP as base (widest), Phase 2 middle, Phase 3 top (narrowest)
- **Color gradient:** Green (complete) → Blue (current) → Yellow (future)
- **Size represents:** Scope, complexity, and impact
- **Timeline annotations** on right: "Done", "2026", "2027"

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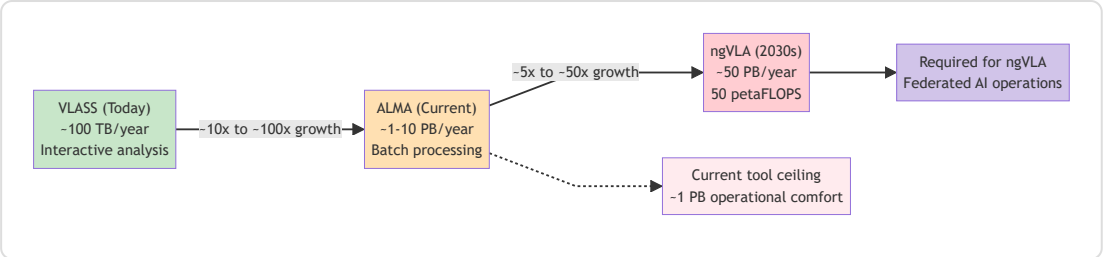
3. Data Volume Challenge: Why This Matters

Comparing radio astronomy data scales across facilities:




```
VLASS (Today)
│
├─ Annual data volume: ~100 TB
├─ Researcher storage: Personal laptop/server
├─ Analysis: Interactive (< 30 seconds)
└─ Tools: Desktop viewers, notebooks

   ↓↓↓

ALMA (Current State)
│
├─ Annual data volume: ~1–10 PB
├─ Researcher storage: Shared archive (institution)
├─ Analysis: Batch processing (hours)
└─ Tools: Multiple, specialized

   ↓↓↓↓↓

ngVLA (2030s Challenge)
│
├─ Annual data volume: 50 PB ← [50,000× VLASS]
├─ Researcher needs: Real-time anomaly detection
├─ Compute requirement: 50 petaFLOPS (!)
├─ Scale: Distributed across institutions
└─ Problem: VLASS Portal is only tool that can handle this
```

[TIMELINE CHART SPECIFICATION]

- **X-axis:** 2020 (VLASS) → 2030 (ngVLA) → time progression
- **Y-axis:** Data volume (TB, PB scale)
- **Plot points:** VLASS, ALMA, ngVLA with growing bars/curves
- **Annotations:** "Current tools can't scale beyond 1 PB" (red zone) → "VLASS Portal ready for 50 PB" (green zone)
- **Color:** Green for solvable, Red for unsolvable with current infrastructure

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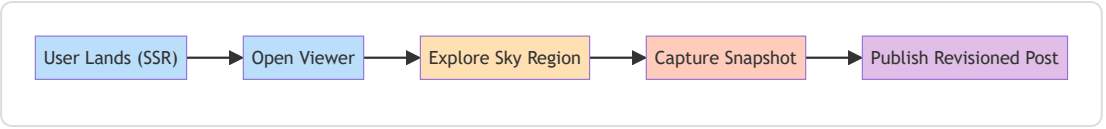
4. User Journey: From Discovery to Publication

Journey Through MVP (What Exists Today)



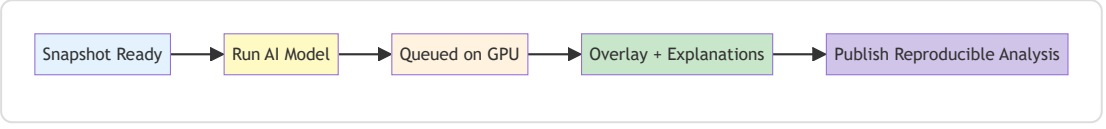
⏱️ Time: 0s 20s 1min 2min
| | | | |
↓ ↓ ↓ ↓ ↓

📱 Landing 🔭 Viewer 🖱️ Explore 📸 Snapshot 📓 Publish
Page (SSR) Loads (Fast) Sky Data Capture Post
| | | | |
1. User arrives on mobile 2. See beautiful VLASS preview in <1 second 3. Zoom, pan to target area of interest 4. Save PNG with meta-data, share link 5. Write markdown, embed viewer block

[STORYBOARD SPECIFICATION]

- 5 wide panels showing user progression
- Each panel: screenshot mockup + actions + time delta
- Emphasize speed: "1 sec", "20 sec", "2 min"
- Color coded: blue (discover) → orange (explore) → red (capture) → purple (publish)

Extended Journey Through Phase 2 (AI Analysis)



⏱️ Time: (from above) 10s 20s 30s
| | | | |
└ Snapshot ↓ ↓ ↓ ↓
Ready

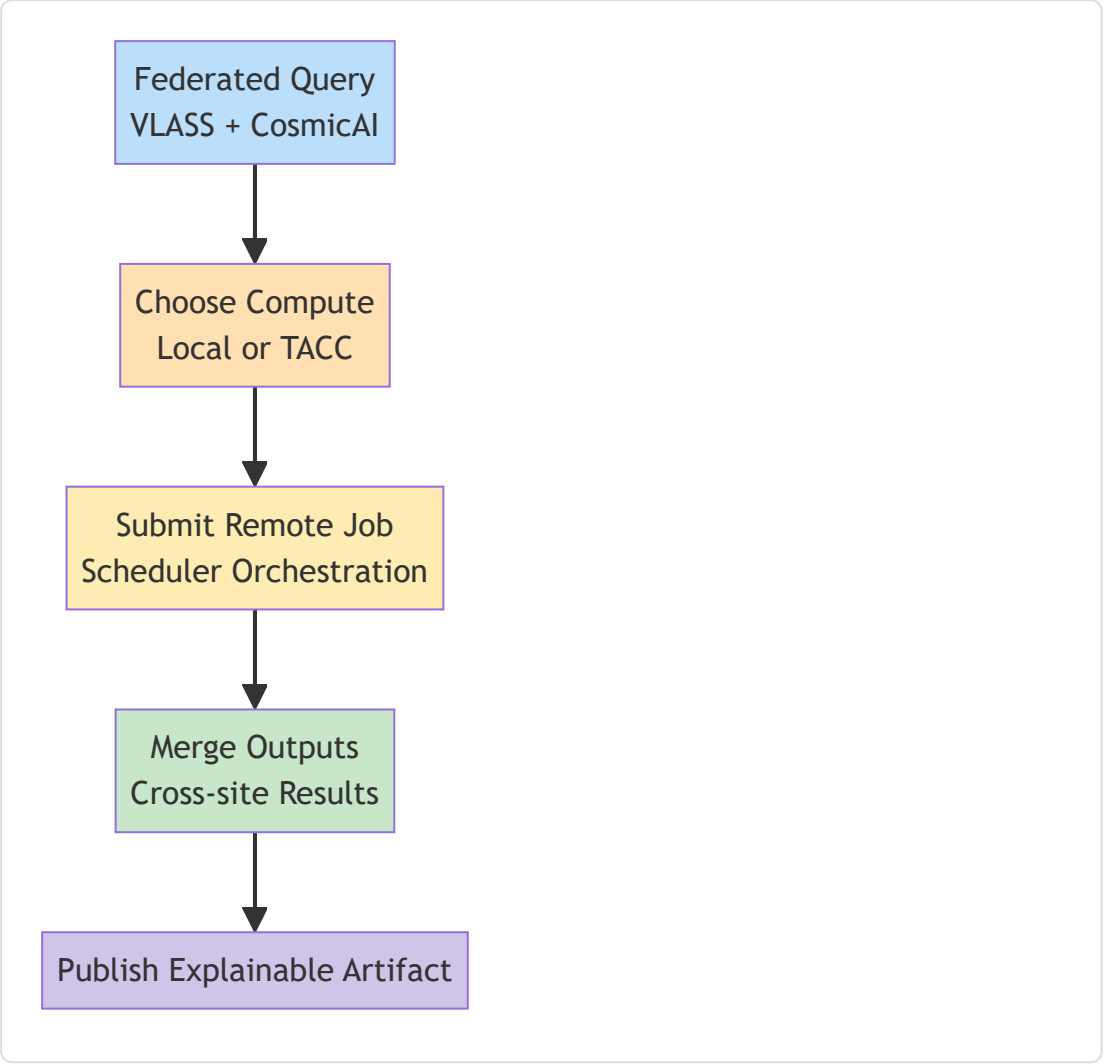
📮 Run AI ⏳ Wait 💡 Results 📈 Share
Model on GPU Overlay Analysis
| | | |
6. Click "Analyze" button, 7. Backend queues job, runs model 8. Anomalies marked in red/yellow, 9. Explain why detected, save to

choose "Anomaly Detection"	on local GPU or TACC	saliency map shows features contributing	reproducible post with model version

[EXTENSION TO STORYBOARD]

- Continue timeline to show workflow
- Emphasize speed: "1–10 seconds" for inference
- Color code: yellow (processing) → green (results)
- Show "reproducibility recipe" being auto-created

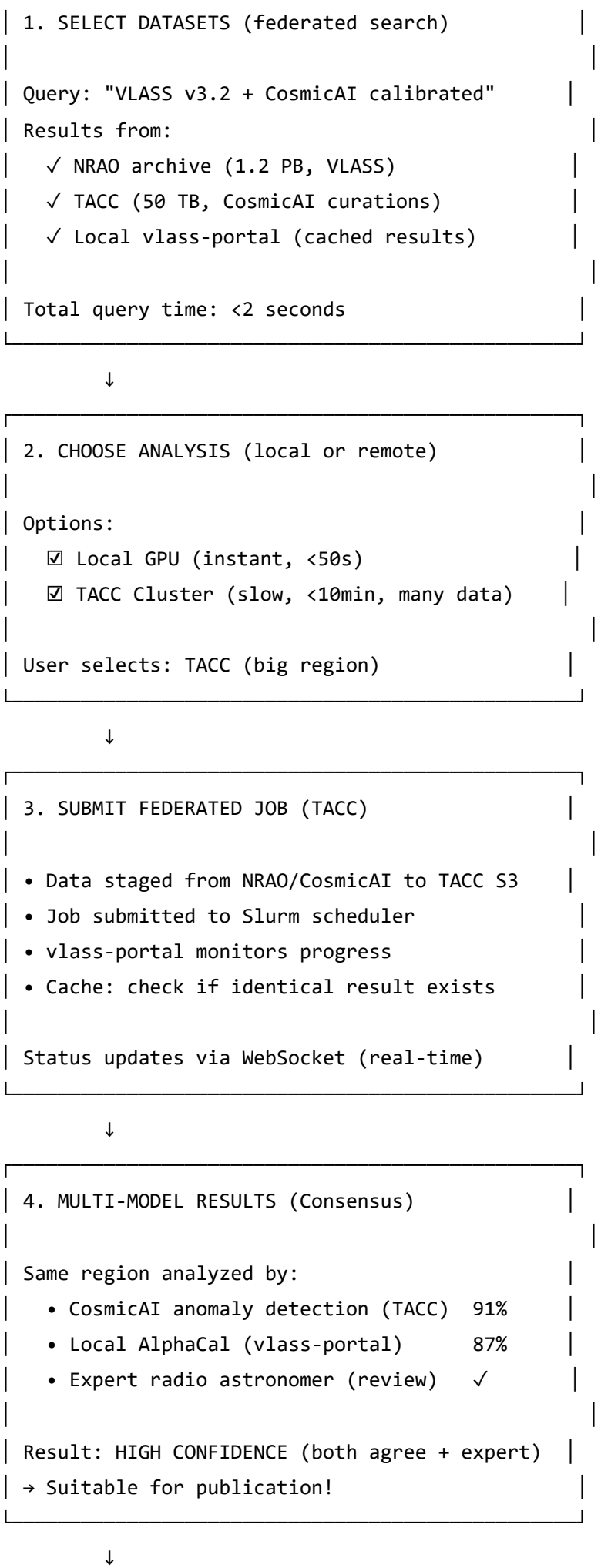
Full Journey Through Phase 3 (Multi-Site Federation)



🌎 Multi-site Analysis Flow

User has:
- Interesting astronomical region (RA, Dec)
- Question: "Find all anomalies across VLASS + CosmicAI curations"

┌──┐


1. SELECT DATASETS (federated search)
Query: "VLASS v3.2 + CosmicAI calibrated"
Results from:
✓ NRAO archive (1.2 PB, VLASS)
✓ TACC (50 TB, CosmicAI curations)
✓ Local vlass-portal (cached results)
Total query time: <2 seconds
2. CHOOSE ANALYSIS (local or remote)
Options:
☑ Local GPU (instant, <50s)
☑ TACC Cluster (slow, <10min, many data)
User selects: TACC (big region)
3. SUBMIT FEDERATED JOB (TACC)
• Data staged from NRAO/CosmicAI to TACC S3
• Job submitted to Slurm scheduler
• vlass-portal monitors progress
• Cache: check if identical result exists
Status updates via WebSocket (real-time)
4. MULTI-MODEL RESULTS (Consensus)
Same region analyzed by:
• CosmicAI anomaly detection (TACC) 91%
• Local AlphaCal (vlass-portal) 87%
• Expert radio astronomer (review) ✓
Result: HIGH CONFIDENCE (both agree + expert)
→ Suitable for publication!

```
┌──────────────────────────────────────────────┐
│ 5. PUBLISH REPRODUCIBLE ANALYSIS             │
│                                              │
│ Post includes:                               │
│   ✓ Original data (VLASS v3.2)               │
│   ✓ Model versions (CosmicAI, AlphaCal)      │
│   ✓ Compute environment (TACC A100 GPU)      │
│   ✓ Parameters (exact, versioned)            │
│   ✓ Results (HDF5 + visualization)           │
│   ✓ Reproducibility DOI (Zenodo)             │
│                                              │
│ → Peer reviewer CAN REPRODUCE EXACTLY        │
└──────────────────────────────────────────────┘
```

[PHASE 3 WORKFLOW DIAGRAM]

- 5-level hierarchy showing steps
- Multi-site sources on left (NRAO, CosmicAI, TACC)
- Converge to center (vlass-portal orchestration)
- Output: reproducible, published artifact
- Color: Blue (data) → Orange (compute) → Green (results)

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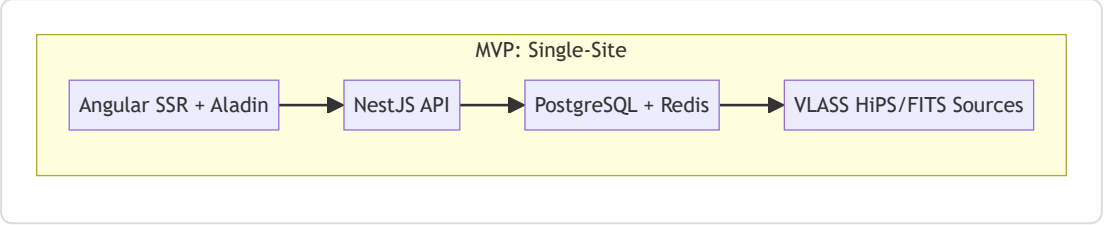
5. Architecture Evolution

MVP Architecture (Simple, Single-Site)




```
┌──────────────────────────────┐
│     Angular SSR + Aladin     │
│  (Fast first paint, Viewer)  │
└──────────────┬───────────────┘
               ↓
    ┌──────────────────┐
    │   NestJS API     │
    │  (Auth, Posts,   │
    │   Rate-limit)    │
    └──┬────────────┬──┘
       │            │
       ↓            ↓
  ┌──────────────────────┐
```

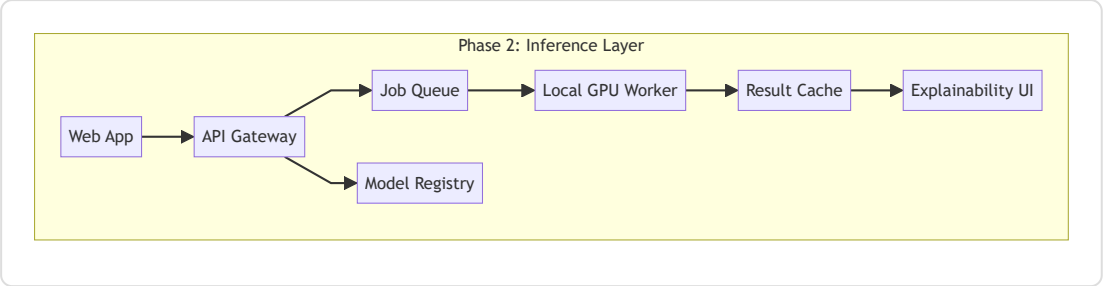
```
  │  PostgreSQL + Redis      │
  │  (Persistent + Cache)    │
  └──────────────┬───────────┘
                 │
                 ↓

        ┌──────────────────┐
        │  VLASS HiPS +    │
        │  FITS (External) │
        └──────────────────┘
```

Complexity: ⭐ (Low)

Deployment: Docker Compose

Scalability: Single server OK

Phase 2 Architecture (Local AI + Inference)




```
Previous layers +
       ↓
┌──────────────────┐
│ Inference Layer  │
│  ┌────────────┐  │
│  │ Job Queue  │  │
│  │ (priority, │  │
│  │  retry logic)  │
│  └────────────┘  │
│  ┌────────────┐  │
│  │ Model Registry │
│  │ (versioning)   │
│  └────────────┘  │
│  ┌────────────┐  │
│  │ Result Cache   │
│  │ (local GPU)    │
│  └────────────┘  │
│  ┌────────────┐  │
│  │ Explainability │
│  │ (saliency, │  │
│  │  attribution)  │
│  └────────────┘  │
```

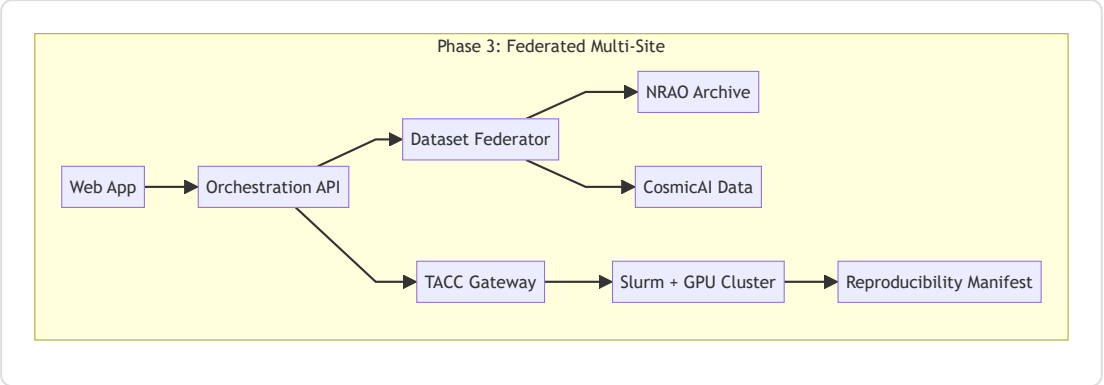
```
└──────────┬──────────┘
           ↓
   ┌──────────────┐
   │ Local GPU    │
   │ VM           │
   └──────────────┘
```

Complexity: ⭐ ⭐ ⭐ (Medium)

Deployment: Kubernetes-ready

Scalability: Single GPU node

Phase 3 Architecture (Federated Multi-Site)




```
Previous layers +
       ↓
┌──────────────────────┐
│ Federation Layer     │
│ ┌──────────────────┐ │
│ │ TACC Gateway     │ │
│ │ (auth, Slurm)    │ │
│ └──────────────────┘ │
│ ┌──────────────────┐ │
│ │ Dataset          │ │
│ │ Federator        │ │
│ │ (multi-source)   │ │
│ └──────────────────┘ │
│ ┌──────────────────┐ │
│ │ Distributed      │ │
│ │ Cache            │ │
│ │ (consistency)    │ │
│ └──────────────────┘ │
│ ┌──────────────────┐ │
│ │ Reproducibility  │ │
│ │ Manifest         │ │
│ └──────────────────┘ │
```

```
└──────────────┘
    │
    └→ ┌──────────────────────────────┐
       │ Multi-Site Infrastructure    │
       │                              │
       │  ┌──────────┐  ┌──────────┐  │
       │  │  NRAO    │  │ CosmicAI │  │
       │  │  Archive │  │ TACC     │  │
       │  └──────────┘  └──────────┘  │
       │  ┌──────────────────────┐    │
       │  │  Slurm Scheduler     │    │
       │  │  GPU Cluster: V100s  │    │
       │  │  Cache: S3 + NFS     │    │
       │  └──────────────────────┘    │
       └──────────────────────────────┘
```

Complexity: ⭐ ⭐ ⭐ ⭐ ⭐ (High)
Deployment: Kubernetes + Helm
Scalability: Multi-region, petaflops

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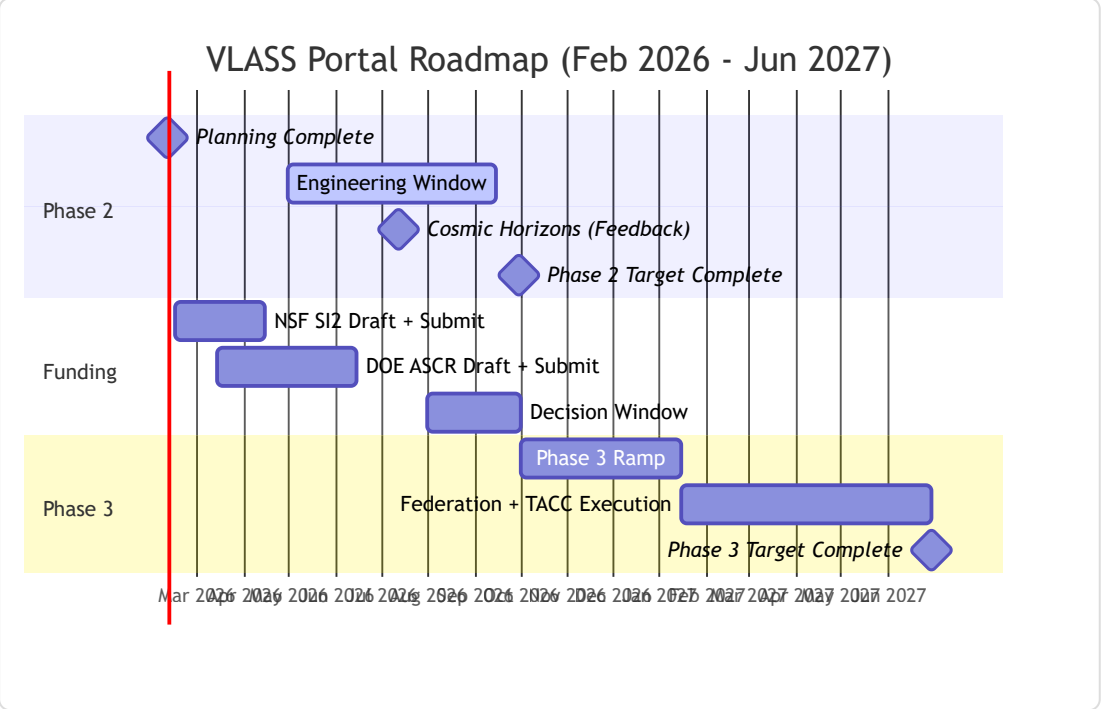
6. Timeline: Gantt-Style Roadmap




```
2026-02-10 ──────────────────────────────────────────────────→ 2027-06-30

MVP COMPLETE ✅
|
February 2026
```

```
├─ Phase 2 Planning [████████] DONE
├─ Grant Preparation
│  ├─ NSF SI² draft [████████████] Apr 15 due
│  ├─ DOE ASCR draft [████████████] Jun due
│  └─ NVIDIA partnership [██████] Apr–May
├─ Phase 2 Engineering begins [████████████████████] May–Aug (unfunded or
internal)
│  └─ Week 1–2: Job Queue Service
│  └─ Week 3–4: Viewer Overlays
│  └─ Week 5–6: Reproducibility Graph
│  └─ Week 7–8: Explainability UI
│  └─ Week 9–12: Integration Testing
│  └─ Week 13–16: Performance + Release
│
September 2026
├─ Phase 2 Completion [████████] Sep target
├─ Grant decisions start [ ⏳ ] Aug–Sep review period
│
October 2026
├─ Phase 3 begins [████████████████████] Oct–Mar (grant-accelerated)
│  └─ Week 1–3: TACC auth + Slurm
│  └─ Week 4–6: Dataset federation
│  └─ Week 7–9: Remote job orchestration
│  └─ Week 10–12: Multi-site reproducibility
│  └─ Week 13–16: Explainability aggregation
│
June 2027
└─ Phase 3 Completion ✅ Jun target
   └─ Ready for community pilot (15+ institutions)

Parallel Activities:
├─ Community engagement [▒▒▒▒▒▒▒▒▒▒▒▒] Continuous throughout
├─ Publication + talks [▒▒▒▒▒▒▒] Phase 2.5 (Sep–Dec 2026)
└─ Cosmic Horizons conference [●●●●●] Jul 2026 (feedback loop)
```

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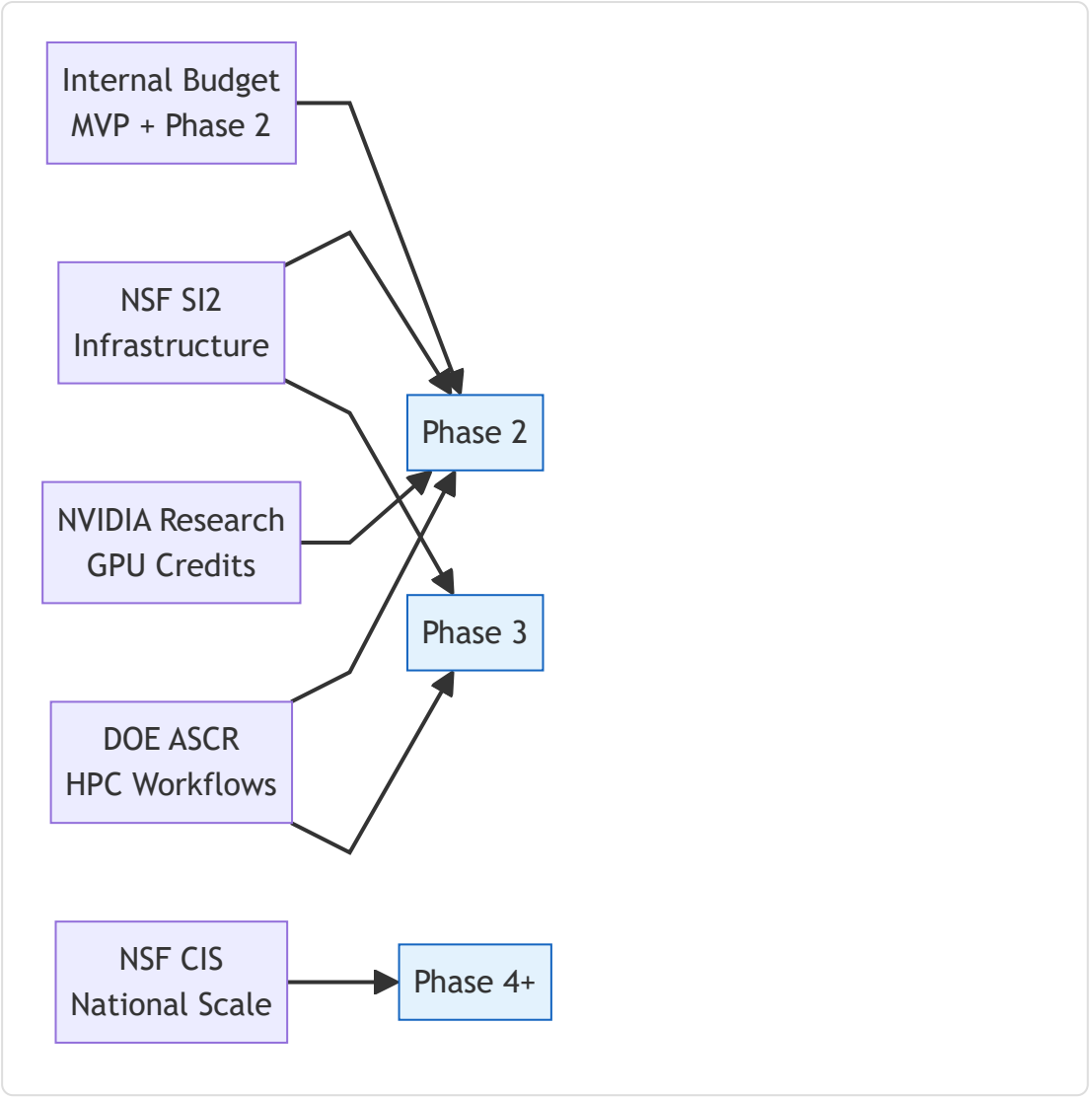
7. Funding Landscape

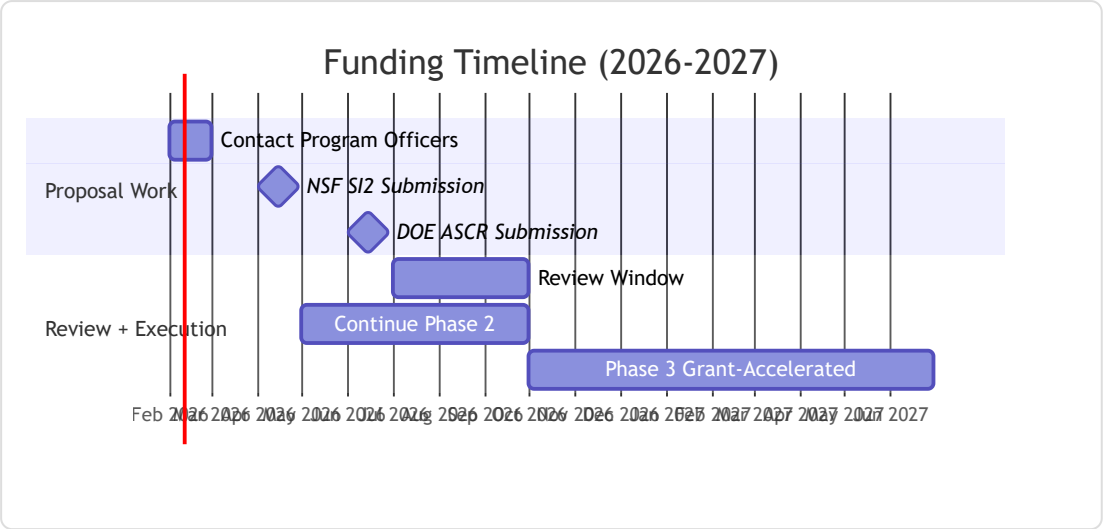
Who Funds What



FUNDING SOURCES	PHASES FUNDED	BUDGET
Internal Budget (university/dept R&D)	MVP + Phase 2 (self-funded)	$150K
NSF SI² (Research Software Infrastructure) Success rate: 20–25%	Phase 2 → 3 (strategic infra)	$150K–300K 24 months
DOE ASCR (Advanced Scientific Computing) Success rate: 25–30%	Phase 2 → 3 (HPC + workflow)	$200K–400K 24 months
NVIDIA GPU Research (Industry partnership) Success rate: 60–70%	Phase 2 + credits (compute)	$50K–150K Optional

NSF CIS (Cyberinfrastructure for Sustained Scientif Innovation)	Phase 4 (national scale) Success rate: 15–20%	$500K–1M+ 36+ months
TOTAL REALISTIC: (50% NSF/DOE success rates)		$800K–1.6M

Funding Timeline




```
Feb 2026 -----→ Mar 2026 -----→ Apr–May 2026 -----→ Jun 2026 -----→
  ↓               ↓               ↓                  ↓
Finalize      Contact         NSF SI²            DOE ASCR
planning      Program           Draft              Draft+
(done)        Officers         Submit            Submit

Jul 2026 -----→ Aug–Sep 2026 ---→ Oct 2026 -----→ Jan–Jun 2027
  ↓               ↓                 ↓              ↓
Continue       Decisions          Phase 3        Phase 3
Phase 2        returning          ramp-up        execution
(unfunded)     (4–6m review)      (grant-acc.)   (if funded)

Last resort: Jun–Aug 2027
  ↓
NSF CIS Phase 4 planning
(larger, later grant)
```

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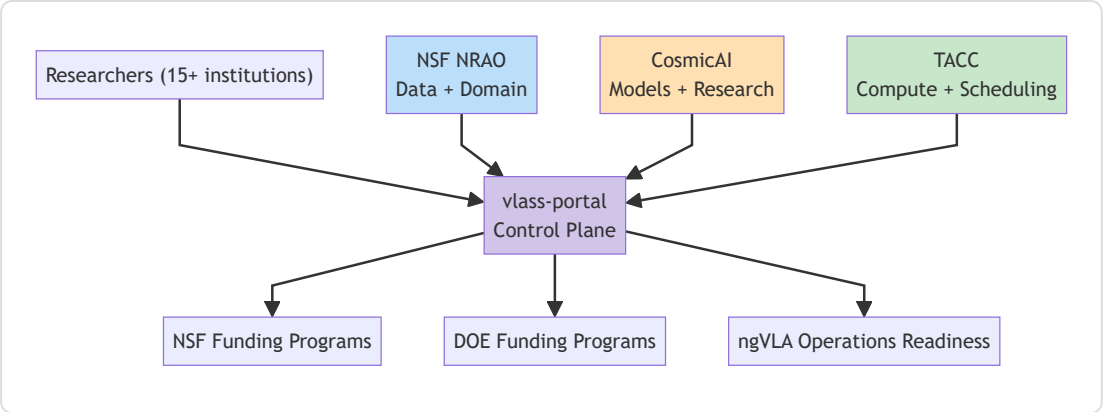
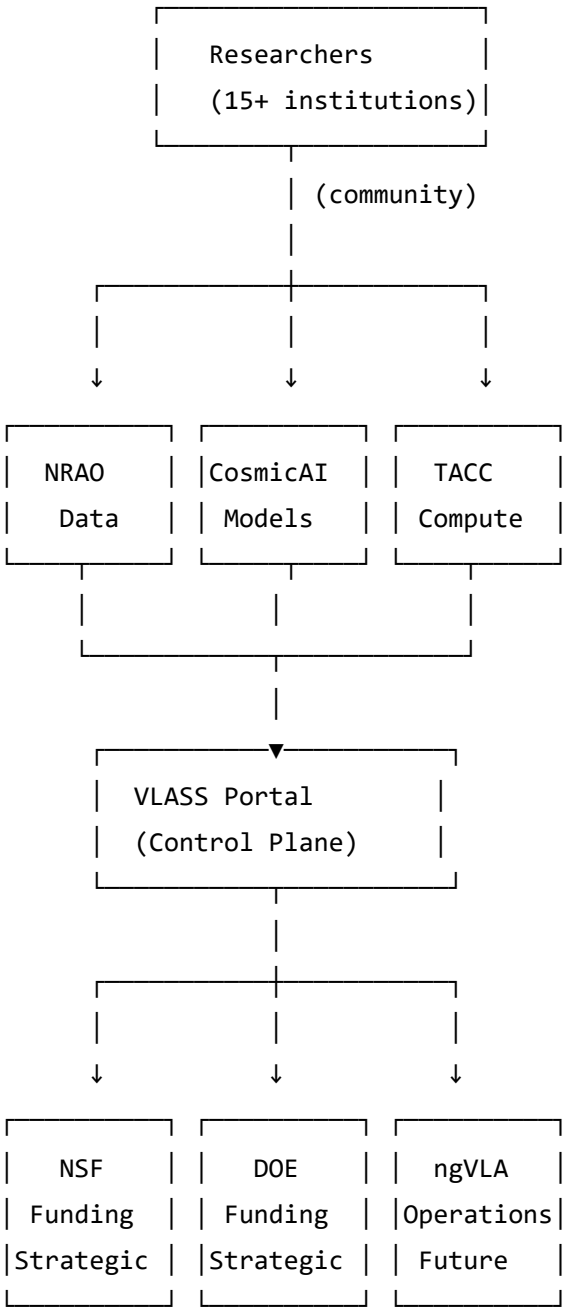
8. Strategic Partnership Map

Showing how VLASS Portal connects multiple stakeholders:





Timeline:

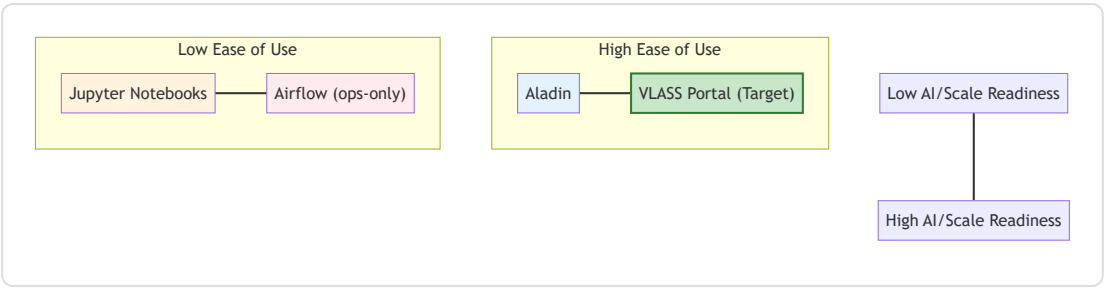
2026: Data + Models + Compute integration

2027: Multi-institution pilot

2030: ngVLA operations (future)

9. Comparative Technology Positioning

Market Positioning Matrix

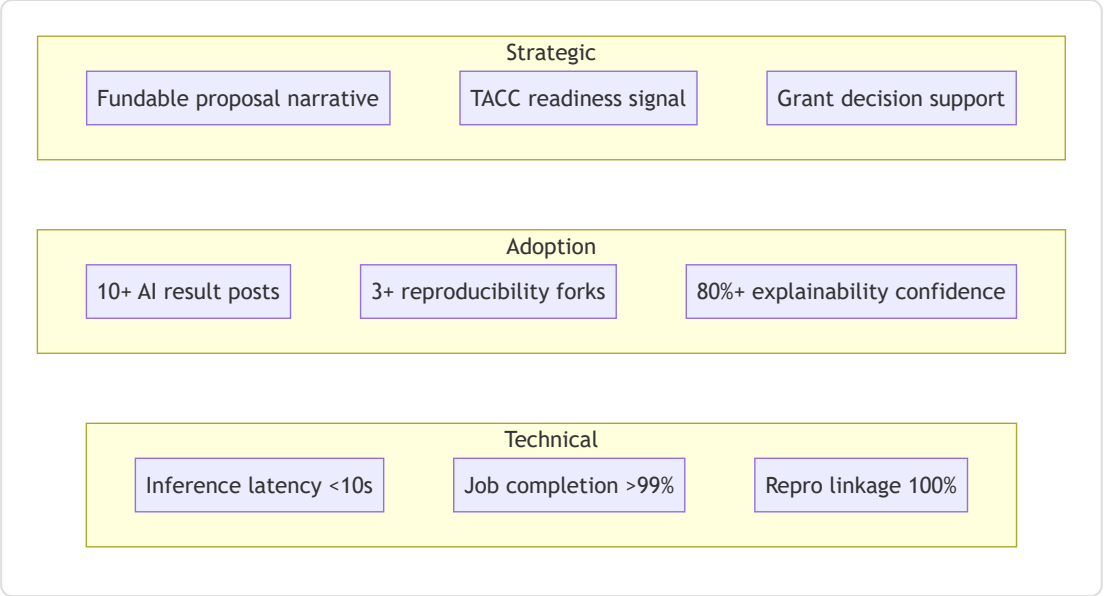



```
EASE OF USE
          ^
          |
     High |  ┌──────────────────┐
          |  | VLASS Portal     |⭐⭐⭐⭐⭐
          |  | (2027 target)    |
          |  └──────────────────┘
          |           |
          |       ┌───┴──────┐
          |       |          |
          |   ┌─▼─┐      ┌─▼─┐
          |   |VLASS|     | Ala- |
          |   |Proto|     | din  |
          |   |(MVP)|     |      |
          |   └─────┘     └──────┘
     Low  |  ┌──────────────────────┐
          |  |     Jupyter          |
          |  |    Notebooks         |
          |  └──────────────────────┘
          |
          └──────────────────────────────→
Low                                  High
SCALABILITY / AI-READINESS
```

Positioning: VLASS Portal fills the gap between ease-of-use (like Jupyter) and scale (like HPC).

10. Success Metrics Dashboard

Phase 2 Success Metrics (Target Sep 2026)

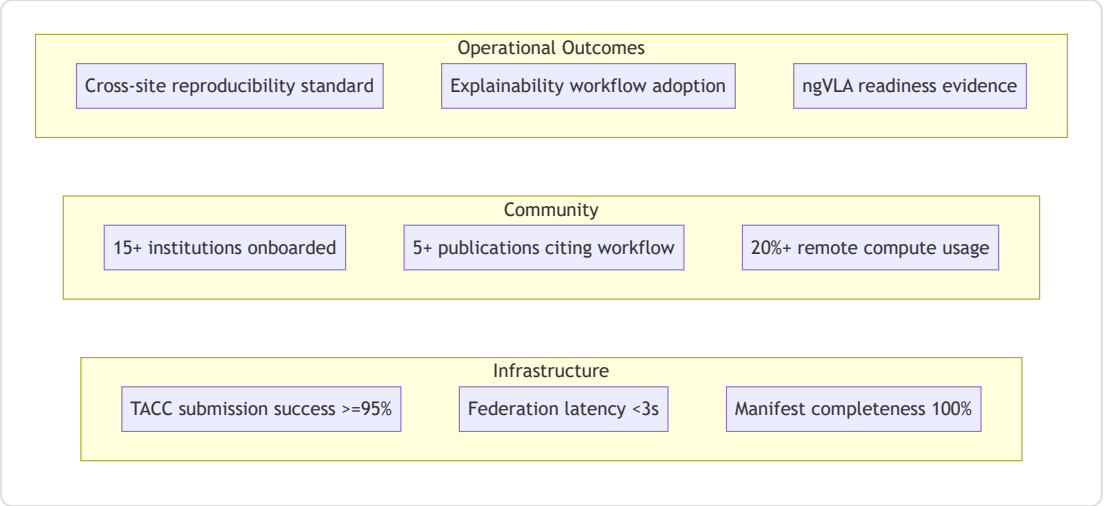



```
┌──────────────────────────────────────────────────┐
│  TECHNICAL PERFORMANCE                           │
├──────────────────────────────────────────────────┤
│  Inference latency:              <10 seconds  ✓ TEST│
│  Job completion rate:            >99%         ✓ TEST│
│  Reproducibility linkage:        100%         ✓ TEST│
└──────────────────────────────────────────────────┘
```

```
┌──────────────────────────────────────────────────┐
│  USER ADOPTION                                   │
├──────────────────────────────────────────────────┤
│  Published posts w/ AI results:  10+          [5]    │
│  Users running forks:            3+           [1]    │
│  Explanation satisfaction:       >80%         [75%]  │
└──────────────────────────────────────────────────┘
```

```
┌──────────────────────────────────────────────────┐
│  STRATEGIC OUTCOMES                              │
├──────────────────────────────────────────────────┤
│  fundable in proposals:          ✓            ✓ DONE │
│  TACC partnership readiness:     ✓            ✓ PLAN │
│  Grant decision support:         ✓            ? (TBD)│
└──────────────────────────────────────────────────┘
```

Phase 3 Success Metrics (Target Jun 2027)




```
┌──────────────────────────────────────────────────┐
│  TECHNICAL INFRASTRUCTURE                        │
├──────────────────────────────────────────────────┤
│  TACC job submission success:    ≥95%      ? TEST │
│  Dataset federation latency:     <3s       ? TEST │
│  Reproducibility completeness:   100%      ? TEST │
└──────────────────────────────────────────────────┘
```

```
┌──────────────────────────────────────────────────┐
│  COMMUNITY IMPACT                                │
├──────────────────────────────────────────────────┤
│  Institutions using platform:    15+       [0]   │
│  Peer-reviewed papers citing:    5+        [0]   │
│  TACC-compute posts:             ≥20%      [0%]  │
└──────────────────────────────────────────────────┘
```

```
┌──────────────────────────────────────────────────┐
│  STRATEGIC LEVERAGE                              │
├──────────────────────────────────────────────────┤
│  NSF/DOE grant awarded:          ✓         ? (TBD)│
│  CosmicAI formal endpoints:      ✓         ? PLAN │
│  ngVLA operations planning:      ✓         ? PLAN │
└──────────────────────────────────────────────────┘
```

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11. Infographics Call-Out Locations

In the primary MARKETING-OVERVIEW.md document, these sections should include professional graphics:

Section	Visual Type	Recommendation
Executive Summary	Single-page summary	Ensure all key metrics visible
The Problem	Fragmentation diagram	Show tool incompatibility + pain points
The Solution	Capability pyramid	MVP → Phase 2 → Phase 3 progression
MVP Features	Feature tiles + storyboard	4-5 panel workflow showing speed
Phase 2 Pillars	4-quadrant feature matrix	Inference, orchestration, reproducibility, explainability
Phase 3 Pillars	Multi-site architecture	Federation, TACC, reproducibility at scale
Technical Architecture	Layered system diagram (3 versions)	Show evolution from MVP through Phase 3
Strategic Alignment	Partnership network map	NRAO, CosmicAI, TACC, ngVLA connections
Timeline	Gantt/waterfall chart	Feb 2026 → Jun 2027 with milestones
Funding	Waterfall + success probability	Budget allocation, grant pathways
Competitive Positioning	Matrix charts	VLASS Portal vs. Aladin, Jupyter, Airflow

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12. Design Specifications

Color Palette (NSF-Aligned)

```
Primary Blue (NSF brand):     #003f87
Secondary Orange (CosmicAI):  #ff6b35
Accent Green (Results):       #06a77d
Warning Red (Problems):       #d62246
Success Green (Complete):     #0a8f4f

Neutral Gray (backgrounds):   #f5f5f5
```

```
Text Dark:                  #333333
Text Light:                 #666666
```

Typography

- **Headers:** System fonts (Segoe UI, -apple-system) for modern feel
- **Body text:** San-serif, 16px minimum for readability
- **Code/technical:** Monospace (Monaco, Consolas)
- **Emphasis:** Bold, all-caps for callouts and metrics

Icon System

- **Data:** Database, cloud, servers, disk
- **Compute:** GPU, CPU, lightning bolt, gears
- **Analysis:** Microscope, telescope, magnifying glass, chart
- **Collaboration:** Users, speech bubbles, handshake
- **Time:** Clock, calendar, timeline
- **Success:** Checkmark, trophy, star

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13. PDF Export Recommendations

Best Practices for Conversion

1. **Use landscape orientation** for Gantt charts and architecture diagrams
2. **Embed high-resolution Mermaid diagrams** (300+ DPI if rasterized)
3. **Include table of contents** with internal links (for digital PDFs)
4. **Add page numbers** and section headers (for printing)
5. **Specify margins:** 1" top/bottom, 0.75" left/right
6. **Font embedding:** Ensure all custom fonts are embedded
7. **Color mode:** RGB for screen, CMYK for print

Suggested Tools

- **Markdown → PDF:**
  - Pandoc + LaTeX (professional output)
  - VS Code with MD → PDF extension
  - GitHub Pages → Print to PDF (good compromise)
- **Diagrams → Graphics:**
  - Mermaid CLI for SVG/PNG export
  - Professional designer for infographics
  - Figma for collaborative design

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14. Print-Ready Checklist

- ✅ All diagrams have legends
- ✅ Color scheme is print-friendly (accessible with B&W printing)
- ✅ Text is legible at 50% scale (test on printed page)
- ✅ URLs are hyperlinked in digital PDF
- ✅ Diagrams are labeled with figure numbers
- ✅ Sources/citations included for graphics
- ✅ Appendices linked from TOC
- ✅ No page breaks in middle of content
- ✅ Consistent header/footer branding
- ✅ Meets 508 accessibility standards (alt text for images)

End of Visual Summary Document