HPC Architecture Strategy

Status	WIP
Stakeholders	
Outcome	
Due Date	28 Mar 2025
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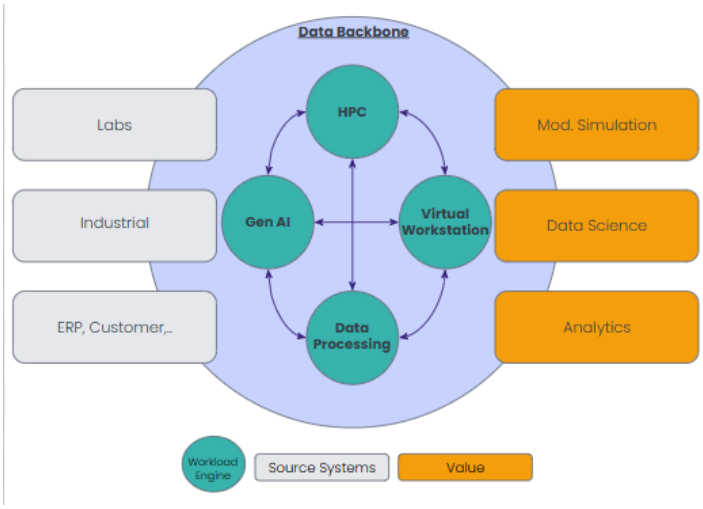
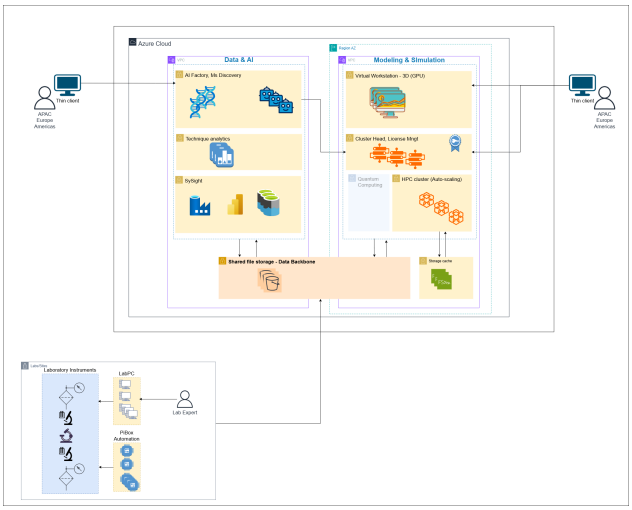
Solution/Domain/Data Architect	OLIVEIRA, Tiago

Target Architecture: Logical Model



Target Architecture: Domain Boundaries

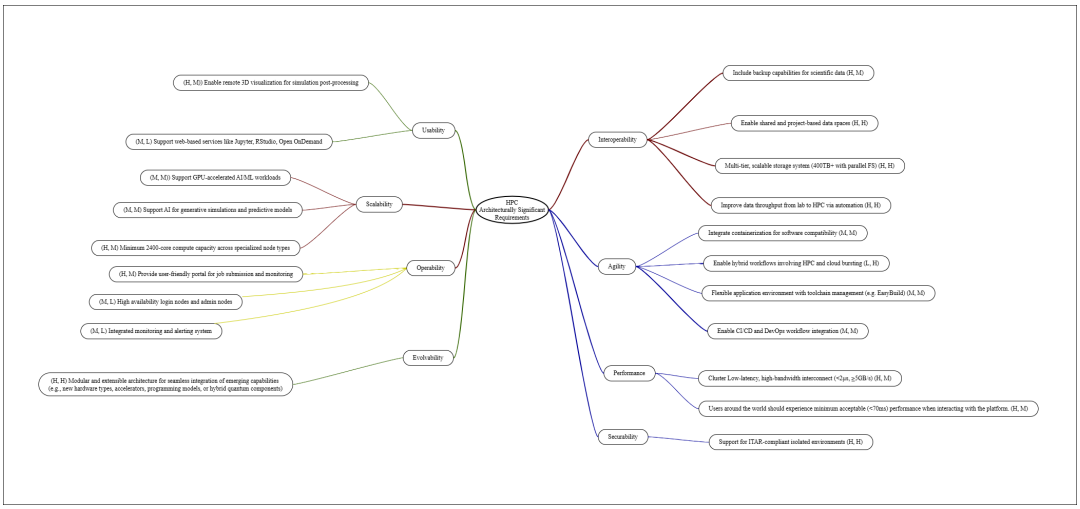


Pillar & Principles

1. **Secure by design**: Architected to meet strict regulatory, ITAR, and compliance standards, embedding security and data isolation into every component - from lab to cloud.
2. **Globally distributed**: Enables distributed collaboration while respecting data sovereignty and regulatory zones, with secure interconnects optimized for compliance and performance.
3. **High Interoperability and Ready for Automation**: Designed to leverage Agentic Architecture to automate scientific workflow tasks on simulation tools and enterprise platforms across heterogeneous environments - securely and without friction.
4. **Cost Efficient & Scalable**: Scales elastically to support burst compute, large simulations, and AI workflows while optimizing cost through dynamic resource allocation and tiered data strategies.
5. **Unified UX**: Offers a seamless, role-aware user experience - from lab scientists to HPC engineers—ensuring consistent access, visualization, and orchestration across environments.
6. **Data Backbone** (Data-Centric by Design leveraging SySight): Establishes a governed, high-throughput data layer that ensures seamless access and movement of data across the platform — enabling consistent ingestion, transformation, AI-driven learning, synthetic data generation, and simulation workflows.
7. **Sustainability-Aligned Computing** (Green by Architecture): Leverages cloud elasticity, workload-based optimization, and infrastructure modernization to reduce energy usage, eliminate underutilized on-prem resources, and support sustainability goals through measurable carbon footprint reduction.
8. **Quantum-Ready Architecture** (Future-Proof by Design): Lays the foundation for seamless integration with quantum computing by enabling hybrid classical-quantum workflows, simulator access, and modular expansion paths - ensuring the HPC platform evolves in parallel with emerging computing paradigms.

Utility Tree

The Utility Tree brings a view on the most most architecturally significant requirements. With this tool, the business capabilities are assessed in terms of importance for the business and architecturally complexity for being accomplish, so a value engineering can be performed and strategical decisions been taken.



Utility