

SIMON-INSTITUTE

SIMON-INSTITUTE Facility White Paper

*A Facility-First Model for Advanced AI, Quantum Experimentation, and
Federation-Ready Academic Formation*

Website White Paper | No Images

Prepared for SIMON-INSTITUTE and prospective university partners

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Executive Summary

SIMON-INSTITUTE is designed to be more than an academic concept, curriculum framework, or collaboration agreement. It is a physical environment where advanced technology, faculty leadership, student formation, and governed research practice converge. The Facility gives a host university a visible and operational platform for building durable capability in artificial intelligence, supercomputing, quantum experimentation, secure research workflows, and federation-ready collaboration.

The Facility model is intentionally university-centered. It is located on or near a participating campus, operated in partnership with university faculty and staff, and connected to degree pathways, honors standards, research workflows, and SIMON-FEDERATION participation. In this model, infrastructure is not treated as a remote utility hidden behind a login. It becomes part of the academic environment: something students can learn from, researchers can test against, and institutional leaders can govern with clarity.

At full planning capacity, each SIMON-INSTITUTE Facility can accommodate up to 4,000 students annually through coursework, labs, capstones, graduate research, honors programming, faculty projects, and workforce-focused training. Across ten Federation universities, the model could support more than 10,000 students and academic participants each year in full-scale degree pathways and frontier technology programs designed to benefit society.

Why a Physical Facility Matters

Many universities are expanding AI coursework, data science certificates, and cloud-compute access. Those are important steps, but they often remain fragmented. A course may teach machine learning while another teaches systems, ethics, or quantum foundations. Faculty may conduct advanced research while students experience only limited exposure to the infrastructure behind it. Departments may pursue compute access without a unified facility, governance model, or academic identity.

The SIMON-INSTITUTE Facility solves a different problem: how to make advanced intelligence visible, teachable, governable, and institutionally durable. It places secure compute, hands-on quantum experimentation, teaching space, collaboration space, and research operations into one integrated setting. This allows a university to move from scattered technology initiatives to a recognizable academic platform with measurable outcomes.

For presidents and provosts, the Facility offers strategic differentiation, donor and sponsor visibility, research credibility, and a governed pathway into advanced AI and quantum capability. For CS department heads and faculty leaders, it offers hands-on teaching infrastructure, research computing support, reproducible workflow expectations, and a deeper connection between technical fluency, ethics, and student formation.

Core Facility Functions

The SIMON-INSTITUTE Facility is organized around three primary functions: research acceleration, hands-on education, and partnership development. Each function is supported by the physical layout, technology stack, staffing model, and governance standards adopted by the university and SIMON.

Advanced Compute Environment

The advanced compute environment gives faculty and students local access to GPU and high-performance computing resources for AI, machine learning, simulation, data engineering, model evaluation, and scientific workflows. Local access matters because it shortens iteration time, reduces dependency on unpredictable external queues, and helps students understand compute as a physical and operational system rather than an abstraction.

In the SIMON model, compute is also a teaching instrument. Students learn how to route work, profile performance, manage reproducibility, document experiments, and operate within security and governance requirements. This prepares graduates for research environments where infrastructure awareness is a workforce advantage.

Dedicated Quantum Suite

The dedicated quantum suite provides a secure university-based environment for quantum teaching, experimentation, workflow development, and faculty-led discovery. The purpose is not merely to display a frontier technology. It is to make quantum constraints real: scheduling, noise, calibration, experimental design, backend selection, and honest comparison against classical baselines.

By placing quantum learning within the Facility, SIMON-INSTITUTE helps students and researchers move beyond abstract literacy into practical experience. The suite becomes a training ground for hybrid quantum-classical thinking, connecting on-prem resources to broader cloud and federation-scale opportunities when projects require larger backends or collaborative access.

Teaching and Collaboration Space

The Facility includes flexible classrooms, project rooms, collaboration areas, and faculty-student workspaces that connect coursework to real infrastructure. This is essential to the SIMON academic model. Students do not simply study AI, quantum, or supercomputing as separate subjects. They learn in an environment where theory, systems, ethics, experimentation, and project execution are connected.

These spaces support lectures, labs, capstones, honors work, graduate seminars, visiting faculty sessions, sponsor briefings, and research team meetings. They also provide a credible setting for demonstrating institutional seriousness to industry, foundations, public agencies, alumni, and prospective faculty.

The Goldilocks Network Inside the Facility Model

The SIMON-INSTITUTE Facility is designed to support the Goldilocks Network principle: using the right scale of power for the right purpose. Baby Bear represents local advanced compute for simulation, baselines, preprocessing, postprocessing, reproducibility, and disciplined experimentation. Mama Bear represents the on-prem quantum environment for hands-on development, teaching, and real constraints. Papa Bear represents the federation collaboration layer for Board-approved multi-institution projects that have completed the required Federation Registry process.

This layered model prevents two common failures. First, it keeps students from treating advanced systems as invisible magic. Second, it prevents institutions from scaling prematurely before their work has been tested, documented, and governed. Work begins close to the learner and the researcher; it expands only when the project, evidence, and standards justify scale.

Academic Integration

A SIMON-INSTITUTE Facility is not separate from the academic mission; it is the environment in which the academic mission becomes concrete. The Facility supports undergraduate, master's, doctoral, and honors pathways in advanced AI, quantum literacy, supercomputing, federated research, cybersecurity, governance, reproducibility, and domain application.

For undergraduate students, the Facility supports foundational programming, AI, systems, quantum information, data ethics, distributed systems, cybersecurity, federated learning, high-performance AI, and capstone development. For master's students, it supports thesis-centered computational research, especially in medical research, biomedical data engineering, clinical AI, population health, and quantum-enabled discovery. For doctoral students, it supports frontier research in hybrid AI, quantum workflows, federated systems, secure research platforms, and large-scale scientific computing.

The Facility also supports a federation-wide honors model. Honors should measure more than grades; it should recognize capstone distinction, reproducibility packages, research integrity, stewardship, benefit measurement, and contribution to the shared academic mission. In this way, the Facility helps make prestige visible through rigor, not branding alone.

Governed Standards, Prompt Language, and Research Artifacts

The SIMON Facility is built for governed execution. Participating universities are expected to adopt standardized programming and prompt language, provenance requirements, reproducibility practices, audit logs, release records, and academic standards approved through the SIMON governance structure.

For inter-school or Papa Bear collaborative work, the Facility model incorporates a five-artifact path: Research Brief, Prompt Contract, Run Request, Evaluation Report, and Release Record. These artifacts are entered into the Federation Registry and create a traceable chain from question to method, from method to execution, and from execution to release. No cross-school release should occur without complete provenance, telemetry, evaluation, security, and registry documentation.

This approach gives universities a practical governance advantage. It helps faculty and students collaborate across institutions without losing control of evidence, responsibility, authorship, security, or academic standards. It also gives sponsors and funding partners greater confidence that research acceleration is being paired with discipline and accountability.

University Operations and Staffing Model

The host university plays an active role in operating the Facility. The selected university is expected to provide qualified faculty, instructors, lab directors, teaching assistants, academic administrators, technical staff, cybersecurity liaison personnel, network and infrastructure support, facility operations personnel, safety personnel, and maintenance support sufficient to deliver SIMON-aligned programs and research activity.

A local SIMON Facility Director or equivalent senior officer should coordinate implementation, staffing, standards adoption, operational readiness, and communication with SIMON. The university also remains responsible for campus approvals, site control, local permits, utilities, campus network integration, maintenance, insurance, environmental health and safety compliance, custodial service, physical security, and day-to-day facility operation, unless otherwise agreed in definitive documents.

This operating model is important because SIMON-INSTITUTE is not intended to function as a remote vendor service imposed on a campus. It is intended to become an institutional capability owned, staffed, governed, and used by the university within the SIMON framework.

Facility Development Pathway

The development pathway begins with site selection and architectural site adjustment. The university identifies a suitable campus or near-campus location, provides site data, utility information, campus design standards, security requirements, IT and network requirements, access constraints, and other information needed to adapt the SIMON facility concept to the local environment.

Pre-development work may include architectural concept adjustment, preliminary engineering review, facility cost estimating, construction bid packages, FF&E planning, AI supercluster leasing analysis, quantum system leasing analysis, contracted cloud quantum reserve-time analysis, staffing assumptions, operating assumptions, and schedule planning.

SIMON-INSTITUTE may coordinate proposed bids and system packages, but universities retain the right to seek alternative bids for construction, equipment, FF&E, computer leasing, quantum systems, cloud resources, installation, service, maintenance, and support. Alternative vendors and solutions should satisfy SIMON technical, curriculum, interoperability, security, provenance, auditability, warranty, integration, and federation-readiness requirements.

Institutional and Workforce Value

The Facility is designed to produce measurable institutional value. It can strengthen research acceleration by shortening iteration cycles, improving local access to compute, and enabling faculty to test ideas in a predictable environment. It can deepen hands-on education by connecting real infrastructure to labs,

capstones, thesis work, doctoral research, and honors programming. It can also become a partnership magnet by giving donors, sponsors, industry, foundations, and public agencies a visible and credible platform for collaboration.

For the workforce, the value is sharper than ordinary AI coursework. A SIMON-trained graduate should understand how to build, evaluate, govern, document, secure, and scale intelligent systems in high-consequence environments. Graduates should be prepared not only to use advanced tools, but to work where intelligence, infrastructure, research integrity, and human consequence meet.

At full annual planning capacity, one Facility can serve up to 4,000 students and academic participants. Across ten Federation universities, the model could support more than 40,000 learners, faculty participants, and research delegates each year. That scale would allow the Federation to create a national workforce pipeline in advanced AI, quantum literacy, supercomputing, secure research systems, and governed innovation.

Benefits by Audience

Audience	Facility Value
University Presidents and Provosts	Strategic differentiation; visible research infrastructure; governed execution; donor and sponsor credibility; a pathway to federation-scale academic collaboration.
CS Department Heads and Faculty Leaders	Hands-on teaching capacity; research computing support; integrated AI, systems, quantum, security, and governance pathways; stronger capstones, theses, and doctoral projects.
Students and Degree Candidates	Direct exposure to advanced compute, quantum experimentation, reproducible workflows, ethics, and real infrastructure that can distinguish them in the workforce.
Researchers and Sponsored Programs	Shorter iteration cycles, stronger provenance, secure workflows, interdisciplinary collaboration, and a platform for high-impact domains such as medical, quantum, environmental, and energy research.
Funding Partners and Donors	A credible physical platform with measurable outcomes, visible institutional commitment, and a governance structure designed to pair innovation with accountability.

Conclusion

The SIMON-INSTITUTE Facility is where the model becomes real. It gives a university the physical environment, academic structure, technology stack, and governance discipline required to move from interest in AI and quantum systems to lasting institutional capability. Its value is not only in the systems it houses, but in the formation it enables. Professors, undergraduates, master's candidates, PhD researchers, honors students, and technical staff can work side by side with on-prem technologies that only a few years ago seemed nearly unimaginable. In that shared environment, students learn not only to become more capable, but to become more accountable as capability grows. For universities prepared to lead, the Facility offers a credible path to research acceleration, workforce formation, donor and sponsor engagement, federation participation, and public benefit. It is a facility-first model for an age in which advanced intelligence must be made teachable, governable, reproducible, and worthy of the society it is meant to serve.