



The Composable Campus **Architecting the** **Agentic University**

September, 2026



Design. Engineering. AI.

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Executive summary

Thoughtworks' Composable Campus provides universities with a governed, extensible operating model for becoming more adaptive, data-driven, and AI-ready. It applies the composable enterprise strategy to higher education, helping institutions modernize from within rather than relying on disruptive rip-and-replace transformation.

At its core, the Composable Campus uses AI/works™ as the enterprise-grade, spec-driven engineering platform and control plane that wraps and unbundles rigid legacy systems into modular, API-backed packaged campus capabilities (PCCs), reusable data products, and a governed knowledge fabric. This turns fragmented systems and hard-to-access institutional logic into reusable building blocks that can be safely discovered, composed, and evolved across the university.

Built on that foundation, the agent runtime and governance layer serves as the runtime orchestration layer for the campus AI operating system, interpreting intent, coordinating the right capabilities and tools, and turning them into governed actions across student, faculty, administrator, and researcher workflows. Together, AI/works™ and the agent runtime and governance layer make it possible to introduce contextual intelligence into everyday university experiences without replacing the core systems those experiences depend on.

The result is a non-disruptive path to becoming an Agentic University: a campus architecture that combines reusable capabilities, the runtime core of the campus AI operating system, and AI-optimized infrastructure with the security, observability, compliance, and spend controls needed to scale responsibly. By also supporting experimentation, prototyping, and a living lab model for workforce enablement and innovation, the Composable Campus gives universities a practical platform for continuously evolving learning, research, and operations.

The AI/works™ platform

AI/works™ is the engineering and governance platform that helps universities build a Composable Campus and evolve toward an Agentic University. Its role is not to replace core systems, but to modernize from within by reverse-engineering, wrapping, and unbundling legacy university applications into reusable PCCs, data products, and a governed knowledge fabric.

This creates the modular foundation needed to support new student, faculty, administrator, and researcher experiences without disrupting the underlying systems of record. Instead of leaving institutional logic trapped inside SIS, LMS, ERP, and other university systems, AI/works™ helps expose that logic through clean interfaces so it can be safely discovered, composed, and reused across applications, workflows, and agents.

In this way, AI/works™ makes the Composable Campus practical. It provides the build-and-operate backbone for turning rigid university systems into reusable campus capabilities, while also supplying the control plane needed to govern how those capabilities are used. Through observability, policy guardrails, security, compliance, spend management, and human oversight, it helps institutions scale agentic experiences in a secure, non-disruptive, and operationally manageable way.

On top of AI-optimized infrastructure, this allows the university to behave more like a living system than a static estate. Modular campus capabilities can be continuously improved and orchestrated into new digital experiences, while the same platform supports experimentation, prototyping, and enablement across campus teams. Where AI/works™ creates and governs the reusable campus capability layer, the agent runtime and governance layer activates that layer at runtime as a core part of the campus AI operating system, orchestrating agents, tools, and PCCs into usable campus journeys. In that sense, AI/works™ is best understood not as the end product itself, but as the enabling platform that makes the Composable Campus executable and the Agentic University sustainable.

What AI/works™ is

- The engineering and governance platform that helps universities modernize from within.
- The build-and-operate backbone behind the Composable Campus, turning legacy systems into reusable PCCs, data products, and a governed knowledge fabric.
- The shared control plane that helps institutions govern, evolve, and scale agentic experiences securely across the campus ecosystem.

What AI/works™ isn't

- Not a shrink-wrapped campus OS or rip-and-replace product.
- Not a single chatbot or thin wrapper over third-party models.
- Not the runtime orchestration layer itself; AI/works™ builds and governs the campus capability layer, while the agent runtime and governance layer activates it at runtime within the campus AI operating system.



The core concept

Traditional university architecture is often monolithic: stable at its core, but difficult to reshape, extend, or connect. The Composable Campus replaces that rigidity with a modular building-block model, allowing institutions to assemble, adapt, and reconfigure services more quickly without disrupting the systems they already rely on.

Rather than pursuing a high-risk, multi-year rip-and-replace transformation, the Composable Campus modernizes from within. It wraps and unbundles legacy university systems into reusable PCCs, exposing core functions through clean, securely managed APIs so they can be reused across applications, workflows, and agents. These PCCs can span the full university landscape:

PCC category	Key packaged campus capabilities (PCCs)
Student lifecycle	Course registration, degree audit, advising workflows
Learning and teaching	Course catalog, assessment submission, grading logic
Research	Grant discovery, IRB compliance, HPC job management
Operations and finance	Tuition billing, room scheduling, staff profiling

This modular approach turns rigid systems of record into reusable campus capabilities, creating the technical foundation for a more adaptive, governed, and agent-ready university.



The four-layer architecture of the Composable Campus

The operational execution of the Composable Campus is defined by a structured, four-layer architecture:

Layer 1

AI infrastructure foundations and operations

This foundational layer provides the AI-optimized infrastructure required to run a modern campus AI ecosystem, including cloud projects, HPC environments, compute clusters, secure research enclaves, and massively parallel storage.

It is the foundation that supports demanding AI workloads across the university, from model training and simulation to inference, research, and production-scale agentic services. This includes services and accelerators such as GPUs and TPUs that enable high-performance, scalable AI operations.

AI/works™ operates on top of and across this foundation, integrating with leading cloud and compute APIs to help institutions provision, govern, observe, and secure these environments consistently. Its control plane adds centralized oversight for infrastructure governance, observability, security, and spend, helping universities scale AI workloads responsibly while supporting both research and operational use cases.

Layer 2

Composable Campus backbone

This layer is the engineering backbone of the Composable Campus. It uses AI/works™ as a spec-driven software engineering platform and production-minded SDLC engine to modernize from within, safely wrapping and unbundling monolithic university systems into reusable PCCs.

By extracting business logic, integration behavior, and institutional rules from legacy applications, this layer creates the technical bridge between systems of record and new agentic experiences. Rather than replacing core platforms, it turns them into modular, governable building blocks that support a non-disruptive layer of intelligence across the university.

- **Reverse engineering (code-to-spec):** AI/works™ analyzes existing systems through source code where available, and through APIs, observable behavior, and integration flows where it is not, to extract business rules and core functions and package them as modular PCCs.
- **Dynamic spec development and spec-to-code:** AI/works™ turns extracted knowledge into structured, refreshable specifications and uses them to generate and regenerate production-grade services, wrappers, tests, pipelines, and new applications that sit cleanly on top of existing systems.
- **Knowledge fabric:** A continuously evolving library of institutional context, higher-ed patterns, reusable components, data products, APIs, agents, and integration blueprints that enriches campus specifications and PCCs so modernization compounds over time rather than restarting from scratch.
- **Evals and control plane:** A shared operational layer that provides observability, governance, delivery oversight, and human-in-the-loop control across capabilities, services, and agent workflows as policies, models, and integrations evolve.

Layer 3

Agent runtime and governance layer

This layer provides the secure orchestration and runtime environment at the core of the campus AI operating system for the specialized, workflow-oriented agents that serve the campus. Powered by the agent runtime and governance layer and built on the modular capabilities exposed in Layer 2, it interprets user intent, coordinates the right PCCs, data products, and tools, and turns them into governed actions across university workflows.

Once legacy systems have been wrapped and unbundled into reusable building blocks, the agent runtime and governance layer becomes the operational layer that makes those capabilities usable at scale. It manages how agents are activated, how they interact with institutional systems, and how they operate safely within defined guardrails for security, compliance, observability, and lineage.

This layer also enables the university to populate the ecosystem with agents from multiple sources:

- **Institution-built agents:** purpose-built agents created by Thoughtworks and university IT using AI/works™ and activated through the agent runtime and governance layer to connect securely to PCCs.
- **Partner-provided agents:** specialized production-ready agents integrated from educational technology and research vendors.
- **Cloud-provider agents:** foundational agents provided through the underlying cloud platform for areas such as coding assistance, advanced research, and knowledge work.

Together, these form a composable agent ecosystem that can support the university's core personas:

- **Student agents (unified discovery):** Agents that support advising, course planning, financial aid, and student success through intuitive web, chat, and mobile experiences, helping students get the guidance they need without navigating legacy systems directly.
- **Faculty agents (contextual teaching & learning):** Agents that support teaching and learning workflows, including grading, course generation, student-performance insights, and intervention planning, embedded into familiar academic and collaboration tools.
- **Admin agents (smart productivity):** Agents that improve retention, service delivery, reporting, and campus operations by helping staff identify priorities, coordinate actions, and generate insights from institutional data.
- **Research agents (accelerated discovery workbench):** Agents that accelerate grant development, discovery, analysis, and research workflows by helping teams search, synthesize, draft, and work across large volumes of data and documents.

Rather than replacing campus systems, this layer orchestrates modular capabilities into secure, reusable agentic services that can be delivered through the user experiences defined in Layer 4.

Layer 4

Campus AI experience

This layer represents the experience surface of the campus AI operating system, where students, faculty, administrators, and researchers interact with AI-powered campus services through familiar tools and channels. It extends the productivity, collaboration, and campus platforms they already use, embedding intelligence directly into everyday workflows rather than forcing people into new, siloed systems.

Where needed, GenAI-assisted prototyping and UX design can also be used to create or enhance lightweight applications and interfaces that make campus capabilities easier to access. This layer is where the campus AI operating system becomes visible and valuable to end users:

- **Students:** Accessing personalized support for mastery, tutoring, advising, and career navigation through intuitive digital experiences.
- **Faculty and educators:** Using embedded assistants for assessment, grading, course support, and data-informed intervention planning within familiar academic workflows.
- **Administrators:** Working through back-office applications and productivity tools to improve retention, planning, service delivery, and campus resource allocation.
- **Researchers:** Using collaborative environments for hypothesis generation, data analysis, grant development, and AI-supported discovery.

This layer can also support a living lab model, where campus IT teams, students, faculty, and other innovators use the same platform to prototype, test, and refine new agentic experiences in a sandboxed, enterprise-grade environment. In that way, the top layer is not only the experience surface of the Composable Campus, but also a practical space for experimentation, learning, and continuous innovation.



The governance, runtime ops and control plane

Anchored in Layer 2 but operating across the full ecosystem, the control plane and runtime ops environment provide the shared governance and operational backbone of the Composable Campus. This is the unified command center for managing agents, services, and campus capabilities at scale.

It delivers end-to-end observability across AI activity, including agent usage, resource consumption, runtime behavior, and spend management, helping institutions govern performance, budgets, and compute-intensive workloads. It also enforces security, policy, and compliance through built-in guardrails such as input and output controls, anomaly detection, continuous evaluation, and full auditability.

Runtime ops also supports continuous modernization. When institutional policy, architecture standards, or regulatory requirements change, AI/works™ can detect the change in the relevant specifications and context libraries, update the underlying system spec, and regenerate impacted services, workflows, or code with human-in-the-loop oversight. At runtime, the agent runtime and governance layer operates within these guardrails, inheriting policy, observability, and spend controls from the AI/works™ control plane as part of the campus AI operating system.



The framework: from strategy to execution

The Composable Campus is the higher-education instantiation of the composable enterprise. AI/works™ is the engineering engine and control plane that industrializes that strategy by creating and governing reusable campus capabilities, while the agent runtime and governance layer is the runtime orchestration layer that puts those capabilities to work through agents and everyday tools. Together, these layers form the campus AI operating system, providing a repeatable framework for moving from architectural vision to governed delivery.

The evolution of the Composable Campus

1. **Composable Enterprise (architectural blueprint):** The strategic and architectural model for building organizations from modular capabilities, data products, and agents. It defines how enterprise functions are exposed through a shared catalog and coordinated through an AI operating system layer.
2. **AI/works™ (engineering engine and control plane):** Thoughtworks' enterprise-grade, spec-driven agentic software engineering platform. It industrializes reverse engineering, dynamic specification development, spec-to-code generation, and runtime operations, while providing the governance, observability, guardrails, and delivery backbone needed to build and operate the ecosystem at scale.
3. **Composable Campus (university instantiation):** The university-specific realization of the Composable Enterprise. It applies this model to higher education by wrapping and unbundling monolithic systems into modular packaged campus capabilities (PCCs), data products, and APIs that the agent runtime and governance layer can orchestrate into student, faculty, administrator, and researcher experiences.

The roadmap for the Composable Campus and AI operating system

1. **'Reinforce' the foundation:** Establish the platform bedrock by standing up a secure technical environment, validating the cloud and data foundation, and using the control plane to govern model usage, safety, spend, and policy across the stack. This creates the secure and observable base required for both research and operational AI workloads.
2. **'Rebuild' the core:** Modernize from within by reverse-engineering, unbundling, and wrapping priority legacy systems into PCCs. In parallel, align with central IT on integration methods, security protocols, operational ownership, and governance so the platform can scale safely before broader agent activation.
3. **'Rewire' for agents:** Stand up the campus capability catalog, data products, governance, and the agent runtime and governance layer needed to activate the first high-value journey within the campus AI operating system. Begin with a focused thin slice and an initial set of flagship agents, such as an IT helpdesk, financial aid navigator, or curriculum assistant, using light-to-moderate integration into core campus systems to deliver the first minimum lovable product (MLP) quickly and credibly.
4. **'Reimagine' value:** Scale from isolated journeys to a broader campus AI ecosystem. Expand into more advanced agents across student, faculty, administrator, and researcher experiences, deepen integration with campus systems, and use the platform as a living lab for AI-bilingual curricula, experimentation, workforce enablement, and continuous innovation.

How AI/works™ powers the Composable Campus

Layer 1

AI infrastructure foundations and operations

AI/works™ extends this layer through its control plane, propagating policy across environments such as data residency, PII handling, and export controls, while providing centralized telemetry for infrastructure usage, agent activity, and spend across campus cloud and HPC environments.

Layer 2

Composable Campus backbone

This is where AI/works™ plays its deepest engineering role: reverse-engineering, wrapping, and unbundling legacy university systems into packaged campus capabilities (PCCs), while building the knowledge fabric of context, components, and solution libraries with reusable domain objects such as Student360, course catalog services, and institutional policy rules.

Layer 3

Agent runtime, governance and agentic ecosystem

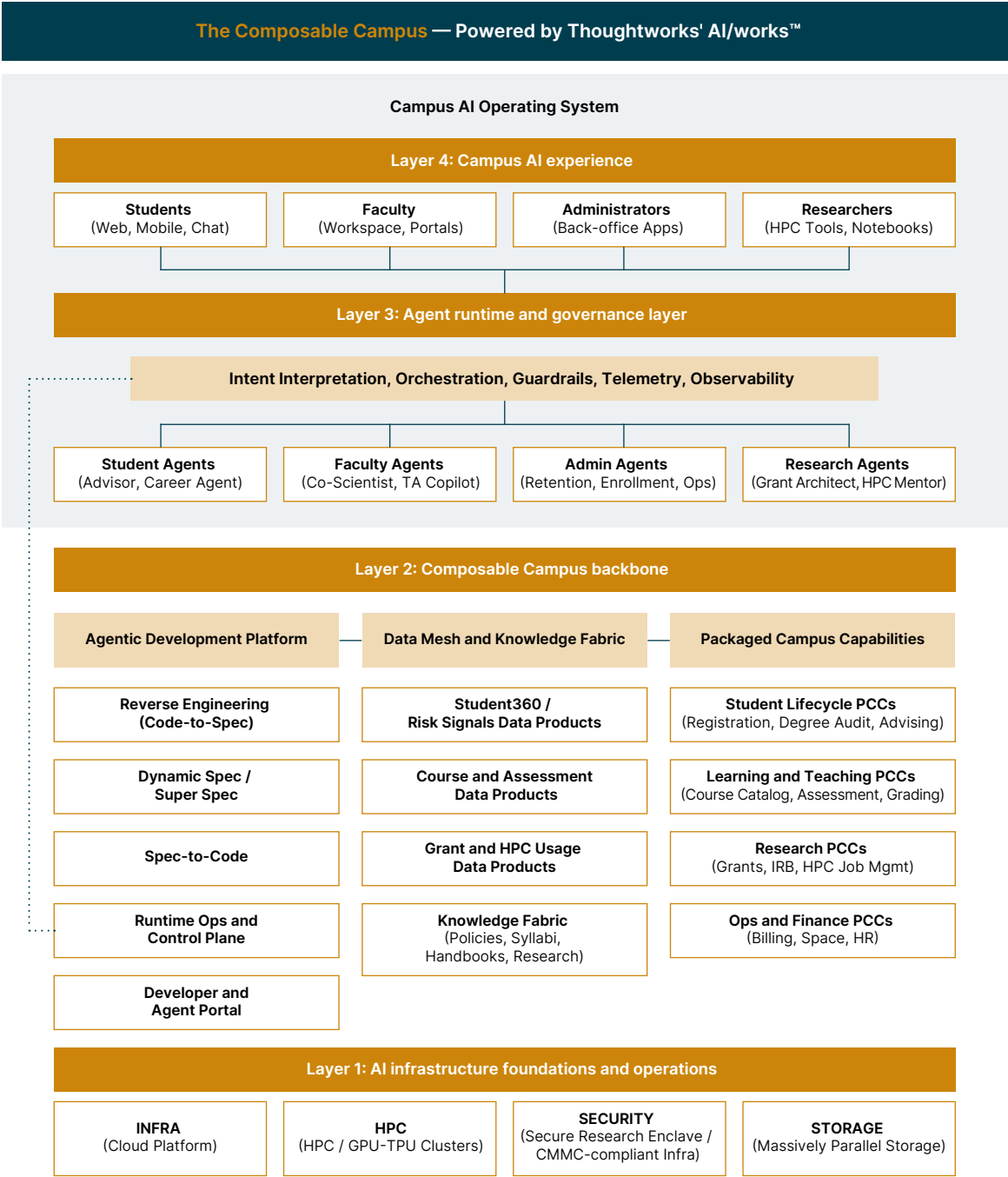
The agent runtime and governance layer powers the orchestration and runtime layer by interpreting intent, coordinating PCCs and tools, enforcing guardrails, and maintaining lineage, observability, and governance across agent workflows. This is the runtime core of the campus AI operating system. In this way, it activates the reusable capabilities created and governed by AI/works™.

Layer 4

Campus AI experience

AI/works™ accelerates the rapid prototyping and continuous evolution of campus-facing experiences by helping teams build and refine front ends, workflows, and pilots, instrument their usage, and fold real-world learnings back into the capability catalog and platform. The agent runtime and governance layer powers the runtime behaviors behind those experiences. Together, Layers 3 and 4 make up the working experience model of the campus AI operating system.

The Agentic University architecture





Conclusion

The transition to a Composable Campus is more than a technical modernization effort; it is a strategic shift toward an Agentic University that is more adaptable, data-driven, and user-centered. By applying AI/works™ to wrap and unbundle rigid legacy systems into modular packaged campus capabilities, institutions can unlock the institutional intelligence trapped inside silos and make it reusable across agents, applications, and human workflows.

The four-layer architecture provides a non-disruptive path to this future state. It allows universities to introduce contextual AI into student, faculty, administrator, and researcher experiences without relying on high-risk rip-and-replace transformation. A unified governance, runtime ops, and control plane helps ensure that this evolution remains secure, compliant, observable, and cost-aware.

Together, the Composable Campus, AI/works™, and the agent runtime and governance layer provide a practical framework for building a governed campus AI operating system for higher education: one that supports continuous modernization, accelerates new agentic experiences, and enables the university to operate as a living system for learning, research, teaching, and operational innovation.

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