DoIT
Division of Information Technology
UNIVERSITY OF WISCONSIN–MADISON

Interoperability Transformation Initiative

Final Report Summary

February 25, 2019

Interoperability Transformation Initiative

February 25, 2019

Table of Contents

Interoperability Final Report Agenda **3**

Problem Statement **4**

Vision and Objectives **4**

Timeline **4**

Recommendations **5**

- Phased Approach 5
- Foundational Projects 5
  - Interoperability Service Design and Practice 5
  - Organizational Change Management 6
  - Interoperability Service Management 6
- Interoperability Framework Projects 6
  - Domain Driven Design and Enterprise Business Objects (EBOs) 6
  - End-User Facing 7
  - Integration Platform 7
  - Identity and Access Management 7

Resource Requests **7**

- Technology 8

Proposed Next Steps **8**

Appendix A: DRAFT Interoperability Service Principles **9**

Appendix B: Interoperability Metaphor **12**

Appendix C: Interoperability Service Management **13**

- Phased Approach 13
- Service Lifecycle 13
- DevOps 14
- Service Management 14

Appendix D: DevOps Diagram **16**

Appendix E: Summary Timeline **17**

Appendix F: Summary Timeline Descriptive Table **18**

Appendix G: Current State of Integration **19**

Appendix H: Low-fidelity Future State Architecture **20**

Appendix I: Prototype Environment **21**

Problem Statement

The purpose of Information Technology (IT) is to enable the work of the institution. Yet, the way IT is delivered at UW-Madison is often out of step with the needs of our constituents, inflexible, and expensive.

This lack of alignment and overall strategy leads to challenges with integrating data across IT systems and business domains, costly and complex integration projects owing to lack of common data definitions and principles across enterprise systems, and difficulty engaging IT to solve business problems. It also results in inconsistent, impersonal experiences for end users and tremendous effort to bridge the gaps between our systems and services.

Vision and Objectives

The Interoperability Transformation Initiative aims to modernize the ways we connect and manage our digital infrastructure and services, and to do so at pace and at scale. This transformation effort will enable us to access, exchange, and cooperatively use information across our complex organization to ensure that learners, faculty, staff, and community members are able to easily and securely use the systems and tools they need. By harnessing our data and infrastructure, we will enable more personalized experiences, appropriate **security and privacy controls**, and better ensure that information is accurate and up-to-date across the ecosystem.

Timeline

The following timeline represents activities we have undertaken up to this point. A more detailed implementation timeline representing future and ongoing activities is included as an appendix.

- **December 2018:** We kicked off this initiative by gathering a diversity of campus pain points and needs, resulting in more than **200 user stories**. These needs helped us better understand the problem space and connect with constituents.
- **January 2019:** A three-week **discovery sprint** was used to further explore the challenges in the current state and engage with campus partners to help think about the future. This discovery sprint included checkpoints with campus constituents and conversations with vendors and external partners.
- **February 2019:** Based on the discovery sprint findings, we continue to refine what the future will look like and the various **potential component projects**.
- **Ongoing:** We have learned that **ongoing communication, campus engagement, and feedback** will be key to the success of this initiative. So, too, will be an investment in **evolving how we work**, **how we organize ourselves**, and **how we serve our constituents**.

Recommendations

This document sets out our recommended strategy for how to proceed in the next several months, including foundational, user-facing, and infrastructure projects, along with estimated timelines and resource needs.

Phased Approach

The following phased approach will enable us to establish foundational projects required to implement the Interoperability Framework Projects thereafter.

- **Phase 0**: Now through decision/approval and funding; pre-implementation steps
- **Phase 1**: Decision/approval through 3 months; quick wins and enacting foundation
- **Phase 2**: 3 months to 9 months; intermediate and beginning of implementation projects
- **Phase 3**: 9 months and beyond; implementation projects on-going and well-established

Foundational Projects

While a primary focus of the interoperability discovery exercise has been to understand the technical infrastructure needed to achieve interoperability, we heard emphatically from campus partners the importance of getting the user experience right and of putting in place services, systems, governance, and communication to sustain and evolve the effort in the long run. (See Appendix B: Interoperability Metaphor)

Interoperability Service Design and Practice

Adopt **service design principles and practices** to ensure that teams working on designing, building, supporting, and delivering interoperability projects work closely together to accurately understand the needs of constituents, design end-to-end solutions, and continue to evolve interoperability services.

- **Interoperability Service Principles** (see Appendix A: DRAFT Interoperability Service Principles) - Service principles will help us keep quality high, speed up implementation, embed security and accessibility, ensure interoperability, enable collaboration, and create a common vision to work towards. This working draft has been informed by the discovery exercise and preliminary campus input. Next steps are to share more widely, within DoIT and with campus partners, to refine and build support.
- **Interoperability Service Manual** - To put these principles into practice, we will need to develop more specific operations-in-practice guidance with specifics for interoperability projects and services. We've begun to gather information to inform this effort.

- **Decision Making Framework** - While service principles and practices will go a long way toward standardizing and streamlining our work, exceptions are the norm in the University. We'll need to anticipate edge cases, develop ways to navigate competing priorities, and find mechanisms for resolving conflict. We will gather more information about the types of questions and conflicts we anticipate and then to begin to determine the best ways to navigate them.

Organizational Change Management

The Interoperability Transformation Initiative will fundamentally change the way campus accesses, shares, and works with systems and data. Asking campus stakeholders and partners to move from the current state of operations to new ways of working and new systems will impact all users.

To ensure program acceptance and adoption, we will need to put in place a **well-defined change management plan** that emphasizes engagement and transparency, and clear and proactive communication of high-level sequencing and impacts. An effective change management plan will mitigate obstacles and risks, engage campus in the entire process, motivate our partners to move toward common goals, and ensure the success of the overall program.

Interoperability Service Management

Develop an Interoperability Service Management framework (see Appendix C: Interoperability Service Management) framework that will allow us to effectively make decisions about **service lifecycle**, create **capacity** to do interoperability projects, and **engage campus**. Additionally, this framework will inform how we do staff augmentation across near- and long-term time frames to enable implementation, operation, and professional development.

Finally, we will begin to operate with a DevOps-focused mindset (see Appendix D: DevOps Diagram) that enables multi-disciplinary teams to incorporate security, test-driven design, and shared ownership of service delivery throughout the entirety of our service management stack.

Interoperability Framework Projects

This section outlines recommended user-facing services and underlying infrastructure to enable the delivery of the recommended Interoperability Transformation Initiative outcomes.

- For timeline information, see Appendix E: Summary Timeline and Appendix F: Summary Timeline Descriptive Table.
- Current state diagrams can be found in Appendix G: Current State of Integration.
- Future state diagrams can be found in Appendix H: Low-fidelity Future State Architecture and Appendix I: Prototype Environment.

Domain Driven Design and Enterprise Business Objects (EBOs)

- Define business domains, under the leadership of Office of Data Management and Analytics Services, around which data, policies, and integrations will be built. Define enterprise business objects (EBOs) within business domains.
- Implement functionality to transform data from authoritative systems into the EBO representation for each business domain. Encapsulate internal domain processes and business logic away from external domain interactions. Provide common functional interfaces for integrating with a domain that are consistent with the structure of other domains.

End-User Facing

- Create both **self-service and guided experiences for campus** to easily integrate with data, supported by an integration team whose purpose is to facilitate engagements and advocate preferred patterns and access methods while meeting business needs.
- Shift to an "identity first" and personalized approach, creating a **digital profile** with the UW that can be enriched with institutional roles, information, and preferences (e.g. preferred name) that evolves as people navigate our ecosystem over time.
- Improve **login experience** to enable multimodal access methods, like social login, to better meet the diverse needs of all people engaging with the University. Incorporate appropriate secure access methods based on role and level of access (e.g. multi-factor authentication).

Integration Platform

- Implement an integration platform that enables the expression of domain data using common standards and modern integration patterns and that enables the secure control of institutional data flow.
- Promote API and event-based integrations over ETL[1]-based integrations. Where we need to support ETL-based integrations, remain consistent with EBOs expressed via API and event-based integrations.
- Incorporate a **developer portal** into the integration platform that enables campus users to understand data models, test, and request production access to services exposed by the integration platform.

Identity and Access Management

- Modernize our Identity and Access platform to enable integration across business domains of data to express institutional roles.
- Create and curate **institutional role definitions** to enable role-based provisioning.
- Develop a **resource catalogue** of institutional and departmental resources provisioned based on roles and ad-hoc requests.

[1] Extract, transform, load data, often via data files, enabling shadow-copies on remote systems

Proposed Next Steps

- Begin enacting phase 0 activities (see attached timeline document), include Interoperability Service Management within the newly formed AIS Interoperability functional area. This also includes more detailed planning for each of the phases.
- Further develop and adopt Interoperability Service Principles, including more specific operations-in-practice guidance, and decision-making framework.
- Determine our resource requests by developing more specific estimates around costs for technology and around staffing for the project.
- Coordinate with CIO and CFO on resource and funding request in preparation for presentation to VCFA.
- Validate and adjust approach with additional partners (including Office of Data Management, DoIT Academic Technology, UW Business Services, UW Office of the Registrar).
- Determine how to engage with CIO, CISO, Deputy CIO and campus partners on an on-going basis.
- Continue to engage large campus community via targeted messaging, it.wisc.edu, FAQs, presentations, workshops, etc.

Appendix A: DRAFT Interoperability Service Principles

The Interoperability Service Principles are a set of 14 criteria developed in response to campus needs and pain points. These principles will help to ensure that we design and run high quality interoperability services.

1. **Make sure users succeed the first time**

   Create a service which is simple to use and intuitive enough that users succeed the first time, wherever, whenever, and however they engage with a service. Research to develop a deep knowledge of who service users are, their contexts, and how their needs may change over time. Do ongoing testing to seek feedback from users to improve the service.

2. **Have a multidisciplinary team; assign a leader**

   Put in place a sustainable multidisciplinary team that can design, build, and operate the service. When outside help is needed, teams should pair with contractors who are good at both building and delivering effective digital services. Teams should be led by a suitably skilled service or business owner with decision-making authority and experience.

3. **Design and build for change**

   Take the time to understand how to design and build a resilient, flexible, and sustainable service and underlying infrastructure. Build your service using agile, iterative, and user-centered methods and ensure that you have the capacity, resources, and technical flexibility to iterate regularly. Emphasis should be placed on being scalable, automated, appropriately self-service.

4. **Evaluate tools and systems**

   We should know the risks and constraints associated with a tool or system and avoid contracts that lock us in and stop us from improving our services. Rigorously evaluate what tools and systems will be needed to build, host, operate and measure the service, and how to procure them. Evaluate solutions based on campus standards and requirements, independent of vendor design.

5. **Use enterprise data and standards, and common platforms**

   Enterprise data and standards and common platforms save time and money by reusing things that are already available, ensures that your technology works and communicates with other technology, and is easily upgraded and expanded.

6. Ensure security and privacy

Our services must keep sensitive data secure and ensure that users can access their information when they need to. Evaluate what data and information your service will be providing or storing and address the security level, legal responsibilities, privacy issues, and risks associated with the service, consulting with experts where appropriate.

7. Make things accessible

All users will have different needs at different times and in different circumstances. Make sure your technology, infrastructure, and systems work for as many users as possible by including accessibility, internationalization, and low- to no-tech users in your research and design.

8. Test the end-to-end service

Individual parts of a service may work in controlled environments but need to work end-to-end and for the numbers of people who want to use them. Be able to test, ideally in an automated fashion, the end-to-end service in an environment identical to that of the live version. Include all common browsers and devices, use test credentials that approximate real users, and test with a representative sample of users.

9. Make a plan for being offline

You need to have a plan for what to do if your service goes offline so that you know how users will be affected and how to get it back online.Ensure that service availability is communicated, users are supported, and that we learn from and take steps to avoid future issues.

10. Identify, collect, and report performance data

Setting and tracking performance indicator allows us to continuously improve our services by understanding strengths and weaknesses, and using data to support improvements. Identify performance indicators for the service, including the mandatory performance indicators defined in the manual [TBD]. Establish a benchmark for each metric and make a plan to enable improvements.

11. Be open, encourage engagement

When we collaborate in the open, we can improve IT together. Make it easy for campus and external partners to adopt and adapt to our interoperability service standard. Ensure that information is understandable and readily accessible. Proactively communicate information, impacts, and decisions. Engage key stakeholders in the process. Document and appropriately share systems, data, and infrastructure.

12. Make the user experience consistent with UW brand

Every interaction a user has with the University contributes to their assessment of and trust in the institution. Build a service consistent with UW brand guidelines, including using the design patterns and voice and style guides.

13. Structure budgets to support delivery

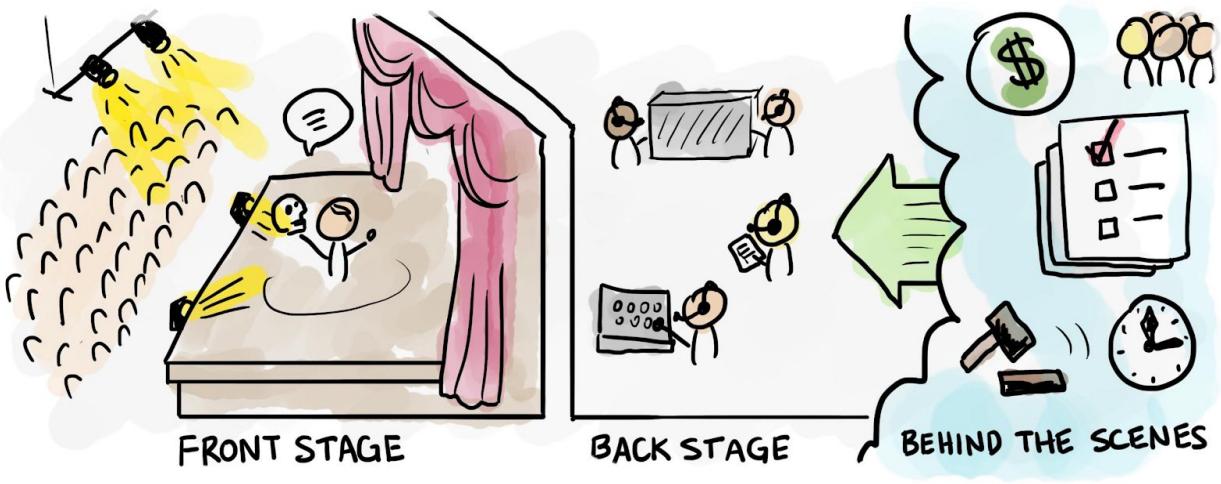
If cost is a barrier to using enterprise data, standards, and platforms, our campus partners will look elsewhere for solutions, further contributing to the complexity of our technology ecosystem. To improve our chances of success, we need to make it easy to the right thing.

14. Test with leadership

Leaders are accountable for the technology and services produced by their teams. Test the service from beginning to end with the leaders responsible for it.

Appendix B: Interoperability Metaphor

While a primary focus of the Interoperability Discovery Exercise, conducted in January 2019, was to understand the technical infrastructure needed to achieve interoperability, we heard emphatically from campus partners the importance of getting the user experience right and of putting in place services, systems, governance, and communication to sustain and evolve the effort in the long run.



We have used the above theater metaphor to describe the Interoperability Transformation Initiative and domain. We believe this metaphor has value as a tool to communicate about the problem space and the initiative at large.

- **Front stage** represents services and applications in our portfolio that people of all roles interact with. Examples include profile management, developer portal, and concierge/consulting services.
- **Back stage** represents services and infrastructure needed to deliver the front stage services and applications. Examples include IAM, the integration platform, and enterprise business objects.
- **Behind-the-scenes** represents foundational elements needed to effectively deliver the complete portfolio. Examples include a service standard (i.e. guiding principles), funding, governance, change management, etc.

Appendix C: Interoperability Service Management

Phased Approach

We recommend a phased approach that will enable us to establish foundational components such as staffing strategy, assess gaps and readiness for future state, begin planning project-specific implementations, etc.

- **Phase 0**: Now through decision/approval and funding; pre-implementation steps
- **Phase 1**: Decision/approval through 3 months; quick wins and enacting foundation
- **Phase 2**: 3 months to 9 months; intermediate and beginning of implementation projects
- **Phase 3**: 9 months and beyond; implementation projects on-going and well-established

Service Lifecycle

Develop and implement a service lifecycle framework that allows us to make decisions about when to take on work, freeze development of work and projects deemed out-of-alignment with the Interoperability strategy, and sunset technologies and services where appropriate.

Phase	Activities
0	● Develop criteria that will allow us to be disciplined and transparent to campus about service lifecycle decisions. These criteria should help us determine the following for each portfolio service: ○ **Continue** current development commitments and take on new work ○ **Freeze new** development but complete in-flight commitments ○ **Freeze all** new development and in-flight commitments ○ **Shift** operations of service to different area within DoIT or campus ○ **Sunset** actively or through attrition ● Perform assessment of existing AIS portfolio against criteria ● Make recommendations to leadership, and obtain sign-off, based on findings
1	● Begin communicating intention and perform impact assessment following service lifecycle recommendations
2	● Continue implementing service lifecycle recommendations ● Reassess service lifecycle recommendations to account for new service and infrastructure that are or will be available
3	● Complete implementation of service lifecycle recommendations ● Begin transitioning campus to newly developed services and infrastructure to enable implementation of updated service lifecycle recommendations

DevOps

DevOps is the intersection of development, operations, and agile methodologies; it is a set of practices and an organizational culture that suggests a unified approach to service delivery across the entire stack (i.e. development, testing, monitoring/alerting, operations/support, service management). Preliminarily, we believe DevOps means we should do the following:

- Build in automation, monitoring, and alerting
- Test-driven design and automated testing
- Alignment with risk management framework
- Infrastructure as code to enable rapid re-deployment and updates
- Multidisciplinary teams, minimize siloes, cross-train competencies
- Standardized operations including service delivery
- Develop metrics and instrumentation recommendations

Phase	Activities
0	• Develop concrete definition of what DevOps means to the Interoperability Program • Assess in-house skills around DevOps champion(s) and practices
1	• Begin organizing teams to enable execution of DevOps • Assess tooling needs to enable DevOps, particularly automated testing
2	• Use DevOps-structured, multi-functional teams to do implementation • Tweak structure of teams based on practical lessons learned during implementation • Purchase and/or implement DevOps tooling
3	• Continue operation as a DevOps team, augmenting with additional parts of Core Ops as restructuring continues

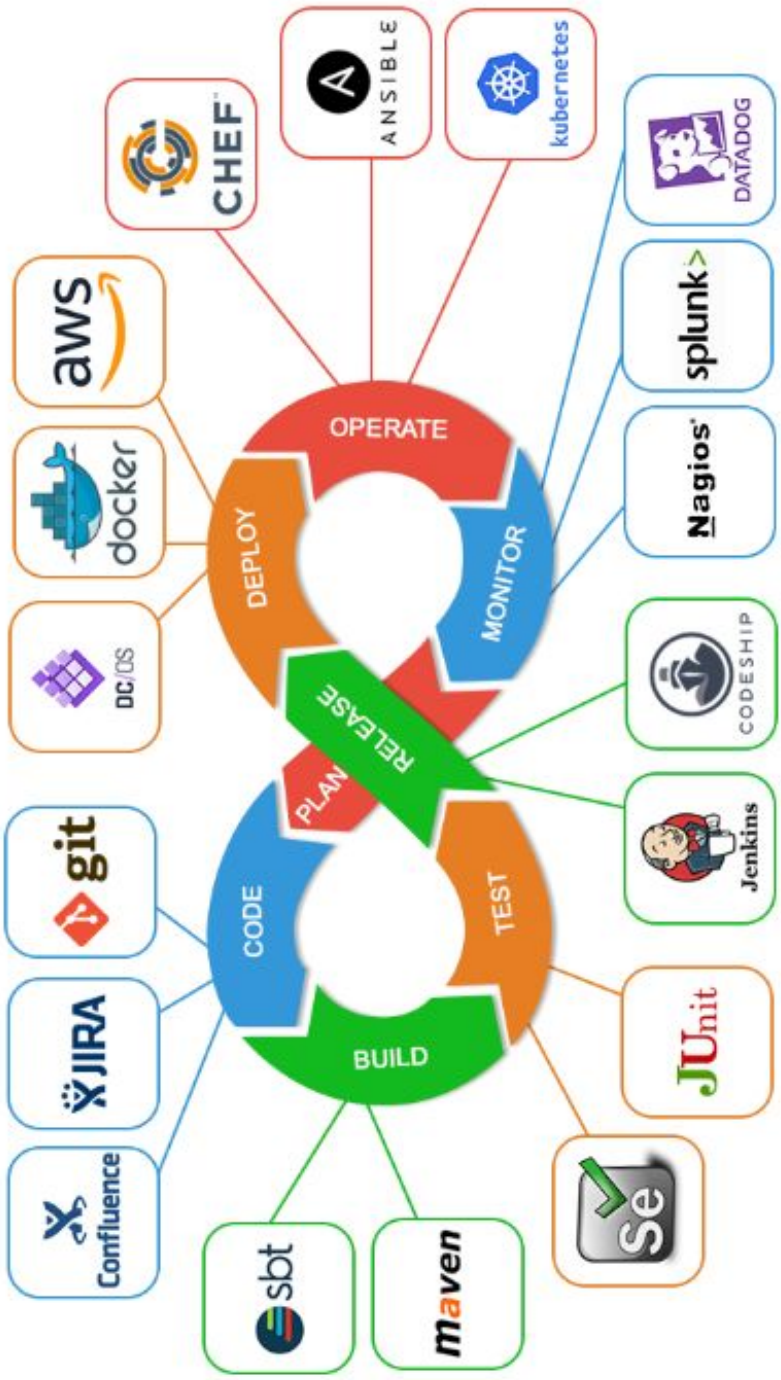
Service Management

Establish consistent service management, decision-making, campus communication, and service governance practices that will be needed for long-term success. Apply principles outlined in the Service Principles to ensure high quality digital services across Interoperability.

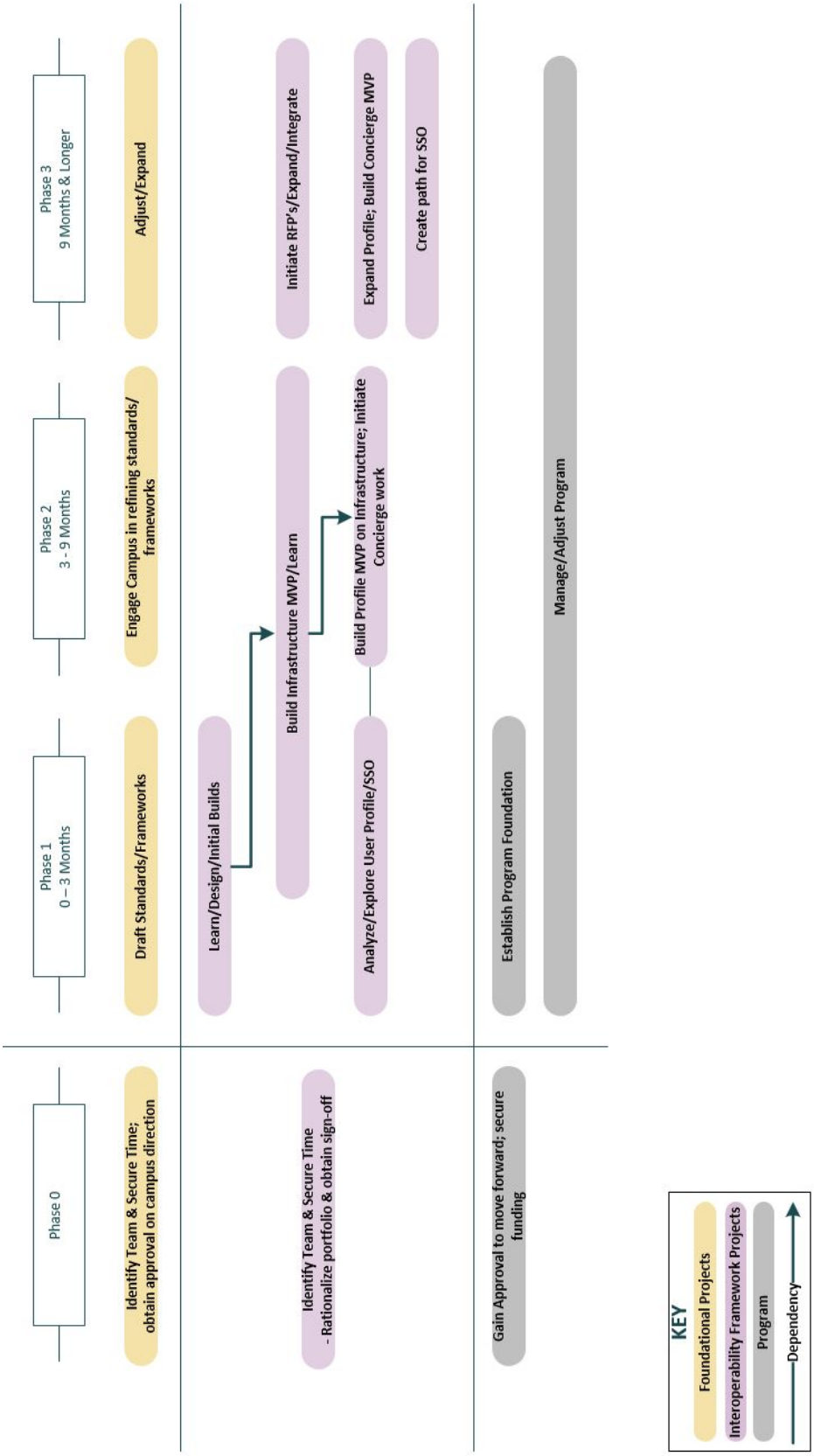
Phase	Activities
0	• Align with UW cloud strategy (i.e. decision-making and best practices around on-premises, hybrid, cloud deployments) • Assess limitations, challenges, and gaps in current portfolio that might be out of alignment with strategies above

	● Develop decision-making guidance around build, buy, value-added customizations
1	● Determine how decisions should be made that will govern the implementation projects, when to escalate to leadership, and what guidance/checkpoints we will need throughout ● Create sponsorship and steering and advisory committee(s) ● Determine funding gaps in current state, accounting for service lifecycle recommendations
2	● Develop communities of practice that will serve as checks and balances to the implementation and ensure campus buy-in ● Continuously evaluate funding to ensure appropriate levels of campus support for Interoperability (“greater good”) services and infrastructure
3	● Continue working with communities and practice and advisory committees to retain strong partnership with campus, ensuring long-term success

Appendix D: DevOps Diagram



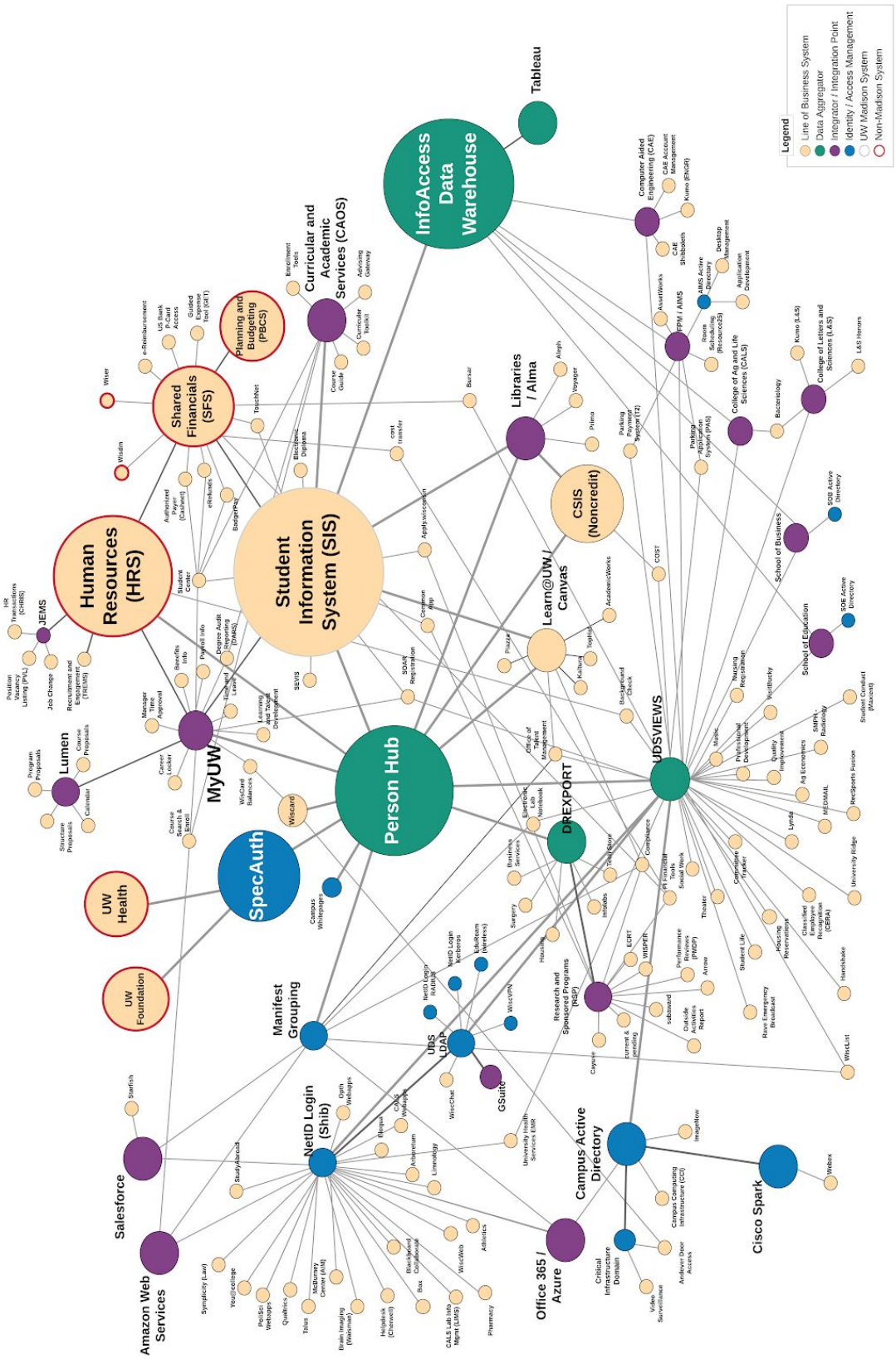
Appendix E: Summary Timeline



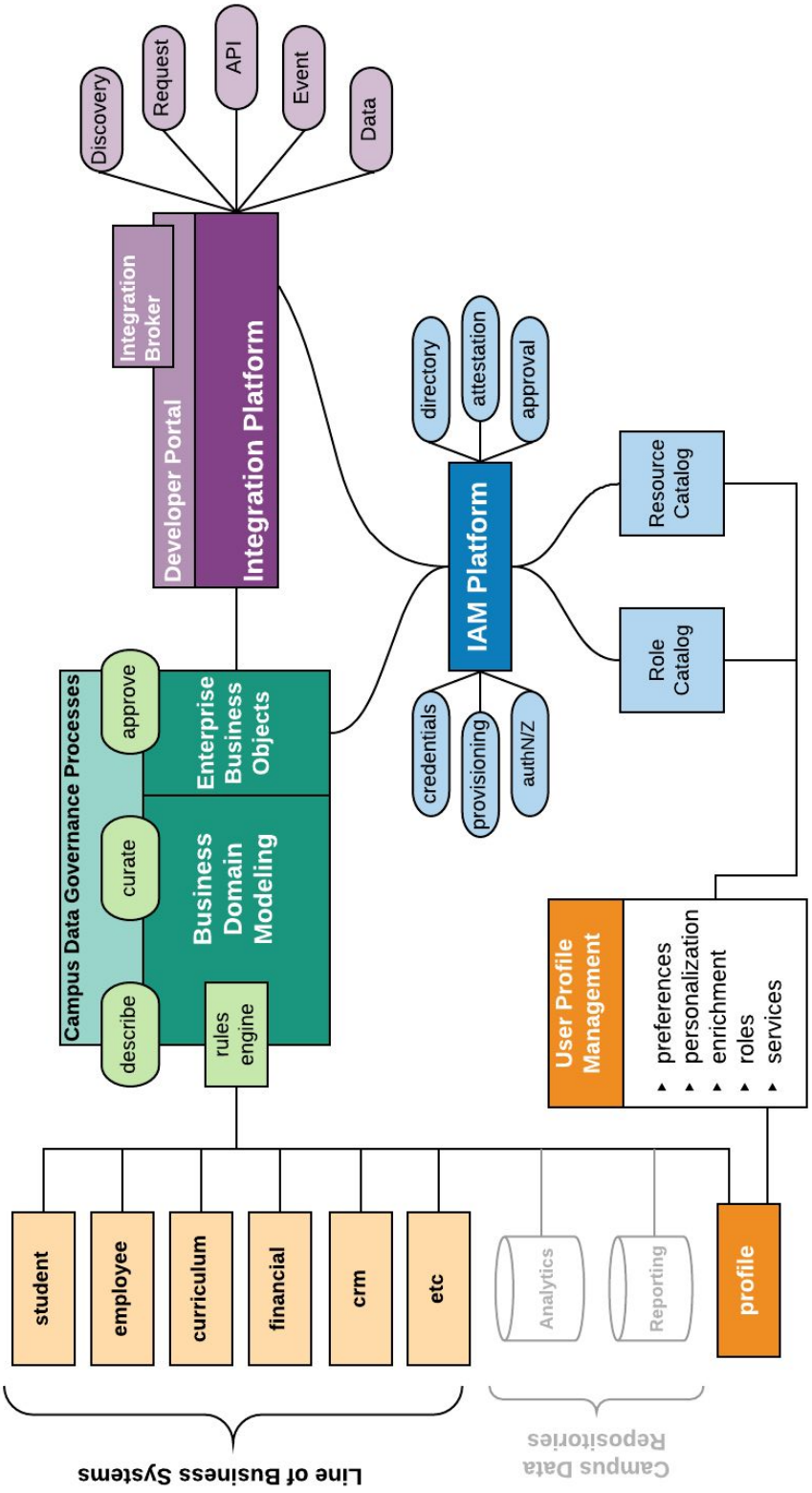
Appendix F: Summary Timeline Descriptive Table

Area	Overall Deliverable Category/Program Area	Phase 0	Phase 1 (0 - 3 months)	Phase 2 (3 - 9 months)	Phase 3 & ERP (over 9 months)
Foundational Projects	Interoperability Service Standard	IDENTIFY, SECURE, APPROVE - Identify Team & Secure Time; obtain approval on campus direction	PREP - Draft business case FORMULATE - Feedback, Refine, Adopt	PROOF - Refine, Metrics	EXPAND -Train, Broaden
	Organizational Change Management		OUTLINE - Draft plan	FINALIZE - Feedback, Refine	ADJUST - Discover reality
	Decision Making Framework		UNDERSTAND & PLAN		
	Interoperability Service Management		ASSESS, ORGANIZE	IMPLEMENT, ALIGN	OPERATE
	Naming, Engagement & Communication		CLARIFY & ENGAGE - Name, Pitch, Engage		
Interoperability Framework Projects	Domains / Enterprise Business Objects (EBOs)	IDENTIFY, SECURE, RATIONALIZE, APPROVE - Identify Team & Secure Time; Rationalize portfolio & obtain sign-off	TRAIN/BUILD - Domain Training, Define, Build	BUILD - Expand EBO's.	PRIORITIZE/BUILD/EXPLORE - Expand, Explore Vendor Options
	Integration Platform - Platform/API Gateway - Event Hub - Developer Portal		DESIGN, BUILD, EXPAND MVP		SCALE, EXPLORE
	Identity and Access Management - IAM Infrastructure - Identity Registration / Identity First - Role Catalog		DESIGN, BUILD POC	TRANSITION TO MVP	MIGRATE, ENHANCE
	Concierge Service			ANALYZE, OPTIONS, SELECT	IMPLEMENT
	User Profile Management		ANALYZE	BUILD MVP	EXPAND
	Login		EXPLORE ID FIRST	*WAIT ON IAM*	CREATE PATH TO SSO
Program	Program Management	APPROVE, FUND - Gain Approval to move forward; secure funding	ESTABLISH FOUNDATION	CONSTRUCT/ADJUST	MANAGE/ADJUST

Appendix G: Current State of Integration



Appendix H: Low-fidelity Future State Architecture



Appendix I: Prototype Environment