NextGen Michigan Program
Enterprise Architecture Capability Project

Architecture Design Process

Version 1.0

1. Table of Contents

2. Introduction

This document provides a description of the technology architecture review process at Michigan. Is comprised of the following sections:

- Section 2 – introduction gives a the value and objectives of architecture governance at U-M.
- Section 3 – Architecture Guiding Principles introduces the guiding principles that drive architecture decisions at the University.
- Section 4 – Solution Architecture Governance Process defines the process which the architecture community will ensure that solutions benefit from the assets, standards, and expertise of the EA group.
- Section 5 – Review Checklist is a checklist of questions that are answered during the review process.
- Section 6 – Project Engagement Questionaire provided the initial questionnaire used to begin the architectural review process.

The University is an ecosystem of autonomous schools, colleges, institutes, and administrative units that provide leading teaching, learning, research, and patient care to University community. IT mirrors the decentralized organization of the university, and U-M views this structure as key to enabling the unique missions of the academic and administrative units.

One of the goals of the NextGen Michigan program is to provide infrastructure services in a way that allows unit IT to redirect their resources to focus on mission-unique needs. When a shared service IT organization exists, there is a continuous tension between maintaining a University-focus and promoting innovation that allows for unit-specific solutions. Effective architecture governance helps IT strike a balance between these two forces.

The objectives of architecture governance are to:

- Increase the percentage of time that implementation teams focus on solution-specific design rather than infrastructure needed to support a solution
- Accelerate the time to market by using architecture assets and patterns to reduce design and development effort services
- Reduce delivery risk and cost by using platforms, technologies, and components that are known and have skilled resources for
- Improve the operational performance of by creating services that use platforms and technologies already in a production environment

3. Architecture Guiding Principles

This section presents why the architecture guiding principles are important for the University and what decisions these principles will help Architects make.

An IT architect must consider many choices when defining an architecture, examples include:

- *Should the solution optimize for performance, availability, or capacity or some combination of the three?*
- *Should the solution be built from the ground up or should we buy off the shelf components?*
- *How integrated should the solution be with other services? Where should it be tightly coupled, loosely coupled, or siloed?*

Guiding principles help the architect by defining the architectural characteristics and design trade-offs that are desirable in solutions. Good principles guide rather than dictate. In order to foster the innovation and allow for unit IT to provide mission-differentiated services, the guiding principles must be defined in a way that does not constrict creativity, elegance, and specific-use.

To achieve this objective, architecture at the university embodies the following four principles:

1. Design is driven by mission requirements
2. Information is the lifeblood of the university
3. Use or extend what already exists
4. Use the architectural standards whenever possible

The following table describes the principle and the value that each principle enables:

Principle	Description	Value Enabled
1. Design is driven by mission requirements	- Ensure that the design meets the explicit business needs of the project; it also considers implicit needs such as support, training, business continuity, expected lifecycle, financial model, and ability to change and scale. - Requires a service and component oriented philosophy as opposed to a technology view. It implies increased reliance on CRM, business analysis, and service management. - Potential short term increases in project cost and time-to-market will be offset by long-term efficiencies and project speed.	- Improved alignment to the mission and to customers - Longer service life with less maintenance and changes - Lower support costs
2. Information is the lifeblood	All information should be managed consistently, with one source and one	Improve decision making quality

of the university	owner. • Applications and data should be accessible by authorized parties from anywhere. • The above point infers data assurance standards, such as single identities for users that are used for all sign-ons and protection of sensitive data during storage and transit. • Applications should support accessibility standards	through the use of accurate, up-to-date information • Increase customer and user satisfaction • Reduce delivery costs by using existing data services
3. Use or extend what already exists	• Whenever possible, use or extend an existing service or building block. • When no existing university service exists, prefer to buy a service rather than build a new one. • EA will help projects identify reusable assets within the university and, when no asset is available, point them at any appropriate third-party solutions.	• Less duplication of effort and services • Reduce delivery costs • Enable reusability and extensibility • Reduce operating cost
4. Use architectural standards whenever possible	• Standards include specific technologies as well as complete models for solutions that are not unique (such as a web site). • The process of maintaining useful standards requires input and collaboration from many parties. • Standards will be updated, published, and changes publicized on a regular basis.	• Provide more consistent user experience • Enable reusability and extensibility • Reduce risk and exposure • Reduce operating costs

## 4. Solution Architecture Governance Process

Introduction

This section defines the architecture governance via the three views:

- Engagement Model expresses how the architecture roles interact with each other in order to manage the governance of solution architecture

- Deliverable Flow expresses what deliverables are produced throughout solution architecture governance and links these deliverable flows to the mobilize-analysis-design-build-test-pilot-deploy phases of the SDLC.

- Solution Architecture Review Process uses a swim-lane diagram to define the step by step process of performing solution architecture governance.

Engagement Model

This section documents the Solution Architecture Engagement model. An engagement model defines who key players in a particular capability or process are and how they interact with each other over the course of that process.

The following diagram depicts the engagement model for solution architecture review.

*Level of governance participation of Review Team will be dependent upon architecture impact of project
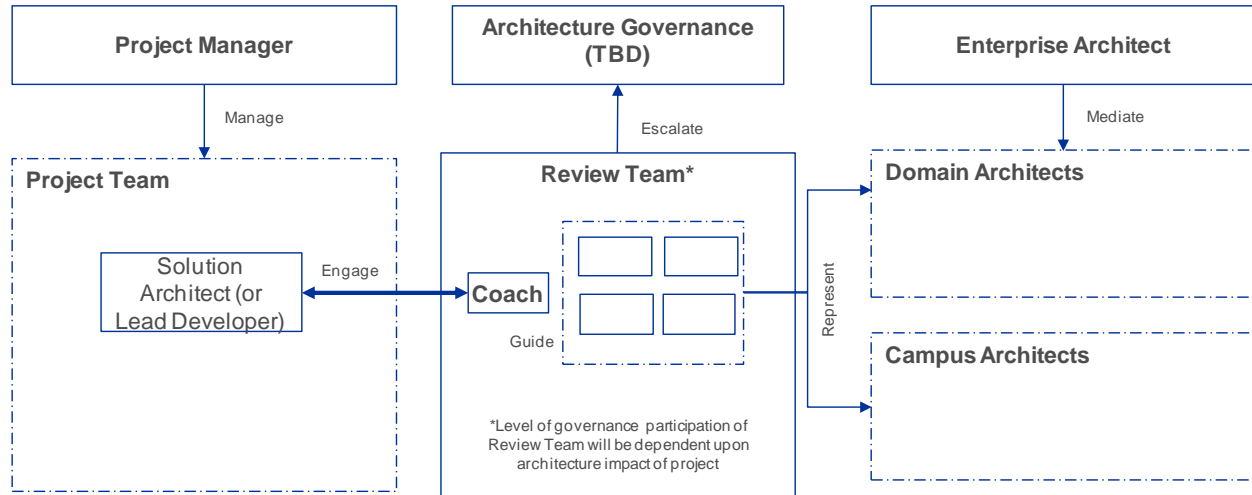
In this model the *Review Team* is the bridge between the project and the university architecture community. The Review team may consist of members of the *Enterprise Architecture*, *Domain Architecture*, and *Campus community*. Their role is to provide guidance for the project team and ensure that the team understands the services, components, and other architectural assets that may be useful to the project.

The following table describes the solution architecture review roles:

Role	Description
Solution Architect	- Accountable to architect and design solutions that meet business requirements in support a portfolio. - Accountable to partner with key project or initiative roles (e.g. project managers, business analysts, etc.) to create solutions that are aligned to U-M's architecture standards and principles, leverage common solutions, services, and processes, and meet the financial targets (cost and benefits). - In the solution development lifecycle, this role will be accountable for solution evaluation and selection, buy vs. build decisions, and early-phase project estimates which contribute to the business case, and high level design. - Provide consulting during the detailed design, build, test and deploy phases, and reengage to perform benefits realization. - Prepare for the Solution Architecture Review process at the required

| Role	Description
	checkpoints.
	• Does not have to be a formal 'architect' but can be anyone on the project who can fulfill the role of Solution Architect.
Review Coach	• Provides architecture review, coaching, and guidance as needed by the project team. • Responsible for facilitating the guide, review, and confirm sessions. • Serves as a single point of contact for a project. • Typically is from the domain that is most relevant to the project.
Review Team	• Consists of a group of architects, representing each domain, that guide and review all architecturally-significant projects. • Assigned to architecturally-significant projects. Only review team members that represent domains that are impacted by a project need to participate in a given project's review.
Domain Architect	• Accountable for the direction, performance, and ongoing health of the architecture within a given Architecture Domain (Business, Information, Application, Infrastructure). • Integrate information from mission and IT strategies, obtain input from business and IT customers, and requirements from architects in multiple domain areas to develop the strategic direction, architecture, functionality, integration and quality for the sub-domains within scope. • Accountable for driving technology evaluation and selection. Also accountable for designing reusable technical assets and standards to support solution development, as well as consulting with projects on how to best leverage these assets and standards.
Enterprise Architect	• Holds organizational accountability for the enterprise architecture framework. This framework includes governance, assets, processes, resource management and performance measurement. • Accountable for designing reusable technical assets and standards to support solution development, as well as consulting with projects on how to best leverage these assets and standards. • Provides leadership and coordination of core EA processes including standards management, architecture reviews, etc. Would also provide library capabilities for managing the EA assets.

Matching "Architectural Impact" with "Process Rigor"

The solution architecture review process has been designed to be lightweight as possible while still ensuring the architectural alignment of projects.   All projects will be assigned an architecture coach, but depending on the size and architectural significant of the project, the review process can range from formal to informal, and may not be required at all on smaller projects. Likewise, the review team will vary in size and for some projects may not exist at all, but have their function covered by the architecture coach.

Deliverable Flow

The Review is designed to be a light-weight process. This process describes how to build four deliverables over the course of the SDLC in order to govern the architecture characteristics of a solution. This section describes these four deliverables.

The following graphic depicts the SDLC and defines the four Solution Architecture Governance gates.
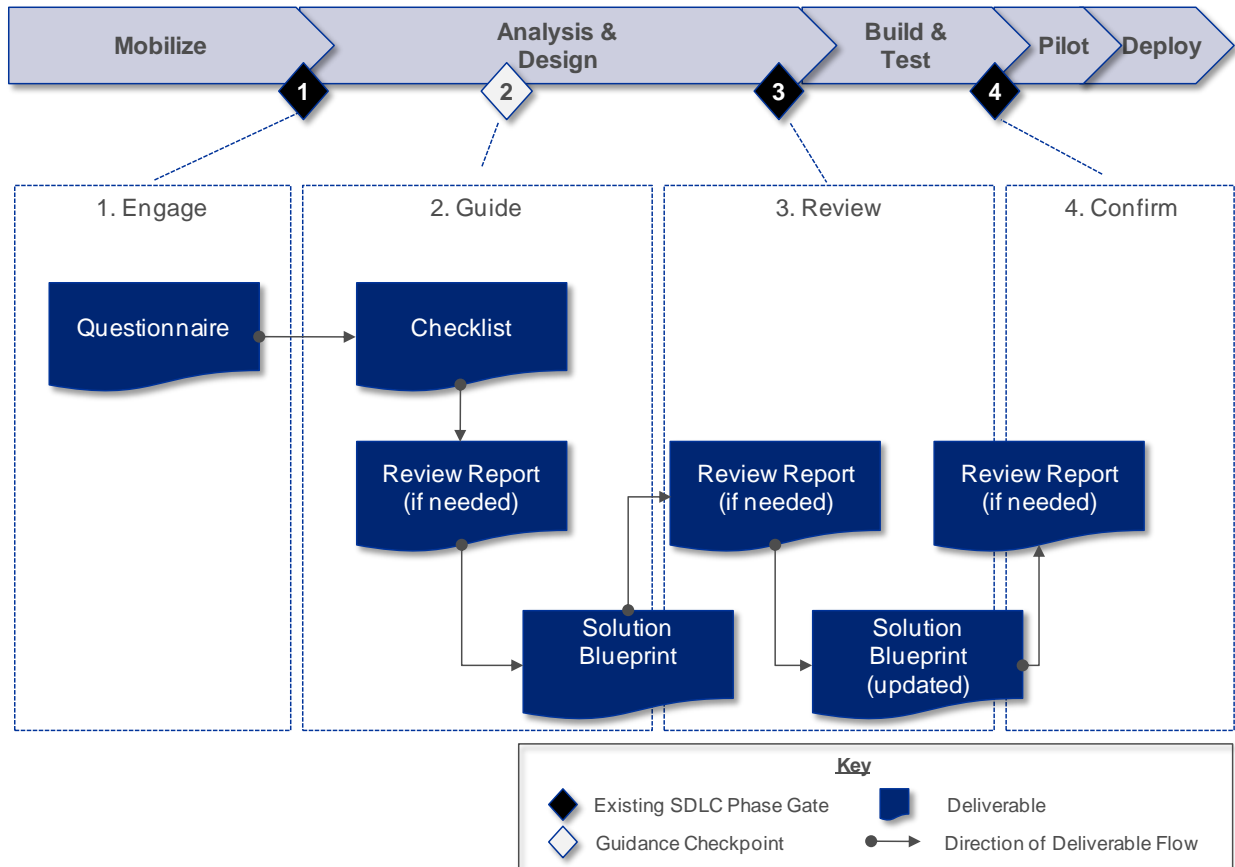
The following table describes the four-step process for solution architecture review.

Step	Purpose	SDLC Phase Gate
Engage	• Create project visibility and awareness for the Architecture community • Determine the architecture impact of each project Provide the appropriate level of architecture support	• Mobilize
Guide	• Create project awareness regarding the architecture assets that can be used in the project • Provide architecture expertise to projects that may not have access to it	• Outside of the SDLC Phase Gate –b between Analysis and

		Design
Review	• Ensure alignment of solution architecture with the domain and enterprise architecture • Provide opportunity to receive feedback and guidance on how the solution architecture • Provide opportunity for solution architecture to inform the broader thinking of the domain and enterprise architecture	• Design
Confirm	• Ensure that recommendations have been implemented • Help domain and enterprise architects plan for the evolution of the solution	• Deploy

Solution Architecture Deliverables

The following table describes the four architecture work products that are used during the solution architecture review.

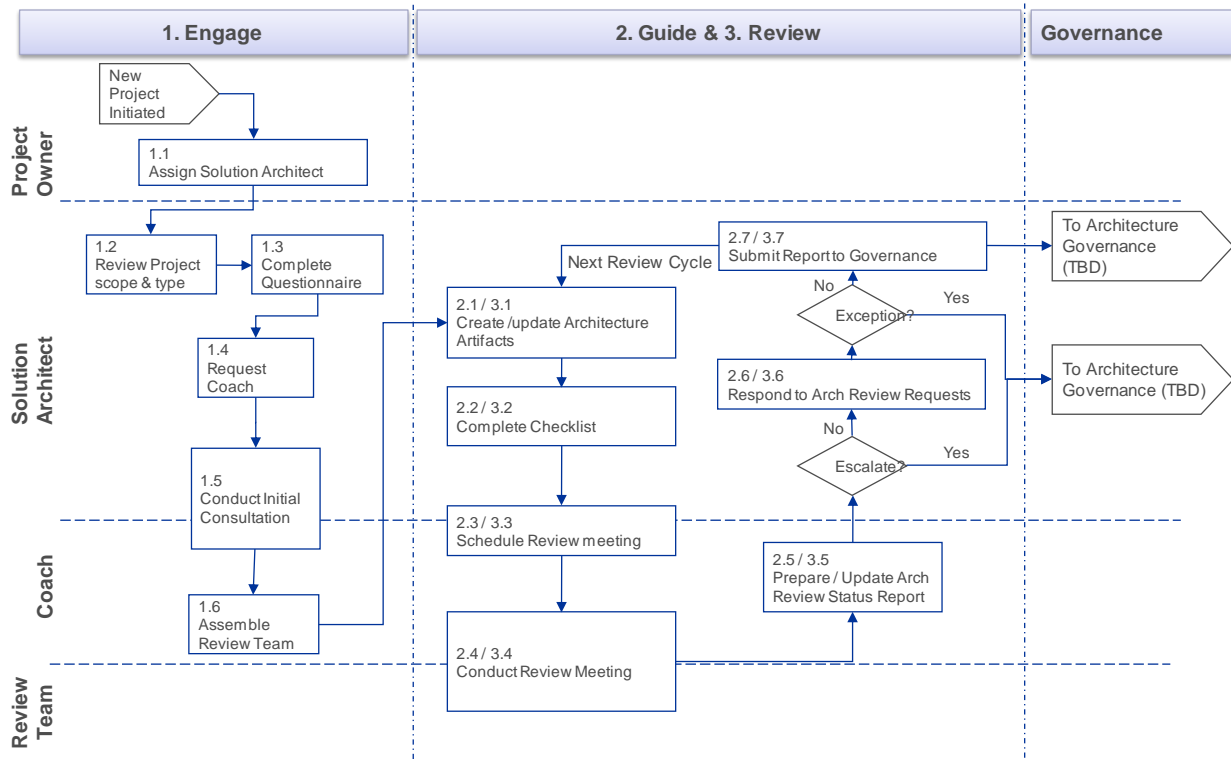| Deliverable	Description
Questionnaire	• A brief questionnaire to gauge the architecture significance of the project. • This deliverable will be expanded during the review process and will eventually become the Solution Blueprint .
Checklist	• The checklist provides a to-do list view of the Review process. This deliverable is the responsibility of the Review Coach and the Solution Architect to complete and serves as evidence that the processes were followed.
Review Report	• Captures the results of analysis and design solution architecture reviews. • Documents the issues, risks, recommendations of the Review team • Captures the remediation activities performed by the solution architects • Identifies the impact to domain and enterprise architecture assets
Solution Blueprint	• Defines the architectural elements of the solution. • Typically defines the solution using the architecture layers defined by the Enterprise Architecture • Identifies the building blocks (bricks, patterns, etc) that are used from domain-level assets • Solution architecture is responsible and accountable for defining • Does not have to be in a standard format

Solution Architecture RACI Matrix

The following matrix defines Responsibility, Accountability, Contribution, and Inform capacity in which each role is expected to participate in the creation and maintenance of the Review deliverables.

Deliverable	Solution Architect	Coach	Review Team	Domain Architect	Enterprise Architect
Questionnaire	R,A	C	I	I	I
Checklist	R	A	R	I	I
Review	C	A	R	I	I
Solution Blueprint	R,A	C	C	I	I

Review Process

The figure below depicts the Review process by describing the step-by-step process by which solution architecture is reviewed.

Note that the process for Guide and Review is the same. The deliverables define how the content and focus of these reviews are different between Step 2 and Step 3.

Step	Activity	Description	Owner

1.1	Identify Solution Architect or Technical Lead	Project manager works with the program and resource managers to obtain a Solution Architect resource for the project.	Project Manager is responsible for obtaining the assignment
1.2	Review project scope	Solution Architect reviews the project charter deliverable to determine the architectural scope of the project. Depending upon scope, Solution Architect could request additional architecture resources to participate in the project.	Solution Architect
1.3	Complete Questionnaire	The solution architect completes the Questionnaire and submits it to the Review Team	Solution Architect
1.4	Request Coach	Review Team will evaluate the questionnaire and determine the architectural impact of the project If appropriate, the Review Team will identify a Coach for the project	Solution Architect Review Team
1.5	Assemble Review Team	Coach is responsible for determining which domain architect representatives need to be included in the Review team	Coach
2.1	Create/update Architecture Artifacts (if needed)	Before the analysis and before the design review, the solution architect is responsible for creating the appropriate artifacts. The typical artifact used to describe the solution architecture is the solution architecture blueprint.	Solution Architect
2.2	Complete Checklist (if needed)	The SA and Coach work together to prepare for the review and use the checklist to guide activities.	Solution Architect Coach
2.3	Schedule Review Meeting (if needed)	The Coach schedules the meeting and ensures that this project Review is on the agenda	Coach
2.4	Conduct Review Meeting (if needed)	The Coach facilitates the review session.	Coach (facilitate) Review Team Solution Architect
2.5	Prepare / Update Architecture Review Outcomes (if needed)	The Coach updates the Review Report to document the outcomes of the meeting. See the Review Report deliverable description for more information If warranted, the Coach will escalate issues and risks to IT Steering	Coach

		The Solution Architect is responsible for addressing or mitigating the issues, risks, and recommendations included in the Review.	Solution Architect
2.6	Respond to Architecture Review Requests (if needed)		
2.7	Submit Review report to governance (if needed)	The Coach ensures that the SA has taken the appropriate action, updates the report, and submits it to the architecture governance body. If an exception is needed, the Coach escalates appropriately (e.g. to IT Steering).	Coach

Depending on the recommendations of the Review Report, the Review Team may request another meeting to confirm that the recommendations have been implemented in the solution. This 'Confirm' meeting typically happens during the Build/Deploy phase gate.

5. Review Checklist

Introduction

The Review Checklist is a list of questions by architecture domain that should be answered during the review process. Each of these questions represent an aspect of one or more of the four guiding principles. In more complex projects, the answers to some of these questions may be the starting point for more detailed analysis, and are not intended to represent the full set of possible questions answered during the architectural review.

Each domain represents a different view on the architecture of the project. These architecture views allow the project team to understand where the project outcomes fit 'in the big picture.' These views are generally used to help shape the solution blueprint.

Perspective	Questions each perspective will ask
Enterprise	✓ Are there any guiding principles or stated directions/strategies that can be applied to help make design decisions? ✓ What patterns, policies, and standards would be useful for this solution?
Mission	✓ What are the customer needs that this project is addressing? ✓ Who are the groups of customers that have this need? ✓ What processes are expected to change when this project is implemented? ✓ What criteria and metrics will be used to measure the success of the project? ✓ What services exist today that address that need? ✓ Can these services be incorporated into the solution design?
Application &	✓ Is there an existing reference architecture that can be used for this

Information	project?
	✓ What existing application building blocks provide functionality that is in the scope of the project?
	✓ What methods exist to integrate with these systems?
	✓ What data flows between applications, both internal to U-M and externally to third parties?
	✓ What is the expected lifecycle and timeframe for the project?
Information	✓ What are the information domains that are impacted by the project?
	✓ Where and who owns the source of truth for these domains?
	✓ What methods exist to access and leverage this type of information?
	✓ What is the data flow of the key data entities?
	✓ What is the data migration and conversion plan, if applicable?
	✓ If there is data being created, what is the lifecycle of the data and how is it being managed?
Data Assurance	✓ What mechanisms are used for authentication, authorization, logging/monitoring, availability, and asset protection?
	✓ What data have special assurance considerations and what are they?
	✓ What are the regulatory considerations for this project?
	✓ Are there any significant assurance risks in delivery and on-going operations of the project?
Infrastructure	✓ Is there an existing reference architecture that can be used for this project?
	✓ Does the project architecture complement long-term technology roadmaps?
	✓ What are the standard technologies, both industry and at U-M, that the solution can be build on or integrated with?
	✓ What are the assurance considerations of using these technology bricks?
	✓ How have others combined these bricks together to solve common infrastructure problems (what are the patterns)?

6. Project Engagement Questionnaire

This section discusses the initial questionnaire used to engage the architecture team. Once this document is submitted to the enterprise architecture department, an architecture coach will be assigned and the process described above will begin.

The questionnaire is intended to be a simple starting point and only has two sections:

1. Project overview
2. Solution architecture information

We understand that, depending on the stage of the project, much of this information will not yet be available. These sections should initially be filled in with as much information as is readily available, and additional information can be added at a later time.

Project Overview

- Provide a short overview of the project to provide context for the reviewers.
- Explain the needs that the project will solve. Include any changes to user processes.
- Provide any timeline targets or milestones and a summary of any costs and/or benefits.

Solution Architecture Information

- If you can describe or diagram the proposed architecture and any alternatives, do that here. Feel free to express the architecture in terms of one or more of the following: application, data, technology, data assurance/security.
- If you have a proposed architecture, describe some of the thinking that went into it. This can include:
  - Trades-offs (e.g. performance, scalability, maintainability, etc).
  - Important risks, concerns, and outstanding issues (and mitigation plans if they exist)
  - Dependencies with other technologies, both at U-M and with third parties.
  - Any assumptions used to make choices in the architecture.
- If you do not have a proposed architecture, leave this section blank and you can work with the Architecture Coach to get it filled out prior to the Architecture Review.
- Where you have the answer to any of the questions in the checklist in section 5, put those answers in the document.