Architecture Review Framework

Guidelines for Macmillan Learning Technology platforms

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# Version History

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| Date | Author | Version |
|  |  |  |
| 01/05/2016 | Dawit Lessanu | 1.0 |

# Architecture Review Overview

The Architecture Review process described in this document is a rigorous, repeatable, fact-based methodology to determine if solutions are properly designed for hosting within Macmillan Learning public cloud environment.

The Architecture Review Process focuses on 5 key areas:

* + Application Readiness
  + Customer Experience (as necessary)
  + Technical Requirements
  + Security Requirements
  + Cost

## Cloud Governance Principles

To the extent possible, the CFF will abide by the following principles.

* Solutions shall realize resilient architectures to ensure high availability and business continuity.
* Solutions will abide by security best practices and reside within a VPC unless otherwise approved.
* Solutions will be instrumented to provide operational health integrity and accelerate discovery of problems.
* Solutions will remain cloud-provider agnostic in order to minimize vendor lock-in
* Solutions should be fully automated with respect to:
  + Resource provisioning and testing
  + Software deployment and testing

# Upfront Architecture Review – Project SME/Team

Initial High-Level Questions and Document for project team to answer ahead of the architecture review meeting.

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| --- | --- |
| Criteria | Considerations |
| Solution can scale up & down | * Is the solution architected in such a way that it can be easily scaled up or down in an automated fashion? * Does the solution have tremendous elasticity demands? |
| Solution Logical Design | Are the logical components of the solution adhering to SOA design principles such as:   * Loosely coupled logic that can be scaled independently * Reusable and Composable logic * Statelessness (resilient state-management) * Proper retry logic * Logging and Robust Exception Handling |
| Cloud Managed Services | * Will the solution adopt SaaS, PaaS elements as part of the migration (e.g. AWS-RDS, SQS, SNS, SWF)? |
| Analytics | * Have the Analytics to be gathered as part of this solution been well defined for all activities? |
| Data Protection | * Data and operational security requirements must be considered (Authentication, Authorization, Encryption, SSL, Digital Signatures, RBAC, IAM, etc.) * Is any PIl data being stored in this solution? * Do PCI-DSS compliance regulations apply? |

|  |  |  |
| --- | --- | --- |
| Artifact | Description | Provided |
| Detailed Architecture diagram | A Visio or PDF file reflecting the proven solution architecture in greater detail than during the “cloud-ready” phase. | ☐ |

# Full Architecture Review Process Details

The architecture of any solution will determine the necessary software and infrastructure components. Architects have 2 choices:

* Private Cloud within a co-location datacenter
* Public Cloud within Amazon Web Services (AWS) - Virtual Private Cloud (VPC)

The ability for a solution to satisfy the following 5 factors will determine if the solution can be placed in the public or private cloud.

## Step 1: Assess Application Readiness

Assessing the readiness of a solution is the first step in the path to cloud. The following are considerations for an architects and solution SMEs to consider when designing a solution. The outcome of this activity should be a general sense of overall application design.

|  |  |
| --- | --- |
| Criteria | Considerations |
| Solution is virtualized | Is the solution currently virtualized? This may require a P2V exercise for some existing platforms. In some cases the P2V may not be automatic and must be carried out manually (e.g. Solaris to Linux migrations). Does the solution have prohibitions with the Xen Hypervisor? |
| Solution can scale up & down | Is the solution architected in such a way that it can be easily scaled up or down in an automated fashion?  Does the solution have tremendous elasticity demands? |
| Solution Logical Design | Are the logical components of the solution adhering to SOA design principles such as:   * Loosely coupled (supports resilient design) * Reusable and Composable logic * Statelessness (resilient state-management) |
| Cloud Managed Services | If solution is a candidate for cloud, will the solution adopt SaaS, PaaS elements as part of the migration (e.g. AWS-RDS, SQS, SNS, SWF)? |
| Solution Resilience (HA) | Can the solution handle partial failures of infrastructure or dependent components/applications (*retry or multi-path logic is key in cloud*)   * Does the system **demonstrate HA**? * Does the solution architecture mitigate the need for downtime for maintenance or upgrades?   Is there a threshold of acceptable downtime? |
| Special Needs Assessment | Are there unique business or technical requirements for the solution that may make public cloud inappropriate? |

### Activities:

* Architects and solution SMEs (for existing workloads) meet and discuss/document solution design and cloud considerations.

### Artifacts to be produced:

* None

## Step 2: Assess Customer Experience

The following are suggested business objectives that should be considered and will inform the decision to select on-premise or cloud for hosting solutions.

|  |  |
| --- | --- |
| Criteria | Considerations |
| Understanding the platform consumers | Who is the customer or dependent systems impacted by the solution? This should be demonstrated in the **test cases/plan** to be developed and **code coverage goals**.  Testing should measure overall system responsive (low latency) across all functionality (e.g. search, submissions, coursework)? |
| New Technology Adoption | If the solution is adopting new technology as a result of moving to the cloud:   * Identify the **business benefits of the new technology** solution compared to the existing or legacy technology? |
| SLA | Are internal **or external SLAs** available? |
| High Performance (time-based) |  |
| Responsive UX | Is the system able to effectively render information across device form factors? |
| Analytics | Have the Analytics to be gathered as part of this solution been well defined for all activities? |
| Accessibility Requirements | TBD |

### Activities:

* Architects will validate that the proposed architecture can provide concrete business benefits.
* Architects will validate that the solution is addressing analytics, accessibility and responsive design requirements and that overall customer experience will benefit from a highly available and responsive design.

### Artifacts to be produced:

|  |  |  |
| --- | --- | --- |
| Artifact | Description | Provided |
| Performance measures | **Baseline** performance metrics (if existing) for system-to-system dependencies where appropriate (usually measuring customer facing performance is a good indicator of overall system performance) | ☐ |

## Step 3: Assess Technical Requirements

Every solution considered for placement would have specific implementation details based on the workload requirements. The following criteria address the technical considerations to measure.

### Functional & Non-Functional Requirements

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| --- | --- |
| Criteria | Considerations |
| Compute Resources | What are the IaaS specification requirements expressed in cloud configurations (e.g. m3.xlarge – RAM, CPU/vCPU)? This is a right-sizing exercise and may take some experimentation. |
| Network Resources | * Does either solution pose limits on network bandwidth and speed required to support ingress and egress of data rates? (Load Balancers, Routers, DNS, switches etc.) * Are there specific transport (ssl) or network protocols or port/firewall requirements? * Have load balancers, DNS routing, IP Address ranges been determined? Consider that Load Balancers can take as many IP address spaces as there are compute nodes under management. |
| State-Management (*Caching*) Resources | - Does the solution require state-management?  - Have managed services such as AWS ElasticCache (memCacheD/Redis) been considered? |
| Storage Resources | - How much data is expected to be stored?  - Does the solution require file or block storage services?  - Performance requirements for storage?  - Is there backend database relational or non-relational requirements (e.g. AWS RDS)? |
| On-Premise Integration Considerations (*Search, Back-office, SSO, etc.)* | - Integration costs associated with dependencies must be identified. - Are there backend systems that you need to integrate with that are not publicly facing (e.g. SSO, ElasticSearch, etc.)?  - Are there other customizations necessary to run the solution?  - Can the backend/dependent systems (e.g. SSO) handle the expected load from the cloud? |
| Planned Growth | - Across each of the first 4 factors (above) what is the planned growth for the solutions. Compute can be auto-scaled (caches will grow in proportion to compute growth) but data/asset storage needs typically grow and do not shrink. |
| Monitoring and Instrumentation | How will operational tools monitor your workload either in the cloud or on-premise and what is the integration costs to instrument your workload? Be sure to include detailed monitoring as part of any cloud-based architecture. |
| Does the IT organization have the skills set to safely and responsibly manage the solution either on-premise or in the cloud? |

The following activities and artifacts will inform the decision for technical requirements.

### Automation Requirements (optional)

Automation imposes greater maturity on the SDLC through a greater emphasis on automating the provisioning, deployment and testing of both software and infrastructure. Furthermore, environmental parity throughout the SDLC (DEV, QA, STAGING, PRODUCTION) is critical to realize the predictable outcome promised by automation. Finally, automation is to provide increased IT/Business Agility for deploying new applications, features or conducting POCs.

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| Criteria | Considerations |
| Increasing IT agility to deploy new applications or POCs more quickly | * Does the current solution provide automation for deploying software, provisioning infrastructure and testing both? |
| Provisioning Infrastructure | * Are you automating provisioning of IT resources? This implies parity of provisioned resources across the SDLC environments (e.g. DEV, QA, STAGING). * Is resource provisioning approval being provided in an adequate fashion (on-premise/in-cloud)? |
| Environment Integrity | * Ensuring that provisioned resources are tested and secure will require automated infrastructure testing to be performed as part of any deployment/provision process. |
| Software Deployment | * Are you automating software deployments (Integration, QA and production)? * Does the solution have unit-tests with adequate code coverage? |
| Automated Testing | * Are other forms of software testing able to be performed? (e.g. Load/Stress, Component Failure, Failover-HA/DR) |

### Activities:

* Determine solution functional and non-functional requirements for proper sizing and architecture design resilience.
* Measure performance, resource utilization.
* Validate capacity assumptions.
* Evaluate maturity of solution automation.

### Artifacts to be produced:

|  |  |  |
| --- | --- | --- |
| Artifact | Description | Provided |
| Detailed Architecture diagram | A Visio or PDF file reflecting the proven solution architecture in greater detail than during the “cloud-ready” phase. | ☐ |
| Load Testing Outcomes | Measures collected while conducting performance testing to solution architecture under sustained load (x times production load) | ☐ |
| Automation Plan | A detailed plan describing degree of automation achieved or expected for solution (including process and tools used). | ☐ |

## Step 4: Assess Security Requirements

The following criteria collectively provide quality of service to the business and solution.

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| --- | --- |
| Criteria | Considerations |
| Security & Data Protection | Data and operational security requirements must be considered (Authentication, Authorization, Encryption, SSL, Digital Signatures, RBAC, IAM, etc.)   * Is any PIl data being stored in this solution? * Do PCI-DSS compliance regulations apply? |
| Hardening Virtual Machines | Are superfluous function locked down?   * Unused operating system services * Leverage private/public IP subnets * Lock-down ports * Security Groups (Root Privileges) * Access Control lists |

### Activities:

* Follow Security best practices for resources and access control levels.

### Artifacts to be produced:

|  |  |  |
| --- | --- | --- |
| Artifact | Description | Provided |
|  |  |  |
| Security, Monitoring and Support Plan | Double check that proper security procedures have been conducted. | ☐ |

## Step 5: Assess Total Cost of Ownership (TCO)

Architecture review will require a TCO analysis if, and only if:

1. One has not been performed for the existing cloud architecture
2. Recommended changes are introducing new/additional cloud resources

To execute an accurate cost analysis the cloud governance team needs:

* 1 Year cloud price estimates for the resources to be used for this architecture

|  |  |
| --- | --- |
| Criteria | Considerations |
| TCO | Has the application usage pattern, based on initial and projected business demand/growth been well understood? |
| Cost comparisons for TCO must be performed for a minimum of 1 year and incorporate planned growth. Compute resource requirements across SDLC states (Dev, integration, QA and staging) must be included. |
| Are there licensing costs associated with this solution stack? |

### Activities:

Perform a 1-year cost analysis for solution including infrastructure, licensing and automation spend.

### Artifacts to be produced:

|  |  |  |
| --- | --- | --- |
| Artifact | Description | Provided |
| 3-Year TCO | A spreadsheet detailing the 3-year CAPEX and OPEX spend for a solution. | ☐ |