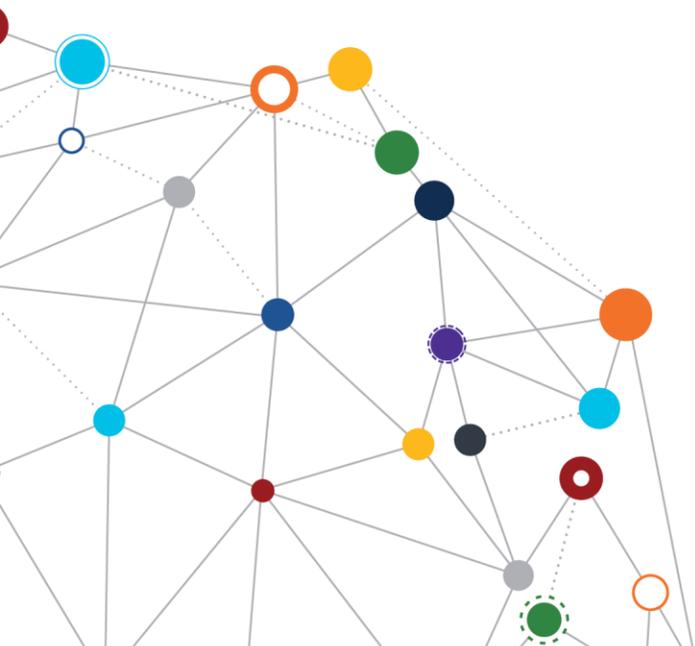


OFFICE OF
INFORMATION
AND TECHNOLOGY

Cloud Computing Architecture (CCA) Enterprise Design Pattern

Migration Framework

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VA



U.S. Department of Veterans Affairs
Office of Information and Technology



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Table 1: Change Matrix

| Version | Date | Description of Updates |
|---------|------|--|
| 1.0 | TBD | CCA Segment: Cloud Migration Framework document approved |



1 Context

A Cloud Migration Framework¹ at the Department of Veterans Affairs (VA) provides a clear roadmap to achieving *cloud requirements* through a *specific solution path*. In turn, VA can realize:

- Economies of scale
- Greater elasticity
- Greater resource efficiency
- Enhanced ability to maintain systems

2 Problem

The VA Office of Information and Technology (OIT) intends to continue to capitalize on marketplace developments to bring an improved level of agility and cost savings to VA. Accordingly, VA has shifted to a cloud-first approach, and project teams *must* determine an appropriate *solution path* to implement migration to the cloud.

This strategy supports Veteran initiatives, while complying with Federal mandates, such as the Federal Information Security Management Act (FISMA), the Federal Risk and Authorization Management Program (FedRAMP) for cloud service providers (CSPs), the Federal Information Technology Acquisition Reform Act (FITARA), and Section 508 of the Rehabilitation Act.

3 Approach

Actionable steps and planning recommendations are presented to project teams, assisting them in the determination of a cloud migration *solution path*. The information draws from various sources, including VA's information technology (IT) service offerings through the VA Enterprise Cloud (VAEC);² and the Enterprise Cloud Solutions Office (ECSO), that works with project managers and business owners to determine an application's suitability for the VAEC. Further guidance on cloud migration can be found in the *Transition to Cloud* Enterprise Design Pattern (EDP).³ In addition, ECSO provides information to project teams through the VAEC Concept of Operations (CONOPS)⁴ and VAEC Cloud Strategy Roadmap.⁵

¹ For information on the Cloud Migration Framework, refer to <https://aws.amazon.com/blogs/enterprise-strategy/6-strategies-for-migrating-applications-to-the-cloud/>.

² Refer to the VA Cloud First Policy, articulated within VA Directive 6517, *Cloud Computing Services*, at http://www.va.gov/vapubs/viewPublication.asp?Pub_ID=852&FType=2.

³ Refer to the *Transition to Cloud* EDP at <https://www.oit.va.gov/library/recurring/edp/index.cfm>.

⁴ Refer to the *VA Cloud Concept of Operations* (CONOPS), November 2018.

⁵ Refer to the *Department of Veterans Affairs Cloud Strategy Roadmap, FY18 & FY19*, May 9, 2018, at http://vistaadaptivemaintenance.info/va-cloud/VA_Cloud_Strategy-Roadmap-2018-2019.pdf.

3.1 Cloud Migration Framework Context

Project teams should consider a best practice migration path to meet cloud migration requirements. Table 2 provides details on each migration framework and the corresponding service models available for each.⁶

Table 2: Cloud Migration Framework Context

| Cloud Migration Framework | Definition | SaaS | PaaS | IaaS |
|--|---|------|------|------|
| Rehosting Lift-and-Shift | Lift-and-Shift is a strategy for moving an application or operation from one environment to another, without redesigning the app. In the Lift-and-Shift Approach, certain workloads and tasks can be moved from on-premises storage to the cloud; or data operations might be transferred from one data center to another. ⁷ | | X | X |
| Replatforming Lift-and-Reshape | Replatforming involves making a few cloud optimizations during migration, thereby shaping the application towards being cloud-native; this process utilizes a new cloud service provider (CSP) or non-CSP platform, as needed. ⁸ Replatforming may also include VA-acquired commercial off-the-shelf (COTS) or approved open source software tools that are hosted in a VAEC IaaS environment. | | X | X |
| Repurchasing Replace – Drop-and-Shop | Repurchasing can be the simplest, fastest, and least-risk method for running applications in the cloud. An organization can eliminate much migration effort and cloud set-up by directly consuming applications via a CSP marketplace. ⁹ This also includes the ability to utilize a self-managed cloud that is based on a COTS solution by the VAEC. | X | | |

⁶ For more information on cloud service models, refer to the *Software-as-a-Service (SaaS)*, *Platform-as-a-Service (PaaS)*, and *Infrastructure-as-a-Service (IaaS)* Enterprise Design Patterns (EDPs) at <https://www.oit.va.gov/library/recurring/edp/index.cfm>.

⁷ For more information on rehosting (Lift-and-Shift), refer to <https://whatis.techtarget.com/definition/lift-and-shift>.

⁸ For more information on replatforming (Lift-and-Shape), refer to <https://cloudsoft.io/migrating-to-aws-method-3-replatforming-aka-lift-and-shape/>.

⁹ For more information on repurchasing (Drop-and-Shop), refer to <https://cloudsoft.io/migrating-to-aws-method-1-repurchasing-aka-drop-and-shop/>.



| Cloud Migration Framework | Definition | SaaS | PaaS | IaaS |
|---|--|------|------|------|
| Refactoring Rewriting / Decoupling Applications | Refactoring enables a project team to break down a specific business process into smaller chunks; and support those chunks with new-generation, cloud-native applications that enable IT to quickly deploy new functionality that the project team and users need. ¹⁰ | | X | X |
| Retire | Retire is decommissioning an application and ending its utilization. | | | |
| Retain | Retaining an application means keeping an application “as is.” | | | |

3.2 Cloud Migration Framework Business Need and Business Case

The diagram in Figure 1 depicts a typical Cloud Migration Framework path that is recommended by one of the leading CSPs.

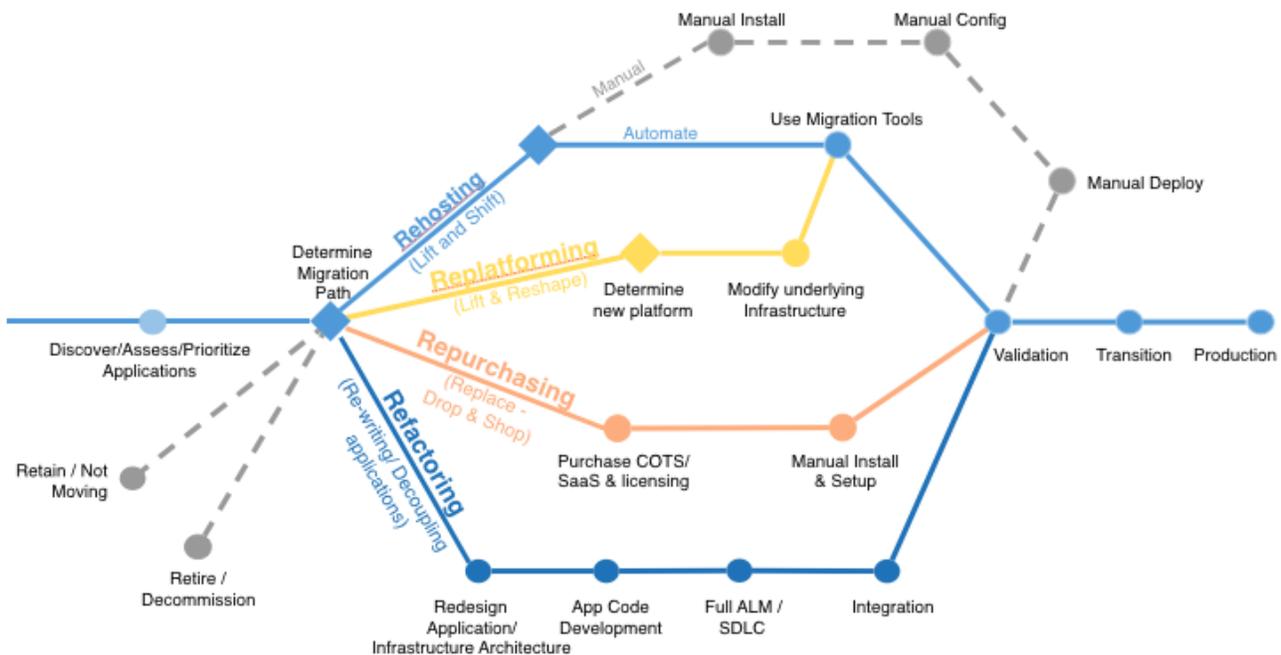


Figure 1 Cloud Migration Framework¹¹

¹⁰ For more information on strategies for migrating applications to the cloud, refer to <https://www.accenture.com/us-en/blogs/blogs-amod-bavare-keys-to-refactoring-cloud-migration>.

¹¹ Source: *The Cloud Migration Framework*, Stephen Orban, Amazon Web Services, November 2016, at <https://aws.amazon.com/blogs/enterprise-strategy/6-strategies-for-migrating-applications-to-the-cloud/>.



The typical business needs and business cases for the cloud migration paths that are depicted in Figure 1 are described in Table 3.

Table 3: Cloud Migration Business Need and Business Case

| Cloud Migration Framework | Business Need | Business Case |
|--|--|---|
| Rehosting Lift-and-Shift | <ol style="list-style-type: none"> 1. Migration Efficiency: There is preference for the fastest migration processing time available to meet application owner needs, with minimal code changes. 2. There are similar and more efficient application platform components and services available in the migrating cloud environment. | <ol style="list-style-type: none"> 1. Minimizing Total Cost of Ownership (TCO) is a key factor; in this scenario, TCO can offer the most savings for the corresponding application(s) or environment. 2. Minimal downtime is a priority to meet end user and stakeholder needs. There are significant time constraints; moving the environment quickly is a top priority. |
| Replatforming Lift-and-Reshape | <ol style="list-style-type: none"> 1. Platform Obsolescence: The current platform is outdated; the application is not efficient. The project team has encountered the following: <ol style="list-style-type: none"> a. Vendor discontinuity or lack of support b. Scarcity of available technical resources required to support application c. Performance/scalability/reliability issues 2. Assuming there is vendor support, the application response time is suboptimal and needs to improve. | <ol style="list-style-type: none"> 1. PaaS and IaaS (CSP service models or VAEC hosted service models) facilitates the ease and efficiency of setting up the environment/application for development and testing environments. 2. Costs (maintenance, licenses, software upgrading) increase with ongoing lifecycle for keeping environment on premise. |
| Repurchasing Replace – Drop-and-Shop | <ol style="list-style-type: none"> 1. End users and stakeholders need end-to-end holistic and enhanced business capabilities; and advanced technical features, such as self-service, ubiquitous omni channel/multi-device access, regionalization, etc. 2. Application owners need a more modern system, with flexibility to | <ol style="list-style-type: none"> 1. Software as-a-Service (SaaS) model or COTS acquisition, hosted on VAEC, places the least amount of responsibilities on the consumer; as the service provider (CSP or VAEC) manages most of the post-migration environment, product |



| Cloud Migration Framework | Business Need | Business Case |
|---|--|---|
| | <p>extend functionality. Advantages include the following (as implementation of change requests for even minor enhancements to current apps are cost-prohibitive):</p> <ol style="list-style-type: none"> a. Ease of ongoing maintenance b. Scalability c. Regionalization d. User friendly interface e. Integration to external systems <p>3. Application needs to be replaced as it reaches end-of-life. Application was built to leverage a specific platform that is now obsolete.</p> | <p>enhancements, and maintenance of the cloud environment.</p> <p>2. Go to the market strategy to counter competition and to quickly address changing market needs, such as demanding customer requirements and geographic expansion. SaaS offers a faster setup and roll-out of existing and new product solutions with minimal effort.</p> |
| <p>Refactoring Rewriting / Decoupling Applications</p> | <ol style="list-style-type: none"> 1. Application owners need to conduct end-to-end rewrite of application by leveraging modern and more efficient cloud native technologies/design patterns. 2. Long term efficiency of application requires migration to cloud environment, due to the following: <ol style="list-style-type: none"> a. Performance issues b. Lack of flexibility c. Tightly coupled functions d. End user friendly interface e. Limited integration with internal and external systems for data sharing/collaboration | <ol style="list-style-type: none"> 1. Long term costs can be transferred from Capital Expenditures (CAPEX) to Operational Expenditures (OPEX). 2. Resources are available to allocate to a longer and more rigorous end-to-end process that will increase functionality for application owners and increase performance for end users and stakeholders. |



| Cloud Migration Framework | Business Need | Business Case |
|---------------------------|--|--|
| Retire | <ol style="list-style-type: none"> 1. Application is no longer relevant and is superseded by a different application. 2. Standalone application has limited number of users. | <ol style="list-style-type: none"> 1. Application is no longer heavily utilized and is gradually decommissioned. 2. TCO, including maintenance, exceeds benefits; retiring has minimal impact on users or stakeholders. |
| Retain | <ol style="list-style-type: none"> 1. Application has satisfied users and stakeholders. 2. High performing, mission critical application, with numerous internal and external dependencies, has no immediate need to migrate. 3. There is no guarantee that same service level agreements (SLAs) can be maintained under the cloud. | <ol style="list-style-type: none"> 1. Transition to cloud is too costly or difficult. Complex applications will take significant effort and time to migrate to cloud. 2. Application is required, but is deemed too complex to move to the cloud. A future application can potentially replace it. |

The following includes potential risks aligned with each migration path:

- Rehosting – The migrated environment may not function as well as the pre-migration environment:
 - There may be dependent systems/applications that are still not migrated to cloud.
 - The transition period may be longer, depending on performance /migration issues.
 - The user interface/interaction process may need to be rearchitected or redesigned to take advantage of Cloud.
- Replatforming – Lack of vendor support may cause difficulties with the migration:
 - Vendor proprietary technologies may prolong migration time.
- Repurchasing – May lose customized features that were available in the pre-migration environment:
 - Newly introduced, automated processes may cause organizational issues for quicker adoption – cultural /technical /process.
 - There may be a need for innovative ways to control the change management – communications/education.
 - There may be a need for upfront business requirement analysis to prevent implementing unwanted modules.
- Refactoring – May be more complicated than originally planned, causing schedule delays



- Retire – May need to replicate functionality from legacy applications that were retired:
 - There may be a need to rebuild new interfaces with the existing systems.
 - Data migration from legacy data technologies may pose a significant challenge.
 - User adoption to newly introduced apps for current functionality may need retraining.
- Retain – May have negative impacts on the budget in the long term, as opposed to migrating to the cloud:
 - Budget concerns may include ongoing/recurring infrastructure costs, product licensing, and vendor support.

4 Impacts

If a cloud migration process is not performed, the following are potential pitfalls:

- Higher capital expenditure costs (CapEx)
- Lower computing power
- Less scalability

Appendix A: References

- 6 Strategies for Migrating Applications to the Cloud:
<https://aws.amazon.com/blogs/enterprise-strategy/6-strategies-for-migrating-applications-to-the-cloud/>
- Cloud Computing Architecture EDP:
https://www.oit.va.gov/library/programs/ts/edp/cloud/CloudComputingArchitecture_V1.pdf
- Cloud First Policy:
http://www.va.gov/vapubs/viewPublication.asp?Pub_ID=852&FType=2
- Cloud Security EDP:
https://www.oit.va.gov/library/programs/ts/edp/privacy/CloudSecurity_V1.pdf
- DEA User Stories:
<https://vaww.portal2.va.gov/sites/asd/TechStrat/IPTS/SitePages/Home.aspx>
- Decision Point for Choosing a Cloud Migration Strategy for Applications
<https://www.gartner.com/document/3893681?ref=TypeAheadSearch&qid=829248fc6784c5682affbac5>
- Disaster Recovery as a Service EDP:
https://www.oit.va.gov/library/programs/ts/edp/itsm/DisasterRecoveryAsAService_V1.pdf
- ECSM EDP:
https://www.oit.va.gov/library/programs/ts/edp/cloud/EnterpriseCloudServiceManagement_v2.pdf
- ECSO Service Request: <https://vaww.portal.va.gov/sites/ECS/SitePages/ECS-Request-Form.aspx>
- FedRAMP: <https://www.fedramp.gov/>
- Handbook 6500:
https://www.va.gov/vapubs/viewPublication.asp?Pub_ID=793&FType=2
- Infrastructure as a Service (IaaS) Service Provider Selection EDP:
https://www.oit.va.gov/library/files/edp/iaas/iaaSEDP_ServiceProviderSelection_v1.pdf
- Platform as a Service (PaaS) EDP:
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- VA Cloud Security Handbook, VA Directive 6517:
https://www.va.gov/vapubs/viewPublication.asp?Pub_ID=853&FType=2
- VA Cost Benefit Analysis Template:
https://www.va.gov/PROCESS/artifacts/cost_benefit_analysis_template.docx
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- VA Enterprise Architecture: <https://www.ea.oit.va.gov/>
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- VAEC: <https://vaww.portal.va.gov/sites/ECS/SitePages/VA-Enterprise-Cloud-VAEC.aspx>
- VAEC Technical Reference Guide for Acquisition Support:
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- VA Cloud Strategy Roadmap, FY18 & FY19, April 2018
- VASI Dashboard:
<http://vaausappdar401.aac.dva.va.gov/views/VAETargetPortfolios/VATargetPortfolioDashboard?iid=1&isGuestRedirectFromVizportal=y&:embed=y>
- VEAR: <https://vaausdarapp82.aac.dva.va.gov/ee/request/home>

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