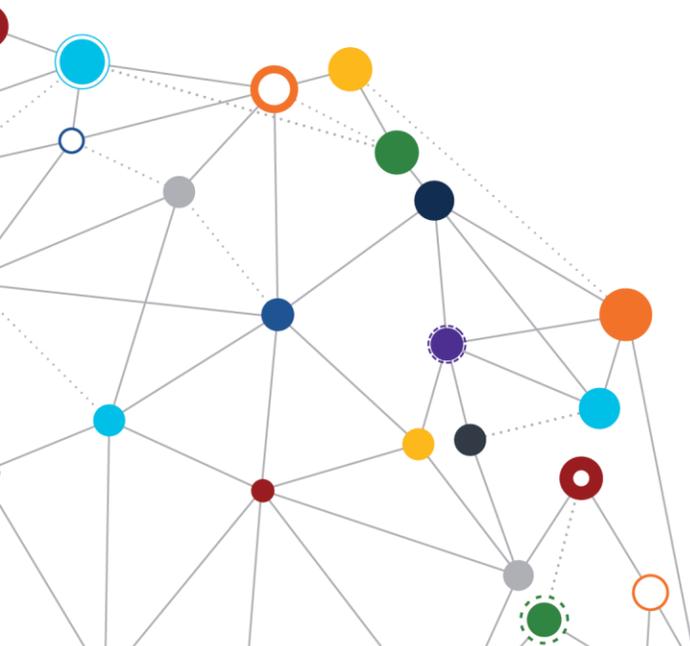


OFFICE OF
INFORMATION
AND TECHNOLOGY

Cloud Computing Architecture Enterprise Design Pattern

VAEC GovCloud Deployment Model

April 2019 | Enterprise Program Management Office



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	02/2019	Cloud Computing Architecture EDP Segment 2 document approved



1 Context

A Government Cloud (GovCloud) Deployment Model enables the Department of Veterans Affairs (VA) to host sensitive data and regulated workloads in the cloud, while meeting Government compliance requirements¹ and achieving economies of scale, greater elasticity, greater resource efficiency, and better ability to maintain systems. This Enterprise Design Pattern (EDP) segment is intended for project managers, business analysts, cloud subject matter experts, and other stakeholders interested in *utilizing GovCloud computing resources*.

2 Problem

As VA shifts to a Cloud First approach, project teams are challenged with *identifying best practices for utilization of GovCloud*. The VA Enterprise Cloud (VAEC) GovCloud is included as part of VA's information technology (IT) service offerings through the VAEC, the hosting environment for all cloud applications. The Enterprise Cloud Solution Office (ECSO) works with project managers and business owners to determine an application's suitability for the VAEC and plan for migration, as it is the governing authority for utilization of all VA cloud assets, including Amazon Web Services (AWS) and Microsoft Azure Government (MAG). The January 2018 *Cloud First Policy Memorandum*² and the January 2019 *VAEC Policy Memorandum*³ support the Cloud First requirement and the VAEC for new application development, testing, and production. For guidance on selecting VAEC AWS or VAEC Azure, refer to *IaaS EDP segment, Service Provider Selection, IaaS Draft Decision Tree*.⁴

3 Approach

The VAEC offers on-demand self-service, broad network access, resource pooling, elasticity, and a measured service. Currently, the VAEC has VAEC GovCloud environments in the AWS

¹ Refer to information on Federal Information Technology Acquisition Reform Act (FITARA) at <https://www.nist.gov/sites/default/files/documents/2017/05/11/doc2017financialmanagementconference-fitara.pdf>; Federal Risk and Authorization Management Program (FedRAMP) for CSPs at <https://www.fedramp.gov/cloud-service-providers/>; Federal Information Security Management Act (FISMA) at <https://iase.disa.mil/fisma/Pages/index.aspx>; VA Performance Goals and Objectives Report (2018-2024), an electronic spreadsheet that outlines VA's performance goals aligned to objectives, at <https://vaww.ea.oit.va.gov/strategic-domain-models-reports/>; and the Cloud First Policy, articulated within VA Directive 6517, *Cloud Computing Services*, at http://www.va.gov/vapubs/viewPublication.asp?Pub_ID=852&FType=2.

² Source:

<https://vaww.portal.va.gov/sites/ECS/Shared%20Documents/Cloud%20101/FY18%20Cloud%20Policy%20180116.pdf>.

³ Source:

<https://vaww.portal.va.gov/sites/ECS/Shared%20Documents/Cloud%20101/VAEC%20First%20Policy%20Memo%2007-Jan-2019.pdf>.

⁴ Refer to the IaaS EDP segment, *Service Provider Selection*, at <https://www.oit.va.gov/library/recurring/edp/index.cfm>.

GovCloud and the MAG GovCloud.⁵ It is mandated that project teams prioritize using the VAEC GovCloud for their cloud deployment approach, when using a public cloud.

3.1 Reference Architecture

Project teams implementing a VAEC GovCloud deployment **must** utilize VAEC-AWS or VAEC-Azure Reference Architecture, as outlined by VAEC. The VAEC-AWS Environment consists of environments within one geographic region, with multiple availability zones provided by the VAEC-AWS GovCloud. The VAEC-Azure Environment consists of two environments within two geographic regions.⁶ For detailed graphics of the VAEC AWS and Azure Simplified Reference Architectures from the ECSO, consult the VAEC-AWS Architecture and VAEC-Azure Architecture sections in the VAEC Technical Reference Architecture for Acquisition Support.⁷

The VAEC-AWS and VAEC-Azure Reference Architectures provide the same core services from each cloud service provider (CSP); the design minimizes differences between the cloud providers as much as possible, within the constraints of each CSP.⁸

The list of general support services (GSS) tools and services can be found on the VAEC website.⁹ The VAEC Utilization of GSS Authority to Operate (ATO) from ECSO is in the VAEC Technical Reference Architecture for Acquisition Support.¹⁰ Project teams inherit the following benefits in using VAEC-AWS and VAEC-Azure for VAEC GovCloud deployment.¹¹

- **Authority to Operate (ATO):** VA grants each GSS an ATO to enable VA to migrate other applications and/or businesses to either VAEC-AWS or VAEC-Azure Clouds. This allows project teams to leverage established security controls, processes, and operations from GSS.
- **Security:** AWS and Azure GSS provides secure and scalable security and core services to VA.

⁵ For more information on VAEC, refer to the VAEC SharePoint Site at <https://vaww.portal.va.gov/sites/ECS/SitePages/Home.aspx>.

⁶ Source: *VAEC Technical Reference Architecture for Acquisition Support*, Version 1.3, July 2018, at <https://vaww.portal.va.gov/sites/ECS/Shared%20Documents/Cloud%20101/VAECTechnicalReferenceArchitectureAcquisitionSupport.docx>.

⁷ Refer to the VAEC Technical Reference Architecture for Acquisition Support, Version 1.3, July 2018, at <https://vaww.portal.va.gov/sites/ECS/Shared%20Documents/Cloud%20101/VAECTechnicalReferenceArchitectureAcquisitionSupport.docx>.

⁸ Source: *VA Cloud Concept of Operations (CONOPS)*, November 2018.

⁹ Refer to the VAEC website at <https://vaww.portal.va.gov/sites/ECS/SitePages/VA-Enterprise-Cloud-VAEC.aspx>.

¹⁰ Refer to the *VAEC Technical Reference Architecture for Acquisition Support*, Version 1.3, July 2018, at <https://vaww.portal.va.gov/sites/ECS/Shared%20Documents/Cloud%20101/VAECTechnicalReferenceArchitectureAcquisitionSupport.docx>.

¹¹ Refer to the VAEC Technical Reference Architecture for Acquisition Support, Version 1.3, July 2018, at <https://vaww.portal.va.gov/sites/ECS/Shared%20Documents/Cloud%20101/VAECTechnicalReferenceArchitectureAcquisitionSupport.docx>.

3.2 VAEC GovCloud Application Design Guidelines

Project teams utilizing a VAEC GovCloud deployment must consider the guidance available in the most current VA Cloud Strategy Roadmap,¹² the VAEC Concept of Operations (CONOPS),¹³ and the VAEC Technical Reference Guide for Acquisition Support.¹⁴ The design guidelines and corresponding guidance in Table 2 pertain to overall goals and guidance on service level agreements (SLAs), availability, and ATO.

Table 2: Design Guidelines

Design Guideline	Source	Attributes	Guidance
Align to the VA Cloud Goals	VA Cloud Strategy Roadmap	Build the foundation for the VAEC capability.	<ul style="list-style-type: none"> Project teams should prioritize general support services (GSS) and VA Enterprise Cloud (VAEC) Government Cloud (GovCloud) resources toward cloud migration. Project teams must choose a migration path and corresponding service model, per the Cloud Computing Architecture (CCA) Migration Framework Enterprise Design Pattern (EDP) segment.¹⁵ Additional guidance on service models can be found in the Software-as-a-Service (SaaS),¹⁶ Platform-as-a-Service (PaaS),¹⁷ and Infrastructure-as-a-Service (IaaS) EDPs.¹⁸

¹² 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.

¹³ Source: VA Cloud Concept of Operations (CONOPS), November 2018.

¹⁴ Refer to the *VAEC Technical Reference Guide for Acquisition Support*, Version 1.3, July 2018, at <https://vaww.portal.va.gov/sites/ECS/Shared%20Documents/Cloud%20101/VAECTechnicalReferenceArchitectureAcquisitionSupport.docx>.

¹⁵ Refer to the *CCA Migration Framework Segment EDP* at <https://www.oit.va.gov/library/recurring/edp/index.cfm>.

¹⁶ Refer to the SaaS EDP at <https://www.oit.va.gov/library/recurring/edp/index.cfm>

¹⁷ Refer to the PaaS EDP at <https://www.oit.va.gov/library/recurring/edp/index.cfm>.

¹⁸ Refer to the IaaS EDP at <https://www.oit.va.gov/library/recurring/edp/index.cfm>.



Design Guideline	Source	Attributes	Guidance
Align to the VA Cloud Goals	VA Cloud Strategy Roadmap	Expediently introduce new, innovative capabilities and services for Veterans.	Project teams must leverage VAEC capabilities to build the required migration resources, such as cloud native tool sets, migration project management, and governance tools.
Align to the VA Cloud Goals	VA Cloud Strategy Roadmap	Ensure Veteran and VA data privacy and security in the cloud.	Project teams must ensure VA data privacy and security by utilizing VA Technical Reference Model (TRM)-approved cloud security tools. Also, refer to the directives in the <i>Cloud Computing Security</i> EDP ¹⁹ and the Identity and Access Management (IAM) EDP Segments. ²⁰
Assess CSP SLAs	VAEC CONOPS	Analyze the CSP's SLAs to understand the distinction between CSP and VA responsibility, as it pertains to availability.	Project teams must assess the CSP SLA contract design documents to understand the various SLA requirements, delineation of CSP/VA responsibilities, and the system impact due to non-availability.
Assess CSP SLAs	VAEC Technical Reference Guide for Acquisition Support	Each VAEC environment provides access to standard services provided in accordance with the CSP's standard SLAs between VA and the CSP (VAEC Standard SLAs).	Project teams must review the VAEC CSP GovCloud standard SLAs and design/architect their application components to conform to those SLA's.
Assess CSP SLAs	VAEC Technical Reference Guide for Acquisition Support	If the VA requirements for a given application/solution require more stringent SLAs between VA and the project team (Project SLAs), it is the responsibility of the project team to meet all requirements, using the VAEC	Project teams must design and build application components by incorporating the required design capabilities and interfaces to conform to VAEC standard SLAs.

¹⁹ Refer to the *Cloud Security* EDP at <https://www.oit.va.gov/library/recurring/edp/index.cfm>

²⁰ Refer to the *IAM* EDP segments at <https://www.oit.va.gov/library/recurring/edp/index.cfm>.



Design Guideline	Source	Attributes	Guidance
		Standard SLAs. This may require the project team to architect, deliver, and ensure that the required, more stringent project SLAs are met, using the VAEC Standard SLAs; and maintain this as it changes over time.	
Assess the availability of AWS and Azure.	VAEC CONOPS	Engineers should design to high availability by implementing controls to mitigate the risks of physical hardware failure within the CSP. Amazon and Microsoft SLAs do not account for high availability.	<ul style="list-style-type: none"> Project teams must assess the availability requirements, such as Recovery Point Objective (RPO) and Recovery Time Objective (RTO) to design, build and test application components that address worst case scenarios. Additional details concerning availability can be leveraged from the Business Impact Analysis (BIA) EDP²¹ and the Disaster Recovery-as-a-Service (DRaaS) EDP.²² For guidance on selecting VAEC-AWS or VAEC-Azure, refer to the <i>IaaS</i> EDP segment, <i>Service Provider Selection</i>, <i>IaaS</i> Draft Decision Tree.²³
Obtain ATO	VAEC Technical Reference Guide for Acquisition Support	The VAEC CSP Environments all have a FedRAMP High Certified VA ATO. VAEC provides access to the FedRAMP certified services of each CSP. Upon request, non-	Project teams should use the existing documentation as part of their ATO package when using VAEC GovCloud (a provider with FedRAMP ATO). The project must still complete controls for anything within the system boundary that is

²¹ Refer to the BIA EDP at <https://www.oit.va.gov/library/recurring/edp/index.cfm>.

²² Refer to the DRaaS EDP at <https://www.oit.va.gov/library/recurring/edp/index.cfm>.

²³ Refer to the IaaS EDP segment, *Service Provider Selection*, at <https://www.oit.va.gov/library/recurring/edp/index.cfm>.



Design Guideline	Source	Attributes	Guidance
		certified services can be made available.	not covered by the authorized service. Note that using an approved enterprise shared service (ESS) lowers the approval burden.
Obtain ATO	VAEC Technical Reference Guide for Acquisition Support	The ATO for an application residing in the VAEC is separate from the VAEC CSP Environment ATO. Each project team is responsible for its application level ATO.	Project teams should use the existing documentation as part of their ATO package when using VAEC GovCloud (a provider with FedRAMP ATO).

3.3 VAEC GovCloud Deployment

Project teams must follow a sequence of steps to implement a successful VAEC GovCloud deployment, while considering internal VA resources (displayed in purple boxes), as shown in Figure 1.

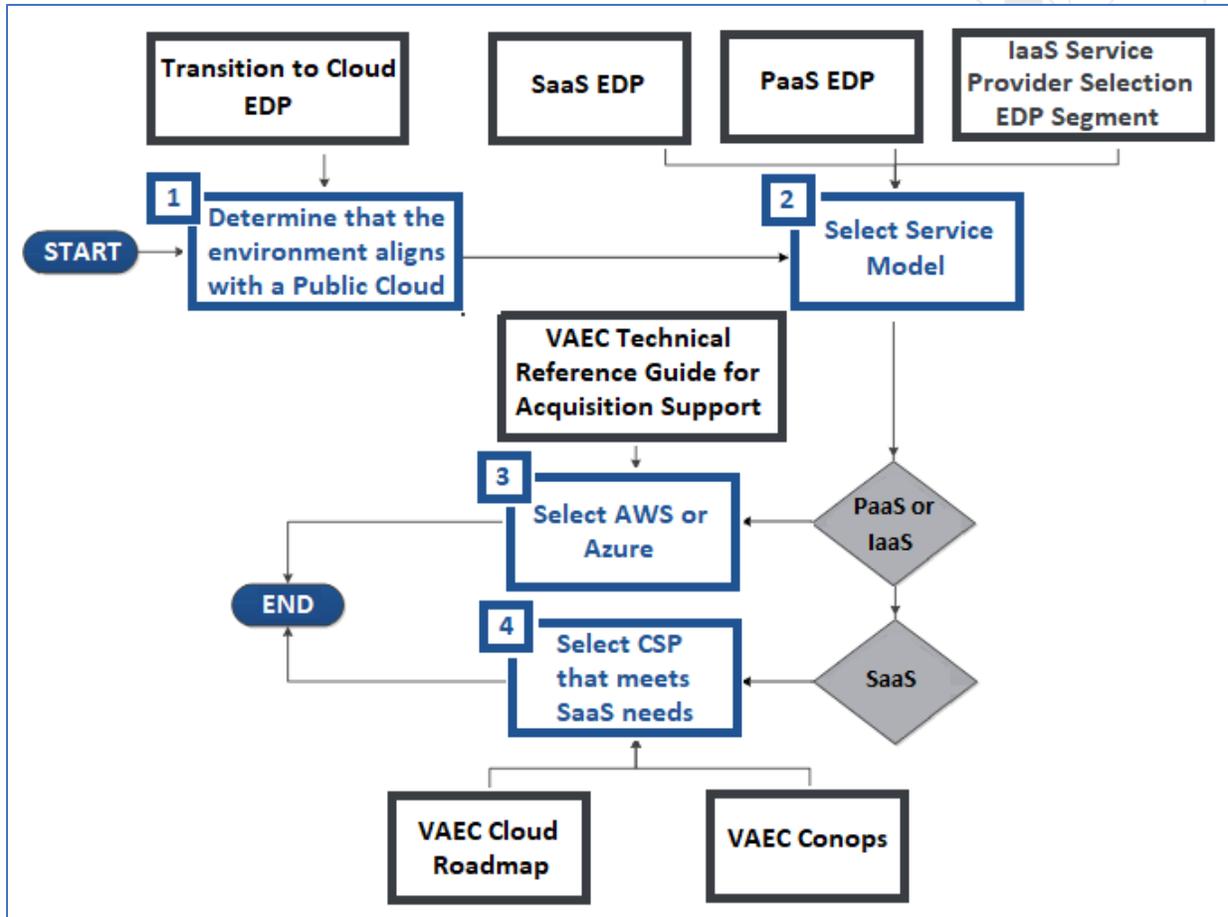


Figure 1: Steps for VAEC GovCloud Deployment²⁴

1. Determine that the environment aligns with a VAEC GovCloud Deployment.
 - a. Refer to “Key Attributes of a Transition to Cloud Framework” in the *Transition to Cloud EDP*.²⁵
 - b. Project teams must verify that the environment and supporting infrastructure can be managed by the CSP.
2. Select an appropriate service model that aligns with the needs of the current environment.
 - a. If project teams have verified a need for the CSP to control the entire deployment process, software-as-a-service (SaaS) will be required. Refer to “Key

²⁴ Source: Figure 1 was created by the VA Office of Information and Technology (OIT) Architecture and Engineering Service (AES) Enterprise Design Pattern (EDP) Team from information obtained from VA OIT IAM Subject Matter Experts (SMEs).

²⁵ Refer to the *Transition to Cloud EDP* at <https://www.oit.va.gov/library/recurring/edp/index.cfm>.

Attributes of Software-as-a-Service” in the *SaaS* EDP for more detailed guidance.²⁶

- b. Proceed to Step 4.
3. Select AWS or Azure if platform-as-a-service (PaaS) or infrastructure-as-a-service (IaaS) is needed, per VAEC guidance.
 - a. If project teams have verified a need to own the data and applications, a PaaS is required. Refer to the “Future Capabilities” section of the *PaaS* EDP for more detailed guidance.²⁷
 - b. If project teams have verified a need to own applications, data, run time, middleware, and an operating system, an IaaS is required. Refer to the *IaaS Service Provider Selection* EDP.²⁸
 - c. Refer to “VAEC-AWS Amazon Web Services (AWS) Introduction” and “VAEC-Azure Introduction” of the *VAEC Technical Reference Guidance and Acquisition Support*²⁹ for a technical breakdown of available resources in both the VAEC-AWS and VAEC-Azure environments.
4. Select the CSP that meets SaaS needs, is sanctioned by VAEC, and adheres to VA requirements for cloud computing and security.
 - a. Utilize the “CONOPS Scenarios” of the VAEC CONOPS.³⁰
 - b. Utilize the “RoadMap” of VAEC Strategy Roadmap.³¹

4 Impacts

A comprehensive list of impacts that are possible when cloud migration is not implemented may be found in the “Cloud Migration Framework Business Case and Business Need” of the *CCA Migration Framework* EDP Segment.³² If VAEC GovCloud is not utilized, the following are potential pitfalls:

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

²⁶ Refer to the *SaaS* EDP at <https://www.oit.va.gov/library/recurring/edp/index.cfm>.

²⁷ Refer to the *PaaS* EDP at <https://www.oit.va.gov/library/recurring/edp/index.cfm>.

²⁸ Refer to the *IaaS Service Provider Selection* EDP at <https://www.oit.va.gov/library/recurring/edp/index.cfm>.

²⁹ Refer to the *VAEC Technical Reference Guide for Acquisition Support*, Version 1.3, July 2018, at <https://vaww.portal.va.gov/sites/ECS/Shared%20Documents/Cloud%20101/VAECTechnicalReferenceArchitectureAcquisitionSupport.docx>.

³⁰ Source: *VA Cloud Concept of Operations (CONOPS)*, November 2018.

³¹ 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.

³² Refer to the *CCA Migration Framework* EDP Segment at <https://www.oit.va.gov/library/recurring/edp/index.cfm>.



Appendix A: References

- 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>
- 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
- January 2018 Cloud First: <https://vaww.portal.va.gov/sites/ECS/Shared%20Documents/Cloud%20101/FY18%20Cloud%20Policy%20180116.pdf>
- January 2019 VAEC First: <https://vaww.portal.va.gov/sites/ECS/Shared%20Documents/Cloud%20101/VAEC%20First%20Policy%20Memo%2007-Jan-2019.pdf>
- Transition to Cloud EDP: https://www.oit.va.gov/library/programs/ts/edp/cloud/TransitiontoCloud_V1.pdf
- TRM: <http://trm.oit.va.gov/>
- VA Available Cloud Training: <https://vaww.portal.va.gov/sites/ECS/SitePages/Cloud-Training.aspx>
- 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



- VA Digital Modernization Strategy, April 11, 2018 VA Directive 6551:
https://www.va.gov/vapubs/viewPublication.asp?Pub_ID=829&FType=2
- VA Enterprise Architecture: <https://www.ea.oit.va.gov/>
- VAEC: <https://vaww.portal.va.gov/sites/ECS/SitePages/VA-Enterprise-Cloud-VAEC.aspx>
- VA Cloud Concept of Operations (CONOPS), November, 2018
- VAEC Technical Reference Guide for Acquisition Support:
<https://vaww.portal.va.gov/sites/ECS/Shared%20Documents/Cloud%20101/VAECTechnicalReferenceArchitectureAcquisitionSupport.docx>
- VA Cloud Strategy Roadmap, FY18 & FY19, May 9, 2018:
http://vistaadaptivemaintenance.info/va-cloud/VA_Cloud_Strategy-Roadmap-2018-2019.pdf.
- VASI Dashboard:
<http://vaausappdar401.aac.dva.va.gov/views/VAEATargetPortfolios/VATargetPortfolioDashboard?iid=1&isGuestRedirectFromVizportal=y&embed=y>
- VEAR: <https://vausdarapp82.aac.dva.va.gov/ee/request/home>

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