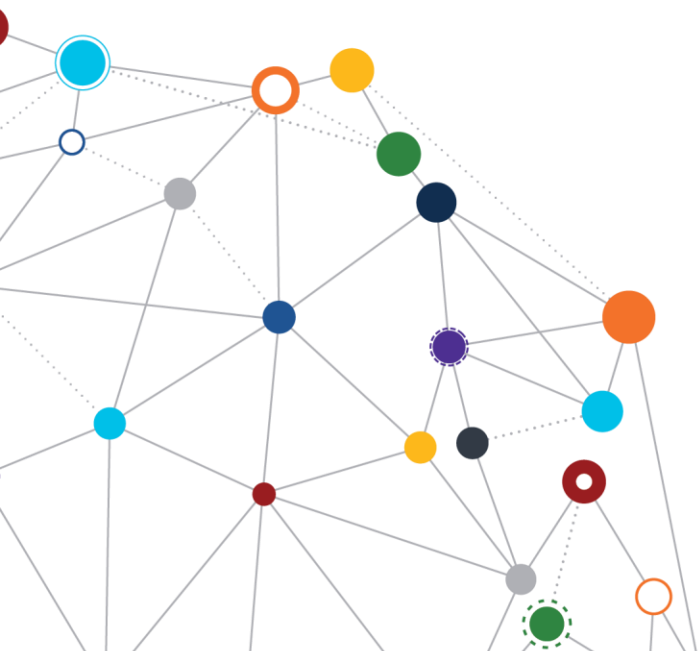# Application Programming Interface (API) Enterprise Design Pattern

API Release Standard

June 2018 | Demand Management Division

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	6/29/2018	API EDP Segment 2 document approved

1   Context

Application programming interfaces (APIs) enable business agility across the Department of Veterans Affairs (VA). The practice of consistently applying standard approaches to developing and releasing APIs enables VA project teams to adapt to change, implement new capabilities, and reuse existing capabilities. The outcome provides the ability to efficiently and expeditiously enhance valuable information technology (IT) functionality to the VA community, improving services to our Nation's Veterans.

2   Problem

Currently, there are challenges in adopting, developing, and implementing APIs within VA. This includes a lack of centralized resources and standardized methods for indexing, accessing, and invoking APIs.

3   Approach

To resolve these issues, VA must establish API standard architectural guidance and practices for API implementation, development, testing, inventorying, and publishing across the enterprise.

3.1 Implementation Tasks

When implementing APIs and the associated services,[1] project teams should consider the following:

- Consult the VA API inventory/repository[2] during architectural and design activities to investigate options for reusing existing APIs.
- Create example code for subsequent teams to reuse the API in the future. Project teams should also begin documenting the API[3] and creating training material.

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[1]The API is an interface to services that perform the IT processing and management.
[2]References available in VEAR at https://vaausdarapp41.aac.dva.va.gov/ee/request/filter?id=29247&pageSize=20, Enterprise GitHub, and at http://api.va.gov, in the future.
[3]Reference: *API EDP Segment, API Documentation Standard*, https://www.oit.va.gov/library/files/edp/apis/APIEDP_DocumentationStandard_v1.pdf.

- Implement the service or services that the API calls in a scalable manner through the VA Enterprise Cloud (VAEC) to support VA enterprise and partner adoption.[4]
- When using open data or third-party APIs, follow the security guidelines and implementation practices offered by the providing organization.
- Where possible, use standard data interchange formats in API implementations (e.g., JavaScript Object Notation (JSON), Extensible Markup Language (XML)).
- Design APIs with the technical safeguards specified by the Health Insurance Portability and Accountability Act (HIPAA) of 1996 and its subsequent rulings. Implement procedures and controls specified in NIST Special Publication 800-66 Rev 1, *An Introductory Resource Guide for Implementing the Health Insurance Portability and Accountability Act (HIPAA) Security Rule*.[5] This will ensure that API data exchanges properly handle protected health information (PHI), personally identifiable information (PII), and personal health records (PHR).
- Use authentication for API communications and connections. Further details will be provided in a separate API EDP segment.
- Align project efforts that invoke or consume APIs with VA initiatives, strategy, and governance.[6]
- Align implementation to agile value processes, including epics and user stories.[7]

3.2 Tools

API tools assist in creating, defining, and testing APIs. These tools also help generate API documentation, manage API access and usage policies, and debug the API codebase. In using these tools, VA project teams should:

- Where possible, use RESTful APIs and document them, using attributes in the OpenAPI specifications.[8]

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[4]For more information on cloud implementation, reference the Platform-as-a-Service (PaaS) EDP at https://www.oit.va.gov/library/programs/ts/edp/cloud/PlatformasaService_v1.pdf.
[5]Reference: NIST SP 800-66 Rev 1 at https://csrc.nist.gov/publications/detail/sp/800-66/rev-1/final, October 2008.
[6]Example: VA Digital Modernization Strategy, April 11, 2018.
[7]Reference: Section 4 for more detail on select, relevant user stories.
[8]Information on OpenAPI specification is referenced at https://github.com/OAI/OpenAPI-Specification.

- Use GitHub as a source code repository and community site for VA projects. Where possible, in accordance with Office of Management and Budget (OMB) Memorandum 16-21[9], use the public VA GitHub presence[10] to promote open source initiatives. Otherwise, use the GitHub Enterprise service.[11]
- Prior to deployment and inventory placement, deploy sandboxes, virtual environments, and testing tools to aid developers in testing API functionality.

3.3 Testing

VA projects should test APIs according to the following guidelines:

- Ensure API implementations are testable, both as individual functional service units, and as an integrated service. Run testing before each commit to the software's source code repository and before each release.
  - o Develop unit tests to verify the performance of pieces of software functionality.
  - o Finalize with integration testing, showing overall API performance.
- Automate API testing using unit, integration, and performance testing tools.[12] These tools aid in testing edge cases, corner cases, conditional software flow, and circumstances that invoke multiple APIs. Complex APIs may also invoke a wide range of input parameters and conditions that are better tested in an automated fashion.
- Separate testing activities from development activities to provide testers an objective position for which to evaluate an API and its underlying service.
- Use sandboxes, testing, and/or virtual environment tools to aid developers in testing the functionality of APIs prior to being deployed and placed in inventory.[12] Benefits of the utilization of a development sandbox include:
  - o Readily discoverable on network

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[9] Reference: https://obamawhitehouse.archives.gov/sites/default/files/omb/memoranda/2016/m_16_21.pdf.
[10] VA's public GitHub presence is available at https://github.com/department-of-veterans-affairs.
[11]Enterprise GitHub enrollment is possible as a service request at https://vaww.portal.va.gov/sites/ECS/SitePages/Home.aspx. Reference more information on GitHub background at GitHub Learning Lab at https://lab.github.com/.
[12]Use One VA TRM to identify approved tools at the internal site at http://trm.oit.va.gov/ for VA stakeholders; and for vendors at a less comprehensive site at https://www.oit.va.gov/services/trm/.

- o Available 24/7
- o Able to host multiple virtual APIs
- o Allows unlimited users to log in and use the virtual API
- VA shall conduct both functional and security testing of VA APIs as a standard required practice.[13]

3.4 Publishing

VA projects that implement APIs and the underlying services should:

- Use the official public VA presence on GitHub, where possible.[14] Otherwise, use Enterprise GitHub as a source code repository and community site.[15]
- Where possible, use the standardized VA terms of service (TOS).[16]
- Ensure that Cross-Origin Resource Sharing (CORS) is supported for API proxies. CORS enables client-side cross-origin requests.[17]
  - o CORS should be disabled for REST APIs if cross-domain calls are not supported or required.
- Implement authorization and authentication for access to APIs.
- Consult relevant external and public support communities when using third party or open data APIs.
- Ensure that VA's Open Data APIs are published in the VA Open Data portal and made public through the OpenAPI initiative.[18]

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[13]For specific API security related testing and techniques, reference the VA Application Programming Interface Security Pattern by the Cybersecurity Architecture Office of the Office of Information Security (OIS), June 2018.
[14]References: VA's public GitHub presence is located at https://github.com/department-of-veterans-affairs, in accordance with OMB Memorandum 16-21.
[15]Enterprise GitHub enrollment is available at https://vaww.portal.va.gov/sites/ECS/SitePages/Home.aspx as a service request.
[16]VA terms of service, which have been reviewed by the Office of the General Counsel (OGC), are referenced at https://github.com/department-of-veterans-affairs/vets-api-clients/blob/master/TermsofService.md.
[17]For more information on CORS, refer to https://www.w3.org/TR/cors.
[18] VA's Open Data Portal is available at https://www.data.va.gov/.

- VA APIs that are developed through the OpenAPI initiative must leverage the HL7 Fast Healthcare Interoperability Resources (FHIR) standard, coupled with the Substitutable Medical Applications, Reusable Technology (SMART) standard.
- Adhere to documentation guidelines from *API EDP Segment: API Documentation Standard* to include versioning (e.g., URI, String, Header, Media) and other specified parameters.
- Align to API management concepts.[19]

3.5 Inventory

The API inventory should be centralized and accessible. The inventory should include an accurate count and possess an accurate description for each API. The following is the standard for managing the API inventory within VA:

- Use VA Enterprise Architecture Repository (VEAR) as the required repository for APIs.[20] In the future, register the APIs at http://api.va.gov (when available for posting data), which will be the required repository for API information.
- Research existing VA APIs when conducting initial architecture and design activities to identify opportunities to reuse existing APIs. Teams should reference the repositories in VEAR and the Integration Hub[21] for those efforts. In the future, teams should reference http://api.va.gov (when available with VA data) for this research.
- Document any currently maintained or new APIs, using the set of attributes referenced in *API EDP Segment: API Documentation Standard*.

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[19]These will be the subject of a separate API EDP segment.
[20] The VEAR OMB API Report is referenced at https://vaausdarapp41.aac.dva.va.gov/ee/request/filter?id=29247&pageSize=20. The API listing that VA provided to the Office of Management and Budget (OMB) is also listed in the VEAR.
[21]Integration hub is referenced at https://qacrmdac.np.crm.vrm.vba.va.gov/WebParts/Documentation/Documentation/ServiceIndex.

4 Application

The Design, Engineering, and Architecture (DEA) user stories have a standard for VistA Integration Control Registrations (ICR), software source code scans, and conceptual and detailed system design models. Project teams using the Veteran-focused Integration Process (VIP), or developing or retaining APIs, must comply with the approved standards in the One-VA TRM; and map to the DEA user stories below. Future changes in the standard will be reflected in the One-VA TRM; and in pertinent DEA user stories that are related to both API consumption and provisioning.

Table 2: DEA User Stories

DEA User Story	Title	User Story Text	Relevant User Story Acceptance Criterion
DEA 04.24.01	Service Design and Documentation	As an Enterprise Architect, I need consistent and reusable service design and documentation, so that interactions between systems are known, costs can be lowered through reuse and consumer discovery.	(1/2)-100% of Enterprise Shared Services are reviewed for compliance with published guidelines, including being published in the VA Service Registry, if applicable (2/2)-100% of APIs that meet the OpenAPI specification standard must be documented according to the API Enterprise Design Pattern API Documentation Template and published in the VA Enterprise Architecture Repository (VEAR).
DEA 04.24.03	Conceptual Design Documentation	As an Enterprise Architect, I need standardized architecture and engineering conceptual design, so that stakeholders can determine whether the product concept meets real customer needs and is technically feasible. Standard conceptual diagrams provide consistent, reusable, and modifiable documentation, which supports compliance reviews,	(3/5)-The product architecture and design documentation includes a Conceptual Software Design Component Diagram that depicts the high-level software components of the product.

DEA User Story	Title	User Story Text	Relevant User Story Acceptance Criterion
		maintainability, and security of the VA Enterprise.	
DEA 04.24.04	Detailed Design Documentation	As an Enterprise Architect, I need standardized architecture and engineering detailed design, so that stakeholders have consistent, reusable, and modifiable documentation, which supports compliance reviews, maintainability, and security of the VA Enterprise.	(4/5)-The product architecture and design documentation includes an Application Design Component Diagram that depicts the software components of the product, their attributes and operations, and their public and private interfaces.
DEA 04.25.02	Integration Control Registrations (ICRs)[22]	As an Enterprise Architect, I need Integration Control Registrations (ICRs), so that I have a mechanism for identifying and documenting integration points with VistA, including application logic available for reuse by consuming applications, while reducing the risk to custodial and consuming applications.	(1/2)-Integration Control Registrations are in an active status prior to application installation in a production system.

(2/2)-Updates to Integration Control Registrations are successfully completed without a negative impact to consuming applications. |
| **DEA 04.26.02** | Programming Standards | As an Enterprise Architect, I need software development to adhere to VA programming standards, so that standards | (1/1)-All software solutions will be checked by automated source-code scans, the results of which are documented, |

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[22] VistA ICRs help define the interactions of different VistA packages.

DEA User Story	Title	User Story Text	Relevant User Story Acceptance Criterion
		and best practices are followed, resulting in higher quality, readable, and maintainable source code.	using TRM-approved software. Examples (subject to change) include XINDEX for M/MUMPS; CheckStyle for Java; and StyleCop for .NET. Documented scan results should include errors and warnings. Results of scans should be manually verified and corrected, as applicable.

Future updates of this document will reflect updates to the DEA compliance criteria to reflect the guiding principles for API release. Compliance with these standards apply to the following major project scenarios:

- All new development efforts leveraging the VAEC
- All new and existing APIs that expose Authoritative Data Sources (ADS)
- All new and existing APIs that provide endpoints for approved Enterprise Shared Services (ESS)

Currently, project teams should register APIs in the VEAR. In the future, teams should register APIs at http://api.va.gov (once available), which will become the required repository for APIs. Future updates of this document will reflect the change and provide associated guidance for how to use http://api.va.gov (once available) for the release of APIs.

5 Impacts

If API standards are not followed, the following have the potential to impact product delivery:

- Errors in API usage can result when testing is not thorough and comprehensive. Problems from edge cases, corner cases, and other circumstances may not be evaluated and resolved.
- APIs may not be discovered and used if there is no central API repository.
- If appropriate API tools are not used, this may cause a lack of consistency in how APIs are developed and inventoried.

Appendix: References

References:

- VEAR: https://vaausdarapp82.aac.dva.va.gov/ee/request/home
- VEAR API OMB Report: https://vaausdarapp41.aac.dva.va.gov/ee/request/filter?id=29247&pageSize=20
- Integration Hub: https://qacrmdac.np.crm.vrm.vba.va.gov/WebParts/Documentation/Documentation/ServiceIndex
- VA API Government Site: http://api.va.gov (not currently available, but will be available in the future)
- 18F GSA API Standards: https://github.com/18F/api-standards
- VA API Terms of Service: https://github.com/department-of-veterans-affairs/vets-api-clients/blob/master/TermsofService.md
- VA GitHub: https://github.com/department-of-veterans-affairs
- VA Digital Modernization Strategy, April 11, 2018
- VA DEA Assessment Guidance: https://vaww.portal2.va.gov/sites/asd/AERB/DEA_Assessment/DEA%20User%20Story%20Alignment/Home.aspx
- VA Directive 6551: https://www.va.gov/vapubs/viewPublication.asp?Pub_ID=829&FType=2

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