

DRAFT

E-Enterprise and Exchange Network
API Collaboration Space Lessons Learned

August 2020

Version 1.0

Table of Contents

- 1 Introduction..... 1
- 2 API and Collaboration Site Drivers..... 2
 - 2.1 Simplify Data Submission 2
 - 2.2 Simplify Data Access..... 2
 - 2.3 Facilitate Data Discovery and Collaboration 2
- 3 API Development and Collaboration Site Best Practices 3
 - 3.1 API Collaboration Platform Requirements 3
 - 3.1.1 Discovery of Data and APIs 3
 - 3.1.2 Access to Documentation and Standards 4
 - 3.1.3 Access to Use Cases and Best Practices 4
 - 3.1.4 Access to Interactive Collaboration and Communities of Practice (CoP)..... 4
 - 3.2 Processes and Tools 5
 - 3.2.1 API Management Processes and Roadmap Development..... 5
 - 3.2.2 Documentation of APIs and Processes..... 5
 - 3.2.3 Change Management and API Deprecation 5
 - 3.2.4 API Management Platforms 6
 - 3.3 Roles and Responsibilities 6
- 4 Conclusions and Recommended Next Steps 7
- Appendix A: Summary of Recommendations 9
- Appendix B: API Integration Platform Use Case Questions 11

1 Introduction

The E-Enterprise and Exchange Network Application Programming Interface (API) Management Framework provides E-Enterprise partners with an overarching API vision and a shared management framework to take advantage of APIs. The API Framework also describes the set of tools that the E-Enterprise partners and their user community will need to support the planning, design, implementation, collaboration and communication about their API development work.

One of the tools currently being conceptualized, is an E-Enterprise API Collaboration Site. An API Collaboration Site would support the following needs:

- Providing access to documentation on E-Enterprise API standards and guidelines
- Facilitating discovery for environmental APIs
- Providing access to use cases and examples of best practices in operational environmental APIs
- Supporting an interactive API Community of Practice (CoP), particularly for cross-program issues and for communities without a collaboration space
- Providing access to product roadmaps for shared APIs
- Providing access to a testbed and possible shared hosting for supporting API Management functions, including gateway, security, and related functions

To better understand how development teams are using APIs to solve business challenges and understand how an API Collaboration Site could strengthen the development and use of APIs, the E-Enterprise Digital Strategy Team interviewed API development teams who have successfully built APIs as part of their development strategy. Discussions focused on gathering information about drivers for building APIs, critical roles and responsibilities for developing and managing APIs; the approach, processes and API integration platforms used; and suggested best practices and lessons learned for fostering collaboration on the development, use and consumption of APIs.

Interviewees included the following:

- New Mexico Environment Department Shared API Management Platform Pilot Team
- Colorado's Office of Information Technology (OIT)
- EPA Enterprise Records Management Division (ERMD)
- EPA Office of Water's (OW) Water Quality Exchange (WQX) and Assessment Total Maximum Daily Loads Tracking and Implementation System (ATTAINS) Team
- U.S. Department of Veteran's Affairs API Platform Team

The findings from the interviews can be found on the [E-Enterprise Website](#). A sample of the discussion questions is provided in [Appendix B: API Integration Platform Use Case Questions](#). In addition to the interviews, the E-Enterprise Digital Strategy Team also reviewed EPA's Energy Star Program's API process documentation and website as Energy Star has a robust API development and management approach. This document provides a summary of the findings, lessons learned, and use cases supported by the development teams interviewed as part of this analysis and the EPA Energy Star Program's documentation. It also provides recommendations and next steps for the E-Enterprise Digital Strategy Team to consider as it evaluates the benefits of developing an E-Enterprise API Collaboration Site.

2 API and Collaboration Site Drivers

Based on the interviews conducted, development teams built APIs and Collaboration Sites to address a variety of business needs¹. The following describes several drivers for developing APIs and Collaboration Sites.

2.1 Simplify Data Submission

During the interviews, Development teams noted that APIs help reduce the burden on their customers for submitting data to meet federal regulatory or other requirements. They noted that their customers have varying resources and access to technical staff to support data submission requirements. For example, EPA's OW noted that WQX Web bridges a gap for state and tribal partners that do not have technical staff and cannot generate XML files to report data to EPA. Instead, these partners can submit a spreadsheet or flat file via WQX Web and WQX Web creates the XML submission to transmit the data to EPA through the Exchange Network. Likewise, EPA's ERMD noted that their APIs enable EPA application owners who have minimal Documentum experience to more easily submit records from their systems to EPA's official record keeping system, the Enterprise Content Management System (ECMS). Thus, APIs provide an opportunity to conserve limited development resources and support customers with differing technical abilities to meet data submission requirements.

2.2 Simplify Data Access

Development teams also noted that APIs can greatly simplify the ability for customers to access and consume data from legacy systems. For example, New Mexico's API strategy began as a mitigation plan to enable internal development teams to access data residing in legacy systems. Many of these systems are Oracle-based and include numerous stored procedures. It would be a heavy lift to migrate off of Oracle, so New Mexico focused on identifying a standard way to access the data in the legacy system without having to refactor the source system. New Mexico further expanded access to data for use with GIS tools and make data available to the public.

The VA's API platform was developed to streamline veterans' access to their healthcare data. Developers can use the VA's API Platform to enable mobile applications to communicate with VA applications and data. The VA's previous Patient Portal was only available via a desktop computer. If a patient was away from a computer or at a doctor's office, they could not access it. In developing [Lighthouse](#), the VA worked with commercial vendors like Apple to help veterans access their health history on mobile devices.

2.3 Facilitate Data Discovery and Collaboration

Development teams commented that their API Collaboration Sites facilitate data discovery activities. Instead of having to access separate systems, customers can go to the Collaboration Site to search for the data they need. For example, Colorado noted that developing a single state-branded location to

¹ Additional discussion of the use cases supported by each of the development teams can be found on the [Enterprise Website](#).

discover data has been important for Colorado’s Open Data initiatives. Potential consumers of the data can go to one location to find what they need without having to know what agency or organization the data comes from. New Mexico and the VA noted similar drivers and indicated a benefit of the Collaboration Platform is that data can “live” in the owning organization’s environment, but links are provided from the Collaboration Site so that there is a central location to search for and access APIs.

Collaboration Sites also serve as a central place for developers to communicate with each other about their API products and services and for development teams to communicate with customers about business needs, service changes, etc. EPA’s EnergyStar Program and the VA both provide links to customer forums from their Collaboration Sites and publish information about their API products, versions, and processes so that they are easily accessible to developers and customers.

3 API Development and Collaboration Site Best Practices

Development teams shared many common ideas regarding the key roles, responsibilities, and capabilities that are needed to successfully implement APIs and Collaboration Sites; however, they differed in their level of maturity with respect to their API Management practices and existing services. They also had differing viewpoints when it came to the approach for selecting an API Collaboration Platform—Open Source versus third-party/proprietary API management solutions. The remainder of this section discusses these perspectives in more detail.

3.1 API Collaboration Platform Requirements

All of the development teams interviewed saw value in having an API collaboration platform to engage developers and the API user community. Following describes the key beneficial components of a collaboration platform.

3.1.1 Discovery of Data and APIs

All interviewees saw the benefit of an API collaboration platform for discovering data and APIs. New Mexico described their vision as an environmental, collaborative, public space to find data that links to each state’s API sites. Colorado had a similar vision and seeks to organize their APIs for the partner agencies around common data domains (human services, child welfare, early childhood, etc.) so that data are seamlessly available from the source agency for users to discover without having to understand the organizational complexities of the source agency.

EPA’s ERMD indicated that the collaboration suite requirements should consider consumption of APIs by both internal and external endpoints. For example, they noted that EPA’s focus has typically been on making their data available to the public and other external entities, but enabling the use of APIs within an organization is also important.

Interviewees noted that the collaboration site will require some level of secure access to APIs. Many noted that leveraging existing, established API Gateways and identity and access management solutions are preferable to custom-coded solutions. It is also beneficial to provide analytics so that development teams can see who is using their APIs which facilitates planning and analysis as well as communication with customers.

Recommendations:

- Organize APIs by data domain as opposed to organizational structures.
- Minimize the burden on development teams and enable data to reside at the source Agency, but link to the Collaboration Site.
- Leverage commercially-available identity and access management solutions to ensure sensitive data are protected and available only to authorized users.

3.1.2 Access to Documentation and Standards

All interviewees agreed that the collaboration sites must include documentation on the available API services, including standards and guidelines for the use of the APIs. However, they cautioned that these standards should not place undue burden on system owners if they need to make changes to their data. Interviewees felt that including Product Roadmaps of upcoming enhancements and other API changes would also be beneficial.

Recommendation:

- Ensure collaboration sites include clear documentation on processes, standards and guidelines for using APIs. This includes communicating API versions, deprecation processes, etc.

3.1.3 Access to Use Cases and Best Practices

Interviewees suggested that the collaboration platform should provide access to API use cases that demonstrate the value of APIs to potential customers. In addition, the collaboration platform should provide developers with best practices and recorded hands-on demonstrations to help them learn techniques for building and interacting with APIs using different, common programming languages. For example, EPA's ERMD noted that development languages such as PHP and Python have different ways of interacting with API requests. Providing recorded videos can help developers tailor their approaches based on the specific programming languages they are using. Providing access to testing environments where developers can experiment with APIs would also be useful.

Recommendation:

- Include opportunities for education and learning. This includes providing training opportunities for developers to learn best practices for developing APIs and customer communications regarding the benefits and use cases of APIs.

3.1.4 Access to Interactive Collaboration and Communities of Practice (CoP)

A collaboration site should support the ability for developers to interact with other developers and their customers. For example, providing access to Community Forums, as is done through the VA and Energy Star sites, provides an opportunity for API developers to learn from each other and to share information with customers.

Recommendation:

- Provide opportunities for interaction including on-line customer forums, discussion boards, etc. to facilitate the exchange of ideas and sharing of best practices and lessons learned.

3.2 Processes and Tools

Interviewees varied with respect to the maturity of their API management processes and thoughts about the best development toolsets. The following sections discuss these concepts in more detail.

3.2.1 API Management Processes and Roadmap Development

All interviewees have processes for gathering input from customers and prioritizing development of new APIs and changes to existing APIs. DVA, Energy Star and EPA's ERMD have roadmaps for releasing new and updated capabilities. DVA does not share their product roadmap with customers, but Energy Star posts theirs to their website. ERMD shares their roadmap with Agency stakeholders. Their roadmap includes key Agency records management initiatives as well as technology-related initiatives such as the timeline for implementing the Content Ingestion Services and APIs.

Colorado's OIT explained that it does not have a state-wide roadmap as there are 17 partner agencies within the state that fund OIT's API development efforts and have their own mission and directives for which they are responsible. They feel API roadmaps need to be developed at the partner agency level and not the state level, given that categories of budget dollars come with specific uses on which the money may be spent. This makes it challenging to find opportunities for state-wide re-use or unification. To promote data sharing, the agencies also need to know their sister agency's data needs and be willing to share their data internally and with the general public.

Recommendation:

- Encourage transparency with respect to future plans for API services. API teams should communicate product roadmaps, upcoming enhancements and modifications, etc.

3.2.2 Documentation of APIs and Processes

All teams recognize the importance of documentation in supporting the use and understanding of their APIs and processes. Some are at earlier stages with their documentation than others, and acknowledge that they could make improvements in this area. DVA, New Mexico, EPA's ERMD, and Colorado's OIT are the most mature in their documentation efforts. DVA uses Swagger, New Mexico uses a combination of Swagger and Open API, ERMD uses Open API and Colorado uses MuleSoft. DVA and Energy Star publish extensive documentation for their APIs on their websites. WQX/ATTAINS is beginning to use Swagger for documenting APIs.

Recommendation:

- Ensure all APIs included on the Collaboration Site are accompanied by standard documentation to facilitate understanding and use of the APIs.

3.2.3 Change Management and API Deprecation

Almost all teams, with the exception of Energy Star, are still formulating their change management approach. Energy Star clearly communicates their standard deprecation process on their website and announces dataset and API updates via the Energy Star Products API Developers Group Forum.

DVA and EPA's ERMD have not yet deprecated an API. DVA tracks users of their APIs and communicates with users via their Portal, email, and their Google Forum. They also include messaging in API headers

regarding planned changes. ERMD tracks the internal EPA applications that use their APIs. Therefore, the customer base is well known and they feel communication will be relatively straightforward.

Colorado leverages MuleSoft, which includes versioning and the ability to track registered usage of APIs through MuleSoft exchange. They feel these capabilities will make it easy to notify users of the intent to deprecate or modify API versions.

Many applications leverage WQX/ATTAINS APIs to consume water monitoring data that EPA collects from a number of entities, including states and tribes. Many of the WQX/ATTAINS APIs are open and EPA's Office of Water (OW) does not always know who is using them. When OW has to modernize the APIs, it is a challenge. They have found they have to keep old APIs and deprecate them and send notices out to the user community. Sometimes they do not find out who is using the open APIs, until they break.

Recommendations:

- Provide a means of tracking the use of APIs made available through the collaboration site. Knowing the users of the APIs will facilitate communication with customers.
- Encourage multiple means of communicating with customers about changes to and deprecation of APIs. This may include posting updates via the collaboration site, community forums, email communications, etc.

3.2.4 API Management Platforms

One of the most significant areas where interviewees had differences of opinion was with respect to whether Open Source or third-party proprietary API management platforms are the best choice. A few interviewees, including DVA and EPA's ERMD strongly preferred Open Source solutions. DVA uses Open API and Swagger to develop its API management approach because they feel it helps them to avoid vendor lock-in. EPA's ERMD is also committed to an Open Source approach and wants to avoid licensing costs. They are currently using Apiman.

New Mexico and Colorado use third-party solutions. New Mexico noted that their APIgee-based solution has met their requirements both in terms of technical capabilities and ease of use. Colorado selected MuleSoft as it supports full API lifecycle management capabilities including development, monitoring and governing capabilities and testing and documentation. WQX/ATTAINS does not have an API management platform.

Recommendations:

- Continue to refine the scope and requirements for an E-Enterprise API Collaboration Site.
- Develop and rank collaboration platform requirements in terms of their priority.
- Evaluate API Integration and Collaboration Platform tools to determine whether a custom or open source solution would best meet E-Enterprise needs.

3.3 Roles and Responsibilities

All teams interviewed have a Product Owner(s)/Product Manager(s) responsible for the design and buildout of their APIs. The Product Owner/Managers understand the user community's needs and connect those needs to overall program goals, enterprise architecture principles, and IT strategies.

Some teams such as WQX/ATTAINS and DVA emphasized the importance of a distinct Customer Advocate/Support role to represent the needs of the user community.

All interviewees recognized the importance of being advocates for their services and performing outreach and education to help customers, business partners and other stakeholders understand the benefits and capabilities of APIs. This advocacy is critical to encouraging an “API First” philosophy within their organizations. All interviewees acknowledged that there are varying levels of understanding and awareness of the benefits and uses of APIs within their organizations so their development teams must look for low barriers to entry and help their colleagues and potential customers to see the value of APIs.

Some interviewees also noted the importance of centralized leadership in implementing successful API strategies. For example, EPA’s ERMD noted that development teams within individual EPA offices are encouraging their offices to pursue “API First” strategies. However, EPA does not currently have an Agency-wide API Manager or API strategy. The effect of this is that each office pursues their own approaches, tools and solutions which causes confusion and duplication of effort. NRPM noted it would be helpful to have an Agency-wide API Manager to lead the Agency’s vision and approach.

Recommendations:

- Establish an EPA API Manager and API Strategy to standardize EPA’s API approach, tools and solutions.
- Develop and conduct a Product Owner workshop for all E-Enterprise partners.

4 Conclusions and Recommended Next Steps

Discussions with development teams highlight the criticality of developing an E-Enterprise API Strategy before embarking on an effort to build an E-Enterprise API Collaboration Site. [Appendix A](#) contains a summary of the API recommendations presented in this paper. The strategy must include establishing the management and governance structure for developing, operating and maintaining an E-Enterprise API Collaboration site. The strategy must also include a role for an E-Enterprise API Manager who is responsible for overseeing and nurturing the build out of the site and the communication and support of the community of developers who use the site. The strategy must also include a process for reviewing and evaluating potential tools to support the site including Open Source, custom-developed, etc. and determining which best meets the needs.

If E-Enterprise decides to move forward with implementing an API Integration and Collaboration Platform, the following are the suggested next steps:

- Continue to refine the scope and requirements for the API Integration and Collaboration Platform. Develop and rank collaboration platform requirements in terms of their priority. Requirements gathering should consider the following:
 - Opportunities for a third-party to develop, host and maintain the collaboration space.
 - Opportunities for creating a marketplace for EPA, states and tribes to link their API sites to the E-Enterprise site.
 - Opportunities for organizing the site to ensure APIs are easily discoverable by type and function.

- Standards for documenting APIs made available via the site and providing access to the documentation.
 - Providing space for learning and interactive communication between developers and their customers.
- Define the governance structure for building, operating and managing the API Integration and Collaboration Platform. This includes identifying the roles and responsibilities for API Managers, Product Owners, and the processes for managing and communicating changes to the site, APIs and making decisions about its build-out.
- Evaluate API Integration and Collaboration Platform tools. Conduct an analysis of potential solutions for the Integration and Collaboration Platform.

Appendix A: Summary of Recommendations

The following table contains a summary of the recommendations presented in this paper.

No.	Recommendation
Discovery of Data and APIs	
1	Organize APIs by data domain as opposed to organizational structures.
2	Minimize the burden on development teams and enable data to reside at the source Agency, but link to the Collaboration Site.
3	Leverage commercially-available identity and access management solutions to ensure sensitive data are protected and available only to authorized users.
Access to Documentation and Standards	
4	Ensure collaboration sites include clear documentation on processes, standards and guidelines for using APIs. This includes communicating API versions, deprecation processes, etc.
Access to Use Cases and Best Practices	
5	Include opportunities for education and learning. This includes providing training opportunities for developers to learn best practices for developing APIs and customer communications regarding the benefits and use cases of APIs.
Access to Interactive Collaboration and Communities of Practice	
6	Provide opportunities for interaction including on-line customer forums, discussion boards, etc. to facilitate the exchange of ideas and sharing of best practices and lessons learned.
API Management Process and Roadmap Development	
7	Encourage transparency with respect to future plans for API services. API teams should communicate product roadmaps, upcoming enhancements and modifications, etc.
Documentation of APIs and Processes	
8	Ensure all APIs included on the Collaboration Site are accompanied by standard documentation to facilitate understanding and use of the APIs.
Change Management and API Deprecation	
9	Provide a means of tracking the use of APIs made available through the collaboration site. Knowing the users of the APIs will facilitate communication with customers.
10	Encourage multiple means of communicating with customers about changes to and deprecation of APIs. This may include posting updates via the collaboration site, community forums, email communications, etc.
API Management Platforms	

No.	Recommendation
11	Continue to refine the scope and requirements for an E-Enterprise API Collaboration Site.
12	Develop and rank collaboration platform requirements in terms of their priority.
13	Evaluate API Integration and Collaboration Platform tools to determine whether a custom or open source solution would best meet E-Enterprise needs.
Roles and Responsibilities	
14	Establish an EPA API Manager and API Strategy to standardize EPA’s API approach, tools and solutions.
15	Develop and conduct a Product Owner workshop for all E-Enterprise partners.

Appendix B: API Integration Platform Use Case Questions

The rise of Application Programming Interfaces (APIs) within EPA and its E-Enterprise partners highlights the increasing need for development teams and product owners to work together to efficiently build and consume APIs. EPA is meeting with teams that have successfully built and integrated APIs as part of their development strategy to gather best practices and other information to help the Agency understand how to best support this community, foster collaboration, and identify needs for an API collaboration space.

As a leader in this area, we would like to meet with you to learn more about your approach, processes and API integration platform. Meetings are expected to be about an hour. Following are some examples of the types of questions to be asked. You are also encouraged to include other topics that you feel are important to share but may not already be included in the list of questions.

Roles and Responsibilities

1.	Do you have a Product Owner or API Product Manager?	
2.	How do you identify what APIs need to be developed?	

Process

1.	Do you have an overarching API strategy?	
2.	Describe the process by which you design, develop and implement your APIs? How does your API integration platform support this?	
3.	What are some of the challenges and successes that you have had with your current API integration platform?	

Collaboration and Information Sharing

1.	E-Enterprise in creating a thriving API community. What ideas do you have for engaging community (monthly newsletters, a chat portal, developer blog, use case studies, coding standards)?	
2.	How do you see the API integration platform supporting this?	

Testing

1.	Describe your testing process for APIs.	
----	---	--

2.	How would a common collaboration site support API testing?	
----	--	--

Planning and Change Management

1.	Do you have a deprecation or change management process? If so, can you describe?	
2.	How often do your APIs change? What are the drivers for those changes?	
3.	As an API provider, do see any budget implications on your organization if there is an increased appetite for your API's? How do you foresee managing the demand?	

Security

1.	APIs enable communication between systems. What was your security strategy to enable integration?	
2.	What security standards did you implement?	