

NATIONAL INFORMATION EXCHANGE MODEL (NIEM) TOOLSET REQUIREMENTS ANALYSIS

DELIVERY MEETING

Program Manager: Rachel Nagle

Project Manager: Corlette Jordan

Technical Lead: Marty White

AUG 2020

INTRODUCTION

OVERVIEW

CONTRACT

- DS TAT Contract
- Contract number: FA8075-14-0-0016
- Period of Performance (PoP) for this effort: 3 months, May-July 2020
- Funding for this effort: \$150,000

TEAM

- Program Manager: Rachel Nagle
- Project Manager : Corlette Jordan
- SME: John Morrison, Mike Sor
- Technical Lead: Marty White
- Technical Analyst: Phillip Brooks, Steve Nelson
- Requirements Analyst: Adrienne Free, Doug Brandenstein
- User Interface / Mock-ups: Ronald Edmonds

DELIVERABLES

- Requirements Analysis Document of the selected capabilities containing the associated requirements, and a Level of Effort (LOE) for the development of the selected requirements
- A high-level analysis and recommendation of potential hosting environments for the NIEM Platform
- High level conceptual mock-ups of the NIEM Platform

BACKGROUND

- In January 2019, the U.S. Department of Defense (DoD) became the official government sponsor of NIEM
 - One of the high-priority projects identified during the transition period and subsequent meetings with stakeholders has been the development of a comprehensive Tool Strategy (TS) to efficiently facilitate widespread adoption and use of NIEM and enhance the current construct of the NIEM framework
- The purpose of the NIEM TS is to identify new application/tools and existing NIEM/tool functionality that requires capability enhancements to ensure they support current priorities
- A full assessment of the current capability's strengths and weaknesses was leveraged to present an updated, intuitive, end-to-end application capability vision that facilitates and automates all phases of the NIEM Information Exchange Package Documentation (IEPD) Lifecycle
- The ultimate goal is to provide users the tools necessary to complete a National Information Exchange Model (NIEM) Information Exchange Package Documentation (IEPD) and publish the IEPD to a public facing environment, this includes the operational and technical assessment of hosting environment alternatives to enable new tool development and support the IEPD Life Cycle (IEPDLC)
- NMO needs a hosting environment that meets the functional tool needs for the following user categories:
 - Stakeholders or stakeholder communities with an interest in NIEM
 - Practitioners, including IEPD developers and implementers such as NMO, technical assistance staff, content management staff, development staff, and government/contract/commercial tool developers
- In May 2020, Booz Allen was asked to conduct a requirement and hosting environment assessments that include the activities on the next slide

OVERVIEW OF THE REQUIREMENTS AND ENVIRONMENT ASSESSMENT

For the Requirements Assessment, Booz Allen conducted an analysis of the current NIEM Platform and the associated capabilities that included:

- Conducted gap analysis and captured capability gaps
- Worked with the government team to prioritize gaps for requirement analysis
- Identified High Level Requirement Groups and next tier requirements within each group
- Conducted a prioritization of the requirement groups to develop three COAs
- Documented all Requirements into a Requirements Traceability Matrix (RTM) which have been incorporated into the Requirements Document
 - Documented Capability Gaps
 - Identified 3 COAs
 - Our Recommendations
- Produced high level mock-ups (HTML) of the proposed user interface for the NIEM Platform

Booz Allen conducted a Hosting Environment Assessment to:

- Identify a suitable COA for meeting NMO requirements and realizing operational efficiencies
- Recommend a COA that considers technical, cost, and risk factors
- Assessed 7 environments based on 5 identified dimensions
- Solicited input on the motivations for the hosting environment along three dimensions:
 - Emergent business requirements
 - Emergent business expectations
 - Aspirational business capabilities
- Solicited input on the desired business outcomes and technical requirements for evaluating the environment
- Comprehensively measured compute resourcing, storage, etc. to provide a recommendation that considers NMO objectives, business and IT stakeholder priorities, and the systematic assessment for each alternative

REQUIREMENT ANALYSIS

REQUIREMENTS ANALYSIS - METHODOLOGY

- Utilized our requirements process which included document review, review of current NIEM support products, and interviews with NIEM stakeholders with a focus on identifying new applications, enhancing existing capabilities, or developing new capabilities to allow current applications to support new policy and/or guidance
- Reviewed the NIEM TS document and the high-level requirements contained within as well as policies, strategies, and outcomes of existing tools currently in use by NIEM and identified user requirements, as captured in the NIEM TS Feedback Matrix references
- Held numerous external and internal stakeholder interviews with the NIEM Program Manager, GTRI contractors, and the Booz Allen program team, documented information needs and available resources. Business processes were documented, and capability gaps were identified with existing systems, NIEM platform applications/tools, and resources
- Assessed finding and developed recommendations that include beneficial designs and capabilities from the current state, incorporating them into a vision of the future state that resolves current challenges.
- The following slides identify the Requirement Analysis Assumptions

REQUIREMENTS ANALYSIS - ASSUMPTIONS

Requirements Analysis - Assumptions	
New application/tool development and enhancements will be containerized and support existing NIEM tools	Prior to any development there will be a series of stakeholder engagements to approve evolving mock-up concepts and requirements
Availability and visibility to existing Georgia Tech Research Institute (GTRI) tools and codebase, in addition to Format Translator API and the Registry and Repository that are currently in development	Access to Government personnel and facilities to conduct stakeholder meetings to collect, prioritize, and review requirements and evaluate capabilities throughout the project lifecycle
The hosting environment should support a Development, Security, and Operations (DevSecOps) workflow	Availability of stakeholder and subject matter experts for stakeholder engagement sessions
New containerized application/tools will be able to interface with legacy application/tools through the development of an API	Understanding of the Government Project Manager's (PM) intent for the purpose and focus of the NIEM TS approved in the roadmap, requirements traceability matrix (RTM), and product backlog
The new NIEM application/tools should address functional gaps rather than replace existing tools	Availability, completeness, usability, and accuracy of required obfuscated data to support development and testing
The new NIEM application should support modular deployments	Gathering and approval of requirements prior to commencement of associated development activities
The team will have access to existing infrastructure to support development activities	Approval of requirements through visualizations (mock-ups) to allow accurate development level of efforts (LOE) to be determined
Coordinated support from other developers to minimize impact to the user experience, existing tools, funding, and availability of data	The development of new NIEM applications/tools (funded by government sponsors) will be open-sourced and coordination between contractors will be necessary to maintain visibility with future NIEM releases
Modifications to existing tools will need to be made to implement enhancements and support new development	New capability development and enhancement to existing functionality will follow an Agile methodology, be released on an independent schedule as completed, and coordinate with future NIEM releases as needed
Cybersecurity concerns will be the responsibility of government representatives given the aggregation of data within the to-be repository	The following existing tools will be maintained by the tool owner during new development: SSGT, ConTesA, Movement, and Migration Assistance
Cybersecurity testing will be required to completely assess third party plug-in access (security controls, overlays, etc.)	Support open-source software licenses as determined through PM engagement, as required
Dictated by hosting site, feedback from the JS J7 Cybersecurity team, and IA scanning tools (e.g. HP Fortify, Web Inspect), if required, will be available to the team to work through the Cybersecurity requirements for accreditation	Development and deployment of the new NIEM application/tools will run in parallel and not impact the NIEM Release schedule
Applications will be modular and containerized from the NIEM Schema	

REQUIREMENTS ANALYSIS - CAPABILITY GAPS

- Requirements gathered were categorized into ten functional groups that considered significant connections to existing NIEM functionality that are not available to the user.

Capability Gap Group	Description
Core Functionality	<ul style="list-style-type: none">• Creation of NIEM Roles and Permissions architecture along with the ability to assign permissions• Adding user registration and update my profile pages• Session management to allow auto-save functionality• In-session data storage within browser or locally
Robust Search Functionality	<ul style="list-style-type: none">• Creation of a comprehensive search function to assist the user's search within a repository; local, organizational, or enterprise wide NIEM components; and published IEPDs
Import and Data Synchronization	<ul style="list-style-type: none">• Creation of an easy-to-use method to import and synchronize data• Includes metadata parsing across all artifacts and schema generation support of XML and JSON
Document Management	<ul style="list-style-type: none">• Creation of intuitive document management that utilizes business rules, a centralized management location, and Unified Modeling Language (UML) creation and storage
Streamlined Element/ Requirement Mappings	<ul style="list-style-type: none">• Alleviate dual mapping efforts between SSGT and Movement while also minimizing manual mapping and data search complexities
Intuitive Lifecycle/IEPD Development	<ul style="list-style-type: none">• Refreshed user interface (UI) components to increase intuitiveness and provide additional guidance and automation between components of the IEPD lifecycle and required artifacts, from conception to validation
End to End Training/Support	<ul style="list-style-type: none">• Creation of training support elements that provide guided instruction of the NIEM application, FAQs, and video tutorials• Ability to be deselected for the experienced user base
Guided UML Diagram Modeling	<ul style="list-style-type: none">• Modeling concepts and interoperative modeling assistance for novice IEPD developers, supported by the incorporation of document management capabilities
Schema Translation	<ul style="list-style-type: none">• Assessment of XML to JSON translation possibilities and the inclusion of NDR and Model Package Description (MPD) catalog conformance for JSON schema representations
Automated Conformance Validation	<ul style="list-style-type: none">• Streamline and provide visibility to conformance and validation status of all IEPD artifacts in one centralized location, with the inclusion of completion margins and report ingestion

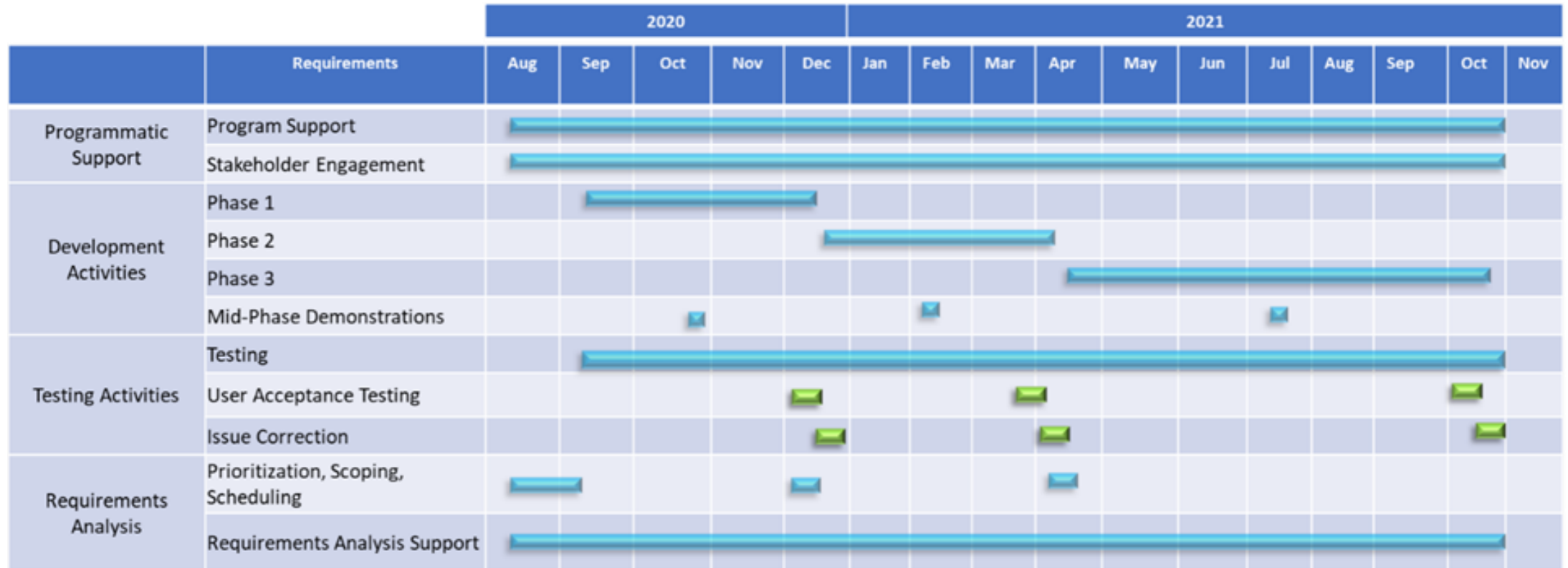
COA 1- MAP & MODEL ENHANCEMENTS

- The Map & Model phase contains a bulk of the functionality that is essential in bridging the exchange gap of information shared between organizations across the world and is a vital part of the IEPD lifecycle
- The Map & Model phase brings tremendous value to the NIEM framework. As an outcome of current and past assessments, both from the Booz Allen team and NIEM community users, COA 1 would:
 - Minimize complexities to all user types (novice through advanced)
 - Reduce IEPD development time
 - Increase NIEM conformance
- Full implementation of COA 1 is dependent upon the standup of the NIEM Registry and Repository (currently in planning by GTRI)
- The greatest LOEs per requirement are encompassed within this option, however, the impact of addressing these outlined capability gaps add value to the area of the IEPD process that an IEPD developer spends their most time.
- The following slides include:
 - Current State vs. Future State
 - Notional Timeline

COA 1 - MAP & MODEL ENHANCEMENTS: CURRENT VS FUTURE STATE

	Current State	Future State
User Experience	No current application UI exists	<ul style="list-style-type: none"> • Development of the application UI • Creation of the default landing page, the IEPD lifecycle management, and document management. Supports the modular growth of future tools and enhancements • As API's are developed and the Registry/Repository are built, these tools and enhancements will be "plugged -in" to the application UI and support the "one-stop shop" functionality
Document Management	Data management is performed by the user, on their machine, with their own management system	<ul style="list-style-type: none"> • The application UI would support structured document management and display in an intuitive, easy-to-see manner • Import and export functions are available to add to the IEPD artifacts
User Registry/Roles and Permissions	No registration process exists to access the current NIEM platform, nor are there any user roles associated	<ul style="list-style-type: none"> • With the development of an application UI, a registration process would be produced • This supports session management and saving a user's work, audit logging of errors, etc. • A Roles and Permissions matrix would also be associated to the user profile, giving a hierarchy of user permissions for the application
Training	Training links and resources are available on the NIEM website	<ul style="list-style-type: none"> • The application UI would support the existing training materials, but also adds interactive walkthrough and guided path functionality to assist users within the application UI, never having to leave the application
Dependency	Development of the application UI	

REQUIREMENTS ANALYSIS - COA 1 TIMELINE



- COA timelines are based on a current high-level understanding of the requirements and stakeholder needs
- The timelines and recommendation include programmatic support and are based on a minimum functional team that will include capabilities across the System Delivery Life Cycle to include but not limited to: 1.5 Developers, 0.75 FTE Requirements Analysts, and 0.5 Testers
- Increasing team size will allow for delivery within a shorter timeframe

COA 2- USER EXPERIENCE ENHANCEMENTS

- COA 2 functionality is driven by enhancing User Experience/UI (UX/UI) as its core and expands to cover the way in which users create, store, and manage metadata and associated IEPD documentation
- COA 2 greatly enhances how the user explores the NIEM Platform, implements the IEPD lifecycle, and ultimately identifies if it is a viable option to support the needs of their organization
- COA 2 would provide a means for guided tutorials and prove essential to personalizing the user experience by:
 - Incorporating user profiles
 - Personalizing the way in which user's access and navigate NIEM tools
 - Providing document management
 - Centralizing artifact management and assembly
 - Establishing import and data synchronization
 - Parsing like components and metadata essential for map & model
 - Providing diagramming support during scenario planning with Unified Modeling Language (UML)modeling
- The LOE per requirement is not as large as COA 1 requirements, however, these capabilities potentially have a touch point on all areas of the IEPD lifecycle
- The following slides include:
 - Current State vs. Future State
 - Notional Timeline

COA 2 - USER EXPERIENCE ENHANCEMENTS: CURRENT VS FUTURE STATE

Current State		Future State
Mapping Process	Performed on the user machine (local) via an Excel mapping spreadsheet. The user imports/uploads spreadsheet to the SSGT tool (website), performs their mapping to NIEM via SSGT, then generates documents for export back to their machine (local)	<ul style="list-style-type: none"> • Mapping will be performed within the application UI • Mapping requirements using SSGT would be accomplished within the application UI via an API • The user would never leave the application during this process
Dependency	API developed interface with SSGT	
Advanced Search	No search capability currently exists due to users storing their IEPD's to self-hosted repositories	<ul style="list-style-type: none"> • Advanced search capability would give visibility to all available IEPD's with the employment of a Registry/Repository
Dependency	Development of Registry/Repository	
Conformance Validation	Conformance validation is performed similar to SSGT, whereby the user goes to the ConTesA webpage, and upload/imports their IEPD and submits for validation. A report is generated and can be downloaded to their machine (local)	<ul style="list-style-type: none"> • Conformance would be performed within the UI application • All documents and artifacts are displayed and can be validated using ConTesA through a to be developed API • The validation report is displayed with the UI and validation statuses within the UI and validation statuses are updated in the UI as well • The user would never need to leave the application in this process
Dependency	API developed interface with ConTesA	

REQUIREMENTS ANALYSIS - COA 2 TIMELINE



- COA timelines are based on a current high-level understanding of the requirements and stakeholder needs
- The timelines and recommendation include programmatic support and are based on a minimum functional team that will include capabilities across the System Delivery Life Cycle to include but not limited to: 1.5 Developers, 0.75 FTE Requirements Analysts, and 0.5 Testers
- Increasing team size will allow for delivery within a shorter timeframe

COA 3 - HYBRID APPROACH

- COA 3 encompasses a balanced solution of requirements that enhances each area of the IEPD lifecycle and of the NIEM resources. The user will experience the:
 - Map & Model process streamlined and enhanced to provide an additional level of accuracy in its search, conformance, and validation properties
 - Ability to customize and tailor their experience
 - Centralized location to store and sync all artifacts
 - Community content leveraged through access of the NIEM Registry & Repository.
 - Registry and Repository as a new NIEM resource
 - COA 3 is not restricted by the availability of the Registry and Repository as it will be worked separately.
 - Select enhancements will be developed and later tailored to the availability of the Registry and Repository
- Though all identified gaps may not be filled for every aspects of the framework, each area will be enhanced, increasing the value and efficiency of NIEM for new and existing users and their organizations
- COA 3 development effort and timeline LOE is comparable to COA 1 and COA 2
- The following slides include:
 - Current State vs. Future State
 - Notional Timeline

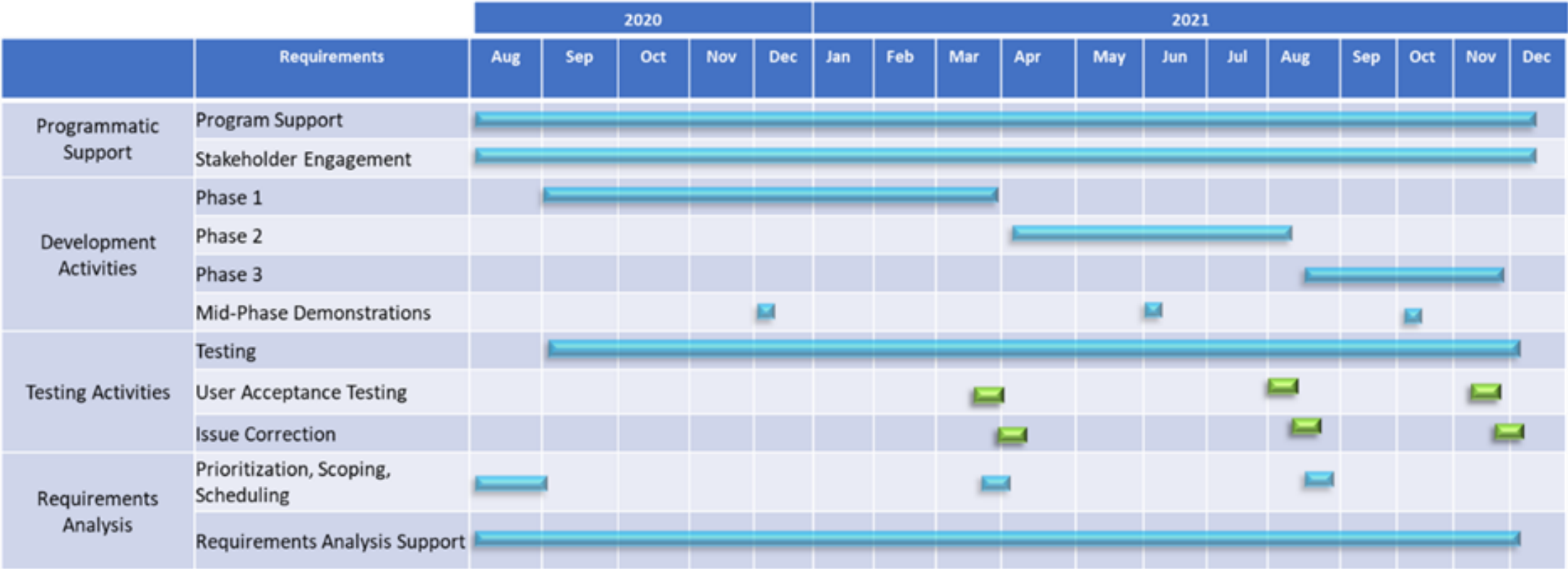
COA 3 - HYBRID APPROACH: CURRENT VS FUTURE STATE

Current State		Future State
User Experience	No current application UI currently exists	<ul style="list-style-type: none"> • Development of the application UI • Creation of the default landing page, the IEPD lifecycle management, and document management. Supports the modular growth of future tools and enhancements • As API's are developed and the Registry/Repository are built, these tools and enhancements will be "plugged -in" to the application UI and support the "one-stop shop" functionality
Dependency	Development of the application UI	
Mapping Process	The current mapping process is performed on the user machine (local) via an Excel mapping spreadsheet. The user imports/uploads spreadsheet to the SSGT tool (website), performs their mapping to NIEM via SSGT, then generates documents for export back to their machine (local)	<ul style="list-style-type: none"> • Mapping will be performed within the application UI • COA 3 differs from COA 1 in that instead of an API to interface with SSGT, the process would allow the user to export their mapping spreadsheet from their artifacts and import to SSGT externally (no API interface) • This is similar to the current process but exploits the document management section of the application UI • COA 3 also supports the phased approach of future development of APIs (leading to COA 1 functionality)
Dependency	Development of the application UI	
Document Management	Data management is performed by the user, on their machine, with their own management system	<ul style="list-style-type: none"> • The application UI would support structured document management and display it in an intuitive, easy-to-see manner • Import and export functions are available to add to the IEPD artifacts • COA 3 supports the ability to package documents for submission to other tools like SSGT, ConTesA, etc.
Dependency	Development of the application UI	

COA 3 - HYBRID APPROACH: CURRENT VS FUTURE STATE (CONT)

	Current State	Future State
Advanced Search	No search capability exists due to users storing their IEPD's to self-hosted repositories	<ul style="list-style-type: none"> Advanced search capability would give visibility to all available IEPD's and leverage community content with the employment of a Registry/Repository
Dependency	Development of Registry/Repository	
User Registry/Roles and Permissions	No registration process exists to access the current NIEM platform, nor are there any associated user roles	<ul style="list-style-type: none"> With the development of an application UI, a registration process would be required This supports session management and saving a user's work, audit logging of errors, etc. A Roles and Permissions matrix would also be associated to the user profile, giving a hierarchy of user permissions for the application
Dependency	Development of the application UI	
Training	Training links and resources are available on the NIEM website	<ul style="list-style-type: none"> The application UI would support the existing training materials, but also adds interactive walkthrough and guided path functionality to assist users within the application UI, never leaving the application
Dependency	Development of the application UI	

REQUIREMENTS ANALYSIS - COA 3 TIMELINE



- COA timelines are based on a current high-level understanding of the requirements and stakeholder needs
- The timelines and recommendation include programmatic support and are based on a minimum functional team that will include capabilities across the System Delivery Life Cycle to include but not limited to: 1.5 Developers, 0.75 FTE Requirements Analysts, and 0.5 Testers
- Increasing team size will allow for delivery within a shorter timeframe

REQUIREMENTS ANALYSIS - COA COMPARISON

The following table compares the Category aligned to each COA, length of time, and the Pros/Con for each capability

High Level Category	COA 1 (14.5 Months)	COA 2 (10.5 Months)	COA 3 (15.5 Months)	Pro/Benefit	Con/Dependency
User Experience	X	X	X	<ul style="list-style-type: none"> Landing page and core UI for End-to-End IEPD development 	<ul style="list-style-type: none"> Development time, build first
Mapping Process	X		X	<ul style="list-style-type: none"> Requirements mapping to NIEM performed with SSGT/Movement within the UI 	<ul style="list-style-type: none"> API to be developed for SSGT / Movement
Advanced Search	X		X	<ul style="list-style-type: none"> Visibility and searchability of all available IEPD's 	<ul style="list-style-type: none"> Development of Registry/Repository
Conformance Validation	X			<ul style="list-style-type: none"> Conformance validation would be performed with ConTesA within the UI 	<ul style="list-style-type: none"> API to be developed for ConTesA
Training		X	X	<ul style="list-style-type: none"> UI supports existing materials interactive and guided path functionality to assist user within the application UI YouTube videos 	<ul style="list-style-type: none"> Varying Levels of detail drive development time
Document Management		X	X	<ul style="list-style-type: none"> UI supports structured document management and intuitive display features Import and export functions are available to add to the IEPD artifacts Ability to package documents for submission to other tools like; SSGT, ConTesA, etc. 	<ul style="list-style-type: none"> API's to be developed to support SSGT and ConTesA submission
User Registry/Roles & Permissions		X	X	<ul style="list-style-type: none"> Supports session management, saving work, and audit logging of errors Roles and Permissions matrix associated to user profile Promotes a permissions hierarchy 	<ul style="list-style-type: none"> Expectation/identification of an overall administrator to manage registration and permissions for users

REQUIREMENTS ANALYSIS - RECOMMENDATION: COA 3

- COA 3 establishes the greatest return on investment by ensuring that where constraints prevent gaps from being fully addressed, enhancements to existing functionality can still provide increased value to key areas of the IEPD lifecycle
- COA 3 fulfills identified capability gaps and aspects of all five of the top priority areas:
 - Publishing IEPDs, publicly or privately, to the NIEM Registry and Repository for reuse
 - Easier incorporation of NIEM XML conformance and validation check (emphasis on JSON inclusion)
 - Minimizing complexities in defining and mapping requirements within the Map & Model phase
 - Inclusion of guided instruction and navigation to support IEPD development
 - Implementation of missing tools or capabilities within phases of the lifecycle that currently directs utilization outside of NIEM
- COA 3 provides long term IEPD development, tracking, validation, and publishing to support the future vision of NIEM
- 15-month timeline can be decreased by increasing size of the development team

MOCK-UPS

NIEM PLATFORM ACTIVITIES - HIGH LEVEL MOCK-UPS

- Worked with the NIEM Program Manager, GTRI contractors, and the Booz Allen program team to understand documented information, business processes, and capability gaps as identified with existing systems, NIEM platform applications/tools, and resources
- Identified High Level Requirement Groups and next tier requirements within each group
- After defining the gaps/developing high level groups and associated requirements the team translated these requirements into visualizations to include:
 - Static Mock-ups captured in the Requirements Document
 - HTML visualizations
- Validated our visions with stakeholders and updated as necessary to finalized the provided visualization
- The user interface visualization incorporated profile management and session management to provide the users:
 - Controlled access
 - Centralized location to access metadata and manage artifacts
 - Personalized navigation through the framework
 - Added capability to regain access to working sessions throughout IEPD development
- Mock-ups are independent of any COA and seeks to visually convey the brand of the NIEM TS based on the requirements
- MOCK-UP Demonstration: Mr. Ron Edmonds

ENVIRONMENT ANALYSIS

NIEM PLATFORM ACTIVITIES - HOSTING ENVIRONMENT

- The hosting environment assessment analyzed environment alternatives. The purpose of the assessment was two-fold:
 - Identify a suitable COA for meeting NMO requirements and realizing operational efficiencies
 - Recommend a COA that considers technical, cost, and risk factors
- NMO needs a hosting environment that meets the functional tool needs for the following user categories:
 - Stakeholders or stakeholder communities with an interest in NIEM
 - Practitioners, including IEPD developers and implementers such as NMO, technical assistance staff, content management staff, development staff, and government/contract/commercial tool developers
- Additionally, the environment should realize the following efficiencies:
 - Maximize information reuse
 - Maximize tool interoperability
 - Minimize the cost of using NIEM (particularly entry costs)
 - Reduce time to develop IEPDs
 - Minimize the cost of increasing automated support for NIEM
 - Maximize consistency and quality of release products, IEPDs, and associated artifacts
 - Maximize domain, developer, and user self-service

NIEM PLATFORM ACTIVITIES - HOSTING ENVIRONMENT (CONT)

- Aligned business and IT stakeholders to create a clear and concise strategy for the environment
- Solicited input on the motivations for the hosting environment, categorizing questions along three dimensions:
 - Emergent business requirements
 - Emergent business expectations
 - Aspirational business capabilities
- Solicited input on the desired business outcomes and technical requirements for evaluating the environment
- Categorized questions along three dimensions:
 - Financial management
 - User engagement
 - System performance
- Comprehensively measured compute resourcing, storage, etc. Our recommendation considers NMO objectives, business and IT stakeholder priorities, and the systematic assessment for each alternative

HOSTING ENVIRONMENT ASSESSMENT- ASSUMPTIONS

Hosting Assessment Assumptions	
Data	<ul style="list-style-type: none">• New NIEM tools should include the ability to upload static files/artifacts (e.g., UML diagrams, database schemas) used to support the Scenario Planning step in the IEPDLC. [Ref: TSRD-24.0] New NIEM tools should include the ability to upload static files/artifacts (e.g., Word/Excel documents containing business rules) used to support the Analyze Requirements step in the IEPDLC. [Ref: TSRD-26.0]• 2.New NIEM tools should store and leverage user custom data mappings for improved search support. [Ref: TSRD-78.0]• 3.New NIEM tools will use both perishable and persistent data. [Ref: Interview]• 4.All NIEM artifacts are and will be UNCLASSIFIED.
Business Outcomes	<ul style="list-style-type: none">• NMO does not specify financial performance indicators, but the cost of the environment should be consistent with industry norms.• NMO does not specify user engagement metrics, but the environment should support user engagements.• NMO does not specify system performance metrics, but the environment's reliability should be consistent with industry norms.
Tool infrastructure	<ul style="list-style-type: none">• The environment should support containerization. [Ref: TSRD-3.0]• The environment should support a DevSecOps workflow. [Ref: TSRD-4.0]• The environment should support a collaborative authoring system for creating and maintaining linked collections of Web pages. [Ref: TSRD-4.0, TSRD-5.0]• The environment should support the ability to search and browse existing NIEM models. [Ref: TSRD-42.0]• The environment should support searching NIEM data components. [Ref: TSRD-45.0]• The environment should support the incorporation of machine learning algorithms to develop an intelligent search capability. [Ref: TSRD-66.0]• The environment should support the ability to identify related IEPDs found within a supported NIEM IEPD Registry and/or Repository. [Ref: TSRD-76.0]

HOSTING ENVIRONMENT ASSESSMENT- ASSUMPTIONS (CONT)

Hosting Assessment Assumptions	
Tools	<ul style="list-style-type: none">• Developing and deploying new NIEM tools must not impact the NIEM release schedule. [Ref: TSRD-Assumptions]• The following tools must be maintained during new tool development: Schema Subset Generation Tool (SSGT), Conformance Testing Assistant (ConTesA), Movement, and Migration Assistance. [Ref: TSRD-Assumptions]• New NIEM tools (funded by government sponsors) must be government-owned/controlled and open-source to the NIEM user community. [Ref: TSRD-Assumptions]• New NIEM tools should be functional without dedicated accessibility to the Internet. [Ref: TSRD-6.0]• New NIEM tools should leverage industry-standard security measures for scanning any external files uploaded by an end user. [Ref: TSRD-14.0]• New NIEM tools should incorporate session management capabilities to keep track of a user's activity of interactions. [Ref: TSRD-33.0]• New NIEM tools should incorporate a user account registration and management capability. [Ref: TSRD-52.0]• New NIEM tools should include a webhook (or endpoint) for the Format Translator application programming interface (API) that SSGT can leverage to return a NIEM JavaScript Object Notation (JSON) Schema Subset. [Ref: TSRD-59.0]• New NIEM tools should address functional gaps rather than replace existing tools. [Ref: NIEM Kickoff Meeting]• New NIEM tools should be web-based. [Ref: NIEM Kickoff Meeting]
Technical Requirement	<ul style="list-style-type: none">• New NIEM tools must serve technical documentation that outlines how third-party developers can interact with the software code base. [Ref: TSRD-106, Interview]• NIEM development staff do not prefer specific DevSecOps tools. [Ref: Interview]• New NIEM tools should support modular deployments. [Ref: Interview]• The environment needs an Impact Level (IL)-4 authorization to include, for example, data designated as CUI• The environment must comprise distinct environments for development, quality assurance (QA), and production.• Current NIEM tools will adapt to communicate via web services with new NIEM tools in the environment.• The environment will depend on access via web services to NIEM tools being maintained (e.g., SSGT, ConTesA, and Movement)

HOSTING ENVIRONMENTS ASSESSED

- The following 7 environments were assessed:

Environments Assessed			
NIEM.gov	DI2E	Platform ONE	Azure Government
MAX.gov	WMAAFIP	AWS Gov Cloud	

- Based the assessment on the following identified dimensions:
 - Data
 - Tools
 - Tool Infrastructure
 - Business Outcomes
 - Technical Requirements
- It was determined that MAX.gov, DI2E, and WMAAFIP are not viable alternatives
- NIEM.gov may be a viable alternative as early as November 2021, subject to several unknowns
- These four environments lacked the ability to host containerized workloads or were not willing/able to provide hosting services
- The following slides include:
 - Scenario for the comparison table
 - Comparison table
 - Our recommendation

HOSTING ENVIRONMENTS - ASSESSMENT SCENARIO

- The scenario is assumed for comparison purposes only.
- This scenario is meant to describe a possible scenario with the three viable environment options applied to show the proposed cost of each options. Actual costs will vary based on number of users, services provisioned, and data storage required
- The scenario:
 - (2) developers
 - 100 Gb of data storage required
 - IL4 controls/protections required for CUI information
 - DevSecOps CI/CD pipeline required
 - Assumes 24/7 operations (AWS and Azure bill in 15 minute or less increments)
 - Assume (4) vCPU's utilized 24 hours daily by up to 2 Dev's
 - Assume 30 GB RAM utilized 24 hours daily by up to 2 Dev's
 - Costs not captured in this scenario:
 - Data leaving AWS & Azure
 - API service usage
 - Identity management if needed
 - Logging capabilities if needed
 - Container registry usage
 - AWS Lambda - variables
 - AWS CodeBuild – variables

HOSTING ENVIRONMENT - COMPARISON

	Platform One (RECOMMENDED)	AWS GovCloud	Azure Government
Compute and Networking	Cloud Native Access Point on AF Cloud One for IL-2/4/5 (Built on AWS, with Azure planned)	Elastic Container Service (Rates are \$0.0486/vCPU per hour (CPU) and \$0.0053/GB per hour (memory))	Azure Container Service (rates are \$0.0486/vCPU per hour (CPU) and \$0.0054/GB per hour (memory))
Storage and Content Delivery	Bundled into capability packages (Party Bus, Repo One, Iron Bank)	Elastic Block Storage (\$10 /month up to 100 Gb)	<ul style="list-style-type: none"> Block Storage (\$19.71 /month up to 128 Gb) Object Storage (Azure Blob) (\$0.188 per Gb)
Deployment and Management	Fully DevSecOps CI/CD platform, CNCF-compliant Kubernetes and hardened containers	Extensive suite of tools for deploying and managing services from developing, building, and testing to deploying and monitoring. Pay for what tools/services are utilized.	Extensive suite of tools for deploying and managing services from developing, building, and testing to deploying and monitoring. Pay for what tools/services are utilized.
Risks	Lack of SLAs	<ul style="list-style-type: none"> If the system is assessed to be higher than IL-4, then some services may not be offered. If building new environment, cyber authorization efforts (ATO) will be required at additional time and cost. 	<ul style="list-style-type: none"> If the system is assessed to be higher than IL-4, then some services may not be offered. If building new environment, cyber authorization efforts (ATO) will be required at additional time and cost.
Estimated Costs to Sustain NIEM	\$4K /month for Party Bus – Platform One	\$1-4K /month for chosen AWS-native services	\$1-4K /month for chosen Azure-native services
DevSecOps Pipeline	<ul style="list-style-type: none"> Minimal labor cost associated with NMO onboarding into Platform One. No cost associated with cyber authorization effort (Platform One-managed) 	\$\$\$ for NMO management of DevSecOps tool suite, cyber authorization efforts (ATO), and process workflows	\$\$\$ for NMO management of DevSecOps tool suite, cyber authorization efforts (ATO), and process workflows

HOSTING ENVIRONMENT - COMPARISON (CONT)

	Platform One (RECOMMENDED)	AWS GovCloud	Azure Government
App Services	Pay-per-use, fully managed by Platform One administrators (Full list of services available, but Party Bus bundle meets initial NMO requirements)	<ul style="list-style-type: none"> • API as a service <ul style="list-style-type: none"> - HTTP APIs \$1.00 for the first 300 million - Caching starts at \$0.02 per hour - WebSocket APIs \$1.20 for the first billion • AWS Lambda (used in CI/CD to run code without provisioning dedicated servers) <ul style="list-style-type: none"> - Requests \$0.20 per million - Duration \$0.0000166667 for every GB-second • AWS CodeBuild (service that compiles and tests source code) <ul style="list-style-type: none"> - Linux price per build minute starts at \$0.005 - Windows platform not available • AWS Elastic Container Registry (managed Docker container registry) <ul style="list-style-type: none"> - Storage: \$0.10 per GB-month - Data Transfer In: FREE - Data Transfer Out: up to 9.999TB per month and \$0.155 per GB 	<ul style="list-style-type: none"> • API Management starts at \$0.26 per hour (Basic 1,000 requests/second) • Azure Functions <ul style="list-style-type: none"> - Execution time \$0.000016/GB-s after first 400,000 GB-s - Total Executions \$0.20 per million executions after first one million executions • Azure Pipelines <ul style="list-style-type: none"> - One Microsoft-hosted job with 1,800 minutes per month for CI/CD and one self-hosted job with unlimited minutes per month - \$40 per extra Microsoft-hosted CI/CD parallel job and \$15 per extra self-hosted CI/CD parallel job with unlimited minutes • Azure Container Registry (Basic \$0.208 per day) <ul style="list-style-type: none"> - 10GB Storage - Two web hooks - Geo Replication not supported

Disclosure:

- Booz Allen Hamilton maintains strategic relationships with leading cloud service providers, including AWS and Microsoft Azure.
- Additionally, Booz Allen Hamilton provides programmatic and engineering contract support to the Air Force Cloud One and Platform One service offerings.

HOSTING ENVIRONMENT - RECOMMENDATION

- Platform One, AWS GovCloud, and Azure Government all offer a wide variety of hosting solutions
 - AWS and Azure offer the most comprehensive list of services and hosting solutions
 - With either AWS or Azure, NMO could host their entire DecSecOps pipeline and the containerized workloads required to serve new NIEM tools
- AWS and Azure offer expansive app suites and the most control over configuring and managing environments. The expansive app suites would give NMO the support to:
 - Improve IT stability
 - Reduce complexity by relying on services
 - Build new technical capabilities
 - Scale to meet demands
- The control would give NMO the ability to highly customize the environment and optimize costs. However, Platform One offers an authorized platform that NMO could use to build a DevSecOps pipeline and host applications
- Our recommendation depends upon NMO's preference:
 - If NMO prefers to have complete control over the environment, then AWS or Azure are suitable choices
 - If NMO does not require complete control and prefers to use an environment that is already authorized, then Platform One is a suitable choice, but stakeholders should establish service level agreements.
- In any case (Platform One, AWS, Azure), legacy tools such as SSGT need to be adapted to communicate with new tools via web services

HOSTING ENVIRONMENT - NEXT STEPS

- NIEM will need to adapt its legacy tools to enable them to communicate with new containerized tools
- The environment architecture should rely on a design that is as cloud agnostic as possible and rely on open source development
- NIEM will need to engage their cloud provider of choice (e.g., Platform One, AWS, Azure) to begin the onboarding process and to review the available products and services
- The products and services provided by each of these providers would enable NMO to implement a CI/CD pipeline and serve new tools that support the NIEM community

REQUIREMENTS ANALYSIS - NEXT STEPS

1. Review and Approve Documents
2. COA Selection
3. Determine way ahead for development effort

DISCUSSION