Ref: A. XML Implementation of MIL STD Message Standards, April 2015

B. JINTACCS Performance Work Statement, Apr 2015

C. Software Testing for Mission Critical Military Systems, Mar 2015

Encl: (1) Plan of Action and Milestones

(2) Deliverables

1. Introduction. This document is intended to define the rationale and requirements for producing a reference implementation of US Message Text Format (USMTF), NATO Message Text Format (NATO MTF), Variable Message Format (VMF), and Tactical Data Link (TDL) military standards (MIL STD) as proposed in Reference (A). These requirements will be described in the context of Reference (B), and provide specific plan, time line and descriptions for deliverable products.

2. Personnel. The tasks described in this document are to be used to determine hiring criteria for qualified personnel, and to evaluate the performance of the team. This project represents a refinement of the general requirements provided in Reference (B), and are meant to influence future iterations of that Reference (B).

3. Implied Tasks. Reference (A) states that MCTSSA IOB will “create reference implementations for every MIL STD using current XML and web technologies in order to allow fully vetted validation, unit testing and configuration management for mission critical information exchanges.” This is considered necessary for “ the development and maintenance of Tactical Data Exchange Standards and Technical Interoperability Standards.” (B.1.1) . This effort is a refinement of the performance requirement which states that “The contractor shall provide technical, engineering and test support for interoperability certification testing, tactical data exchange standards configuration control, analysis of operational procedures, and information modeling and data management support. “ (B.3).

a. Unit Testing. This is a code and data level process which supports the requirement that “The contractor shall provide technical and engineering support for the review, analysis and development of message standards (TDL, VMF and USMTF), related interoperability and system documentation. Unit Testing applies automated processes to mitigate complexity and ensure granular compliance as described in Reference (C).

b. Reference Implementations. As a function of the requirement to provide “Analysis (which includes) comparisons of existing data standards with data models proposed to meet future net centric requirements,” (B.3.6.4 ) it is necessary to have “known good” implementations of the standard. Development of this resource is consistent with the requirement that “The contractor shall participate in the development and evaluation of native schema and information exchanges.” (B.3.6.5)

c. Net Centric Data Standards Analysis Reporting. They creation of unit tests to support “known good” implementations of message standards provides authoritative and quantifiable metrics by which all implementations can be evaluated. Unit Test rationale and design will be included in the reporting requirement defined in Reference B.4.11, and made available to programs which seek to implement MIL STD message standards in a consistent and compliant manner.

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4. XML Standards Maintenance. Adjustments or improvements to existing XML standards in order to achieve NIEM conformance and standards compliance will be preemptive to approval by Joint and International standards bodies. For this reason they must be maintained, documented and advocated internally until official ratification may occur. The reference implementation and Unit Tests will serve as substantive justifications for any changes which require approval.

5. Objectives. Specific tasks and deliverables are provided in the enclosures. This section describes final results desired in terms of functionality and applicability to the mission of Interoperability using standardized military message formats.

a. Entity Re-Use. The use of the NIEM methodology to define military standard message formats enables the re-use, extension and restriction of information items in order to support reusable, verifiable and supportable implementations. This project will leverage this concept in order to demonstrate best-practices and design principles. All standards will be implementation concurrently vice consecutively in order to ensure common, re-usable strategies throughout.

b. Full Implementation. Proposed changes and additions to message standards impact data entities at all levels. Redundant definitions of like concepts increase complexity and violate re-use principles. Validation of changes requires awareness of complex data relationships which cannot be discerned without automated analysis. This project will implement all versions of all messages using uniform methods which support automated testing.

c. Information Delivery. XML is useful for generation, consumption, and validation of information. It is not practical for information delivery over networks. MIL STD formats have specific formats for delivery which are defined in XML Schema characterizations. Reference implementations will include interfaces and code which employ these formats.

d. User Interfaces. Some messages are designed for human entry and viewing while others support automated information exchange resulting in cumulative results. Both purposes will be implemented in this project.

e. Web Services. Platform, application and vendor dependencies cause interoperability issues for MIL STD implementations. Reference implementations will implement web services for all functions in order to allow usage from any network connected device. Web browser caching technology will be employed to allow off-line use.

f. Mobile Platforms. All functionality will be accessible using mobile as well as desktop computing devices.

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PLAN OF ACTION AND MILESTONES

1. Background. This project will provide fully functional user interfaces for message selection, creation, delivery, receipt and viewing. It will provide interfaces to allow auto-population of test data and reporting of automated test operations. It will provide interfaces to perform, annotate, collaborate, and validate changes to XML Schema definitions in order to support necessary configuration management procedures and product generation.

2. Plan of Action. All message standard implementations will be developed in a coordinated manner in order to promote re-usable interface components and testing procedures. All tasks will be completed using the Angular JavaScript framework and HTML 5. NodeJS will be employed to provide server functionality. All development activities will be performed in a continuous build environment. A phased approach will be executed as follows:

a. Phase 1: XML Schema Definitions

(1) Leverage existing work to complete XML Schema representations of MTF, VMF and TDL standards in order to create NIEM conformant products..

(2) Leverage existing work to create web based views of all components of each standard which include the ability to annotate, adjust and track changes to the XML Schemas using a collaborative web interface.

(3) Leverage existing work to create reusable web based form fields for all components of each standard. Employ user-interface validation using Javascript.

(4) Express all cases and conditions using rule based schema language.

(5) Create unit tests using JavaScript to validate content of components using XML Schema and rules which can be employed individually or in context of combinatorial data structures.

(6) Create sample data collections for use in auto-population and testing of all message components.

b. Phase 2: Message Implementation

(1) Create XML Schema Aware Javascript modules to generate valid text and binary data formats from XML Instances.

(2) Create XML Schema Aware Javascript models to parse text and binary formats into XML Instances.

(3) Create Unit Tests which leverage sample data to verify all message generation and parsing operations.

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(4) Create user interfaces to support configuration of automated message exchanges which populate cumulative data products.

(5) Create and interface that allows selection of specific messages for implementation, and provides a means to set default values and specify or create required supplemental information resources.

(6) Generate NIEM compliant Information Exchange Product Documentation (IEPD) for each message which includes documentation, forms, sample data and specifications for default values and supplemental data sources.

(7) Create Unit Tests for all user interface implementations and for all processing modules.

c. Phase 3: Deployment

(1) Publish and document all implementation and testing products using a web service which allows performance or replication of all functions.

(2) Create a web service which allows customization and generation of Mobile compatible application packages for deployment.

(3) Create a web service which leverages the continuous build environment to provide validation reports for proposed changes to XML Schema definitions.

(4) Create a web service which generates and consumes valid and invalid test data for use in the testing of external systems.

(5) Create message viewing service which includes the representation of individual and cumulative messages using web based Geodesy services and views.

(6) Create a Configuration Management service which supports collaboration and digital signature so that Interface Change Proposals to MIL STDs can be generated and validated for content by Standards Board members with access to the analysis and reporting tools inherent to the reference implementations.

2. Milestones. This plan assumes a 36 week development period. These milestones will be implemented using weekly Agile sprints driven by the following monthly objectives.

a. Week 4

(1) Complete XML Schema definitions for MTF, VMF and TDL.

(2) Complete rule based schema language definitions for all cases and conditions.

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b. Week 8

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(1) Complete auto-generated validated web forms for each standard.

(2) Complete establishment of collaborative development and automated build environment.

c. Week 12 : Phase 1 Complete.

(1) Complete development of test data libraries for each standard.

(2) Complete web interface and service which allows viewing of all message documentation and sample forms, auto-population of selected messages.

(3) Complete interface which allows specification of default values, and loading or generation of supplemental data required to create, consume and validate messages.

d. Week 16

(1) Complete Unit Tested modules for consumption and generation of US and NATO MTF Text data formats.

(2) Complete Unit Tested modules for consumption and generation of VMF and TDL Binary data formats.

e. Week 20

(1) Complete user interfaces that allow specification or generation of default values for messages.

(2) Complete user interface to allow annotations describing implementation details of specific messages in specific contexts.

(3) Complete a web service which provides storage and collaboration capabilities for tracking of implementation specific details not provided by XML Schema.

f. Week 24: Phase 2 Complete

(1) Complete web service and user interface which allows creation of situation specific message implementations and the generation of NIEM IEPD products which include documentation, forms, sample data, annotations, default values and supplemental data provisioning details.

(2) Complete a web service which employs the continuous build environment to provide an automated validation report using NIEM IEPD artifacts.

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g. Week 28

(1) Complete web service which allows execution of all functions by users who are authorized to access MIL STD information.

(2) Complete web service which allows download of all code and provides instruction on how to implement all functions independently using MIL STD data resources obtained independently.

h. Week 32

(1) Complete a web service which applies the IEPD generation service to select and generate message interfaces for implementation on mobile devices.

(2) Complete a web service to receive, store and deliver individual and cumulative messages and message data for use by implementers.

(3) Complete a web service to allow the representation of individual and cumulative messages using web based Geodesy services and views.

i. Week 36: Phase 3 Complete

(1) Complete a Configuration Management service to collaborate, annotate and generate reports and documentation to support Interface Change Proposals to the MIL STD process.

(2) Complete a web service which generates and consumes valid and invalid test data for use in the testing of external systems.

3. Remarks. This plan and schedule represent an initial estimation. Feasibility and schedule will be adjusted in accordance on developer capabilities, re-usability of existing work, and unforeseen obstacles. In this case objectives will be prioritized. Specific efforts will be expended to prevent mission creep or inclusion of unneeded or unplanned capabilities.

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DELIVERABLES

1. Work Products. All work products are to be employed throughout the duration of the project in accordance with continuous, collaborative and open source development principles. The purpose of these products is to fuel productivity during the execution phases, as well as to encourage and enable enduring external participation and collaboration by an engaged community of stake holders.

2. Restricted Distribution. The only restricted artifacts used in the project are the MIL STD definitions and products. All efforts will be performed in a manner which maintains separation from these artifacts.

3. Required Products.

1. Password protected development repository which includes restricted data and provides cloud based collaborative development and continuous build functionality.

2. Publicly accessible development repository with instructions on how to implement all features using independently acquired restricted baseline MIL STD data.

3. Modified XML Schema products which support reference implementations, and all transformation scripts which allow generation of these products from MIL STD baseline data.

4. Documented Unit Tests for (1) User Interface and (2) Message processing and validation.

5. Documented Angular Framework JavaScript code and HTML 5 pages which follow Model-View-Controller design methodology to implement all functionality.

6. XML data library containing sample data for use in automated testing.

7. Exemplars for desktop and mobile deployment.

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