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Editor(s): Jeff Harrison

## **OGC Testbed-11 NIEM & IC Data Encoding Specification Assessment and Recommendations Engineering Report**

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## **Abstract**

The goal of the Geo4NIEM thread in Testbed 11 was to gain Intelligence Community (IC) concurrence of the National Information Exchange Model (NIEM) Version 3.0 architecture through the development, implementations, test, and robust demonstration making use of IC specifications, Geography Markup Language (GML), and NIEM in a simulated “real-world” scenario. The demonstration scenario begins with NIEM-conformant Information Exchange Packages (IEPs) containing operational data and IC security tags from the Information Security Marking (ISM) and Need-To-Know (NTK) access control metadata, and the Trusted Data Format (TDF) for binding assertion metadata with data resource(s). Those instance documents are deployed on Open Geospatial Consortium (OGC) Web Services to be used by client applications. Access control is based on attributes of the end-user and the instance data.

Recommendations to update these information exchanges were provided to reflect NIEM 3.0 architecture and security tags in a ‘NIEM/IC Data Encoding’. The assessment exercised this data encoding in OGC Web Feature Services (WFS) and Policy Enforcement Points (PEP) accessed by multiple client applications. Results from this task provided a preliminary architecture that was tested and demonstrated in Testbed 11, and summarized in other OGC Testbed 11 Engineering Reports.

## **Business Value**

Geospatial information technologies are increasingly a foundation for supporting homeland security, law enforcement, emergency management, and public safety missions in the U.S. While these technologies rely upon much of the same data, they are typically developed in silos within a specific mission area. As a result, data duplication and data exchange delays occur.

In addition, many mission partners have developed stand-alone geospatial information systems (GIS) or Common Operating Picture (COP) /Situational Awareness (SA) applications to support their stakeholder communities during incidents and for daily operational support. While different missions, these GIS or COP/SA capabilities rely upon much of the same data or generate specific data during an event. The data are often stove-piped and not exposed to a broader community that could benefit from these data, resulting in duplication and delayed or incorrect decisions. While mission partners do not need to use the same GIS or COP/SA tools, they could benefit from shared access to the common operating data and services used within these systems if they were exposed and exchanged using open standards.

To meet this challenge, the Program Manager for the Information Sharing Environment (PM-ISE) is funding work to enhance NIEM. One focus of these efforts is to enhance

NIEM's geospatial exchange capabilities to improve inter-government information sharing. Validating and testing the NIEM (Version 3.0) technical architecture related to the IC Data Encoding Specifications (i.e. security tags such as ISM, NTK, and TDF), aligned to OGC Web Services was identified as a need. Specifically, if the framework's geospatial exchange capability is enhanced with security and standards issued by the OGC it will significantly improve inter-government information sharing.

## **Keywords**

ogcdocs, testbed-11, Geo4NIEM, NIEM, WFS, WFS-T, GML, PEP, security, access control, ISM, NTK and TDF



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# OGC Testbed-11 NIEM & IC Data Encoding Specification Assessment and Recommendations Engineering Report

## 1 Introduction

### 1.1 Scope

The focus of the Geo4NIEM thread in the OGC Testbed 11 was to assess the potential for security tagging and access control from Intelligence Community (IC) Data Encoding Specifications to be combined with NIEM for information exchange. The purpose was to determine if the current NIEM architecture can be aligned with the IC Data Encoding Specifications, which include (but are not limited to) ISM, NTK and TDF. This alignment would enable secure information exchange and enhance user/developer understanding. The assessment included review of real world data exchanges defined in the form of a NIEM Information Exchange Package Documentation (IEPD). A number of Extensible Markup Language (XML) instance documents from those real-world exchanges, populated with operational data and IC security tags, were deployed using standards enabled OGC Web Services for testing.

This effort builds on the previous work of the Geo4NIEM Pilot Project. Much of the work was focused on the GML (ISO 19136) data exchange standard and the mechanisms by which GML and NIEM data could be intermingled. A key driver was to clarify how data conforming to one framework could be included or “embedded” in the other using various encapsulation strategies. A secondary goal was to conduct various software demonstrations in order to assess the feasibility of the various approaches and to explore the prospects for making use of fundamental OGC web services such as WFS.

Based on the results of the Geo4NIEM Pilot the sponsors of the Geo4NIEM thread in the Testbed worked with OGC staff to articulate specific functional requirements in order to meet the following objectives:

- Validating the NIEM (Version 3.0) technical architecture related to the IC Data Encoding Specifications (i.e. ISM, NTK, and TDF) aligned to OGC Web Services, Phase 9 (OWS-9) Testbed related work.
- Testing and demonstrating use of 1) NIEM 3.0 architecture, and access control and security tagging metadata defined by the IC Data Encoding Specifications leveraging OWS-9; and 2) full round tripping of NIEM-conformant information exchanges to GML feature(s) and back to a NIEM-conformant information exchange.

- Testing and demonstrating use of an application programming interface (API) for operating primarily on GML feature representations leveraging NIEM components; features may be searched, retrieved, inserted, updated, and deleted.

Reviewing and documenting recommendations to enable full round tripping from NIEM-conformant information exchange to Geography Markup Language (GML) feature(s) and back to NIEM-conformant information exchange.

To accomplish these objectives, five primary tasks were identified:

**Task 1:** *NIEM & IC Data Encoding Specification Assessment and Recommendations*

This task assessed the potential for security tagging and access control from the IC Data Encoding Specifications to be leveraged with NIEM in support of information exchange. The purpose was to determine if the current architecture of NIEM can support IC specification alignment. The IC Data Encoding Specifications include but are not limited to ISM, NTK and TDF metadata.

The assessment included review of real world IEPDs, where the Extensible Markup Language (XML) schema and NIEM instance documents were populated with relevant content and IC security tags. IEPDs assessed were:

- Notice of Arrival IEPD
- Incidents IEPD
- Resources IEPD

Recommendations to update these information exchanges were provided to reflect NIEM 3.0 architecture and included sample security and dissemination control markings. The assessment exercised OGC web services to test NIEM Version 3.0 conformant IEPDs containing the appropriate IC security markings. Results from this task provided a preliminary proposed architecture structure that was tested and demonstrated in Task 2.

This task produced one document:

- Testbed 11 NIEM IC Data Encoding Specification Assessment and Recommendations ER

**Task 2:** *NIEM & IC Data Encoding Specification Test and Demonstration*

This task used preliminary findings and recommended architectures for IC Data Encoding Specification support identified in Task 1, and performed a Test and



Demonstration of the recommended architecture leveraging the results of Testbed 9 and previous Geo4NIEM initiatives where appropriate. Results of this task provided updates to the proposed architecture prepared in Task 1.

Results of this test and demonstration were documented in an Engineering Report containing the Findings and Recommendations with reference to refinements to the originally proposed architecture prepared in Task 1.

This task produced one document:

- Testbed 11 Results of Test and Demonstration of NIEM Using IC Data Encoding Specifications ER

### **Task 3:** *NIEM-GML-NIEM Round-trip Assessment and Recommendations*

This task assessed the NIEM and GML support for geospatial data exchange round-trip workflow process to include: creation, transfer, receipt, modification, return, and acceptance of XML content originating as NIEM IEPDs.

This task produced one document:

- Testbed 11 NIEM-GML-NIEM Round Trip Assessment and Recommendations ER (Preliminary)

### **Task 4:** *NIEM-GML-NIEM Round-trip Test and Demonstration*

This task used the findings and recommended architecture structure supporting NIEM-GML-NIEM round-trip assessment identified in Task 3 and performs a Test and Demonstration of the recommended architecture.

This task produced one document:

- Testbed 11 NIEM-GML-NIEM Round Trip Assessment and Recommendations ER (Final)

### **Task 5:** *Test and Demonstration of an API for Processing GML Feature Representations*

This task performed Test and Demonstrations using OGC web services, such as Basic and Transactional Web Feature Service (WFS-T) and Policy Enforcement Points (PEPs), to process GML feature representations leveraging NIEM components. The Test and Demonstration included, but are not limited to feature retrieval, insert, update and delete.

This task produced one document:

- Testbed 11 NIEM-GML Feature Processing API using OGC Web Services ER.

## 1.2 Participating organizations

### 1.2.1 Sponsoring Organizations

Geo4NIEM in Testbed 11 was sponsored by the following organizations:

- US Department of Homeland Security (DHS)

### 1.2.2 Participating Organizations

The following organizations played one or more roles in Geo4NIEM in Testbed 11 as participants (i.e. responded to the RFQ/CFP)

- The Carbon Project
- Secure Dimensions
- con terra
- Jericho Systems

This document also integrates comments and content from MITRE and Safe Software.

## 1.3 Document contributor contact points

The following participants (listed in alphabetical order by surname) made substantial contributions to the content of this report. All questions regarding this document should be directed to the editor or any of the contributors.

| Name             | Organization       |
|------------------|--------------------|
| Jan Drewnak      | con terra          |
| Rüdiger Gartmann | con terra          |
| Jeff Harrison    | The Carbon Project |

|                 |                    |
|-----------------|--------------------|
| Dean Hintz      | Safe Software      |
| Andreas Matheus | Secure Dimensions  |
| Mark Mattson    | The Carbon Project |
| Scott Renner    | MITRE              |
| Tim Schmoyer    | Jericho Systems    |

Many thanks are extended to the reviewers who submitted comments over the course of the project.

#### 1.4 Future work

Improvements in this document are desirable and will be included based on ongoing interoperability engineering activities.

#### 1.5 Foreword

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The Open Geospatial Consortium shall not be held responsible for identifying any or all such patent rights.

Recipients of this document are requested to submit, with their comments, notification of any relevant patent claims or other intellectual property rights of which they may be aware that might be infringed by any implementation of the standard set forth in this document, and to provide supporting documentation.

## 2 References

The following documents are referenced in this document. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the normative document referred to applies.

- *Intelligence Reform and Terrorism Prevention Act of 2004 (IRTPA)*
- *Guidelines and Requirements in Support of the Information Sharing Environment*, Presidential Memo, December 2005.
- Open Geospatial Consortium (OGC), Summary and Recommendations of the Geospatial Enhancement for the National Information Exchange Model (Geo4NIEM) Interoperability Program Pilot (<http://www.opengeospatial.org/standards/per>)

- Open Geospatial Consortium (OGC), Geography Markup Language (GML) Encoding Standard (<http://www.opengeospatial.org/standards/gml>)
- Open Geospatial Consortium (OGC), Web Feature Service (WFS) (<http://www.opengeospatial.org/standards/wfs> )
- Open Geospatial Consortium (OGC), Filter Encoding Implementation Specification (<http://www.opengeospatial.org/standards/filter> )
- Intelligence Community (IC) Data Encoding Specifications (<http://www.dni.gov/index.php/about/organization/chief-information-officer/icio-enterprise-integration-architecture>)
- IC Enterprise Authorization Attribute Exchange between IC Attribute Services, Authorization Attribute Set (<http://www.dni.gov/index.php/about/organization/chief-information-officer/idam-authorization-attribute-set>)
- XML Data Encoding Specifications for Information Security Marking Metadata (<http://www.dni.gov/index.php/about/organization/chief-information-officer/information-security-marking-metadata>)
- XML Data Encoding Specification for Need-To-Know Metadata (<http://www.dni.gov/index.php/about/organization/chief-information-officer/need-to-know-metadata>)
- XML Data Encoding Specification for Trusted Data Format (<http://www.dni.gov/index.php/about/organization/chief-information-officer/trusted-data-format>)
- NIEM Version 3.0 (<http://release.niem.gov/niem/3.0>)
- NIEM.gov (<http://www.niem.gov>)
- Open Geospatial Consortium (OGC), Web Services Common Standard (<http://www.opengeospatial.org/standards/common> )

NOTE The OWS Common Standard contains a list of normative references that are also applicable to this Implementation Standard.

In addition to this document, this report includes several XML Document files as specified in Annexes A and B.

### 3 Terms and definitions

For the purposes of this report, the definitions specified in Clause 4 of the OWS Common Implementation Standard [OGC 06-121r3] shall apply.

### 3.1 Abbreviated Terms

|        |   |
|--------|---|
| ABAC   | Access Based Access Control                             |
| AIXM   | Aeronautical Information Exchange Model                 |
| ARH    | Access Rights and Handling                              |
| DES    | Data Encoding Specification                             |
| EDH    | Enterprise Data Header                                  |
| GML    | Geography Markup Language                               |
| HTTP   | Hypertext Transfer Protocol                             |
| HTTPS  | Hypertext Transfer Protocol over SSL/TLS                |
| IC     | Intelligence Community                                  |
| IEP    | Information Exchange Package                            |
| IEPD   | Information Exchange Package Documentation              |
| ISM    | Information Security Markings                           |
| MDA    | Maritime Domain Awareness                               |
| NIEM   | National Information Exchange Model                     |
| NTK    | Need to Know  |
| OGC    | Open Geospatial Consortium                              |
| OWS    | OGC Web Services  |
| PDP    | Policy Decision Point                                   |
| PEP    | Policy Enforcement Points                               |
| PM-ISE | Program Manager for the Information Sharing Environment |
| RFC    | Request For Comments                                    |
| SSL    | Secure Sockets Layer                                    |
| TDF    | Trusted Data Format                                     |
| TDO    | Trusted Data Object                                     |
| TLS    | Transport Layer Security                                |
| UAAS   | Unified Attribute and Authorization Service             |
| UIAS   | Unified Identity Attribute Set                          |
| WFS    | OGC Web Feature Service                                 |

|       |   |
|-------|---|
| WFS-T | OGC Web Feature Service – Transactional |
| XLink | XML Linking Language                    |
| XML   | Extensible Markup Language              |

#### **4 Encoding Development**

For the OGC Testbed 11 Geo4NIEM thread, participants assessed security and dissemination control markings leveraging the TDF, ISM and NTK IC Data Encoding Specifications. They also investigated how to provide appropriate access control to NIEM IEPs served through an OGC Web Feature Service (WFS) instance. The assessment was conducted by implementing prototype components that use NIEM/IC Data Encodings in a functional test environment. Access control was conducted via one of several Policy Enforcement Points that filter based upon the user attributes stored in the OGC Attribute Store. Details on the prototype test environment and test results are provided in separate Engineering Reports, and an overview is provided in the figure below.

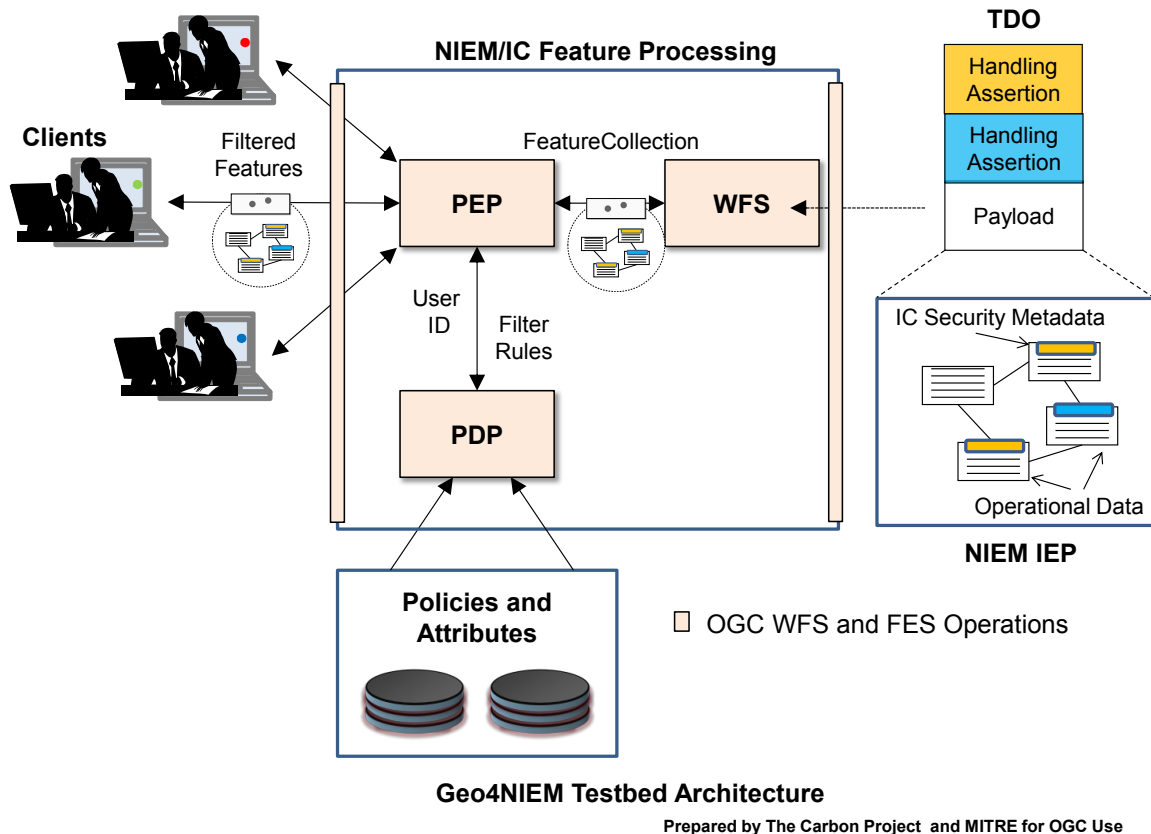


Figure 1 – Geo4NIEM Testbed Architecture <sup>1</sup>

For this testbed three information exchange frameworks and encodings were considered:

- IC Data Encoding Specifications
- NIEM 3.0
- OGC Web Services

<sup>1</sup> User attributes created to support the Geo4NIEM Testbed 11 architecture were extended from the IC Enterprise Attribute Exchange Between IC Attribute Services Unified Identity Attribute Set (UIAS) to support fine-grained access control using NTK.

#### **4.1 IC Data Encoding & Service Specifications**

The success of intelligence, defense, homeland security, and law enforcement missions is dependent on information producers and consumers being able to share, manage, discover, retrieve, and access information across national and international boundaries. The IC Data Encoding Specifications (DES) are the result of IC collaboration and coordination in response to public law, executive orders, policy and guidance, and change requests submitted by IC elements. Data encoding specifications define agreed upon digital encodings or formats for information being shared or exchanged within the enterprise. These specifications should be viewed as component modules. Many of the specifications are tightly integrated and dependent on each other. They can be integrated into other data encoding specifications or profiled (i.e., configured or constrained) to achieve a particular mission or business objective - such as supporting security tagging within the NIEM.

While this flexibility exists, users of the IC Data Encoding Specifications are required to maintain conformance to the relevant specification. An instance document is considered conformant to an IC DES if it passes all of the normative validation steps. The IC DES XML schemas (unless noted otherwise) CVE values from the XML CVE files, and the Schematron code version of the constraint rules are normative for the specifications.

##### **4.1.1 XML Data Encoding Specification for Information Security Marking (ISM) Metadata**

The XML Data Encoding Specification (DES) for Information Security Markings (ISM.XML) defines detailed implementation guidance for using XML to encode Information Security Markings (ISM) metadata. This DES defines the XML attributes, associated structures and relationships, restrictions on cardinality, permissible values, and constraint rules for representing electronic information security markings.

##### **4.1.2 XML Data Encoding Specification for Need-To-Know (NTK) Metadata**

The XML Data Encoding Specification (DES) for Need-to-Know Metadata (NTK.XML) defines detailed implementation guidance for using XML to encode metadata necessary to facilitate automated systems making access control decisions. This DES defines the XML elements and attributes, associated structures and relationships, restrictions on cardinality, and permissible values for representing access control data concepts using XML.

The metadata, are used to represent the system-specific properties assigned to an information resource that will be used, in conjunction with information about the user, and possibly other information, to determine the user's access to the data. A single

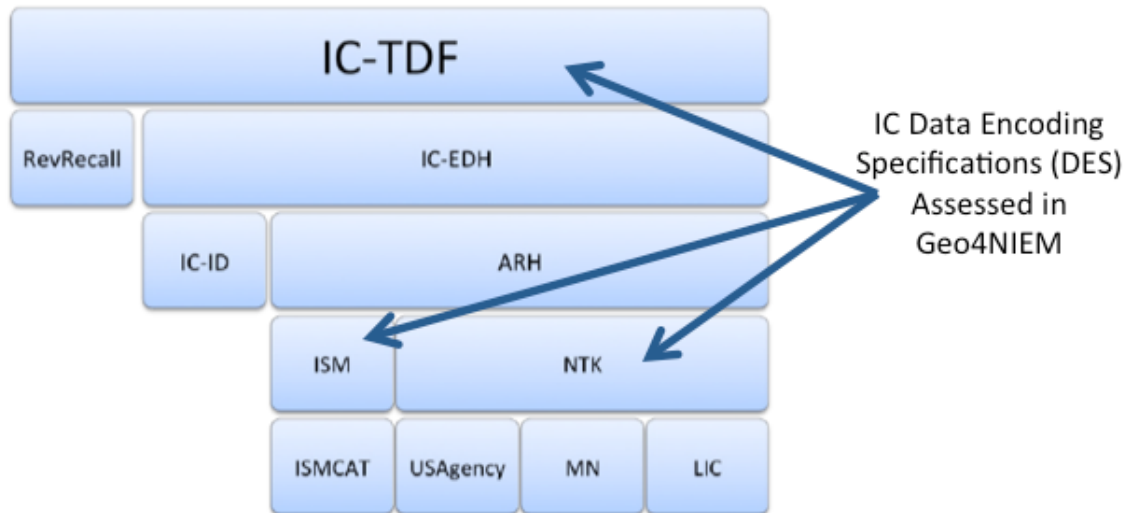


information resource may include multiple occurrences of these metadata in order to specify access control information according to multiple, different access systems.

#### 4.1.3 XML Data Encoding Specification for Trusted Data Format (TDF)

The XML Data Encoding Specification (DES) for Trusted Data Format (IC-TDF.XML) defines detailed implementation guidance for using XML to encode IC-TDF data. This Data Encoding Specification (DES) defines the XML elements and attributes, associated structures and relationships, mandatory and cardinality requirements, and permissible values for representing trusted data format data concepts using XML.

The Intelligence Community (IC) has standardized the various classification and control markings established for information sharing within the Information Security Markings (ISM), Need-To-Know (NTK), Enterprise Data Header (EDH), and Access Rights and Handling (ARH) XML specifications of the Intelligence Community Enterprise Architecture (ICEA) Data Standards. The IC-TDF.XML specification further expands on this body of work, adapting and extending it as necessary for TDF to function as the IC submission format for binding assertion metadata with data resource(s). This TDF functionality supports the IC way-ahead strategy of implementing secure cloud-based information exchange and discovery on the IC Enterprise



**IC-TDF Dependencies<sup>2</sup>**

<sup>2</sup> Graphic provided by the Office of the Director of National Intelligence (ODNI) Office of the Chief Information Officer (OCIO) with annotations provided by Defense Information Systems Agency (DISA) and the NIEM Program Management Office (PMO).

The IC-TDF.XML specification has a consistent and simple concept of Assertions and Payloads. There are two options for root elements: Trusted Data Object (TDO) and Trusted Data Collection (TDC). A TDO contains some data (the payload) and some statements about that data (the assertions). In the context of TDF, an 'assertion' is defined as a statement providing handling, discovery, or mission metadata describing a payload, TDO, or TDC, depending on the scope of the assertion. To facilitate handling and access control decisions, each TDO and TDC must contain at least one Handling Assertion. A Handling Assertion is a special type of structured assertion that contains the IC Enterprise Data Header (EDH) for the TDO or payload, providing the attributes needed for policy decisions regarding access control and how the data must be handled. ISM and NTK markings are contained in Handling Assertions, as part of the Access Rights and Handling (ARH) block. Additional discovery and mission assertions may also be provided. A TDC contains a list of TDOs (the payload) and some statements about those TDOs (the assertions). A TDC may also be a collection of collections, and contain other TDCs.

Each TDO consists of one or more assertions and a payload. Assertions may optionally be cryptographically bound to the payload to provide assurance over the integrity of the assertion, the payload, and the relationship between the assertion and payload. Each IC-TDF requires at least one handling assertion, optional discovery and mission assertions, and a payload. The handling assertion must consist of a structured IC-EDH block. Mission specific metadata may consist of a structured block (XML) or unstructured data (binary). The payload may be structured XML, unstructured data, or a reference. A TDC consists of a collection of TDOs or TDCs. It is expected but not required that the child TDOs and TDCs within a TDC are in some way related, with relationships encoded in the TDC assertions.

Information sharing within the national intelligence enterprise increasingly relies on information assurance metadata to allow interagency access control, automated exchanges, and appropriate protection of shared intelligence. This requires a structured, verifiable representation of security metadata bound to the intelligence data in order for the enterprise to become inherently "smarter" about the information flowing in and around it. This representation when implemented with other data formats, improved user interfaces, and data processing utilities, can provide part of a larger robust information assurance infrastructure capable of automating some of the management and exchange decisions now requiring human involvement. These specifications are in operational usage outside of the IC currently for other missions such as Defense and Law Enforcement. In Geo4NIEM they were successfully applied to a disaster management scenario.

#### **4.1.4 IC Enterprise Attribute Exchange Between IC Attribute Services Unified Identity Attribute Set (UIAS)**

NIEM is a standards-based approach to the design of structured information exchange specifications. Figure 2 illustrates the process, which is described in reverse order (right to left) as follows: Producer and consumer software applications exchange structured information in the form of XML documents known as information exchange packages (IEPs). Developers of that software understand the expected content of those IEPs by understanding the exchange specification, which in NIEM is called an Information Exchange Package Documentation (IEPD). The designers of the IEPD follow the NIEM process, reusing data components from the NIEM data model and extending their exchange with new components as needed. The NIEM community [3] creates shared data components for those concepts on which they can agree and for which they believe a common definition will be useful.

Defining the mandatory minimum set of IC enterprise authorization attributes and values for sharing through the IC UAAS federation supports consistent and assured information sharing across the enterprise. The IC UAAS supports Attribute-Based Access Control (ABAC) to promote on-demand access to information and other resources by IC users and services, and reduces authorization vulnerabilities by strengthening the access control decision process.

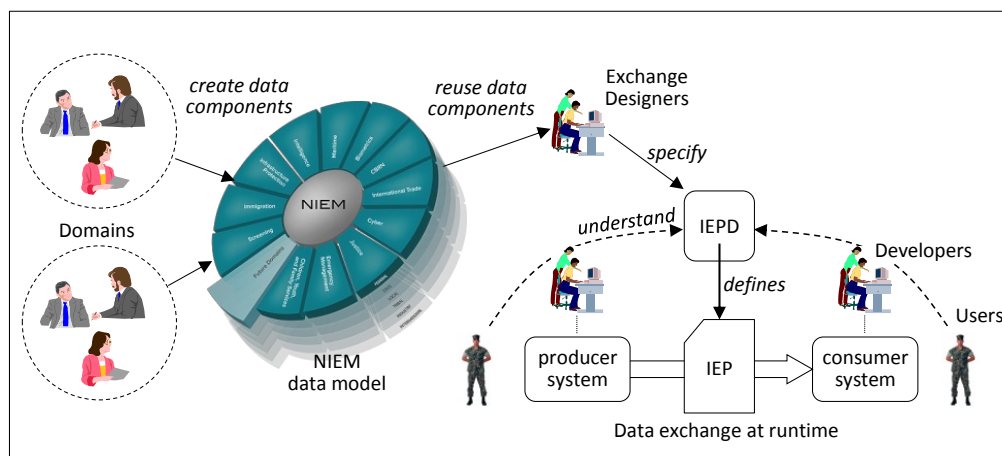
IC Enterprise Attribute Exchange Between IC Attribute Services Unified Identity Attribute Set (UIAS) specification is implemented by the OGC Attribute Store to define the user attributes used for the Testbed 11. While the UIAS specification codifies the minimum set of enterprise-level authorization attributes that IC elements are expected to provide if they participate in the Intelligence Community Unified Authorization and Attribute Service (UAAS) architecture, Testbed 11 applies the specification to state and local emergency responder participants. These attributes are explicitly used as parameters for access to the data assets tagged with NTK.XML.

## **4.2 NIEM 3.0**

NIEM is a standards-based approach to the design of structured information exchange specifications. Figure 2 illustrates the process, which is described in reverse order (right to left) as follows: Producer and consumer software applications exchange structured information in the form of XML documents known as information exchange packages (IEPs). Developers of that software understand the expected content of those IEPs by understanding the exchange specification, which in NIEM is called an Information Exchange Package Documentation (IEPD). The designers of the IEPD follow the NIEM process, reusing data components from the NIEM data model and extending their exchange with new components as needed. The NIEM community [3] creates shared data components for those concepts on which they can agree and for which they believe a common definition will be useful.

An IEPD consists of a minimal but complete set of artifacts (XML schemas, documentation, sample XML instances, etc.) that defines and describes an implementable NIEM information exchange. A complete and conforming IEPD will contain all the schema definitions and instructional material necessary to:

- Understand information exchange content, semantics, and structure.
- Create and validate information exchanges defined by the IEPD.
- Identify the lineage of the IEPD and optionally its artifacts.



Prepared by MITRE for OGC

**Figure 2 - The NIEM Process**

### 4.3 Web Feature Service (WFS)

The OGC Web Feature Service (WFS) Implementation Specification allows a client to retrieve geospatial data encoded in Geography Markup Language (GML) from multiple Web Feature Services. The standard defines interfaces for data access and manipulation operations on geographic features, using HTTP as the distributed computing platform. Via these interfaces, a Web user or service can combine, use and manage geodata -- the feature information behind a map image -- from different sources. A Transactional Web Feature Service allows a client to send messages relating to making changes to a geospatial database.

#### 4.4 Encoding Principles

As a first step Trusted Data Objects (TDO) including ISM and NTK metadata in XML were added to the NIEM IEP documents along with GML feature geometries for testing. An example of a NIEM/IC Data Encoding with these security tags is provided as Annex A. The next step in the project was to serve the security-tagged NIEM/IC Data Encoding through an OGC Web Feature Service – Transactional (WFS-T). This process is summarized in Figure 3.

A key consideration at this phase in the project was that the modular nature of the NIEM and IC security tags allows them to be combined in multiple ways to support the needs of information exchange. Accordingly, the encoding of the NIEM/IC Data Encoding on WFS needed to be flexible and allow for many different types IEP instance documents as input. For example, each Homeland Security domain may have many information exchanges, each with its own IEP documents for data exchange.

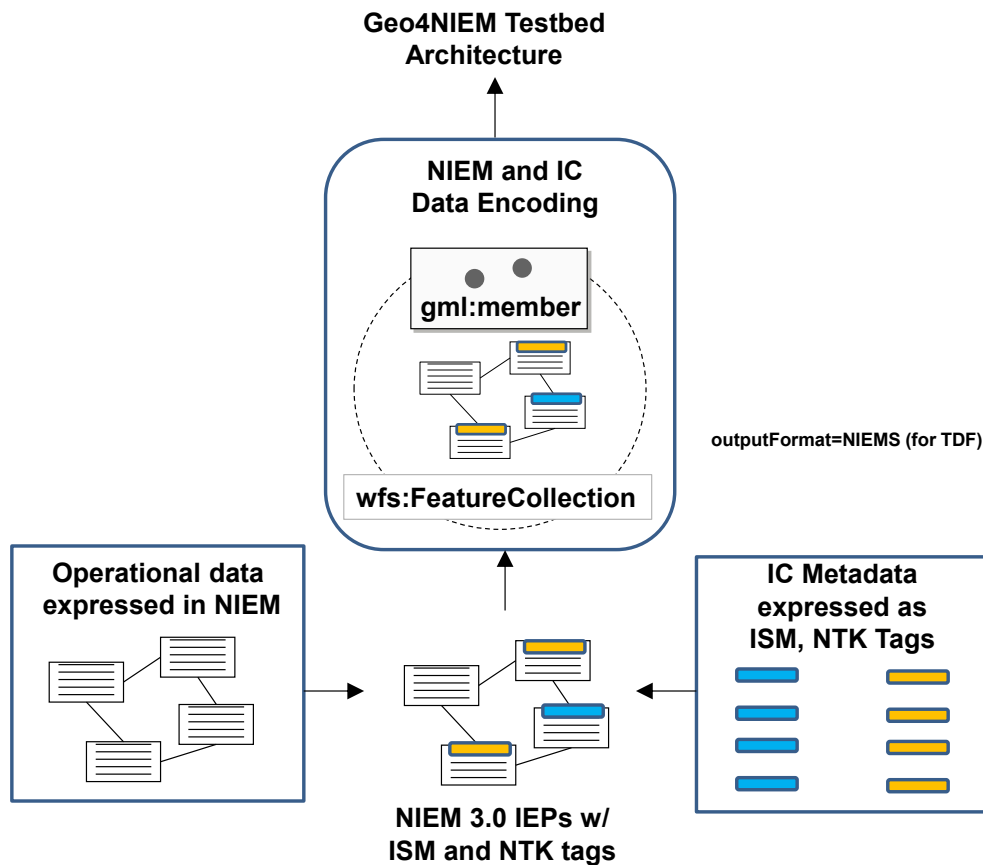


Figure 3 – Converting NIEM IEP with ISM/NTK tags into wfs:FeatureCollections

To support this flexibility, guiding principles were applied to the development of the NIEM/IC Data Encoding. For example, it must support multiple namespaces and complex nested schema. It must also be discoverable, self-describing and support interactive query and update. Finally, it must support multiple security tagged IEP instance documents. The OGC Web Feature Service – Transactional (WFS-T) was selected as a template to test the NIEM/IC Data Encoding since it supports all these principles.

Using these principles and WFS-T as a template, the project assessed two ways of delivering the data encoding:

- NIEM IEP containing ISM and NTK metadata as a member of wfs:FeatureCollection (called the ‘NIEM/IC WFS’)
- NIEM IEP with ISM and NTK metadata, appearing as the structured payload in a TDO, which in turn is a member of wfs:FeatureCollection. (This encoding was made available via the outputFormat parameter called ‘NIEMS’)

This approach provided the NIEM/IC WFS as a default option since it was assessed this model may be more readily handled by server and client applications during initial testing. Three IEPs were converted, Notice of Arrival, Incident and Resource, into NIEM/IC wfs:FeatureCollection and tested during hands-on collaborative engineering. From that engineering a set of candidate rules were developed to guide the development of NIEM/IC Data Encoding in an environment where there may be hundreds of potential IEP instance documents, each with security tags. These rules are summarized in the following sections.

## 4.5 Encoding

To support testing of the NIEM/IC Data Encoding a cloud-based test environment was established by The Carbon Project. PEPs from multiple Participants including Secure Dimensions, con terra and Jericho Systems then accessed the NIEM/IC Data Encoding on the cloud-based test environment. Hands-on collaborative engineering yielded the following set of parameters to guide the development of NIEM/IC Data Encodings.

### 4.5.1 wfs:FeatureCollection

This encoding tested NIEM/IC Data Encoding as an XML document with a root element, wfs:FeatureCollection for information exchange. The wfs:FeatureCollection contained 1 or more gml: featureMembers representing geographic features. A *summary* representation of the wfs:FeatureCollection with gml:featureMembers is provided below. Structured content as NIEM 3.0 would be provided within the mda:noticeofarrival tags.

```

<wfs:FeatureCollection
  <gml:featureMember>
    <mda:noticeofarrival
...
...
    </mda:noticeofarrival>
  </gml:featureMember>
  <gml:featureMember>
    <mda:noticeofarrival
...
...
    </mda:noticeofarrival>
  </gml:featureMember>
</wfs:FeatureCollection>

```

A complete example wfs:FeatureCollection with a single gml:featureMembers from the prototype the NIEM/IC Data Encoding is included as Annex B. For Geographic Features as wfs:FeatureCollection the version of GML that shall be supported is ISO 19136:2007.

The use of the term gml:featureMember is based on the designation provided for in NIEM 3.0. This designation may be slightly different based on the Version of OGC WFS Specification implemented.

Data exchange implementing this encoding provided structured content as NIEM 3.0 within a wfs:FeatureCollection. A summary representation of a wfs:FeatureCollection with NIEM 3.0 mda:noticeofarrival content is provided below.

```

<wfs:FeatureCollection
  <gml:featureMember>
    <mda:noticeofarrival
      <mda:Voyage ownerProducer="USA" classification="U">
        <m:VoyageCategoryText>Foreign to
US</m:VoyageCategoryText>
        <m:VoyageIdentification>
          <nc:IdentificationID>1</nc:IdentificationID>
        </m:VoyageIdentification>
      <mda:VoyageClosedLoopIndicator>>false</mda:VoyageClosedLoopIndicator>
    </mda:Voyage>
...
...
  </mda:noticeofarrival>

```

```
</gml:featureMember>
</wfs:FeatureCollection>
```

### 4.5.2 Namespaces

Multiple namespaces are required in a NIEM/IC Data Encoding using WFS, including NIEM 3.0, IC Data Encoding and OGC. Below is a partial listing of the namespaces for NIEM/IC Data Encoding development using a sample Notice of Arrival IEP instance document with security tagging.

#### Namespaces

| Prefix    | Url  | Default                             | + |
|-----------|--|-------------------------------------|---|
| cp        | http://www.thecarbonproject.com                              | <input checked="" type="checkbox"/> |   |
| mda       | http://release.niem.gov/niem/domains/maritime/3.0/mda/       | <input type="checkbox"/>            |   |
| ntk       | urn:us:gov:ic:ntk  | <input type="checkbox"/>            |   |
| ism       | urn:us:gov:ic:ism  | <input type="checkbox"/>            |   |
| nc        | http://release.niem.gov/niem/niem-core/3.0/                  | <input type="checkbox"/>            |   |
| mda-codes | http://release.niem.gov/niem/domains/maritime/3.0/mda/codes/ | <input type="checkbox"/>            |   |
| m         | http://release.niem.gov/niem/domains/maritime/3.0/           | <input type="checkbox"/>            |   |
| geo       | http://release.niem.gov/niem/adapters/geospatial/3.0/        | <input type="checkbox"/>            |   |

















**Figure 4 - Namespaces for the NIEM/IC Data Encoding on WFS (Notice of Arrival)**

### 4.5.3 ISM and NTK Attributes

Documents included an “ism:classification” attributes nested in various tags throughout the rest of the document. The following ISM and NTK attributes were used in the NIEM/IC Data Encoding development and nested in the data structure on the NIEM/IC WFS:



## Attributes

| Name                     | Value  |   |
|--------------------------|--|---|
| ntk:DESVersion           | 9  |   |
| ism:DESVersion           | 11   |   |
| ism:ownerProducer        | USA  |   |
| ism:classification       | C  |   |
| ism:resourceElement      | true   |   |
| ism:classifiedBy         | USCG   |   |
| ism:classificationReason | Classified due to sensitive maritime security information. |   |
| ism:declassDate          | 2050-12-01   |   |

**Figure 5 – ISM and NTK attributes for the NIEM/IC Data Encoding on WFS (Notice of Arrival)**

Data exchange implementing this encoding provided `ism:classification` and `ntk:Access` tags within a `wfs:FeatureCollection`. A summary representation of a `wfs:FeatureCollection` with NIEM 3.0 `mda:noticeofarrival` content and IC `ism:classification` and `ntk:Access` tags is provided below.

```
<wfs:FeatureCollection xmlns:wfs="http://www.opengis.net/wfs"
xmlns:gml="http://www.opengis.net/gml"
xmlns:mda="http://release.niem.gov/niem/domains/maritime/3.0/mda/"
xmlns:m="http://release.niem.gov/niem/domains/maritime/3.0/"
xmlns:nc="http://release.niem.gov/niem/niem-core/3.0/">
  <gml:featureMember>
    <mda:noticeofarrival
mda="http://release.niem.gov/niem/domains/maritime/3.0/mda/"
ntk="urn:us:gov:ic:ntk" ism="urn:us:gov:ic:ism"
nc="http://release.niem.gov/niem/niem-core/3.0/" mda-
codes="http://release.niem.gov/niem/domains/maritime/3.0/mda/code
s/" m="http://release.niem.gov/niem/domains/maritime/3.0/"
geo="http://release.niem.gov/niem/adapters/geospatial/3.0/"
DESVersion="11" ownerProducer="USA" classification="C"
resourceElement="true" classifiedBy="USCG"
classificationReason="Classified due to sensitive maritime
security information." declassDate="2050-12-01"
id="noticeofarrival.1" p7="http://www.opengis.net/gml">
    <gml:featureMember>
      <mda:noticeofarrival
...
```

```

...
  </mda:noticeofarrival>
</gml:featureMember>
</wfs:FeatureCollection>

```

#### 4.5.4 Nested Properties

Data exchange implementing this encoding provided NIEM wfs:FeatureCollections with attributes on the featurtype and fields, which may be nested. An example of a Vessel component is shown below using the CarbonCloud Group Edit tools for NIEM. In this example, nesting is visible for VesselCharterer and contained components.

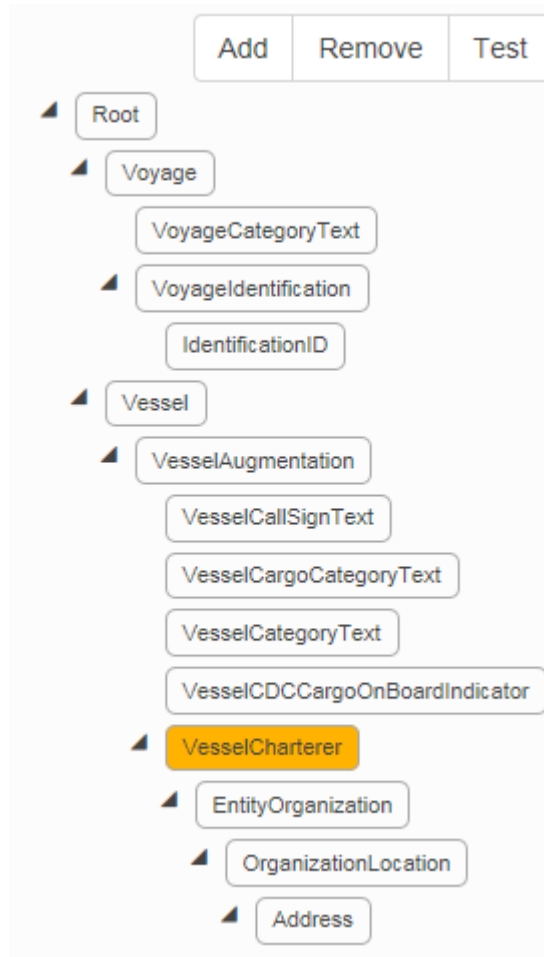


Figure 6 – Nesting for VesselCharterer Component

A *summary* representation of a wfs:FeatureCollection with nested content for an <mda:VesselCharterer> component is provided below.

```

<wfs:FeatureCollection
  <gml:featureMember>
    <mda:noticeofarrival
...
...
<mda:Vessel ownerProducer="USA" classification="U">
  <m:VesselAugmentation ownerProducer="USA"
classification="U">
    <m:VesselCallSignText>H3LP</m:VesselCallSignText>
    <m:VesselCargoCategoryText>Harmful
Substances</m:VesselCargoCategoryText>
    <m:VesselCategoryText>Container
Ship</m:VesselCategoryText>

<mda:VesselCDCCargoOnBoardIndicator>true</mda:VesselCDCCargoOnBoa
rdIndicator>
  <mda:VesselCharterer ownerProducer="USA"
classification="C" access="#Roles|Group^MDA-USCG-Msn-District11-
ROC">
    <nc:EntityOrganization>
      <nc:OrganizationLocation>
        <nc:Address>

<nc:LocationCountryISO3166Alpha2Code>KR</nc:LocationCountryISO316
6Alpha2Code>
          </nc:Address>
        </nc:OrganizationLocation>
        <nc:OrganizationName>SK
Shipping</nc:OrganizationName>
      </nc:EntityOrganization>
    </mda:VesselCharterer>
...
...
  </mda:noticeofarrival>
</gml:featureMember>
</wfs:FeatureCollection>

```

Data exchange implementing this encoding supported fields which are the same name. In the summary example below fields named <nc:Date> are structured so the parent elements define what it is a date for.

```

<wfs:FeatureCollection
  <gml:featureMember>
    <mda:noticeofarrival
...
...
      <m:VesselDOCCertificate>
        <nc:DocumentExpirationDate>
          <nc:Date>2028-04-24T00:00:00</nc:Date>
        </nc:DocumentExpirationDate>
        <nc:CertificateIssueDate>
          <nc:Date>2028-04-25T00:00:00</nc:Date>
        </nc:CertificateIssueDate>
        <m:CertificateIssuingAgency>
          <nc:EntityOrganization>
            <nc:OrganizationName>U.S. Coast
Guard</nc:OrganizationName>
          </nc:EntityOrganization>
        </m:CertificateIssuingAgency>
      </m:VesselDOCCertificate>
      <m:VesselISSC ownerProducer="USA" classification="C"
access="#Roles|Group^MDA-USCG-Msn-District11-ROC">
        <m:CertificateIssueDate>
          <nc:Date>2022-06-22T00:00:00</nc:Date>
        </m:CertificateIssueDate>
...
...
      <m:VesselSafetyManagementCertificate ownerProducer="USA"
classification="C" access="#Roles|Group^MDA-USCG-Msn-District11-
ROC">
        <nc:DocumentExpirationDate>
          <nc:Date>2027-12-01T00:00:00</nc:Date>
        </nc:DocumentExpirationDate>
        <nc:CertificateIssueDate>
          <nc:Date>2017-03-12T00:00:00</nc:Date>
        </nc:CertificateIssueDate>
        <m:CertificateIssuingAgency>
          <nc:EntityOrganization>
            <nc:OrganizationName>U.S. Coast
Guard</nc:OrganizationName>
          </nc:EntityOrganization>
        </m:CertificateIssuingAgency>
      </m:VesselSafetyManagementCertificate>
...
...
    </mda:noticeofarrival>
  </gml:featureMember>
</wfs:FeatureCollection>

```

#### 4.5.5 Unrestricted Schema

Data exchange implementing this encoding provided schemas for the NIEM and IC Data Encoding in GML with no restrictions placed on non-spatial properties – equivalent to those that comply with level two (2) of the OGC Simple Features (SF) for GML Profile.. The spatial properties, however, may be limited to the set of geometric property types supported by compliance levels SF-0 and SF-1 to support broad adoption in as many geospatial applications as possible.

#### 4.5.6 outputFormat

Data exchange implementing this encoding may provide additional TDO wrapped security information for a 'NIEMS' wfs:FeatureCollection via WFS outputFormat.

An example of the NIEMS outputFormat is included as Annex C.

#### 4.5.7 Schema Description

Data exchange implementing this encoding can provide a DescribeFeatureType operation that returns a schema description of feature types offered by a WFS instance. The schema descriptions define how WFS expects NIME/IC feature instances to be encoded on input and on output (for example, in response to a GetFeature operation). This model is described in more detail in a separate ER.

Servers that implemented the NIEM/IC Data Encoding also use the GetCapabilities operation to generate a service metadata document describing a WFS service provided by a server. This model is described in more detail in a separate ER.

#### 4.5.8 Tags and Roles

Each document included an <ntk:Access /> tag and various <ntk:AccessGroup /> and <ntk:AccessGroupValue /> information nested in various tags throughout the rest of the document. Any tag in the document payload, and all of its children tags could be filtered from being sent to the client based upon the ntk:access="#Roles|Group^{role list}" attribute for that tag. These role attributes are specific and need exact pattern match to allow the tag and its children to pass. More specifically, if a tag has an ntk:access attribute that does not match exactly the user attribute Role, then that information should not be sent to the client.

By specifying Roles, ntk:AccessGroups, ism:classification and AccessPolicy PEPs, leveraging attributes defined in alignment of UIAS, can grant access to geospatial

information exchange resources to some users, limited kinds of access to other users, and completely deny access to yet another set of users.

Each access control rule implemented by a different Policy Enforcement Points (PEP) grants (or denies) requests made by an individual or group of individuals, possibly depending on details associated with the request. Referring to one or more web services, rules can specify, for a given set of users, the conditions under which access is to be granted to them. A user can be associated with roles within an organization or with a group whose membership is known throughout the system.

The responsibility for implementing this access control is delegated to the PEP in this prototype NIEM/IC information exchange. NIEM/IC API responses and response pass through the PEPs, and each access control rule implemented by different PEPs grants (or denies) requests made by an individual or group of individuals, depending on the Roles, ntk:AccessGroups, ism:classification and AccessPolicy associated with the user making the request.

In addition, because rules will refer to user roles and names, security within NIEM/IC information exchange the test and demonstration implementation provides a way to name users and mechanisms to manage user identities, including the means by which users can be authenticated. A person is authenticated and assumes an identity by demonstrating knowledge of a secret (such as a password), or possession of some other information, that is associated with that identity.

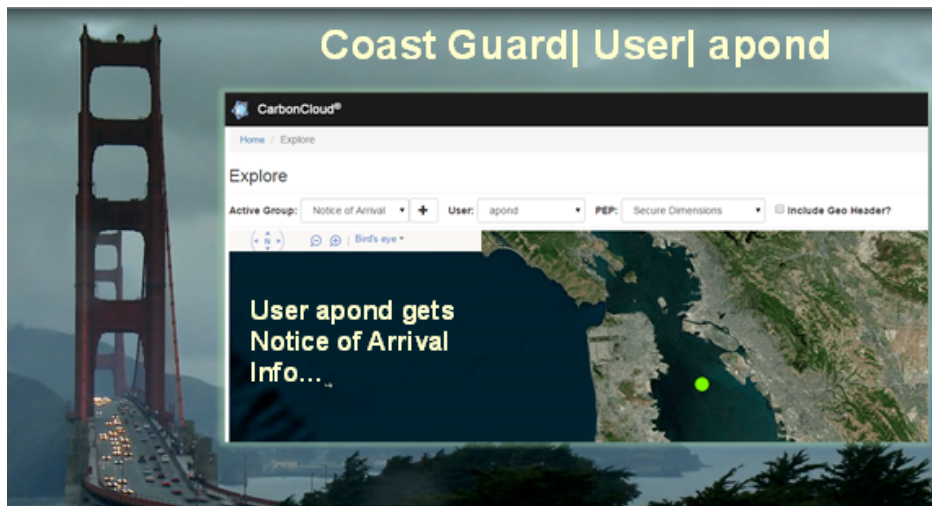
NIEM/IC information exchange has a flexible authentication framework that supports multiple authentication methods. This approach allows an organization to use existing authentication methods. For example, a user might be authenticated at an organization by providing a username/password (HTTP AUTH) that is recognized in the organization, or via X.509 certificates.

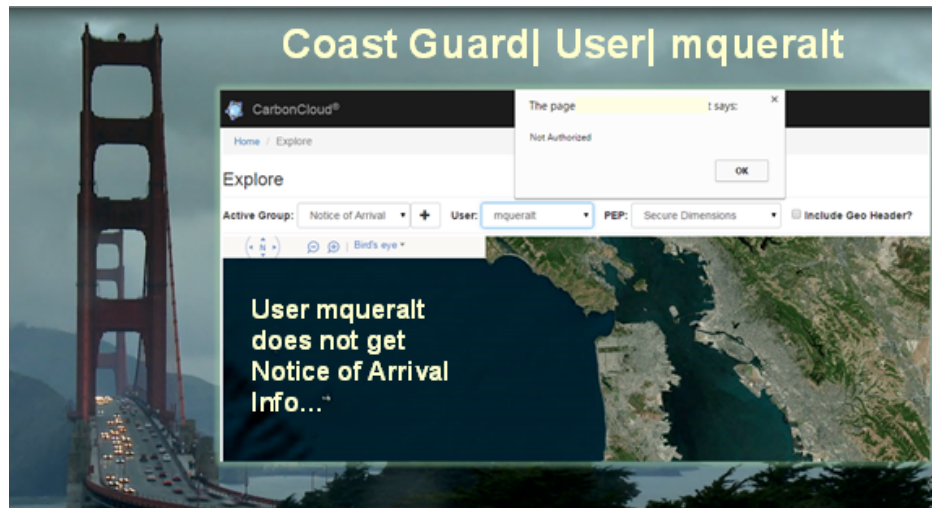
Key within this test and demonstration implementation is the OGC Attribute Store. The OGC Attribute Store implements the IC Enterprise Attribute Exchange Between IC Attribute Services Unified Identity Attribute Set (UIAS) specification. The specification documents a set of IC enterprise identity attributes and associated values that are required for participation in Intelligence Community Unified Authorization and Attribute Service (UAAS) architecture. Information about user and role assignment is stored in an LDAP. The data can be accessed via the OGC IdP Attribute Service interface.

## **5 Examples of NIEM/IC Data Encoding in Use**

This section provides examples of the NIEM/IC Data Encoding in use by applications and services provided by Testbed 11 participants including a cloud-based test WFS from The Carbon Project and PEPs from multiple Testbed participants including Secure

Dimensions, con terra and Jericho Systems. The following examples provide a very brief, sample overview of the demonstration scenario. For a complete description please see the Test and Demonstration ER, and the actual Testbed 11 Geo4NIEM Demonstration videos.





The basic flow of events in the demonstration was:

1. Clients authenticate<sup>3</sup>.
2. Clients issue `getCapabilities` and `getFeature` requests to the PEP, which is acting as a WFS proxy.
3. The PEP passes a `getFeature` request to the WFS, receives a `featureCollection`.
4. The PEP passes the user identity to the PDP.
5. The Policy Decision Point (PDP) looks up user attributes and related access control policies.
6. The PDP creates a filter rule from the user attributes and access control policies. The rule is expressed in terms of data attributes; i.e. ISM and NTK security and access control metadata attributes.
7. The PDP forwards the filter rule to the PEP.
8. The PEP applies the filter rule to the `featureCollection`. Sometimes the rule completely removes a member from the collection. Sometimes it redacts the information that is in a collection member.
9. The filtered `featureCollection` is returned to the client. Note – the effort demonstrated two different ways of handing NIEM IEPs that contain embedded GML data: with and without the TDO wrapper. In both cases the *feature* is the NIEM IEP. The TDO wrapper is treated as an *output format*.

---

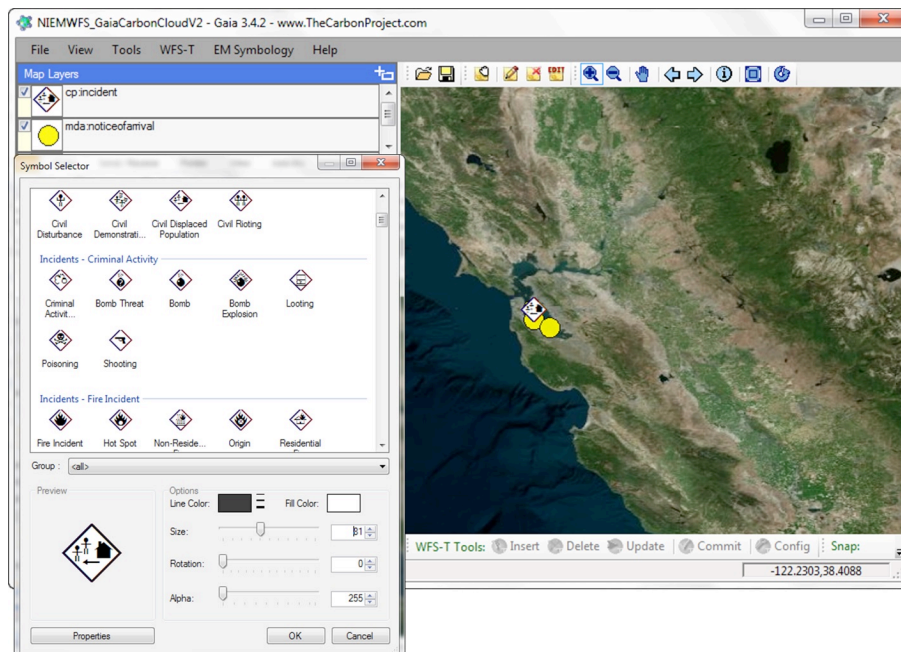
<sup>3</sup> Discussed in ER 15-050.



10. Based on some user action, the client can send a WFS Transaction operation to the PEP, which is still acting as a WFS proxy for the WFS server.
11. The PEP executes authenticate and filtering steps again, this time to see if the policy permits the user to make the transaction request. The PEP lets the request pass through or it doesn't.
12. Based on the WFS-T request, the WFS server updates its internal state.

## 5.1 The Carbon Project

The Carbon Project implemented the NIEM/IC Data Encoding in an OGC WFS instance as well as in multiple client applications, including a new web client developed for Testbed 11. The Web Feature Service (WFS) provided NIEM/IC Data Encoding as `wfs:FeatureCollections` to multiple Policy Enforcement Point (PEP) services. In addition, the WFS provided NIEM/IC Data Encoding directly to client applications such as Gaia shown below with symbolized Incident `wfs:FeatureCollections` and Notice of Arrival content. It should be noted that Gaia represents an older geospatial application. The Carbon Project also developed new web clients able to access the NIEM/IC Data Encoding via PEP from Secure Dimensions, con terra and Jericho Systems, and NIEM/IC WFS from The Carbon Project. An example of this new web client for NIEM/IC is shown in the second graphic below.



**Figure 7 – Incident and Notice of Arrival content from The Carbon Project NIEM/IC WFS in Gaia**

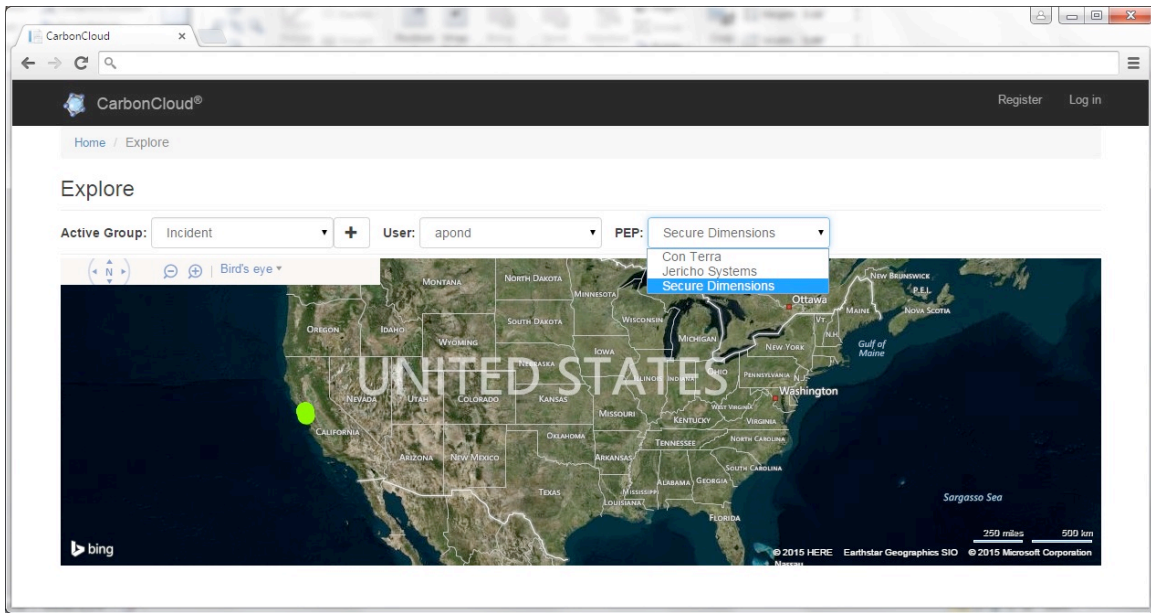


Figure 8 - Web Client from The Carbon Project accessing NIEM/IC Data Encoding from Secure Dimensions, con terra and Jericho Systems PEP

## 5.2 Secure Dimensions

Examples of the Secure Dimensions PEP and The Carbon Project NIEM/IC web client are below.<sup>4</sup>

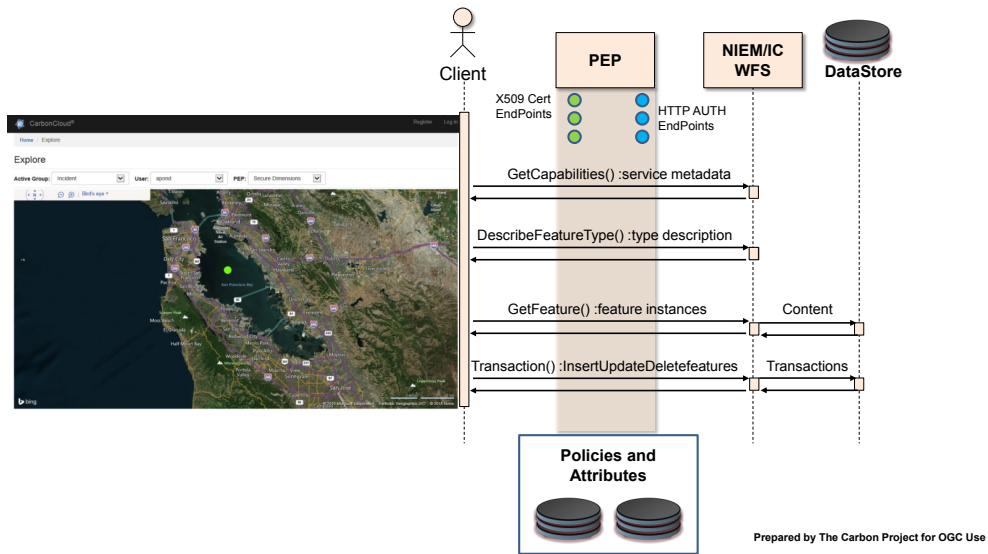


Figure 9 - Secure Dimensions PEP in The Carbon Project web client

<sup>4</sup> Discussed in ER 15-050

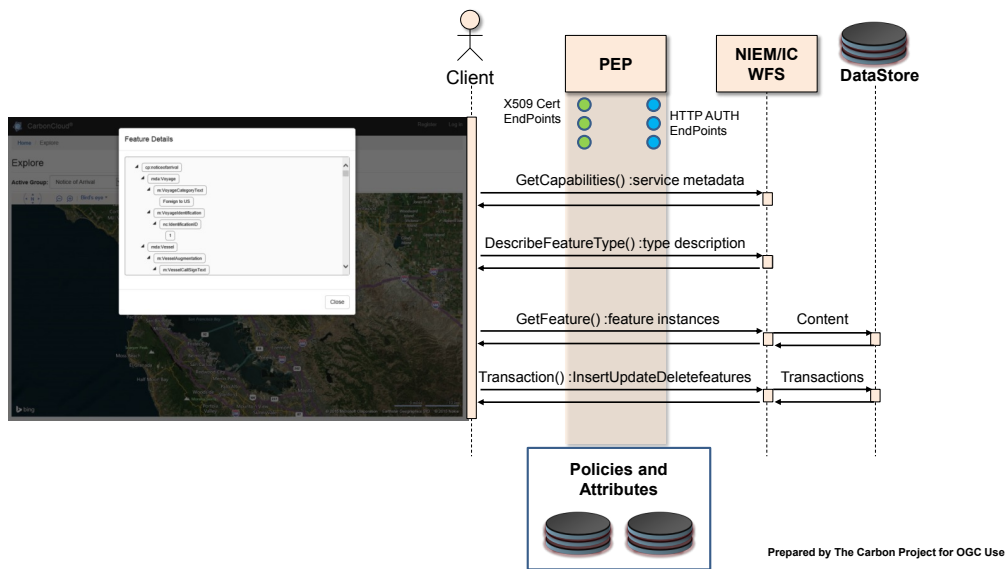


Figure 10 - Secure Dimensions PEP in The Carbon Project web client, feature detail displayed

### 5.3 Con terra

con terra implemented the NIEM/IC Data Encoding in PEP services.<sup>5</sup> Examples are provided below.

<sup>5</sup> Discussed in ER 15-050

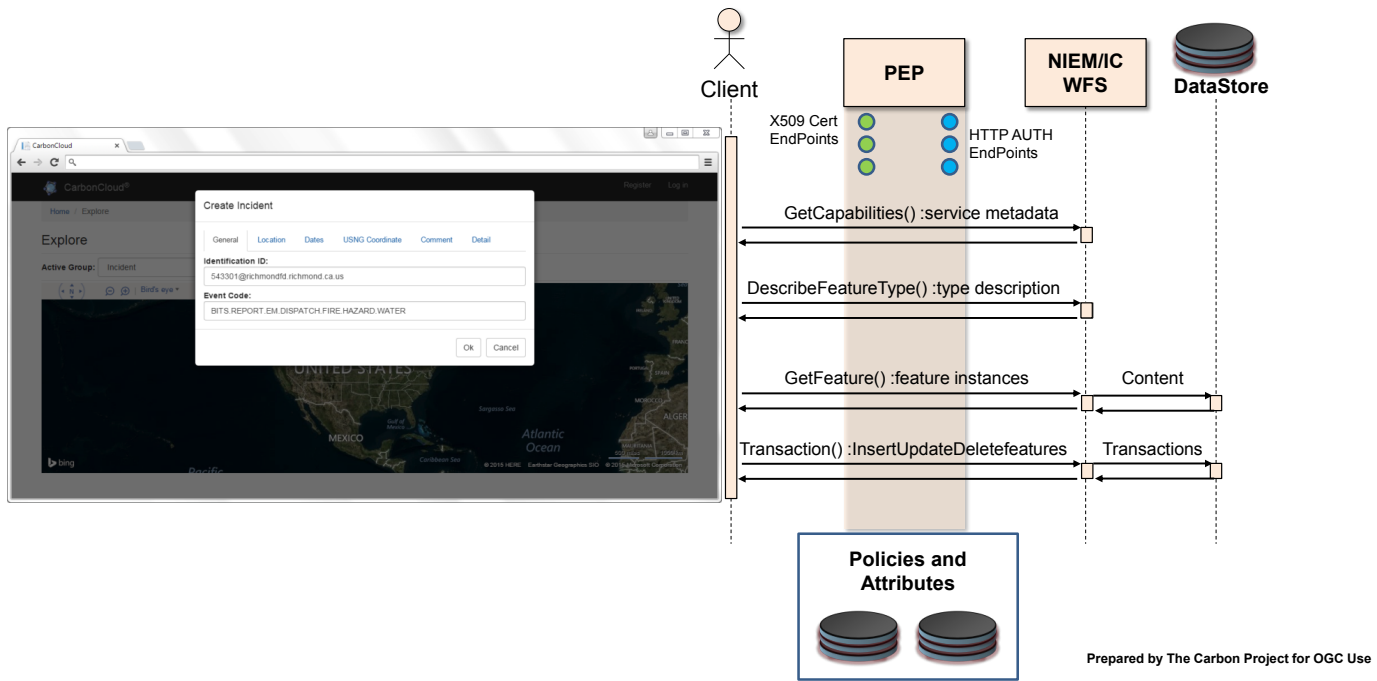
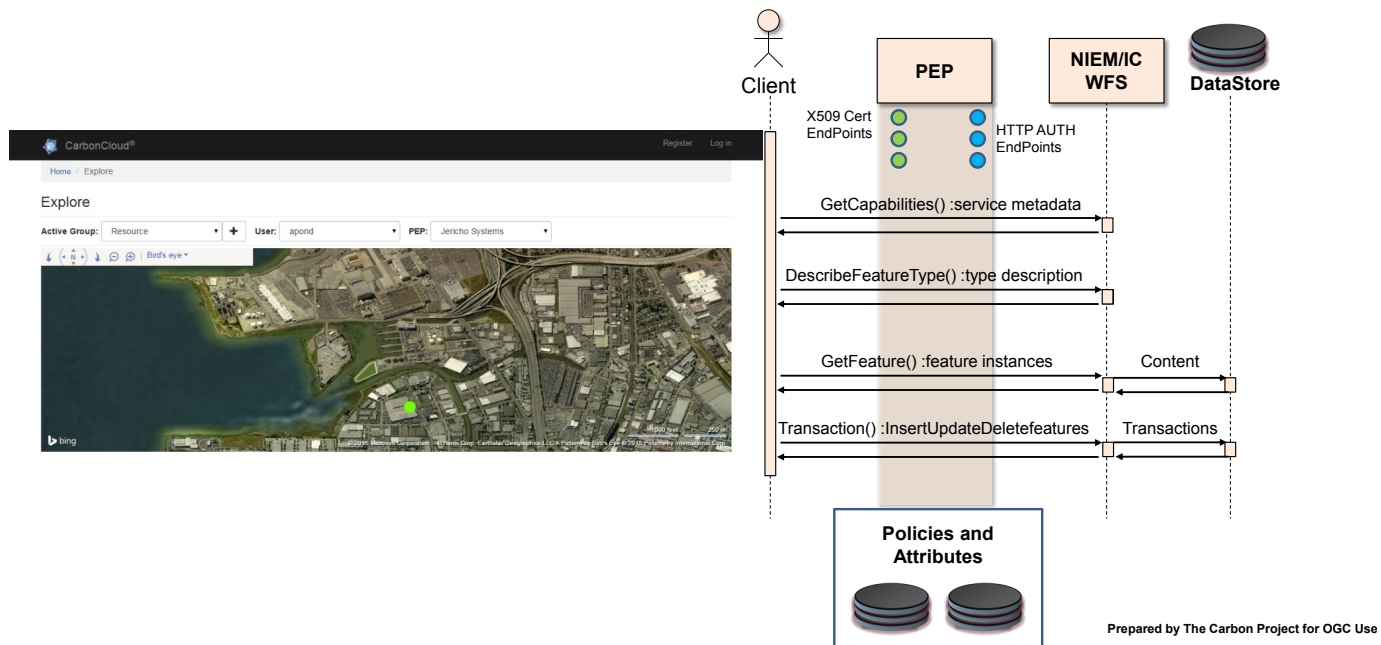


Figure 11 – con terra PEP in The Carbon Project web client, executing WFS Transactions

#### 5.4 Jericho Systems

Jericho Systems implemented the NIEM/IC Data Encoding in PEP services.<sup>6</sup> Examples are provided below.

<sup>6</sup> Discussed in ER 15-050



**Figure 12 – Jericho Systems PEP in The Carbon Project web client, accessing Resource encoding**

## 6 Findings and Recommendations

The evidence obtained through the Testbed 11:Geo4NIEM thread supports three main findings:

- First, with reasonable effort it is possible to combine NIEM, IC security specifications, OGC Web Service components, and GML-aware clients to support information exchange with authorized users.
- Second, implementing such an exchange requires extra work, compared to a typical exchange of features that conform to the GML Simple Features profile. However, this level of effort is not greater than encodings already in OGC, such as Aeronautical Information Exchange Model (AIXM), where a community of interest has defined a standard GML application schema for exchanging geographic data.
- Finally, it is possible to simplify the implementation of NIEM and IC security specifications and still meet information exchange needs. This simplification can reduce the technical overhead required to broadly implement secure information exchanges and emerging collaborative partnerships. Simplification options

include NIEM IEPD development guidance or recommended practices that reduce the impact of generating excessive namespaces.

The following sections describe these findings and any associated recommendations.

### **6.1 Combining NIEM, IC security, and OGC Web Services is feasible**

The demonstration used real-world NIEM IEPs, containing embedded GML elements, properly tagged with IC access control and security metadata, and optionally enclosed within the IC's dissemination format for binding assertion metadata with data resources (i.e. IC-TDF.XML/TDO). The demonstration was constructed using a cloud-based WFS server, multiple Policy Enforcement Points that provide access controls and filters based upon the user attributes stored in the OGC Attribute Store and multiple GML-aware clients. Major OGC operations in a simulated distributed information exchange were assessed including:

- WFS server with GetCapabilities, DescribeFeatureType, GetFeature, and Transaction operations
- Access control engines enforcing access policy based on user attributes and IC metadata attributes in the WFS FeatureCollection payload
- Clients interpreting the WFS FeatureCollection elements and performing transaction operations

NIEM 3.0 was compatible with the IC security, access control and dissemination specifications (ISM, NTK, and TDF) and supported the access control policies for the demonstration scenario. There is no evidence to suggest incompatibility with more complex policies, schemas and security markings. Access control engines can work with NIEM/IC Data Encoding, with or without a services framework.

The participants spent most of their time learning about the NIEM exchange specifications and the IC security specifications. Implementation of the second and third information exchanges (based on Incident and Resource IEPs) took less development time since specialized tools were created to speed the 'cloning' of the first WFS instance (based on the Notice of Arrival IEP).

In the developed NIEM/IC Data Encoding security attributes were part of the field definitions. The project team assessed that it makes good engineering sense to structure the encoding in this manner and that IC security can work successfully within NIEM. For example, imagine there is a field for personal identifiers (like US SSN). Implementers would want the SSN content to be able to be secure, no matter whose SSN it is.

*Recommendation 1: Develop, test and demonstrate tools that clone and adjust data elements of WFS instances of NIEM/IC Data Encodings to simplify and speed development and deployment of service-based information exchanges. Assess tools that promote export of NIEM/IC Data Encodings.*

*Recommendation 2: Assess how IC security specifications (ISM, NTK, and TDF) may further enable WFS and GML-based data exchange.*

## 6.2 Extra effort relative to typical use of Simple Features profile

The GML Simple Features profile defines fixed coding patterns for the use of a subset of XML Schema and GML constructs. It is intended to address the case where a client interacts with a previously unknown server offering. This is the typical case for many OWS components. Relative to that typical case, the demonstration implementation for NIEM/IC Data Encoding required extra effort in three areas: complex non-spatial properties, multiple namespaces and DescribeFeatureType, and context-dependent value references in filter encodings.

### 6.2.1 Complex non-spatial properties

Information exchanges implementing the draft NIEM/IC Data Encoding required schemas in wfs:FeatureCollections roughly equivalent to those that comply with level SF-2 for GMLsf. This finding means that some current WFS and GML applications and services expecting GMLsf Level 0 or 1 tools may not be able to fully operate with NIEM/IC Data Encoding ‘out of the box’. This finding also means that exporting NIEM/IC Data Encoding from a WFS may not be possible in common GIS formats such as Shapefiles.

The SF-0 profile does not allow complex non-spatial properties. These are permitted but unusual in the SF-1 profile. This simplicity can be exploited in server and client software, allowing off-the-shelf components to handle new application schemas with little or no special effort. However, this simplicity is not present in the NIEM/IC encoding. For example, the Notice of Arrival IEPD defines a complex property with six levels of nested elements, resulting in data like this:

```
<mda:Vessel ...>
  <m:VesselAugmentation ...>
    <m:VesselCallSignText>H3LP</m:VesselCallSignText>
```

```

<m:VesselCargoCategoryText>Harmful Substances ...
<m:VesselCategoryText>Container Ship ...
<m:VesselCDCCargoOnBoardIndicator>>true ...
<m:VesselCharterer ...>
  <nc:EntityOrganization>
    <nc:OrganizationLocation>
      <nc:Address>
        <nc:LocationCountryISO3166Alpha2Code>KR ...
      </nc:Address> ...

```

From the perspective of an Information Exchange designer or implementer, this level of complexity may require effort in the WFS server implementations when compared with less extensive SF-0 and SF-1 schemas, especially when implementing the WFS-T functions. It also requires extra effort in the client applications, where specialized Filter Encodings using XPath expressions are necessary to retrieve values from the complex properties.

*Recommendation 3: Develop and test a Best Practice that defines more limited, but useful, subsets of NIEM/IC schema components (including location as GML) to lower the ‘implementation bar’ of time and resources required for developing software that supports NIEM/IC Data Encoding. By lowering the level of effort, Information Exchange designers, geospatial developers and access control software implementers will be encouraged to take greater advantage of the rich functionality in NIEM/IC. The Best Practice should be designed around the business elements needed by Information Exchange Designers.*

## 6.2.2 Multiple namespaces, and DescribeFeatureType

The WFS DescribeFeatureType operation returns an XML Schema document containing a complex type definition for the specified feature type. In order to form a complete schema, the client must then either retrieve or already possess a separate schema document for each imported namespace. This is essential for WFS servers and GML clients implemented with validating parsers. On the other hand, implementations based on non-validating parsers do not need the schema and do not rely on DescribeFeatureType. Both approaches were tested in Testbed 11 Geo4NIEM Thread.

For application schemas conforming to the Simple Features profile, implementing the DescribeFeatureType operation is relatively simple. These schemas typically define features within a single namespace, and clients usually have schema documents for the imported GML namespaces.



Implementing the DescribeFeatureType operation for a NIEM/IC data encoding is more complicated. The schema for such a feature type will have many namespaces, and clients may not always have the corresponding schema document. This can greatly complicate the implementation of the DescribeFeatureType operation.

Two aspects of NIEM IEPDs may be exploited in future work to reduce much of this complexity. A conforming IEPD contains the complete set of schema documents. It also contains a set of OASIS XML Catalog files providing a mapping between namespace URI and schema document file name. A WFS server could use the catalog to rewrite every <import> schema element so that the schemaLocation attribute resolves to a schema document on the server.

*Recommendation 4: Develop, test and demonstrate the feasibility of making schemas available from WFS implementing NIEM/IC Data Encoding. This may or may not be part of the DescribeFeatureType operation so PEPs can create filter rules based upon them. This recommendation may also include assessing methods by which PEPs may process security tag information from the DescribeFeatureType.*

*Recommendation 5: Assess, develop, test and demonstrate governance methods to provide complete sets of public-accessible schema document. In particular, assess methods to assist IEPD developers in maintaining and accessing schemas.*

### 6.2.3 Context-dependent value references in Filter Encodings

From the perspective of a developer implementing OGC standards or a user, the nested structure in the NIEM/IC Data Encoding means implementing fully capable OGC Filter Encodings for WFS will require a subset of XPath. For example, the Notice of Arrival NIEM IEPD describes data like this:

```
<m:VesselDOCCertificate>
  <nc:DocumentExpirationDate>
    <nc:Date>2028-04-24T00:00:00</nc:Date>
  </nc:DocumentExpirationDate>
  <nc:CertificateIssueDate>
    <nc:Date>2026-03-11T00:00:00</nc:Date>
  </nc:CertificateIssueDate>
```

XPath is required to distinguish between the `nc:Date` of document expiration and certificate issue. There is a similar context dependency in NTK, where XPath is required to distinguish between the `ntk:AccessGroupList` element within `ntk:RequiresAnyOf`, and the same element within `ntk:RequiresAllOf`. Therefore, the use of either NIEM or IC security requires Filter processing with XPath enabled.

XPath is accounted for in the Filter Encoding specification, but it is a specialized case and not as broadly implemented as the standard spatial, logical and comparison operators of WFS.

*Recommendation 6: Develop, test and demonstrate the feasibility of fully capable OGC Filter Encodings for WFS implementing NIEM/IC Data Encoding using a subset of XPath. This approach provides the potential for high fidelity queries on NIEM/IC Data Encodings in support of mission and community requirements.*

### 6.3 Simplifying use of NIEM and IC security and meeting exchange needs

The extra effort required to implement the NIEM/IC encoding is not unique to either of those standards. It is common in situations where a community of interest has defined a standard GML application schema for exchanging geographic data, and presumes understanding on the part of all community participants. For example, the Aeronautical Information Exchange Model (AIXM) provides a standard GML application schema for aeronautical information exchange. This application schema defines many complex non-spatial properties, uses multiple namespaces, and includes context-dependent element values. Implementing AIXM-based exchanges with off-the-shelf components requires the same sort of extra effort needed for the NIEM/IC encoding. For example, the Gaia client requires a special "AIXM extender" in order to process AIXM data.

This extra effort can be reduced by careful NIEM-conformant IEPD design. Instead of using all available NIEM objects, designers can carefully construct IEPD schemas using just enough NIEM objects to meet the community's information exchange need. It may be possible to satisfy a large set of information exchange needs with a simple "what, where, when" IEPD that approaches the Simple Feature profile, using reduced nesting and a subset of location designations and security tags.

Achieving broad implementation of these approaches will make it possible for NIEM/IC data encodings to support emerging agile information exchanges driven by collaborative partnerships. This transformation is vital to confronting the security challenges of the future.

*Recommendation 7: Develop, test, and demonstrate the feasibility of a 'Generic' NIEM-conformant IEPD with location, time, what, who information as 'core' elements in simple GMLsf.*

*Recommendation 8: Develop, test and demonstrate the feasibility of a generic GML Application Schema leveraging NIEM-conformant components and IC specification components. This would extend the usefulness of NIEM components from an OGC implementation stand-point within a particular community of interest.*

## Annex A

### Sample IEP Instance Document with Security Tags

```

<?xml version="1.0" encoding="UTF-8"?>
<!--All classification marks in this example are for illustrative
purposes only.-->
<!--There are no actual classified data elements contained in
this example.-->
<mda:LOAReport

xsi:schemaLocation="http://release.niem.gov/niem/domains/maritime
/3.0/mda/ ../xsd/extension/mda.xsd"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:ntk="urn:us:gov:ic:ntk"
  xmlns:ism="urn:us:gov:ic:ism"
  xmlns:gml="http://www.opengis.net/gml/3.2"
  xmlns:nc="http://release.niem.gov/niem/niem-core/3.0/"
  xmlns:m="http://release.niem.gov/niem/domains/maritime/3.0/"

xmlns:mda="http://release.niem.gov/niem/domains/maritime/3.0/mda/"
" ntk:DESVersion="9" ism:DESVersion="11" ism:createDate="2025-12-
10" ism:ownerProducer="USA" ism:classification="S"
ism:resourceElement="true" ism:classifiedBy="USCG"
ism:classificationReason="Classified due to sensitive maritime
security information." ism:declassDate="2050-12-01">
  <mda:Access>
    <ntk:Access ism:classification="U"
ism:ownerProducer="USA">
      <ntk:RequiresAnyOf ism:classification="U"
ism:ownerProducer="USA">
        <ntk:AccessGroupList>
          <ntk:AccessGroup ism:classification="U"
ism:ownerProducer="USA">
            <ntk:AccessPolicy ism:classification="U"
ism:ownerProducer="USA">Roles</ntk:AccessPolicy>
              <ntk:AccessGroupValue
ism:classification="U" ism:ownerProducer="USA">NIMS-FEMA-Msn-
RegionIX-ICS</ntk:AccessGroupValue>
                <ntk:AccessGroupValue
ism:classification="U" ism:ownerProducer="USA">MDA-USCG-Msn-
District11-ROC</ntk:AccessGroupValue>
                  <ntk:AccessGroupValue
ism:classification="U" ism:ownerProducer="USA">SEMS-CA-Ent-
CoastalRegion-MAC</ntk:AccessGroupValue>

```

```

        <ntk:AccessGroupValue
ism:classification="U" ism:ownerProducer="USA">SEMS-CA-Ent-
StateOperationsCenter-MAC</ntk:AccessGroupValue>
        </ntk:AccessGroup>
    </ntk:AccessGroupList>
    <ntk:AccessProfileList ism:classification="U"
ism:ownerProducer="USA">
        <ntk:AccessProfile ism:classification="U"
ism:ownerProducer="USA">
            <ntk:AccessPolicy ism:classification="U"
ism:ownerProducer="USA">slt-ntk.aces</ntk:AccessPolicy>
            <ntk:AccessProfileValue
ism:classification="U" ism:ownerProducer="USA"
ntk:vocabulary="urn:us:gov:ic:cvenum:usagency:agencyacronym">SLT<
/ntk:AccessProfileValue>
            </ntk:AccessProfile>
        </ntk:AccessProfileList>
    </ntk:RequiresAnyOf>
</ntk:Access>
</mda:Access>
    <mda:LevelOfAwarenessCode ism:ownerProducer="USA"
ism:classification="S" ntk:access="#Roles|Group^MDA-USCG-Msn-
District11-ROC Roles|Group^NIMS-FEMA-Msn-RegionIX-
ICS">1</mda:LevelOfAwarenessCode>
    <mda:Vessel ism:ownerProducer="USA" ism:classification="U">
        <m:VesselAugmentation>
            <m:VesselBeamMeasure>
                <nc:MeasureValueText>120.0</nc:MeasureValueText>
            </m:VesselBeamMeasure>
            <m:VesselCallSignText>H3LP</m:VesselCallSignText>
            <m:VesselCargoCategoryText>Harmful
Substance</m:VesselCargoCategoryText>
            <m:VesselCategoryText>Container
Ship</m:VesselCategoryText>
            <m:VesselCharterer ism:ownerProducer="USA"
ism:classification="C" ntk:access="#Roles|Group^MDA-USCG-Msn-
District11-ROC">
                <nc:EntityOrganization>
                    <nc:OrganizationLocation>
                        <nc:Address>
                            <nc:LocationCountryISO3166Alpha2Code>KR</nc:LocationCountryISO316
6Alpha2Code>
                                </nc:Address>
                            </nc:OrganizationLocation>
                            <nc:OrganizationName>SK
Shipping</nc:OrganizationName>
                        </nc:EntityOrganization>
                    </m:VesselCharterer>
                <m:VesselClassText>Bulk Carrier</m:VesselClassText>
            </m:VesselAugmentation>
        </mda:Vessel>
    </mda:LevelOfAwarenessCode>
</mda:Access>

```

```

        <m:VesselClassificationSocietyName>Germanischer
Lloyd</m:VesselClassificationSocietyName>
        <m:VesselContactInformation ism:ownerProducer="USA"
ism:classification="C" ntk:access="#Roles|Group^MDA-USCG-Msn-
District11-ROC">
            <nc:ContactTelephoneNumber>
                <nc:InternationalTelephoneNumber>
                    <nc:TelephoneNumberID>800-555-
1212</nc:TelephoneNumberID>
                </nc:InternationalTelephoneNumber>
<nc:TelephoneNumberCategoryCode>work</nc:TelephoneNumberCategoryC
ode>
            </nc:ContactTelephoneNumber>
            <nc:ContactTelephoneNumber>
                <nc:InternationalTelephoneNumber>
                    <nc:TelephoneNumberID>800-555-
1213</nc:TelephoneNumberID>
                </nc:InternationalTelephoneNumber>
<nc:TelephoneNumberCategoryCode>fax</nc:TelephoneNumberCategoryCo
de>
            </nc:ContactTelephoneNumber>
            <nc:ContactEntity>
                <nc:EntityPerson>
                    <nc:PersonName>
                        <nc:PersonFullName>James
Smith</nc:PersonFullName>
                    </nc:PersonName>
                </nc:EntityPerson>
                <nc:EntityOrganization>
                    <nc:OrganizationName>Horizon
Lines</nc:OrganizationName>
                </nc:EntityOrganization>
            </nc:ContactEntity>
        </m:VesselContactInformation>
        <m:VesselDOCCertificate>
            <nc:DocumentExpirationDate>
                <nc:Date>2028-04-24</nc:Date>
            </nc:DocumentExpirationDate>
            <m:CertificateIssueDate>
                <nc:Date>2018-04-25</nc:Date>
            </m:CertificateIssueDate>
            <m:CertificateIssuingAgency>
                <nc:EntityOrganization>
                    <nc:OrganizationName>U.S. Coast
Guard</nc:OrganizationName>
                </nc:EntityOrganization>
            </m:CertificateIssuingAgency>
        </m:VesselDOCCertificate>

```

```

    <m:VesselDraftMeasure>
      <nc:MeasureValueText>12.1</nc:MeasureValueText>
      <nc:MeasureUnitText>m</nc:MeasureUnitText>
    </m:VesselDraftMeasure>

<m:VesselGrossTonnageValue>54881</m:VesselGrossTonnageValue>

<m:VesselIMONumberText>9278155</m:VesselIMONumberText>
  <m:VesselISSC ism:ownerProducer="USA"
ism:classification="C" ntk:access="#Roles|Group^MDA-USCG-Msn-
District11-ROC">
    <m:CertificateIssueDate>
      <nc:Date>2022-06-22</nc:Date>
    </m:CertificateIssueDate>
    <m:CertificateIssuingAgency>
      <nc:EntityOrganization>
        <nc:OrganizationName>Government of
Bermuda, Department of Maritime
Administration</nc:OrganizationName>
      </nc:EntityOrganization>
    </m:CertificateIssuingAgency>
    <m:RecognizedISSCSecurityEntity>
      <nc:EntityOrganization>
        <nc:OrganizationName>Government of
Bermuda, Department of Maritime
Administration</nc:OrganizationName>
      </nc:EntityOrganization>
    </m:RecognizedISSCSecurityEntity>
    <m:VesselSecurityOfficerContactInformation>
      <nc:ContactTelephoneNumber>
        <nc:InternationalTelephoneNumber>
          <nc:TelephoneNumberID>888-234-
5432</nc:TelephoneNumberID>
        </nc:InternationalTelephoneNumber>
      </nc:ContactTelephoneNumber>
    </m:VesselSecurityOfficerContactInformation>
    <nc:TelephoneNumberCategoryCode>work</nc:TelephoneNumberCategoryC
ode>
      </nc:ContactTelephoneNumber>
      <nc:ContactTelephoneNumber>
        <nc:InternationalTelephoneNumber>
          <nc:TelephoneNumberID>888-234-
5431</nc:TelephoneNumberID>
        </nc:InternationalTelephoneNumber>
      </nc:ContactTelephoneNumber>
    </m:VesselSecurityOfficerContactInformation>
    <nc:TelephoneNumberCategoryCode>fax</nc:TelephoneNumberCategoryCo
de>
      </nc:ContactTelephoneNumber>
    </m:VesselSecurityOfficerContactInformation>
    <nc:ContactEmailID>ftest@test.com</nc:ContactEmailID>
      <nc:ContactEntity>
        <nc:EntityPerson>

```

```

                <nc:PersonName>
                    <nc:PersonFullName>Frank
Test</nc:PersonFullName>
                </nc:PersonName>
            </nc:EntityPerson>
        </nc:ContactEntity>
    </m:VesselSecurityOfficerContactInformation>

<m:VesselSecurityPlanImplementedIndicator>true</m:VesselSecurityP
lanImplementedIndicator>
    </m:VesselISSC>
    <m:VesselMMSIText>352948000</m:VesselMMSIText>
    <m:VesselName>MSC NERISSA</m:VesselName>

<m:VesselNationalFlagISO3166Alpha2Code>PA</m:VesselNationalFlagIS
O3166Alpha2Code>

<m:VesselOfficialCoastGuardNumberText>US878N2</m:VesselOfficialCo
astGuardNumberText>

<m:VesselOperationalConditionOfEquipmentDescriptionText>Operation
al</m:VesselOperationalConditionOfEquipmentDescriptionText>
    <m:VesselOperator ism:ownerProducer="USA"
ism:classification="C" ntk:access="#Roles|Group^MDA-USCG-Msn-
District11-ROC">
        <nc:EntityPerson>
            <nc:PersonName>
                <nc:PersonFullName>Dan
James</nc:PersonFullName>
            </nc:PersonName>
        </nc:EntityPerson>
    </m:VesselOperator>
    <m:VesselOverallLengthMeasure>
        <nc:MeasureValueText>294.08</nc:MeasureValueText>
        <nc:MeasureUnitText>m</nc:MeasureUnitText>
    </m:VesselOverallLengthMeasure>
    <m:VesselOwner ism:ownerProducer="USA"
ism:classification="C" ntk:access="#Roles|Group^MDA-USCG-Msn-
District11-ROC">
        <nc:EntityOrganization>
            <nc:OrganizationLocation>
                <nc:Address>

<nc:LocationCountryISO3166Alpha2Code>US</nc:LocationCountryISO316
6Alpha2Code>
                    </nc:Address>
            </nc:OrganizationLocation>
            <nc:OrganizationName>American Shipping
Company</nc:OrganizationName>
        </nc:EntityOrganization>
    </m:VesselOwner>
</m:Vessel>

```



```

        </m:VesselOwner>
        <m:VesselSafetyManagementCertificate
ism:ownerProducer="USA" ism:classification="C"
ntk:access="#Roles|Group^MDA-USCG-Msn-District11-ROC">
            <nc:DocumentExpirationDate>
                <nc:Date>2027-12-01</nc:Date>
            </nc:DocumentExpirationDate>
            <m:CertificateIssueDate>
                <nc:Date>2017-03-12</nc:Date>
            </m:CertificateIssueDate>
            <m:CertificateIssuingAgency>
                <nc:EntityOrganization>
                    <nc:OrganizationName>U.S. Coast
Guard</nc:OrganizationName>
                </nc:EntityOrganization>
            </m:CertificateIssuingAgency>
        </m:VesselSafetyManagementCertificate>
    </m:VesselAugmentation>
</mda:Vessel>
    <mda:Position ism:ownerProducer="USA" ism:classification="C"
ntk:access="#Roles|Group^MDA-USCG-Msn-District11-ROC
Roles|Group^NIMS-FEMA-Msn-RegionIX-IC Roles|Group^SEMS-CA-Ent-
StateOperationsCenter-MAC">
        <m:LocationPoint>
            <gml:Point gml:id="p1"
srsName="http://www.opengis.net/def/crs/EPSSG/0/4326">
                <gml:pos>36.79771 -122.5665</gml:pos>
            </gml:Point>
        </m:LocationPoint>
        <mda:PositionSpeedMeasure>
            <nc:MeasureValueText>3.2</nc:MeasureValueText>
            <nc:SpeedUnitCode>KNT</nc:SpeedUnitCode>
        </mda:PositionSpeedMeasure>
        <mda:PositionCourseMeasure>
            <nc:MeasureValueText>17</nc:MeasureValueText>
        </mda:PositionCourseMeasure>
        <mda:PositionDateTime>
            <nc:DateTime>2025-12-07T00:00:00Z</nc:DateTime>
        </mda:PositionDateTime>
    </mda:Position>
    <mda:Arrival ism:ownerProducer="USA" ism:classification="U">
        <mda:VisitAnchorageText>Main
Anchorage</mda:VisitAnchorageText>
        <mda:VisitExpectedArrivalDateTime>
            <nc:DateTime>2025-12-10T14:30:00Z</nc:DateTime>
        </mda:VisitExpectedArrivalDateTime>
        <mda:VisitLocationInPort>
            <m:PortName>Oakland</m:PortName>
            <nc:LocationStateName>CA</nc:LocationStateName>
            <nc:LocationCityName>Oakland</nc:LocationCityName>
            <mda:PortAugmentation>

```



```

    <mda:PreviousForeignPortOfCallList ism:ownerProducer="USA"
ism:classification="U" ntk:access="#Roles|Group^MDA-USCG-Msn-
District11-ROC">
      <mda:PreviousForeignPortOfCall>
        <mda:VisitLocationInPort>
          <m:PortName>Port of St. John's</m:PortName>
        </mda:VisitLocationInPort>
        <nc:LocationCountryISO3166Alpha2Code>CA</nc:LocationCountryISO316
6Alpha2Code>
      </mda:PreviousForeignPortOfCall>
    </mda:PreviousForeignPortOfCallList>
    <mda:Interest ism:ownerProducer="USA" ism:classification="S"
ntk:access="#Roles|Group^MDA-USCG-Msn-District11-ROC">
      <mda:CANUSLexiconAPR07CategoryCode>1a</mda:CANUSLexiconAPR07Categ
oryCode>
      <mda:InterestDateRange>
        <nc:StartDate>
          <nc:Date>2022-01-10</nc:Date>
        </nc:StartDate>
        <nc:EndDate>
          <nc:Date>2027-01-17</nc:Date>
        </nc:EndDate>
      </mda:InterestDateRange>
      <mda:CANUSLexiconAPR07ThreatCode>High</mda:CANUSLexiconAPR07Threa
tCode>
      <mda:InterestNotificationCategoryCode>Notification:Warning</mda:I
nterestNotificationCategoryCode>
    </mda:Interest>
    <mda:Interest ism:ownerProducer="USA" ism:classification="S"
ntk:access="#Roles|Group^MDA-USCG-Msn-District11-ROC">
      <mda:InterestCategoryText>A5312</mda:InterestCategoryText>
      <mda:InterestDateRange>
        <nc:StartDate>
          <nc:Date>2022-01-10</nc:Date>
        </nc:StartDate>
        <nc:EndDate>
          <nc:Date>2027-01-17</nc:Date>
        </nc:EndDate>
      </mda:InterestDateRange>
      <mda:InterestDescriptionText>Hazardous
Materials</mda:InterestDescriptionText>
      <mda:InterestLevelText>5</mda:InterestLevelText>
      <mda:InterestLexiconSourceText>Lexicon LT-004; US
Standard Codes for Generalized Threat
Levels</mda:InterestLexiconSourceText>

```

```

<mda:InterestNotificationCategoryCode>Notification:Warning</mda:InterestNotificationCategoryCode>
  </mda:Interest>
  <mda:CDCCargoList ism:ownerProducer="USA"
ism:classification="C" ntk:access="#Roles|Group^MDA-USCG-Msn-District11-ROC Roles|Group^NIMS-FEMA-Msn-RegionIX-IC">
    <mda:CDCCargo>
      <m:CargoHazmatDeclaration>
        <m:HazmatDeclarationDescriptionText>Division 2.3
Poisonous Gas</m:HazmatDeclarationDescriptionText>
        <m:HazmatDeclarationMaterialAmountMeasure>
          <nc:MeasureValueText>100</nc:MeasureValueText>
          <nc:MeasureUnitText>Barrel</nc:MeasureUnitText>
        </m:HazmatDeclarationMaterialAmountMeasure>
        <m:HazmatDeclarationUNHazmatCode>UN3018</m:HazmatDeclarationUNHazmatCode>
      </m:CargoHazmatDeclaration>
    </mda:CDCCargo>
  </mda:CDCCargoList>
  <mda:CrewNationalityList ism:ownerProducer="USA"
ism:classification="C" ntk:access="#Roles|Group^MDA-USCG-Msn-District11-ROC">
    <mda:CrewNationalityCount>
      <mda:CrewNationalityISO3166Alpha2Code>US</mda:CrewNationalityISO3166Alpha2Code>
      <mda:CrewNationalityQuantity>20</mda:CrewNationalityQuantity>
    </mda:CrewNationalityCount>
    <mda:CrewNationalityCount>
      <mda:CrewNationalityISO3166Alpha2Code>CA</mda:CrewNationalityISO3166Alpha2Code>
      <mda:CrewNationalityQuantity>30</mda:CrewNationalityQuantity>
    </mda:CrewNationalityCount>
  </mda:CrewNationalityList>
  <mda:NonCrewNationalityList ism:ownerProducer="USA"
ism:classification="C" ntk:access="#Roles|Group^MDA-USCG-Msn-District11-ROC">
    <mda:NonCrewNationalityCount>
      <mda:NonCrewNationalityISO3166Alpha2Code>US</mda:NonCrewNationalityISO3166Alpha2Code>
    </mda:NonCrewNationalityCount>
  </mda:NonCrewNationalityList>

```

```
<mda:NonCrewNationalityQuantity>250</mda:NonCrewNationalityQuantity>
  </mda:NonCrewNationalityCount>
  <mda:NonCrewNationalityCount>

<mda:NonCrewNationalityISO3166Alpha2Code>CA</mda:NonCrewNationalityISO3166Alpha2Code>

<mda:NonCrewNationalityQuantity>120</mda:NonCrewNationalityQuantity>
  </mda:NonCrewNationalityCount>
  </mda:NonCrewNationalityList>
</mda:LOAReport>
```

## Annex B

### NIEM/IC WFS - wfs:FeatureCollection Sample

This annex provides a sample NIEM/IC wfs:FeatureCollection.

```
<?xml version="1.0" encoding="UTF-8"?>
<wfs:FeatureCollection xmlns:wfs="http://www.opengis.net/wfs"
xmlns:gml="http://www.opengis.net/gml"
xmlns:mda="http://release.niem.gov/niem/domains/maritime/3.0/mda/"
xmlns:m="http://release.niem.gov/niem/domains/maritime/3.0/"
xmlns:nc="http://release.niem.gov/niem/niem-core/3.0/">
  <gml:featureMember>
    <mda:noticeofarrival
mda="http://release.niem.gov/niem/domains/maritime/3.0/mda/"
ntk="urn:us:gov:ic:ntk" ism="urn:us:gov:ic:ism"
nc="http://release.niem.gov/niem/niem-core/3.0/" mda-
codes="http://release.niem.gov/niem/domains/maritime/3.0/mda/code
s/" m="http://release.niem.gov/niem/domains/maritime/3.0/"
geo="http://release.niem.gov/niem/adapters/geospatial/3.0/"
DESVersion="11" ownerProducer="USA" classification="C"
resourceElement="true" classifiedBy="USCG"
classificationReason="Classified due to sensitive maritime
security information." declassDate="2050-12-01"
id="noticeofarrival.1" p7="http://www.opengis.net/gml">
      <mda:Voyage ownerProducer="USA" classification="U">
        <m:VoyageCategoryText>Foreign to
US</m:VoyageCategoryText>
        <m:VoyageIdentification>
          <nc:IdentificationID>1</nc:IdentificationID>
        </m:VoyageIdentification>

<mda:VoyageClosedLoopIndicator>>false</mda:VoyageClosedLoopIndicat
or>
      </mda:Voyage>
      <mda:Vessel ownerProducer="USA" classification="U">
        <m:VesselAugmentation ownerProducer="USA"
classification="U">
          <m:VesselCallSignText>H3LP</m:VesselCallSignText>
          <m:VesselCargoCategoryText>Harmful
Substances</m:VesselCargoCategoryText>
          <m:VesselCategoryText>Container
Ship</m:VesselCategoryText>
```

```

<mda:VesselCDCCargoOnBoardIndicator>true</mda:VesselCDCCargoOnBoa
rdIndicator>
  <mda:VesselCharterer ownerProducer="USA"
classification="C" access="#Roles|Group^MDA-USCG-Msn-District11-
ROC">
    <nc:EntityOrganization>
      <nc:OrganizationLocation>
        <nc:Address>
<nc:LocationCountryISO3166Alpha2Code>KR</nc:LocationCountryISO316
6Alpha2Code>
          </nc:Address>
        </nc:OrganizationLocation>
        <nc:OrganizationName>SK
Shipping</nc:OrganizationName>
      </nc:EntityOrganization>
    </mda:VesselCharterer>
    <m:VesselClassText>Bulk Carrier</m:VesselClassText>
    <m:VesselClassificationSocietyName>Germanischer
Lloyd</m:VesselClassificationSocietyName>
    <m:VesselContactInformation>
      <nc:ContactTelephoneNumber>
        <nc:InternationalTelephoneNumber>
          <nc:TelephoneNumberID>800-555-
1212</nc:TelephoneNumberID>
        </nc:InternationalTelephoneNumber>
<nc:TelephoneNumberCategoryCode>work</nc:TelephoneNumberCategoryC
ode>
      </nc:ContactTelephoneNumber>
      <nc:ContactEntity>
        <nc:EntityPerson>
          <nc:PersonName>
            <nc:PersonFullName>James
Smith</nc:PersonFullName>
          </nc:PersonName>
        </nc:EntityPerson>
      </nc:ContactEntity>
    </m:VesselContactInformation>
    <m:VesselDOCCertificate>
      <nc:DocumentExpirationDate>
        <nc:Date>2028-04-24T00:00:00</nc:Date>
      </nc:DocumentExpirationDate>
      <nc:CertificateIssueDate>
        <nc:Date>2028-04-25T00:00:00</nc:Date>
      </nc:CertificateIssueDate>
      <m:CertificateIssuingAgency>
        <nc:EntityOrganization>
          <nc:OrganizationName>U.S. Coast
Guard</nc:OrganizationName>

```

```

        </nc:EntityOrganization>
    </m:CertificateIssuingAgency>
</m:VesselDOCCertificate>
    <m:VesselISSC ownerProducer="USA" classification="C"
access="#Roles|Group^MDA-USCG-Msn-District11-ROC">
    <m:CertificateIssueDate>
        <nc:Date>2022-06-22T00:00:00</nc:Date>
    </m:CertificateIssueDate>
    <m:CertificateIssuingAgency>
        <nc:EntityOrganization>
            <nc:OrganizationName>Government of Bermuda,
Department of Maritime Administration</nc:OrganizationName>
        </nc:EntityOrganization>
    </m:CertificateIssuingAgency>
    <m:RecognizedISSCSecurityEntity>
        <nc:EntityOrganization>
            <nc:OrganizationName>Government of Bermuda,
Department of Maritime Administration</nc:OrganizationName>
        </nc:EntityOrganization>
    </m:RecognizedISSCSecurityEntity>
    <m:VesselSecurityOfficerContactInformation>
        <m:ContactTelephoneNumber>
            <nc:InternationalTelephoneNumber>
                <nc:TelephoneNumberID>888-234-
5432</nc:TelephoneNumberID>
            </nc:InternationalTelephoneNumber>
<nc:TelephoneNumberCategoryCode>work</nc:TelephoneNumberCategoryC
ode>
        </m:ContactTelephoneNumber>
<nc:ContactEmailID>ftest@test.com</nc:ContactEmailID>
        <nc:ContactEntity>
            <nc:EntityPerson>
                <nc:PersonName>
                    <nc:PersonFullName>Frank
Test</nc:PersonFullName>
                </nc:PersonName>
            </nc:EntityPerson>
        </nc:ContactEntity>
    </m:VesselSecurityOfficerContactInformation>
<m:VesselSecurityPlanImplementedIndicator>true</m:VesselSecurityP
lanImplementedIndicator>
    </m:VesselISSC>
    <m:VesselMMSIText>352948000</m:VesselMMSIText>
    <m:VesselName>MSC NERISSA</m:VesselName>
<m:VesselNationalFlagISO3166Alpha2Code>PA</m:VesselNationalFlagIS
O3166Alpha2Code>

```



```

<m:VesselOfficialCoastGuardNumberText>US878N2</m:VesselOfficialCo
astGuardNumberText>
  <m:VesselOperator ownerProducer="USA"
classification="C" access="#Roles|Group^MDA-USCG-Msn-District11-
ROC">
    <nc:EntityPerson>
      <nc:PersonName>
        <nc:PersonFullName>Dan James</nc:PersonFullName>
      </nc:PersonName>
    </nc:EntityPerson>
  </m:VesselOperator>
  <m:VesselOwner>
    <nc:EntityOrganization>
      <nc:OrganizationName>MSC Mediterranean Shipping
Company</nc:OrganizationName>
    </nc:EntityOrganization>
  </m:VesselOwner>
  <m:VesselSafetyManagementCertificate
ownerProducer="USA" classification="C" access="#Roles|Group^MDA-
USCG-Msn-District11-ROC">
    <nc:DocumentExpirationDate>
      <nc:Date>2027-12-01T00:00:00</nc:Date>
    </nc:DocumentExpirationDate>
    <nc:CertificateIssueDate>
      <nc:Date>2017-03-12T00:00:00</nc:Date>
    </nc:CertificateIssueDate>
    <m:CertificateIssuingAgency>
      <nc:EntityOrganization>
        <nc:OrganizationName>U.S. Coast
Guard</nc:OrganizationName>
      </nc:EntityOrganization>
    </m:CertificateIssuingAgency>
  </m:VesselSafetyManagementCertificate>
</m:VesselAugmentation>

<mda:VesselCargoOnBoardIndicator>true</mda:VesselCargoOnBoardIndi
cator>
  <mda:VesselCertificateOfFinancialResponsibilityOperator
ownerProducer="USA" classification="U" access="#Roles|Group^MDA-
USCG-Msn-District11-ROC">

<mda:VesselCertificateOfFinancialResponsibilityOperator>
  <nc:EntityOrganization>
    <nc:OrganizationName>MSC Mediterranean Shipping
Company</nc:OrganizationName>
  </nc:EntityOrganization>

</mda:VesselCertificateOfFinancialResponsibilityOperator>
</mda:VesselCertificateOfFinancialResponsibilityOperator>

```

```

    <mda:VesselSubCategoryText>Anhydrous
Ammonia</mda:VesselSubCategoryText>
  </mda:Vessel>
  <mda:Arrival ownerProducer="USA" classification="U">
    <mda:VisitAnchorageText>Main
Anchorage</mda:VisitAnchorageText>
    <mda:VisitExpectedArrivalDateTime>
      <nc:DateTime>2025-12-10T14:30:00</nc:DateTime>
    </mda:VisitExpectedArrivalDateTime>
    <mda:VisitLocationInPort>
      <m:PortName>Oakland</m:PortName>
      <nc:LocationStateName>CA</nc:LocationStateName>
      <nc:LocationCityName>Oakland</nc:LocationCityName>
      <mda:PortAugmentation>
        <m:LocationPoint>
          <gml:Point gml="http://www.opengis.net/gml"
srsName="EPSG::4326">
            <gml:pos srsName="EPSG::4326" srsDimension="2">-
122.295 37.6965</gml:pos>
          </gml:Point>
        </m:LocationPoint>
      </mda:PortAugmentation>
    </mda:VisitLocationInPort>
    <mda:VisitReceivingFacilityName>Pier
57</mda:VisitReceivingFacilityName>
  </mda:Arrival>
  <mda:Departure ownerProducer="USA" classification="U">
    <mda:VisitExpectedDepartureDateTime>
      <mda:DateTime>2025-12-16T00:00:00</mda:DateTime>
    </mda:VisitExpectedDepartureDateTime>
  </mda:Departure>
  <mda:LastPortOfCall ownerProducer="USA" classification="U"
access="#Roles|Group^MDA-USCG-Msn-District11-ROC">
    <mda:VisitActualArrivalDateTime>
      <nc:DateTime>2025-11-25T00:00:00</nc:DateTime>
    </mda:VisitActualArrivalDateTime>
    <mda:VisitActualDepartureDateTime>
      <mda:DateTime>2025-11-30T00:00:00</mda:DateTime>
    </mda:VisitActualDepartureDateTime>
    <mda:VisitLocationInPort>
      <m:PortName>Port of Portland, Oregon</m:PortName>
<nc:LocationCountryISO3166Alpha2Code>US</nc:LocationCountryISO316
6Alpha2Code>
      <nc:LocationStateName>OR</nc:LocationStateName>
      <nc:LocationCityName>Portland</nc:LocationCityName>
    </mda:VisitLocationInPort>
  </mda:LastPortOfCall>

```

```

    <mda:NextPortOfCallList ownerProducer="USA"
classification="U" access="#Roles|Group^MDA-USCG-Msn-District11-
ROC">
      <mda:NextPortOfCall>
        <mda:VisitExpectedArrivalDateTime>
          <nc:DateTime>2026-01-02T00:00:00</nc:DateTime>
        </mda:VisitExpectedArrivalDateTime>
        <mda:VisitExpectedDepartureDateTime>
          <nc:DateTime>2026-01-07T00:00:00</nc:DateTime>
        </mda:VisitExpectedDepartureDateTime>
        <mda:VisitLocationInPort>
          <m:PortName>Port of Long Beach</m:PortName>
        </mda:VisitLocationInPort>
      </mda:NextPortOfCall>
    </mda:NextPortOfCallList>
    <nc:LocationCountryISO3166Alpha2Code>US</nc:LocationCountryISO316
6Alpha2Code>
      <nc:LocationStateName>CA</nc:LocationStateName>
      <nc:LocationCityName>Long Beach</nc:LocationCityName>
    </mda:VisitLocationInPort>
  </mda:NextPortOfCallList>
  <mda:CDCCargoList ownerProducer="USA" classification="C"
access="#Roles|Group^MDA-USCG-Msn-District11-ROC
Roles|Group^NIMS-FEMA-Msn-RegionIX-IC">
    <mda:CDCCargo>
      <m:CargoDestinationLocation>
        <nc:Address>
          <nc:LocationStateName>CA</nc:LocationStateName>
        </nc:Address>
      </m:CargoDestinationLocation>
      <nc:LocationCountryISO3166Alpha2Code>US</nc:LocationCountryISO316
6Alpha2Code>
        </nc:Address>
      <m:LocationAugmentation>
        <m:LocationPort>
          <m:PortCodeText>USOAK</m:PortCodeText>
          <m:PortName>Port of Oakland</m:PortName>
        </m:LocationPort>
      </m:LocationAugmentation>
    </m:CargoDestinationLocation>
  </mda:CDCCargo>
  <m:HazmatDeclarationChemicalCommonName>Pesticide</m:HazmatDeclara
tionChemicalCommonName>
    <m:HazmatDeclarationDescriptionText>Division 2.3
Poisonous Gas</m:HazmatDeclarationDescriptionText>
    <m:HazmatDeclarationMaterialAmountMeasure>
      <nc:MeasureValueText>100</nc:MeasureValueText>
      <nc:MeasureUnitText>Barrel</nc:MeasureUnitText>
    </m:HazmatDeclarationMaterialAmountMeasure>
  </m:HazmatDeclarationUNHazmatCode>UN3018</m:HazmatDeclarationUNHaz
matCode>

```

```
        </m:CargoHazmatDeclaration>
<m:CargoPackagedIndicator>true</m:CargoPackagedIndicator>
<m:CargoResidueIndicator>>false</m:CargoResidueIndicator>
    </mda:CDCCargo>
    </mda:CDCCargoList>
    </mda:noticeofarrival>
  </gml:featureMember>
</wfs:FeatureCollection>
```

## Annex C

### OutputFormat for Security Info Sample

This annex provides a sample 'NIEMS' wfs:FeatureCollection from an outputFormat request.

```
<?xml version="1.0" encoding="UTF-8"?>
-<wfs:FeatureCollection
xsi:schemaLocation="http://schemas.opengis.net/wfs/2.0/wfs.xsd
http://schemas.opengis.net/gml/3.1.1/base/gml.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:gml="http://www.opengis.net/gml"
xmlns:wfs="http://www.opengis.net/wfs">
-<gml:member>
-<tdf:TrustedDataObject xmlns:tdf="urn:us:gov:ic:tdf">
-<tdf:HandlingAssertion tdf:scope="TDO">
-<tdf:HandlingStatement>
-<edh:Edh ntk:DESVersion="9" ism:DESVersion="10"
arh:DESVersion="2" icid:DESVersion="1" edh:DESVersion="3"
xmlns:ntk="urn:us:gov:ic:ntk" xmlns:ism="urn:us:gov:ic:ism"
xmlns:arh="urn:us:gov:ic:arh" xmlns:icid="urn:us:gov:ic:id"
xmlns:edh="urn:us:gov:ic:edh">
<icid:Identifier>guide://999123/NOA001EDH01</icid:Identifier>
<edh:DataItemCreateDateTime>2025-12-
10T00:00:35Z</edh:DataItemCreateDateTime>
-<edh:ResponsibleEntity>
<edh:Country>USA</edh:Country>
<edh:Organization>USG</edh:Organization>
</edh:ResponsibleEntity>
-<arh:Security ism:ownerProducer="USA" ism:classification="U">
-<ntk:Access ism:ownerProducer="USA" ism:classification="U">
-<ntk:RequiresAnyOf ism:ownerProducer="USA"
ism:classification="U">
-<ntk:AccessGroupList>
-<ntk:AccessGroup>
<ntk:AccessPolicy ism:ownerProducer="USA"
ism:classification="U">Roles</ntk:AccessPolicy>
<ntk:AccessGroupValue ism:ownerProducer="USA"
ism:classification="U">NIMS-FEMA-Msn-RegionIX-
ICS</ntk:AccessGroupValue>
<ntk:AccessGroupValue ism:ownerProducer="USA"
ism:classification="U">MDA-USCG-Msn-District11-
ROC</ntk:AccessGroupValue>
```

```

<ntk:AccessGroupValue ism:ownerProducer="USA"
ism:classification="U">SEMS-CA-Ent-CoastalRegion-
MAC</ntk:AccessGroupValue>
<ntk:AccessGroupValue ism:ownerProducer="USA"
ism:classification="U">SEMS-CA-Ent-StateOperationsCenter-
MAC</ntk:AccessGroupValue>
</ntk:AccessGroup>
</ntk:AccessGroupList>
-<ntk:AccessProfileList ism:ownerProducer="USA"
ism:classification="U">
-<ntk:AccessProfile ism:ownerProducer="USA"
ism:classification="U">
<ntk:AccessPolicy ism:ownerProducer="USA"
ism:classification="U">slt-ntk.aces</ntk:AccessPolicy>

<ntk:AccessProfileValue ism:ownerProducer="USA"
ism:classification="U"
ntk:vocabulary="urn:us:gov:ic:cvenum:usagency:agencyacronym">SLT<
/ntk:AccessProfileValue>
</ntk:AccessProfile>
</ntk:AccessProfileList>
</ntk:RequiresAnyOf>
</ntk:Access>
</arh:Security>
</edh:Edh>
</tdf:HandlingStatement>
</tdf:HandlingAssertion>
-<tdf:HandlingAssertion tdf:scope="PAYL">
-<tdf:HandlingStatement>
-<edh:Edh ntk:DESVersion="9" ism:DESVersion="10"
arh:DESVersion="2" icid:DESVersion="1" edh:DESVersion="3"
xmlns:ntk="urn:us:gov:ic:ntk" xmlns:ism="urn:us:gov:ic:ism"
xmlns:arh="urn:us:gov:ic:arh" xmlns:icid="urn:us:gov:ic:id"
xmlns:edh="urn:us:gov:ic:edh">
<icid:Identifier>guide://999123/NOA001EDH01</icid:Identifier>
<edh:DataItemCreateDateTime>2025-12-
10T00:00:35Z</edh:DataItemCreateDateTime>
-<edh:ResponsibleEntity>
<edh:Country>USA</edh:Country>
<edh:Organization>USG</edh:Organization>
</edh:ResponsibleEntity>
-<arh:Security ism:ownerProducer="USA" ism:classification="U">
-<ntk:Access ism:ownerProducer="USA" ism:classification="U">
-<ntk:RequiresAnyOf ism:ownerProducer="USA"
ism:classification="U">
-<ntk:AccessGroupList>
-<ntk:AccessGroup>
<ntk:AccessPolicy ism:ownerProducer="USA"
ism:classification="U">Roles</ntk:AccessPolicy>

```

```

<ntk:AccessGroupValue ism:ownerProducer="USA"
ism:classification="U">NIMS-FEMA-Msn-RegionIX-
ICS</ntk:AccessGroupValue>
<ntk:AccessGroupValue ism:ownerProducer="USA"
ism:classification="U">MDA-USCG-Msn-District11-
ROC</ntk:AccessGroupValue>
<ntk:AccessGroupValue ism:ownerProducer="USA"
ism:classification="U">SEMS-CA-Ent-CoastalRegion-
MAC</ntk:AccessGroupValue>
<ntk:AccessGroupValue ism:ownerProducer="USA"
ism:classification="U">SEMS-CA-Ent-StateOperationsCenter-
MAC</ntk:AccessGroupValue>
</ntk:AccessGroup>
</ntk:AccessGroupList>
-<ntk:AccessProfileList ism:ownerProducer="USA"
ism:classification="U">
-<ntk:AccessProfile ism:ownerProducer="USA"
ism:classification="U">
<ntk:AccessPolicy ism:ownerProducer="USA"
ism:classification="U">slt-ntk.aces</ntk:AccessPolicy>

<ntk:AccessProfileValue ism:ownerProducer="USA"
ism:classification="U"
ntk:vocabulary="urn:us:gov:ic:cvenum:usagency:agencyacronym">SLT<
/ntk:AccessProfileValue>
</ntk:AccessProfile>
</ntk:AccessProfileList>
</ntk:RequiresAnyOf>
</ntk:Access>
</arh:Security>
</edh:Edh>
</tdf:HandlingStatement>
</tdf:HandlingAssertion>
-<tdf:StructuredPayload>
-<cp:noticeofarrival ism:DESVersion="11" ntk:DESVersion="9"
xmlns:ntk="urn:us:gov:ic:ntk" xmlns:ism="urn:us:gov:ic:ism"
ism:ownerProducer="USA" ism:classification="C"
fid="noticeofarrival.1" ism:declassDate="2050-12-01"
ism:classificationReason="Classified due to sensitive maritime
security information." ism:classifiedBy="USCG"
ism:resourceElement="true"
xmlns:geo="http://release.niem.gov/niem/adapters/geospatial/3.0/"
xmlns:m="http://release.niem.gov/niem/domains/maritime/3.0/"
xmlns:mda-
codes="http://release.niem.gov/niem/domains/maritime/3.0/mda/code
s/" xmlns:nc="http://release.niem.gov/niem/niem-core/3.0/"
xmlns:mda="http://release.niem.gov/niem/domains/maritime/3.0/mda/
" xmlns:cp="http://www.thecarbonproject.com">
-<mda:Voyage ism:ownerProducer="USA" ism:classification="U">
<m:VoyageCategoryText>Foreign to US</m:VoyageCategoryText>
-<m:VoyageIdentification>

```

```

<nc:IdentificationID>1</nc:IdentificationID>
</m:VoyageIdentification>
</mda:Voyage>
-<mda:Vessel ism:ownerProducer="USA" ism:classification="U">
-<m:VesselAugmentation ism:ownerProducer="USA"
ism:classification="U">
<m:VesselCallSignText>H3LP</m:VesselCallSignText>
<m:VesselCargoCategoryText>Harmful
Substances</m:VesselCargoCategoryText>
<m:VesselCategoryText>Container Ship</m:VesselCategoryText>
<mda:VesselCDCCargoOnBoardIndicator>true</mda:VesselCDCCargoOnBoa
rdIndicator>
-<mda:VesselCharterer ism:ownerProducer="USA"
ism:classification="C" ntk:access="#Roles|Group^MDA-USCG-Msn-
District11-ROC">
-<nc:EntityOrganization>
-<nc:OrganizationLocation>
-<nc:Address>
<nc:LocationCountryISO3166Alpha2Code>KR</nc:LocationCountryISO316
6Alpha2Code>
</nc:Address>
</nc:OrganizationLocation>
<nc:OrganizationName>SK Shipping</nc:OrganizationName>
</nc:EntityOrganization>
</mda:VesselCharterer>
<m:VesselClassText>Bulk Carrier</m:VesselClassText>
<m:VesselClassificationSocietyName>Germanischer
Lloyd</m:VesselClassificationSocietyName>
-<m:VesselContactInformation>
-<nc:ContactTelephoneNumber>
-<nc:InternationalTelephoneNumber>
<nc:TelephoneNumberID>800-555-1212</nc:TelephoneNumberID>
</nc:InternationalTelephoneNumber>
<nc:TelephoneNumberCategoryCode>work</nc:TelephoneNumberCategoryC
ode>
</nc:ContactTelephoneNumber>
-<nc:ContactEntity>
-<nc:EntityPerson>
-<nc:PersonName>
<nc:PersonFullName>James Smith</nc:PersonFullName>
</nc:PersonName>
</nc:EntityPerson>
</nc:ContactEntity>
</m:VesselContactInformation>
-<m:VesselDOCCertificate>
-<nc:DocumentExpirationDate>
<nc:Date>2028-04-24T00:00:00</nc:Date>
</nc:DocumentExpirationDate>
-<m:CertificateIssueDate>
<nc:Date>2028-04-25T00:00:00</nc:Date>

```



```

</m:CertificateIssueDate>
-<m:CertificateIssuingAgency>
-<nc:EntityOrganization>
<nc:OrganizationName>U.S. Coast Guard</nc:OrganizationName>
</nc:EntityOrganization>
</m:CertificateIssuingAgency>
</m:VesselDOCCertificate>
-<m:VesselISSC ism:ownerProducer="USA" ism:classification="C"
ntk:access="#Roles|Group^MDA-USCG-Msn-District11-ROC">
-<m:CertificateIssueDate>
<nc:Date>2022-06-22T00:00:00</nc:Date>
</m:CertificateIssueDate>
-<m:CertificateIssuingAgency>
-<nc:EntityOrganization>
<nc:OrganizationName>Government of Bermuda, Department of
Maritime Administration</nc:OrganizationName>
</nc:EntityOrganization>
</m:CertificateIssuingAgency>
-<m:RecognizedISSCSecurityEntity>
-<nc:EntityOrganization>
<nc:OrganizationName>Government of Bermuda, Department of
Maritime Administration</nc:OrganizationName>
</nc:EntityOrganization>
</m:RecognizedISSCSecurityEntity>
-<m:VesselSecurityOfficerContactInformation>
-<nc:ContactTelephoneNumber>
-<nc:InternationalTelephoneNumber>
<nc:TelephoneNumberID>888-234-5432</nc:TelephoneNumberID>
</nc:InternationalTelephoneNumber>
<nc:TelephoneNumberCategoryCode>work</nc:TelephoneNumberCategoryC
ode>
</nc:ContactTelephoneNumber>
<nc:ContactEmailID>ftest@test.com</nc:ContactEmailID>
-<nc:ContactEntity>
-<nc:EntityPerson>
-<nc:PersonName>
<nc:PersonFullName>Frank Test</nc:PersonFullName>
</nc:PersonName>
</nc:EntityPerson>
</nc:ContactEntity>
</m:VesselSecurityOfficerContactInformation>
<m:VesselSecurityPlanImplementedIndicator>>true</m:VesselSecurityP
lanImplementedIndicator>
</m:VesselISSC>
<m:VesselMMSIText>352948000</m:VesselMMSIText>
<m:VesselName>MSC NERISSA</m:VesselName>
<m:VesselNationalFlagISO3166Alpha2Code>PA</m:VesselNationalFlagIS
O3166Alpha2Code>
<m:VesselOfficialCoastGuardNumberText>US878N2</m:VesselOfficialCo
astGuardNumberText>

```

```

-<m:VesselOperator ism:ownerProducer="USA" ism:classification="C"
ntk:access="#Roles|Group^MDA-USCG-Msn-District11-ROC">
-<nc:EntityPerson>
-<nc:PersonName>
<nc:PersonFullName>Dan James</nc:PersonFullName>
</nc:PersonName>
</nc:EntityPerson>
</m:VesselOperator>
-<m:VesselOwner>
-<nc:EntityOrganization>
<nc:OrganizationName>MSC Mediterranean Shipping
Company</nc:OrganizationName>
</nc:EntityOrganization>
</m:VesselOwner>
-<m:VesselSafetyManagementCertificate ism:ownerProducer="USA"
ism:classification="C" ntk:access="#Roles|Group^MDA-USCG-Msn-
District11-ROC">
-<nc:DocumentExpirationDate>
<nc:Date>2027-12-01T00:00:00</nc:Date>
</nc:DocumentExpirationDate>
-<m:CertificateIssueDate>
<nc:Date>2017-03-12T00:00:00</nc:Date>
</m:CertificateIssueDate>
-<m:CertificateIssuingAgency>
-<nc:EntityOrganization>
<nc:OrganizationName>U.S. Coast Guard</nc:OrganizationName>
</nc:EntityOrganization>
</m:CertificateIssuingAgency>
</m:VesselSafetyManagementCertificate>
</m:VesselAugmentation>
<mda:VesselCargoOnBoardIndicator>true</mda:VesselCargoOnBoardIndi
cator>
-<mda:VesselCertificateOfFinancialResponsibilityOperator
ism:ownerProducer="USA" ism:classification="U"
ntk:access="#Roles|Group^MDA-USCG-Msn-District11-ROC">
-<mda:VesselCertificateOfFinancialResponsibilityOperator>
-<nc:EntityOrganization>
<nc:OrganizationName>MSC Mediterranean Shipping
Company</nc:OrganizationName>
</nc:EntityOrganization>
</mda:VesselCertificateOfFinancialResponsibilityOperator>
</mda:VesselCertificateOfFinancialResponsibilityOperator>
<mda:VesselSubCategoryText>Anhydrous
Ammonia</mda:VesselSubCategoryText>
</mda:Vessel>
-<mda:Arrival ism:ownerProducer="USA" ism:classification="U">
<mda:VisitAnchorageText>Main Anchorage</mda:VisitAnchorageText>
-<mda:VisitExpectedArrivalDateTime>
<nc:DateTime>2025-12-10T14:30:00</nc:DateTime>
</mda:VisitExpectedArrivalDateTime>

```

```

-<mda:VisitLocationInPort>
<m:PortName>Oakland</m:PortName>
<nc:LocationStateName>CA</nc:LocationStateName>
<nc:LocationCityName>Oakland</nc:LocationCityName>
-<mda:PortAugmentation>
-<m:LocationPoint>
-<gml:Point xmlns:gml="http://www.opengis.net/gml">
<gml:pos srsDimension="2">-122.295 37.6965</gml:pos>
</gml:Point>
</m:LocationPoint>
</mda:PortAugmentation>
</mda:VisitLocationInPort>
<mda:VisitReceivingFacilityName>Pier
57</mda:VisitReceivingFacilityName>
</mda:Arrival>
-<mda:Departure ism:ownerProducer="USA" ism:classification="U">
-<mda:VisitExpectedDepartureDateTime>
<mda:DateTime>2025-12-16T00:00:00</mda:DateTime>
</mda:VisitExpectedDepartureDateTime>
</mda:Departure>
-<mda:LastPortOfCall ism:ownerProducer="USA"
ism:classification="U" ntk:access="#Roles|Group^MDA-USCG-Msn-
District11-ROC">
-<mda:VisitActualArrivalDateTime>
<nc:DateTime>2025-11-25T00:00:00</nc:DateTime>
</mda:VisitActualArrivalDateTime>
-<mda:VisitActualDepartureDateTime>
<mda:DateTime>2025-11-30T00:00:00</mda:DateTime>
</mda:VisitActualDepartureDateTime>
-<mda:VisitLocationInPort>
<m:PortName>Port of Portland, Oregon</m:PortName>
<nc:LocationCountryISO3166Alpha2Code>US</nc:LocationCountryISO316
6Alpha2Code>
<nc:LocationStateName>OR</nc:LocationStateName>
<nc:LocationCityName>Portland</nc:LocationCityName>
</mda:VisitLocationInPort>
</mda:LastPortOfCall>
-<mda:NextPortOfCallList ism:ownerProducer="USA"
ism:classification="U" ntk:access="#Roles|Group^MDA-USCG-Msn-
District11-ROC">
-<mda:NextPortOfCall>
-<mda:VisitExpectedArrivalDateTime>
<nc:DateTime>2026-01-02T00:00:00</nc:DateTime>
</mda:VisitExpectedArrivalDateTime>
-<mda:VisitExpectedDepartureDateTime>
<nc:DateTime>2026-01-07T00:00:00</nc:DateTime>
</mda:VisitExpectedDepartureDateTime>
-<mda:VisitLocationInPort>
<m:PortName>Port of Long Beach</m:PortName>
<nc:LocationCountryISO3166Alpha2Code>US</nc:LocationCountryISO316
6Alpha2Code>

```

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<nc:LocationStateName>CA</nc:LocationStateName>
<nc:LocationCityName>Long Beach</nc:LocationCityName>
</mda:VisitLocationInPort>
</mda:NextPortOfCall>
</mda:NextPortOfCallList>
-<mda:CDCCargoList ism:ownerProducer="USA" ism:classification="C"
ntk:access="#Roles|Group^MDA-USCG-Msn-District11-ROC
Roles|Group^NIMS-FEMA-Msn-RegionIX-IC">
-<mda:CDCCargo>
-<m:CargoDestinationLocation>
-<nc:Address>
<nc:LocationStateName>CA</nc:LocationStateName>
<nc:LocationCountryISO3166Alpha2Code>US</nc:LocationCountryISO316
6Alpha2Code>
</nc:Address>
-<m:LocationAugmentation>
-<m:LocationPort>
<m:PortCodeText>USOAK</m:PortCodeText>
<m:PortName>Port of Oakland</m:PortName>
</m:LocationPort>
</m:LocationAugmentation>
</m:CargoDestinationLocation>
-<m:CargoHazmatDeclaration>
<m:HazmatDeclarationChemicalCommonName>Pesticide</m:HazmatDeclara
tionChemicalCommonName>
<m:HazmatDeclarationDescriptionText>Division 2.3 Poisonous
Gas</m:HazmatDeclarationDescriptionText>
-<m:HazmatDeclarationMaterialAmountMeasure>
<nc:MeasureValueText>100</nc:MeasureValueText>
<nc:MeasureUnitText>Barrel</nc:MeasureUnitText>
</m:HazmatDeclarationMaterialAmountMeasure>
<m:HazmatDeclarationUNHazmatCode>UN3018</m:HazmatDeclarationUNHaz
matCode>
</m:CargoHazmatDeclaration>
<m:CargoPackagedIndicator>true</m:CargoPackagedIndicator>
<m:CargoResidueIndicator>>false</m:CargoResidueIndicator>
</mda:CDCCargo>
</mda:CDCCargoList>
</cp:noticeofarrival>
</tdf:StructuredPayload>
</tdf:TrustedDataObject>
</gml:member>
</wfs:FeatureCollection>

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## Annex D: Revision history

| <b>Date</b> | <b>Release</b> | <b>Editor</b> | <b>Primary clauses modified</b> | <b>Description</b>   |
|-------------|----------------|---------------|---------------------------------|--|
| 2015-05-14  | 061            | J Harrison    | All                             | Final project deliverable.   |
| 2015-05-21  | 063            | J Harrison    | All                             | Incorporated edits to all sections from Testbed 11 Participants and Sponsors |
| 2015-06-22  | 064            | J Harrison    | Sections 5 and 6                | Incorporated edits from Testbed 11 Participants and Sponsors                 |
| 2015-06-23  | 070            | J Harrison    | All                             | Incorporated edits to all sections from Testbed 11 Participants and Sponsors |
| 2015-07-02  | 071            | J Harrison    | Findings                        | Incorporated edits to Findings from Testbed 11 Participants and Sponsors     |
| 2015-07-18  | 076            | J Harrison    | All                             | Incorporated edits from Testbed 11 Participants and Sponsors                 |
| 2015-09-19  | 077            | J Harrison    | All                             | Incorporated edits from Testbed 11 Participants and Sponsors                 |
| 2015-10-20  |                | C. Reed       | Various                         | Edits for publication.   |