Open Geospatial Consortium

Publication Date: 2014-04-28

Approval Date: 2014-03-30

Posted Date: 2014-03-05

Reference number of this document: OGC 14-017

Reference for this document: http://www.opengis.net/doc/ER/testbed10/owscontextinniem

Category: Public Engineering Report

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OGC® Testbed 10 OWS Context in NIEM Engineering Report

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Document type: OGC® Engineering Report
Document subtype: NA
Document stage: Approved for public release
Document language: English

Preface

This Engineering Report was prepared as a deliverable for OGC Testbed 10, an initiative of the OGC Interoperability Program. The document presents the work completed with respect to the Open Mobility thread within the testbed.

The Engineering Report describes and evaluates options for integrating OWS Context documents in requests for information based on the National Information Exchange Model (NIEM).

Suggested additions, changes, and comments on this report are welcome and encouraged. Such suggestions may be submitted by email message or by making suggested changes through OGC procedures.

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Contents

Page

Figures

Page

Tables

Page

1 Introduction

1.1 Scope

The National Information Exchange Model (NIEM) is a US government programme commissioned to facilitate the exchange of data between multiple and different Communities of Interest (CoI) at all levels of government. CoI are groups of practitioners and technical representatives who authoritatively represent their respective domains and thus have a stake in NIEM information exchanges. Among components of the initiative is the NIEM data model, which provides the reference vocabulary for consistent and reusable intra- and interdomain information exchanges. The NIEM data model is represented as an Extensible Markup Language (XML) Schema in order to provide a common framework for data exchange between different information systems. In order to facilitate reusability, NIEM adopts different namespaces for codelists from different authoritative sources. The Information Exchange Package Documentation (IEPD) are collections of artefacts that define and describe the structure and content of an Information Exchange Package (IEP), which itself is the real data and metadata transmitted during exchange. One important source of motivation for the development of NIEM is the need for shared situational awareness when federal agencies respond to incidents.

Shared Situational Awareness is typically achieved through provision of a Common Operating Picture (COP), which refers to a single representation of relevant information, within an area of interest, tailored to the user's requirements and based on common data and information that could be shared across service command centres during a multi-agency response [6]. The term Request for Information (RFI) is used to describe the format in which an information need is specified and passed between different agencies, allowing the responding agencies to provide information to the requestor that addresses the specified information need. To facilitate shared situational awareness between the requestor and the agency responding to the RFI it can be beneficial to provide a COP that is accessible to both the requestor and responder.

This engineering report aims to describe an approach for encoding a NIEM RFI IEPD with an OGC Web Services Context (OWS Context) document embedded inside the IEPD. The OGC Web Services Context Document (OWS Context) standard has been developed to facilitate configuration of a set information resources that are to be passed between applications. The information resources are typically services but may also be in-line content. The goal of OWS Context is to support use cases such as the distribution of search results, the exchange of collections of resources such as OGC Web Feature Service (WFS), Web Map Service (WMS), Web Map Tile Service (WMTS), Web Coverage Service (WCS) and others. OWS Context can therefore be considered to provide the ability to specify a COP such that the area of interest, time range, resources and their configuration is unambiguously exchanged between applications. This

capability makes OWS Context a potential enabler of operations across different federal agencies and COI, hence the requirement to investigate the possibility to wrap OWS Context documents in NIEM RFI IEPDs.

To achieve the aim of this engineering report, the following objectives have been identified:

1. Review the findings of the Geo4NIEM interoperability experiment
2. Identify the relevant rules in the NIEM Naming and Design Rules
3. Design solution options
4. Produce sample encodings
5. Discuss and document findings

1.2 Document contributor contact points

All questions regarding this document should be directed to the editor or the contributors:

Name	Organization
Gobe Hobona	Envitia Ltd.
Roger Brackin	Envitia Ltd.

1.3 Revision history

Date	Release	Editor	Primary clauses modified	Description
2014/03/05	0.0.1	GH	All	Initial version

1.4 Future work

None planned.

1.5 Forward

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.

1. OGC 12-080r2, *OGC OWS Context Conceptual Model, 2014*

2. OGC 12-084r2, *OGC OWS Context Atom Encoding Standard, 2014*

3. OGC 06-121r3, *OWS Common Implementation Specification, 2010*

4. OGC 13-054r1, *Summary and Recommendations of the Geospatial Enhancement for the National Information Exchange Model (Geo4NIEM) Interoperability Experiment, 2013*

5. NTAC. *National Information Exchange Model Naming and Design Rules by the NIEM Technical Architecture Committee (NTAC), 2008*

6. Keuhlen, D.T., Bryant, O.L. and Young, K.K. *The Common Operational Picture in Joint Vision 2020: a less layered cake, Norfolk, VA: National Defense University Joint Forces Staff College, 2002*

7. RISS. *Sensitive But Unclassified / Controlled Unclassified Information (SBU/CUI) Secure Federated Search (SFS) - NIEM Information Exchange Package Master Document, Regional Information Sharing Systems, Last Accessed 05 March 2014, Available from http://tools.niem.gov/niemtools/iepdt/display/container.iepd?ref=LCV0g_N7Oh4*

3 Terms and definitions

For the purposes of this report, the definitions specified in Clause 4 of the OWS Common Implementation Specification [OGC 06-121r3] and in OpenGIS® Abstract Specification shall apply. In addition, the following terms and definitions apply.

3.1
model
abstraction of some aspects of a universe of discourse [ISO 19109]

3.2
interoperability
capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units [ISO 19119]

3.3
common operating picture
A COP is a single identical display of relevant information shared by more than one command. A common operational picture facilitates collaborative planning and assists all echelons to achieve situational awareness.

3.4
context document
A context document is a document describing the set of resources and their configuration, and ancillary information (area of interest, etc.) which defines the information representation of a common operating picture.

3.5
resource
A resource is a configured set of information which is uniquely identifiable to a user. This can be realised as in-line or external content or by one or more configured web services.

3.6
Area of Interest
An area of interest is a geographic area which is significant to a user.

4 Conventions

4.1 Abbreviated terms

ER	Engineering Report
GML	Geography Markup Language
NIEM	National Information Exchange Model
OGC	Open Geospatial Consortium
OWS	OGC Web Service
OWS-10	OGC Web Services Initiative, Phase 10

SDI	Spatial Data Infrastructure
URL	Uniform Resource Locator
WFS	Web Feature Service
XML	eXtensible Markup Language
XSD	XML Schema Definition

5 Background Information

This section presents a review of relevant recent works and standards.

5.1 Review of the Geo4NIEM Engineering Report

The Geo4NIEM interoperability experiment was commissioned by the US Department of Homeland Security (DHS), NIEM Program Management Office and the Office of the Program Manager for the ISE (PM-ISE) to enhance interoperability with respect to the handling of geospatial information based on OGC standards and NIEM-conformant information exchanges. A primary goal of the interoperability experiment was to improve understanding of strategies for including or embedding data conforming to one framework into another. Another goal was to assess the feasibility of the various approaches through software demonstrations, including through the use of OGC web services.

The Geo4NIEM interoperability experiment observed that version 1.3 of the NIEM Naming and Design Rules (NDR) document specifies rules and principles for developing conforming data components and schemas [5]. Section 7 of the NDR specifies the rules for the creating and using external adaptor types. “The adapter mechanism is the only means of incorporating content from an external namespace into NIEM-conformant schemas” [4]. In considering support for GML within NIEM, the Geo4NIEM interoperability experiment focused on the extensibility offered by creation and use of external adapter types.

The interoperability experiment recommended that the reference schema in NIEM should define geometry adapters that cover the basic geometry types allowed by the GML Simple Features Profile. Other recommendations most relevant to this OGC Testbed 10 included the definition of a generic feature adapter, definition of a general purpose geometry adapter, removal of adapters for curve segments and deprecation of adapters of specific GML elements.

5.2 Review of Naming and Design Rules

The following rules from Section 7 of the NDR are relevant to Testbed 10. As the rules relate to NIEM 2.1, this engineering report identifies key changes observed in NIEM 3.0 that should be considered in future applications of the NDR. Whereas NIEM 3.0 schemas have been published, revisions of the NDR were still pending at the time of writing this engineering report. Therefore, changes discussed in this section were identified through examination of the schemas.

- Rule 7-61: Within the schema, an element xsd:import that imports a namespace defined by an external schema MUST have the application information appinfo:ConformantIndicator, with a value of false. None of the NIEM 3.0 external adapters were observed to include the ConformantIndicator elements. This suggests that use of the element is now deprecated, however, should be confirmed when the NIEM NDR revision is published.

- Rule 7-62: Within the schema, an element xsd:import that imports a namespace defined by an external schema MUST be a documented component.

- Rule 7-63: Within the schema, an adapter type MUST have application information appinfo:ExternalAdapterTypeIndicator with a value of true. A type that is not an adapter type SHALL NOT contain that indicator. Testbed 10 participants observed that in NIEM 3.0, the attribute name is in lowerCamelCase i.e. appinfo:externalAdapterTypeIndicator.

- Rule 7-64: Within the schema, an adapter type MUST be an immediate extension of type structures:ComplexObjectType. Testbed 10 participants observed that structures:ComplexObjectType is not available within NIEM 3.0, presumably due to deprecation, and has been replaced with structures:ObjectType.

- Rule 7-65: Within the schema, an adapter type MUST be composed of only elements and attributes from an external standard.

- Rule 7-66: Within the schema, an element reference used in an adapter type definition MUST be a documented component.

- Rule 7-67: Within the schema, an attribute reference used in an adapter type definition MUST be a documented component.

- Rule 7-68: Within the schema, an adapter type MUST NOT be extended or restricted.

5.3 Review of IEPDs

A review of the NIEM IEPD clearinghouse on January 5th 2014 showed that there were 192 shared IEPDs registered, none of which had been registered after the date of release of NIEM 3.0. This suggests that NIEM 2.0 is still the more widely implemented version.

In the intelligence domain, Requests for Information (RFI) are mechanisms through which analysts and other operators can request and receive relevant information for processing and analysis. The Geo4NIEM interoperability experiment extended the DHS RFI IEPD to explore the conversion of NIEM exchange messages to GML feature type instances. This suggests that extension of an RFI IEPD to include Classes that have properties to hold OWS Context objects would be consistent with the approach adopted by Geo4NIEM.

The participants of the testbed reviewed a selection of IEPDs offered by the NIEM clearinghouse and observed that the Sensitive But Unclassified (SBU)/Controlled Unclassified Information (CUI) Secure Federated Search IEPD used by Law Enforcement agencies imports an extension of an Atom feed to include external content that uses NIEM types [7]. The SBU/CUI Secure Federated Search (SFS) has been developed to help establish a nationwide secure federated search that allows authorized law enforcement and homeland security personnel to search across domains, retrieving structured and unstructured data. Some of the content exchanged in the Federated Search system is encoded as Atom-formatted content, with restrictions as specified in the modified Atom schema. This suggests that development of Atom-encoded OWS Context documents that can also hold external (non-OGC) content would be consistent with the Federated Search IEPD.

6 Use Cases

A number of possible uses of an OWS Context document are identified in the standard, these include:

- UC1. Exchange of a common view or common operating picture for shared situational awareness.
- UC2. Exchange of discovery results from various catalogue searches, to avoid duplication of effort.
- UC3. Exchange of configuration and/or results of an analysis or processing activity.

Of the above listed use cases, the first is most applicable to RFI. Indeed, the OWS Context standard acknowledges that the exchange of a COP is recognized as the most important usage of the OWS Context Document. As illustrated in Table 1, the use case may involve, for example, the agency issuing the RFI also sharing its operating picture with the agency responding to the RFI.

Table 1. Use Case UC1 – Exchange of a common view or common operating picture

Title	UC1. Exchange of a common view or common operating picture for shared situational awareness.
Actors	Requesting Agency, Providing Agency, System
Pre-condition	The Requesting Agency has a need for information collected by the Providing Agency but does not currently have access to the required information
Trigger	An incident occurs requiring resources from multiple agencies
Basic Flow	1. Requesting Agency creates a NIEM RFI with an embedded OWS Context document that gives detailed background information about the requested information 2. Requesting Agency sends the enhanced NIEM RFI to the Providing Agency 3. Providing Agency processes the RFI 4. Providing Agency returns the requested information
Post-condition	The information needs of the Requesting Agency have been met

The second use case may be applicable in situations where, for example, there is a need to share catalogue inventories or their subsets in order to avoid duplication of effort. Where some of the resources cannot be directly accessed, an RFI could be embedded to identify specific information resources and their publishing organisations.

Table 2. Use Case UC2 – Exchange of discovery results from various catalogue searches

Title	UC2. Exchange of discovery results from various catalogue searches, to avoid duplication of effort.
Actors	Client application, Federated Search System
Pre-condition	A user(e.g. analyst) has an information need that requires searching multiple catalogue services from different agencies
Trigger	A user initiates a search through a client application
Basic Flow	1. Client application sends a distributed search request to the federation of catalogue services

	2. Client application receives discovery results, from the catalogue services, encoded as OWS Context documents 3. Client application removes duplicate resources from the discovery results 4. Client application presents the processed discovery results
Post-condition	The user's information needs have been met

The third use may be applicable to situations where information is sought in relation to results of an analysis or processing activity. An RFI could for example include a context document that retrieves the latest calculations from a plume modelling web processing service.

Table 3. Use Case UC3 – Exchange of configuration and/or results of an analysis or processing activity

Title	UC3. Exchange of configuration and/or results of an analysis or processing activity.
Actors	Analyst 1, Analyst 2
Pre-condition	A collection of services have been made available to different analysts working on the same data but from the perspective of different domains (e.g. in a MULTI-INT environment).
Trigger	An incident occurs requiring resources from multiple agencies
Basic Flow	1. Analyst 1 configures an analysis process and invokes it. 2. Upon completion of the analysis process, Analyst 1 generates an OWS Context document with the configuration of the analysis 3. Analyst 1 publishes the configuration to Analyst 2 4. Analyst 2 uses the configuration to initiate his own analytical process.
Post-condition	Analyst 2 has an analysis configuration that resembles that of Analyst 1

7 Solution Options

This section presents a number of solution options for integrating OWS Context in NIEM.

7.1 Option 1

Options 1 involves creating an RFIRequestContextType, which then contains both a DHS RFIRequestType and an Atom encoded OWS Context document. An alternative could be to wrap a representation of the OWS Context conceptual model however, the Atom encoding of OWS Context is favoured due to the potential mass uptake by Atom readers.

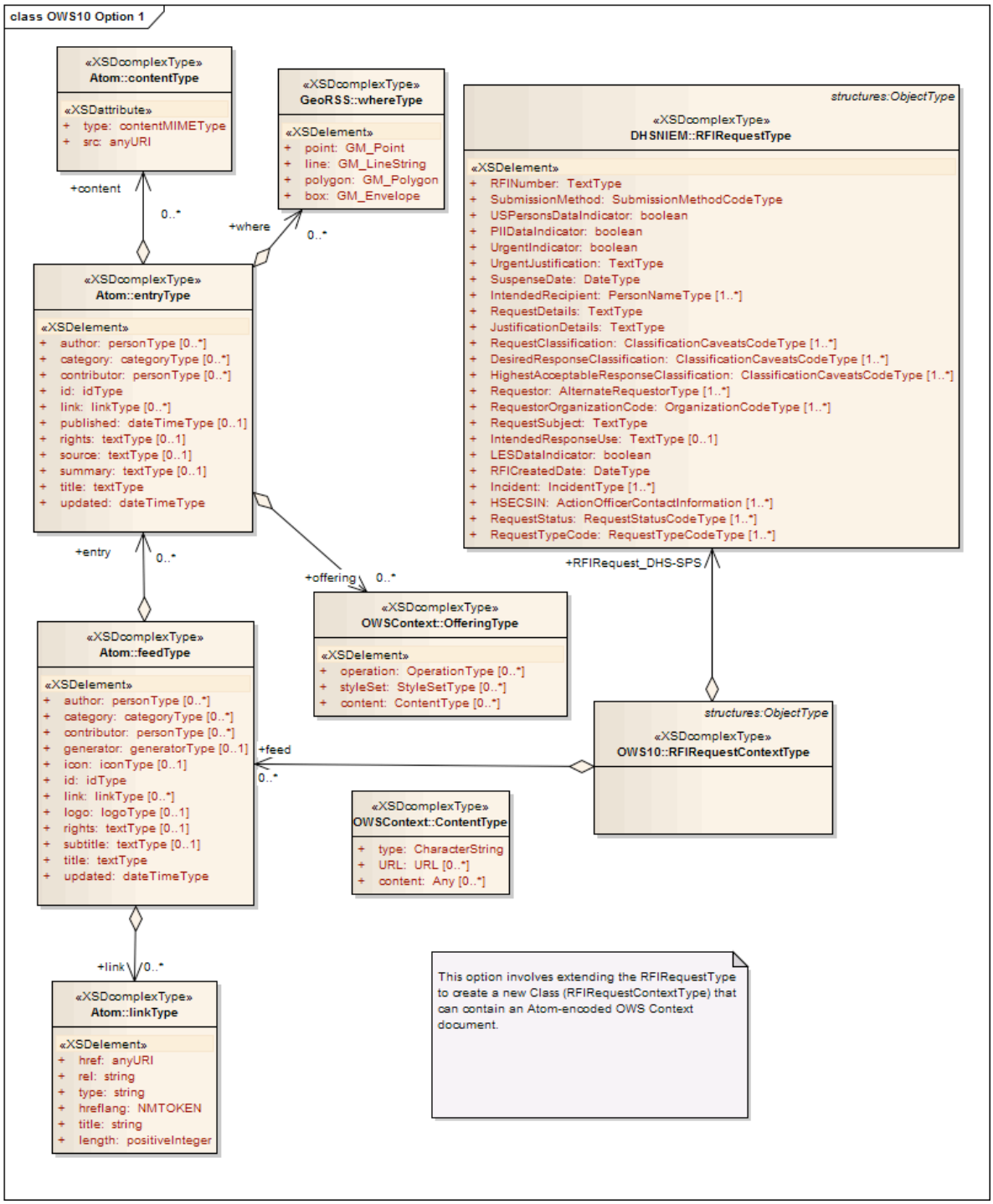

Figure 1. Class model of solution option 1

An example encoding of solution option 1 is shown below.

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<owscniem:RFIRequestContext
    xmlns:xsi='http://www.w3.org/2001/XMLSchema-instance'
    xmlns:rfi="http://www.pmise.gov/niem/rfi-extension"
    xmlns:nc="http://niem.gov/niem/niem-core/2.0"
    xmlns:atom="http://www.w3.org/2005/Atom"
    xmlns:owscniem="http://www.opengis.net/owscniem"
    xmlns:rfi-request="http://www.pmise.gov/niem/rfi-request"
    xsi:schemaLocation='http://www.opengis.net/owscniem
../Exchange/ows10_option1.xsd'>
   <rfi-request:RFIRequest_DHS-SPS>
    <rfi-request:RFINumber ></rfi-request:RFINumber>
    <rfi-request:SubmissionMethod >Email</rfi-request:SubmissionMethod>
    <rfi-request:USPersonsDataIndicator >false</rfi-
request:USPersonsDataIndicator>
    <rfi-request:PIIDataIndicator >false</rfi-request:PIIDataIndicator>
    <rfi-request:UrgentIndicator >true</rfi-request:UrgentIndicator>
    <rfi-request:UrgentJustification >Test RFI</rfi-
request:UrgentJustification>
    <rfi-request:SuspenseDate ></rfi-request:SuspenseDate>
    <rfi-request:IntendedRecipient >
        <nc:PersonGivenName >John</nc:PersonGivenName>
        <nc:PersonSurName >Smith</nc:PersonSurName>
    </rfi-request:IntendedRecipient>
    <rfi-request:RequestDetails >Test RFI</rfi-request:RequestDetails>
    <rfi-request:JustificationDetails >
          Test RFI
    </rfi-request:JustificationDetails>
    <rfi-request:RequestClassification >
           UNCLASSIFIED
    </rfi-request:RequestClassification>
    <rfi-request:DesiredResponseClassification >
          UNCLASSIFIED
    </rfi-request:DesiredResponseClassification>
    <rfi-request:HighestAcceptableResponseClassification >
          UNCLASSIFIED
    </rfi-request:HighestAcceptableResponseClassification>
    <rfi-request:Requestor >
        <nc:JurisdictionText >Federal</nc:JurisdictionText>
        <nc:PersonSurName >Someone</nc:PersonSurName>
        <nc:EmailSenderAddressID
>someone@dhs.gov</nc:EmailSenderAddressID>
        <nc:TelephoneNumberFullID >0012345678</nc:TelephoneNumberFullID>
        <rfi:PersonTitle >Administrator</rfi:PersonTitle>
    </rfi-request:Requestor>
    <rfi-request:RequestorOrganizationCode >
          T1: State
    </rfi-request:RequestorOrganizationCode>
    <rfi-request:RequestSubject >Someoneelse</rfi-request:RequestSubject>
    <rfi-request:IntendedResponseUse ></rfi-request:IntendedResponseUse>
    <rfi-request:LESDataIndicator >false</rfi-request:LESDataIndicator>
    <rfi-request:RFICreatedDate ></rfi-request:RFICreatedDate>
    <rfi-request:Incident >
        <nc:IncidentEvent >
            <nc:ActivityName >Test RFI</nc:ActivityName>
        </nc:IncidentEvent>
```

```
        <rfi:IncidentLocation >
            <nc:LocationAddress ></nc:LocationAddress>
        </rfi:IncidentLocation>
    </rfi-request:Incident>
    <rfi-request:HSECSIN >
        <nc:PersonGivenName >John</nc:PersonGivenName>
        <nc:PersonSurName >Smith</nc:PersonSurName>
        <rfi:OfficerPhoneNumber ></rfi:OfficerPhoneNumber>
        <rfi:OfficerEmailAddress >
            <nc:EmailSenderAddressID
>somebody@dhs.gov</nc:EmailSenderAddressID>
        </rfi:OfficerEmailAddress>
    </rfi-request:HSECSIN>
    <rfi-request:RequestStatus >
          Open - Being Processed
    </rfi-request:RequestStatus>
    <rfi-request:RequestTypeCode >
          Request For Information
    </rfi-request:RequestTypeCode>
    </rfi-request:RFIRequest_DHS-SPS>
    <atom:feed xmlns="http://www.w3.org/2005/Atom"
                      xmlns:atom="http://www.w3.org/2005/Atom"
                      xmlns:dc="http://purl.org/dc/elements/1.1/"
                      xmlns:georss="http://www.georss.org/georss"
                      xmlns:gml="http://www.opengis.net/gml"
                      xmlns:owc="http://www.opengis.net/owc/1.0">
        <atom:category
scheme=http://www.opengis.net/spec/owc/specReference
        term="http://www.opengis.net/spec/owc/1.0/req/atom"
        label="This file is compliant with version 1.0 of OGC Context"/>
        <atom:id>http://www.opengis.net/owc/1.0/examples/wmts</atom:id>
        <atom:title>WMTS Example</atom:title>
        <atom:subtitle type="html">
            WMTS Example
        </atom:subtitle>
        <atom:author>
            <atom:name>John Smith</atom:name>
        </atom:author>
        <atom:updated>2012-11-04T17:26:23Z</atom:updated>
        <atom:entry>
            <atom:id>http://www.opengis.net/spec/owc-
atom/1.0/req/wmts/1</atom:id>
            <atom:title>WMTS Example</atom:title>
            <atom:updated>2011-11-01T00:00:00Z</atom:updated>
            <atom:content type="text">WMTS example</atom:content>
            <owc:offering code="http://www.opengis.net/spec/owc-
atom/1.0/req/wmts">
            <owc:operation code="GetCapabilities" method="GET"
            type="application/xml"
href="http://www.opengis.uab.es/...SERVICE=WMTS"/>
            <owc:operation code="GetTile" method="GET" type="image/jpeg"
            href="http://www.opengis.uab.es/...leCol=0"/>
            </owc:offering>
        </atom:entry>
    </atom:feed>
```

```
</owscniem:RFIRequestContext>
```

7.2 Option 2

Options 2 involves using OWS Context, without any modifications, to contain a DHS RFIRequestType. Effectively this would be a profile of OWS Context. It should be noted that an OWS Context ContentType type could be modelled to accept types from the NIEM structures:ObjectType substitution group (or structures:ComplexObjectType for NIEM 2.1). Use of a substitution group would allow the OWS Context ContentType to hold the RFIRequestType and other types from the substitution group

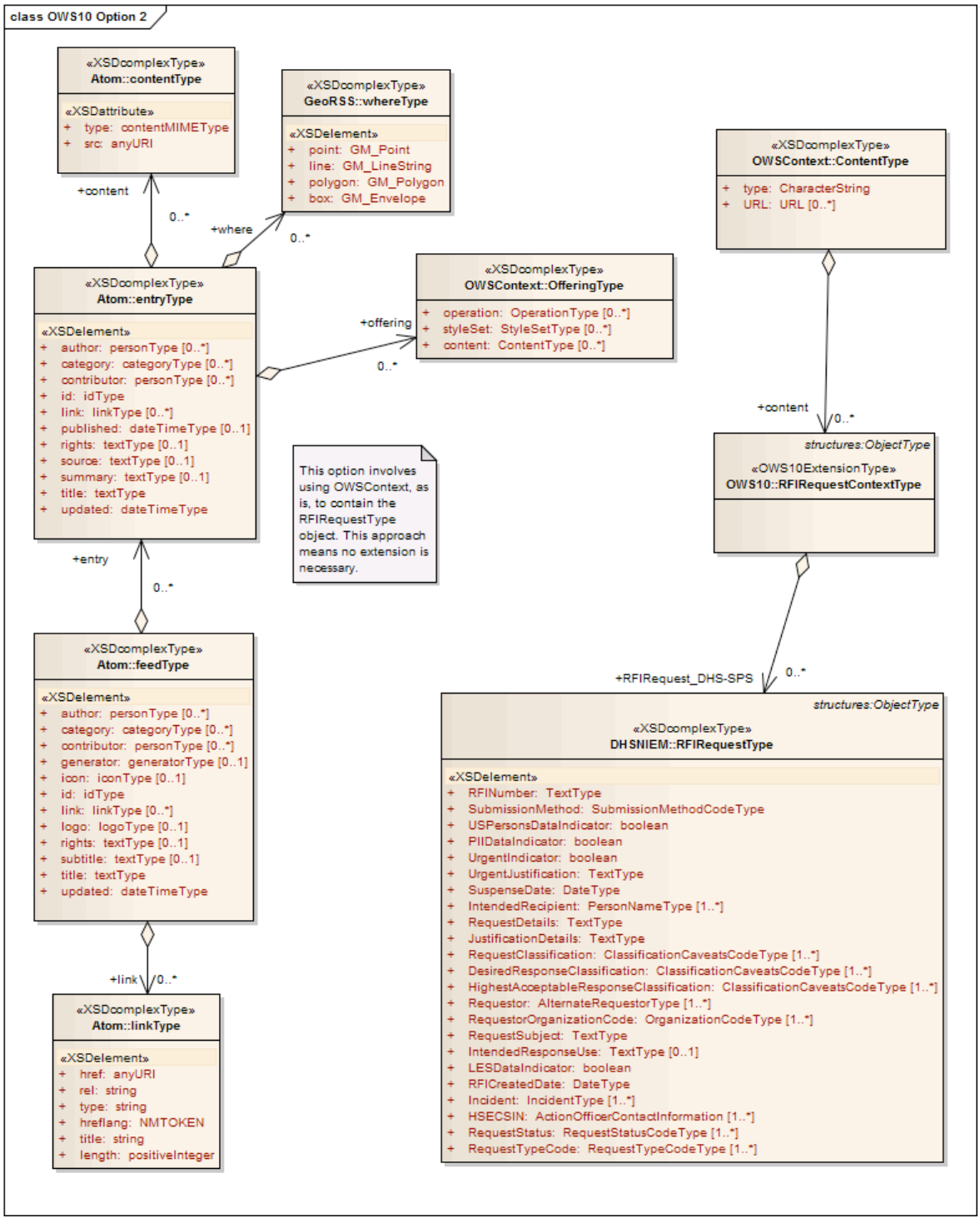

Figure 2. Class model of solution option 2

An example encoding of solution option 2 is shown below.

```
<?xml version="1.0" encoding="UTF-8"?>
<atom:feed     xmlns:xsi='http://www.w3.org/2001/XMLSchema-instance'
```

```
                xmlns:rfi="http://www.pmise.gov/niem/rfi-extension"
                xmlns:nc="http://niem.gov/niem/niem-core/2.0"
                xmlns:owscniem="http://www.opengis.net/owscniem"
                xmlns:rfi-request="http://www.pmise.gov/niem/rfi-request"
                xmlns:atom="http://www.w3.org/2005/Atom"
                xmlns:dc="http://purl.org/dc/elements/1.1/"
                xmlns:georss="http://www.georss.org/georss"
                xmlns:gml="http://www.opengis.net/gml"
                xmlns:owc="http://www.opengis.net/owc/1.0"
                xsi:schemaLocation='http://www.w3.org/2005/Atom
                ../Exchange/atom.xsd'>
    <atom:category scheme="http://www.opengis.net/spec/owc/specReference"
     term="http://www.opengis.net/spec/owc/1.0/req/atom"
     label="This file is compliant with version 1.0 of OGC Context"/>
    <atom:id>http://www.opengis.net/owc/1.0/examples/wmts</atom:id>
    <atom:title>WMTS Example</atom:title>
    <atom:subtitle type="html">WMTS Example</atom:subtitle>
    <atom:author><atom:name>John Smith</atom:name></atom:author>
    <atom:updated>2012-11-04T17:26:23Z</atom:updated>
    <atom:entry>
        <atom:id>
          http://www.opengis.net/spec/owc-atom/1.0/req/wmts/1
        </atom:id>
        <atom:title>WMTS Example</atom:title>
        <atom:updated>2011-11-01T00:00:00Z</atom:updated>
        <atom:content type="text">WMTS example</atom:content>
        <owc:offering
        code="http://www.opengis.net/spec/owc-atom/1.0/req/wmts">
            <owc:operation code="GetCapabilities" method="GET"
            type="application/xml" href="http://www.opengis.uab.es/..."/>
            <owc:operation code="GetTile" method="GET" type="image/jpeg"
             href="http://www.opengis.uab.es/...TileCol=0"/>
            <owc:content>
                <owc:type>text/xml</owc:type>
                 <owc:content>
                <rfi-request:RFIRequest_DHS-SPS>
                    <rfi-request:RFINumber ></rfi-request:RFINumber>
                    <rfi-request:SubmissionMethod >Email</rfi-
request:SubmissionMethod>
                    <rfi-request:USPersonsDataIndicator >false</rfi-
request:USPersonsDataIndicator>
                    <rfi-request:PIIDataIndicator >false</rfi-
request:PIIDataIndicator>
                    <rfi-request:UrgentIndicator >true</rfi-
request:UrgentIndicator>
                    <rfi-request:UrgentJustification >Test RFI</rfi-
request:UrgentJustification>
                    <rfi-request:SuspenseDate ></rfi-request:SuspenseDate>
                    <rfi-request:IntendedRecipient >
                        <nc:PersonGivenName >John</nc:PersonGivenName>
                        <nc:PersonSurName >Smith</nc:PersonSurName>
                    </rfi-request:IntendedRecipient>
                    <rfi-request:RequestDetails >Test RFI</rfi-
request:RequestDetails>
                    <rfi-request:JustificationDetails >Test RFI</rfi-
```

```
request:JustificationDetails>
                    <rfi-request:RequestClassification >UNCLASSIFIED</rfi-
request:RequestClassification>
                    <rfi-request:DesiredResponseClassification
>UNCLASSIFIED</rfi-request:DesiredResponseClassification>
                    <rfi-request:HighestAcceptableResponseClassification
>UNCLASSIFIED</rfi-request:HighestAcceptableResponseClassification>
                    <rfi-request:Requestor >
                        <nc:JurisdictionText
>Federal</nc:JurisdictionText>
                        <nc:PersonSurName >Someone</nc:PersonSurName>
                        <nc:EmailSenderAddressID
>someone@dhs.gov</nc:EmailSenderAddressID>
                        <nc:TelephoneNumberFullID
>0012345678</nc:TelephoneNumberFullID>
                        <rfi:PersonTitle >Administrator</rfi:PersonTitle>
                    </rfi-request:Requestor>
                    <rfi-request:RequestorOrganizationCode >T1:
State</rfi-request:RequestorOrganizationCode>
                    <rfi-request:RequestSubject >Someoneelse</rfi-
request:RequestSubject>
                    <rfi-request:IntendedResponseUse ></rfi-
request:IntendedResponseUse>
                    <rfi-request:LESDataIndicator >false</rfi-
request:LESDataIndicator>
                    <rfi-request:RFICreatedDate ></rfi-
request:RFICreatedDate>
                    <rfi-request:Incident >
                        <nc:IncidentEvent >
                            <nc:ActivityName >Test RFI</nc:ActivityName>
                        </nc:IncidentEvent>
                        <rfi:IncidentLocation >
                            <nc:LocationAddress ></nc:LocationAddress>
                        </rfi:IncidentLocation>
                    </rfi-request:Incident>
                    <rfi-request:HSECSIN >
                        <nc:PersonGivenName >John</nc:PersonGivenName>
                        <nc:PersonSurName >Smith</nc:PersonSurName>
                        <rfi:OfficerPhoneNumber ></rfi:OfficerPhoneNumber>
                        <rfi:OfficerEmailAddress >
                            <nc:EmailSenderAddressID
>somebody@dhs.gov</nc:EmailSenderAddressID>
                        </rfi:OfficerEmailAddress>
                    </rfi-request:HSECSIN>
                    <rfi-request:RequestStatus >Open - Being
Processed</rfi-request:RequestStatus>
                    <rfi-request:RequestTypeCode >Request For
Information</rfi-request:RequestTypeCode>
                </rfi-request:RFIRequest_DHS-SPS>
            </owc:content>
        </owc:content>
    </owc:offering>
</atom:entry>
</atom:feed>
```

8 Discussion

The testbed considered the possibility of extending the DHS RFI type in order to encapsulate an OWS Context document. Such an approach would however violate NDR rule 7-68, which requires that an adapter should not be extended or restricted. The testbed therefore modelled the solution options as presented in the previous sections.

Solution Option 1 has the advantage of allowing any number of DHS RFI elements to be associated with any number of OWS Context documents. In relation to the use cases presented in Section 1, the ability to associate any number of RFI elements with any number of OWS Context documents could allow a single RFI to support multiple common operating pictures tailored for different emergency services. For example, a single RFI on the state of roads could support separate OWS Context documents designed to support law enforcement and emergency medical services. Solution Option 1 also has the advantage of not requiring any profiling of neither the RFI nor OWS Context documents. This means that once the elements are extracted from the root element, they can be handled by current applications as-is. The solution option has the disadvantage that the root element would be from a new and non-NIEM type, which may require current applications to be modified in order to support the new type.

Solution Option 2 has the advantage of explicitly associating an RFI with the OWS Context document that contains it. The solution option also has the advantage that the root element is an Atom feed, which is widely supported in both the geo and non-geo domains. Wrapping content in an Atom feed would also be consistent with existing NIEM IEPDs such as the Secure Federated Search IEPD [7]. Conversely, solution option 2 has the disadvantage that as the RFI is embedded inside the OWS Context document, it is not possible for a single RFI document to reference multiple OWS Context documents. The same RFI would need to be repeated for it to support multiple OWS context offerings.

9 Conclusions

This report has presented an approach for integrating OWS Context documents in NIEM. The report offers different solution options for modeling an enhancement of the DHS RFI IEPD and provides a discussion of the advantages and disadvantages of the different solution options. The report also provided an overview of NIEM Naming and Definition Rules, identifying those rules that have most impact on the integration of OWS Context in NIEM. The report also presented an overview of possible use cases.

The report concludes that it is possible to integrate OWS Context and NIEM. There are several potential benefits of such integration but most of all the ability to distribute common operating pictures and improve shared situational awareness.

10 Recommendations

The following recommendations have been identified.

10.1 Integrate OWS Context into more IEPDs

The findings of this OGC testbed provide a means for integrating OWS Context in RFI IEPDs. The solution options presented are generic enough to be applied to a variety of IEPDs. It is therefore recommended that OWS Context be integrated into other IEPDs.

10.2 Update of the NIEM Naming and Definition Rules

The current version of the NDR is based on previous version of NIEM. There are therefore references to complexTypes that are not present in version 3.0 of NIEM. It is therefore recommended that the NDR be updated to be inline with NIEM 3.0.

10.3 Update of IEPDs to use NIEM 3.0

Several existing IEPDs were found to have been published prior to the release of NIEM 3.0. Therefore producers of those IEPDs should be encouraged to upgrade their implementations to NIEM 3.0. It is therefore updated that existing IEPDs be updated to adopt NIEM 3.0.