# NIEM-UML-3 Alpha-1

### As of: 9/12/2013

This document summarizes the changes and contents of “NIEM-UML-3, Revision Alpha-1. NIEM-UML-3 provides a UML representation of NIEM-3 as an update to the then current NIEM-UML specification as produced through the OMG process. NIEM-UML as published by the OMG is based on NIEM-2 where as NIEM-UML-3 (Alpha 1) is based on NIEM-3, Release candidate one[[1]](#footnote-1).

It should be noted that NIEM-3 is still in flux and not complete. There are inconsistencies in the NIEM reference models and details not yet fully specified (such as the MPD format). In addition, changes to NIEM-3 imply changes to NIEM-UML that are subject to interpretation. The NIEM-3-UML team has made best efforts at resolving NIEM-3 issues and open questions but further discussion and changes are anticipated. For the above reasons this version should be considered for comment and review only and is expected to undergo substantial change prior to being finalized. Finalization by the NIEM-3 team is expected to initiate a corresponding OMG standards process, which may propose further changes.

TaBle Of Contents

[NIEM-UML-3 Alpha-1 1](#_Toc366666391)

[Contents of Alpha-1 3](#_Toc366666392)

[What remains to be done 3](#_Toc366666393)

[Issues 5](#_Toc366666394)

[Changes impacting the NIEM-UML modeler 5](#_Toc366666395)

[Change Set 1: Unified Reference & Content 6](#_Toc366666396)

[Change Set 2: NIEM-3 Augmentations 8](#_Toc366666397)

[Change Set 3: Code list substitution groups 10](#_Toc366666398)

[Change Set 4: Changes to structures & “Simplified Annotations” 11](#_Toc366666399)

[Change Set 5: Constraint Schema 12](#_Toc366666400)

[Change Set 6: Business Rules 13](#_Toc366666401)

[Change Set 7: Local Vocabulary 14](#_Toc366666402)

[Change Set 8: NDR & MPD Rule References 15](#_Toc366666403)

[Change Set 9: Updated Reference Models 16](#_Toc366666404)

[Change Set 10: MPD Restructuring & References 17](#_Toc366666405)

[Change Set 11: Oasis Catalog 18](#_Toc366666406)

# Contents of Alpha-1

|  |  |
| --- | --- |
| File(s) | Contains |
| NIEMUML3-Alpha1 | This file, summarizing NIEM-UML-3, Alpha-1 |
| Documents/NIEM-UML-3-Draft.docx | The OMG NIEM-UML specification updated to include NIEM-UML-3 changes, with change tracking. Note that not all changes have been made as some technical sections require substantial effort and will be revised on finalization |
| Models/NIEM-UML-Profile.mdzip | Magicdraw version of the NIEM-UML profile updated for NIEM-3. Note that changes at this level are not substantial |
| ConopsExamples.pptx | Examples of new NIEM-3 concepts in UML |
|  | |
|  | |
| Under Models/NIEM UML Machine Readable Files | |
| mpd2pim.qvto  mpd2pimOasis.qvto  NIEMglobals.qvto  NIEMmpdartifact2model.qvto  NIEMmpdmodel2artifact.qvto  NIEMpim2psm.qvto  NIEMpim2Schematro.qvto  NIEMplatformBinding.qvto  NIEMpsm2xsd.qvto  NIEMpim2psm.qvto  pimSubsetReference.qvto  pimSubsetReferenceN20.qvto | QVT supporting NIEM-UML-3 mappings |
| XmlPrimitiveTypes.mdzip | XML types used by NIEM. |
|  | |
| Under Models/NIEM UML Machine Readable Files/NIEM-Reference | |
| NIEM-Reference\*.mdzip | 49 NIEM-3 Reference schema converted to NIEM-UML-3 |
| Under Models/NIEM UML Machine Readable Files/Nonnormative | |
| \*.ecore | 8 Meta models in “Eclipse ecore format required to support transformations |
|  | |
| Under Models/Examples | |
| \*.mpd | 11 Legacy NIEM-2 models transformed to NIEM-3 to serve as examples and test cases. Note that, to the best of our knowledge, these are the first examples of NIEM-3 IEPDs. |

# What remains to be done

### Adapting to revised reference models

The NIEM-3 reference models as provided contain a substantial number of inconsistencies (in excess of 10,000). Once these inconsistencies are resolved and final reference models are provided conversions will have to be redone. The NIEM-UML-3 team can work with the NIEM-3 (XML) team to resolve these issues.

### Adapting to revised NDR

As the NIEM-3 NDR is finalized, updates will be required.

### Support for the NIEM-3 MPD format

Once the NIEM-3 MPD format is complete and provided, changes to the PIM, PSM and mappings are expected.

### Feedback on/improvement of the PIM representation

We expect feedback from NIEM-UML stakeholders on the PIM representation. For example, on the treatment of aggregation and code list substitution groups.

### OMG Conformant XMI

Machine readable artifacts are developed using the “Magicdraw UML” tool. Final artifacts to be provided to the OMG standards process must be “cleansed” of produce specifics and made OMG conformant. This is a time consuming process and one which seems unnecessary for preliminary versions. OMG compliant XMI artifacts will be provided when the OMG process has been initiated.

### Test cases and examples

The examples and test cases provided are based on conversion of legacy NIEM-2 IEPDs. More examples and test cases exercising new NIEM-3 features are required.

### Schematron support

Schematron support for business rules and constraint schema is very preliminary and requires substantially more testing and test cases.

### Specification document - Examples

The examples and in particular the example XML should be re-generated once all the capabilities are in place and validated for NIEM-3 conformance. Also, examples will need to be updated for NIEM-3 URLs.

### Specification document – Profile Reference section

The specification reference section is generated and will be re-generated based on the final models.

### Specification document – Transformation Reference section

The transformation reference text and diagrams require updates (marked as “Note:” in document).

### Specification document – Structured English

The “structured English” provided by GTRI will require substantial updates. Optionally, it could be removed.

### Other items

* external/xml has been added. This schema is not conformant, but according to NDR should be imported as if it were conformant. That schema is referenced by niem-core.
* The proxy schema contains various forms of "List" types. Those types were not referenced in last release, so there was no particular issue. However, there are now 2 or 3 references to those types from the reference models. We have no representation for those types in NIEM-UML. Perhaps we need to add those types to the XML Primitive Types library.

# Changes impacting the NIEM-UML modeler

The following changes have been made based on the current NIEM-3:

## Unified Reference & Content

### Summary

NIEM-3 no longer recognizes any distinction in the schema between containment (content) and reference and uses a NIEM specific mechanism to support reference. In NIEM-UML-2, UML aggregation (black or white diamond) was used to express aggregation.

In addition, allowing for NIEM-3’s unique mechanism for references requires that any reference specified as “nil”. Therefor if reference is to be allowed, so must nil.

### Status: Resolved for Alpha-1

### Impact

NIEM-UML-2 models no longer mean the same thing as they did. In addition, there is no way (without business rules) to express that an element must be contained or by reference.

### Resolution for Alpha-1: Option 3, Ignore aggregation.

However other options have been discussed as follows:

### Resolution Option 1

UML aggregation will still be available in the NIEM PIM but will not impact the schema. Schematron artifacts will be generated to express aggregation constraints. If aggregation is set for an element, Schematron will be used to disallow use of reference. Note that this does not provide a way to dis-allow a composite – but this seems less of an issue for users. All non-aggregations would imply “nil” as a legal value.

In addition, UML aggregation would follow UML semantics and require that any aggregated element must be owned by exactly one instance of the aggregating type.

For conversion from NIEM-2 to NIEM-3, all aggregation should probably be removed except for where the target is a data type.

**This resolution will be tentative until the issue is socialized with the NIEM-3 team. No action will be taken in the profile at this time.**

### Resolution Option 2

UML will still be available in the NIEM PIM but will not impact the schema. Schematron artifacts may, optionally, be generated to express aggregation constraints. Aggregation kind will map to the composition constraints as follows:

* None = reference required
* Shared=Reference/composite optional (NIEM Default)
* Composite=Composition required

Issue: Default of “Shared (open diamond) is not standard or intuitive use of UML

### Resolution Option 3

Ignore AggregationKind

#### Profile Impact

Documentation only, no change to machine readable profile.

#### QVT Impact

Remove schema generation for aggregation (easy). Add Schematron support (substantial).

Remove support for Reference types and the associated naming conventions.

#### Example

TDB

## NIEM-3 Augmentations

### Summary

The changes to the concept and representation of augmentations is substantial. In NIEM-2 it was expected that a class using an augmentation extended some (augmented) base class and had a property for each augmentation. In NIEM-3 no such extension or properties of augmented classes exist. Instead, substitution groups are used to add augmentations to a type, the type is augmented “in place” without an extension and there is no additional property in an augmented class. Each class that may have augmentations defines a substitution group head and each augmentation can substitute for that head.

The fundamental changes are summarized as follows:

* The mere fact of defining an augmentation type implicitly allows it to augment an instance of another class
* The set of classes it may augment is controlled by the substitution group property (what it can substitute for)
* A substitution can be a class or a property
* There is no longer a way to specify the cardinality of an augmentation

### Status: Resolved for Alpha-1

### Questions

It is not clear if the “old” way of using augmentations (using an extension and a property) is still legal, is legal but not recommended or is illegal. How should existing models should be changed?

### Impact

All NIEM models (XML and UML) using augmentations will require change. The semantics of augmentations in UML will also change.

Augmentations in NIEM-UML involve <<AugmentationType>> and <<Augments>> stereotypes. In addition, a class may inherit multiple augmentation types which then correspond to augmentation elements. Augmentation elements may also be directly defined.

### Resolution Option

The following changes would support NIEM-3

* A type marked as <<AugmetnationType>> would implicitly be able to augment any <<ObjectType>> or <<AssociationType>>.
* The set of classes an <<AugmentationType>> may augment (the substitution head) may be specified using <<Augments>>, which would map to the definition of the substitution group. If no <<Augments>> is specified, the global augmentation group head would be used.
* Inheriting an <<AugmentationType> will have the effect of generating a Schematron constraint that exactly one instance of the augmentation will augment each instance of the inheriting class.
* An <<AugmentationType>> may also be marked as a <<PropertyHolder>>. This would have the effect of defining each of the contained properties as being individually substitutable for the subject substitution group head.
* All object and association types defined in UML will generate an augmentation point (A PSM option could be added to suppress this, but always producing it is in keeping with the recommendation).
* [TBD – not included in alpha-1]Each augmentation would also generate a single property referencing the augmentation, these properties would be hidden from the PIM and use the standard naming convention. If additional reference properties are allowed (**Pending resolution of recommended NDR rule #15**), each such property will be included in a single <<PropertyHolder>> for the namespace.

For conversion from NIEM-2 – not sure yet how to handle this (depends on the legality of the legacy structure).

#### Open Questions

Handling of restrictions: Can a restriction define new properties (that are substitutes of an augmentation point)? Can any property be added to a restriction in this way. Would restrictions ever include the augmentationpoint head?

#### Profile Impact

Documentation, examples. However, the interpretation of a NIEM-UML would be different from NIEM-2 to NIEM-3. This may suggest it would be preferable to add a new stereotype for the new NIEM-3 and deprecate the old one, perhaps the old one could still be supported as legacy (interpretation TBD).

#### QVT Impact

The QVT would be substantially different

#### Example

See updated specification.

## Code list substitution groups

### Summary

Code lists are now expected to define a substitution group where there is an abstract head and different concrete representations of those codes allowed for.

### Status: Resolved for Alpha-1, other options to be explored

### Impact

The introduction of an abstract element does change PIM models, in an additive way.

### Resolution Option for Alpha-1.

At this time property holders will be used, no PIM representation has been devised.

#### Profile Impact

None

#### QVT Impact

None

## Changes to structures & “Simplified Annotations”

### Summary

There are substantial changes to structures and apinfo:

* i:ConformantIndicator must be changed to @appinfo:externalImportIndicator attribute. Rule for its use has also changed as now we are indicating use of external imports.
* s:ComplexObjectType must be changed to structures:ObjectType.
* s:ComplexObjectType must be changed to structures:ObjectType. (XML Schema Representation)
* s:ComplexObjectType must be changed to structures:AssociationType.
* Any references to i:AppliesTo will be removed or replaced.
* Any references to s:MetaData will be removed or replaced.
* Any references to appinfo:ReferenceTarget will be removed or replaced.
* Any references to structures:ReferenceType will be removed or replaced.
* Any references to namespace http://niem.gov/niem/structures/2.0 will be replaced.
* Any references to namespace http://niem.gov/niem/appinfo/2.0 will be replaced.
* Any references to structures:Augmentation will be removed or replaced.
* Any references to structures:ComplexObjectType will be removed or replaced.
* Any references to appinfo:Base will be removed or replaced.
* Any references to structures:Association will be removed or replaced.
* Any references to structures:SequenceId will be removed or replaced.
* Any references to structures:sequenceID will be removed.
* More…

### Status: Resolved for Alpha-1

### Impact

At this time the changes to structures and apinfo seem to be syntactic and may not impact the profile.

### Resolution Option

Minimize PIM changes, make changes to the mapping in QVT

#### Profile Impact

None known at this time.

#### QVT Impact

Substantial changes to support the NIEM-3 structures.

## Constraint Schema

### Summary

Constraint schema are being deprecated, but are still legal in some way. Schematron is being substituted as a recommendation (not part of the technical architecture).

### Status: In Progress

### Impact

The only use for constraint schema in NIEM-UML 2.1 is the ability to change the type of a property in a subset schema to one defined in an extension schema.

### Resolution Option

**Both a constraint schema and Schematron artifacts will be produced.**

### Resolution for Alpha-1: Schematron not generated.

#### Profile Impact

None known at this time

#### QVT Impact

Substantial: Support Schematron mapping

## Business Rules

### Summary

Support for “business rules” is mentioned but has no specific representation.

### Status: Resolved for Alpha-1

### Impact

UML can support rules in OCL, most of which can be mapped to Schematron. Additionally, native UML semantics, such as aggregation, may be mapped to Schematron. Business rule support could be added.

### Resolution Option

Add Schematron meta-model. Support OCL and native UML semantics via QVT to Schematron.

### Resolution for Alpha-1: Defined but not fully tested, Schematron generation is enabled.

#### Profile Impact

Allow OCL constraints

#### QVT Impact

Substantial: Support Schematron mapping

## Local Vocabulary

### Summary

NIEM-3 allows for the definitions of a “local vocabulary”. “Annotations in the schema identify non-dictionary terminology: jargon, acronyms, slang”. This appears to be documentation – it does not impact NIEM exchanges.

### Status: Not started

### Impact

There is no current support for local vocabularies

### Resolution Option for Alpha-1

Add <<LocalVocabulary>> stereotype of Enumeration. Also add <<Source>> Stereotype with a URI tag to enumeration literal.

Enumeration literal will define a vocabulary entry as follows:

* Name->Term
* Specification->Literal
* Documentation->Definition
* <<Source>>::URI->sourceURI

#### Profile Impact

Add <<LocalVocabulary>> and <<Source>> stereotypes.

#### QVT Impact

Produce local vocabulary as per NIEM-3

## NDR & MPD Rule References

### Summary

The rules in the NDR will change as well as their identity. These rules are referenced from the NIEM-UML profile. Stable NIEM-3 rules identifiers will be required.

### Status

Waiting on the next version from NTAC.

### Impact

Changes to NIEM rule identifiers have a large impact on the NIEM-UML specification references to NDR/MPD rules, as well as names of OCL constraints within the UML Profiles.

### Resolution Option

Suggest all rules retain their identity across NIEM revisions.

#### Profile Impact

#### QVT Impact

## Updated Reference Models

### Summary

NIEM-UML contains UML representations of all of the reference models. The NIEM reference models will need to be completely regenerated for NIEM-UML-3.

### Status

The NIEM-3 RC1 release contained a number of issues, none of which adversely affect progress on NIEM3-UML Reference Models.

### Impact

Lack of sample NIEM-3 IEPDs, or a machine-readable log of the changes between NIEM 2.1 and NIEM 3.0 hinders progress on development of MPD/UML transformations. Alpha-1 is providing a set of NIEM-3 examples.

### Resolution Option

Transform selected NIEM 2.1 IEPDs to NIEM 3.0. This will be based on assumptions regarding the reference model changes from NIEM 2.1 to NIEM 3.0, and will be confined to those aspects of the reference models referenced by the selected IEPDs. It is a labor-intensive effort to determine the nature of these changes, which includes changes to namespaces, names of attributes/elements/schemas, structural changes to types, movement of components across schemas, etc.

#### Profile Impact

#### QVT Impact

QVT development has progressed based on examples produced within the NIEM-UML-3 project.

## MPD Restructuring & References

### Summary

There will be a new version of the MPD for NIEM-3. It is known that there will be a completely new form of MPD Catalog, and that there will be, in addition, an OASIS Catalog. There will be references to business-rules, expressed using Schematron. It is unknown when the new MPD will be available, but it will be some time after the new NDR is complete.

### Status

Availability of NIEM-3 MPD and related schemas is unknown.

### Impact

The addition of an OASIS Catalog requires construction of a corresponding MOF model plus additional QVT transformations to read/provision that model. This is not a problem, since the OASIS Catalog is well defined. The major changes made for the MPD Catalog requires construction of a corresponding MOF model, changes to QVT transformations, and changes to the MPD Profile. The lack of availability of the schema for the new MPD Catalog is a major obstacle to finalizationt of the NIEM-UML-3 specification.

### Resolution Option

There can be no complete resolution until the MPD specification is released in its final form, along with any related schemas such as the MPD Catalog. The 2.1 MPD format is being used.

#### Profile Impact

Changes to MPD Profile may need to be delayed until after final version of MPD, and its associated schemas, are released. In the interim, we will need to continue with existing form of MPD Profile (possibly removing nature, since it will no longer exist). Any constraints expressed in any of the Profiles related to exchange or subset schemas cannot be completed until the MPD is released, since those types of schemas are not addressed by the NDR.

#### QVT Impact

The MPD Catalog meta-model cannot be finalized until the MPD Catalog Schema is made available. The corresponding QVT cannot be completed until the MPD Catalog meta-model is constructed. The apparent lack of a mechanism to identify exchange or subset schemas will pose some challenges to interpreting the contents of an MPD.

## Oasis Catalog

### Summary

An OASIS Catalog will be a required artifact within a NIEM-3 MPD.

### Status

A meta-model for the OASIS Catalog has been constructed. Some additional QVT for reading the catalog has been implemented.

### Impact

Meta-model for the OASIS Catalog must be generated and QVT for reading/provisioning OASIS Catalog must be implemented.

### Resolution Option

Existing MPD/Information Model mechanisms for the PIM Perspective are sufficient to identify OASIS Catalog provisioning requirements.

#### Profile Impact

May have no impact on profiles, if information in existing profiles are retained (i.e., purpose of an information model).

#### QVT Impact

Additional QVT mappings will be provided for reading/provisioning the OASIS Catalog.

1. NIEM-3, release candidate 1: http://reference.niem.gov/.3rc1/niem-3.0rc1.rel.zip [↑](#footnote-ref-1)