What's New In NIEM 6.0?

22 May 2025

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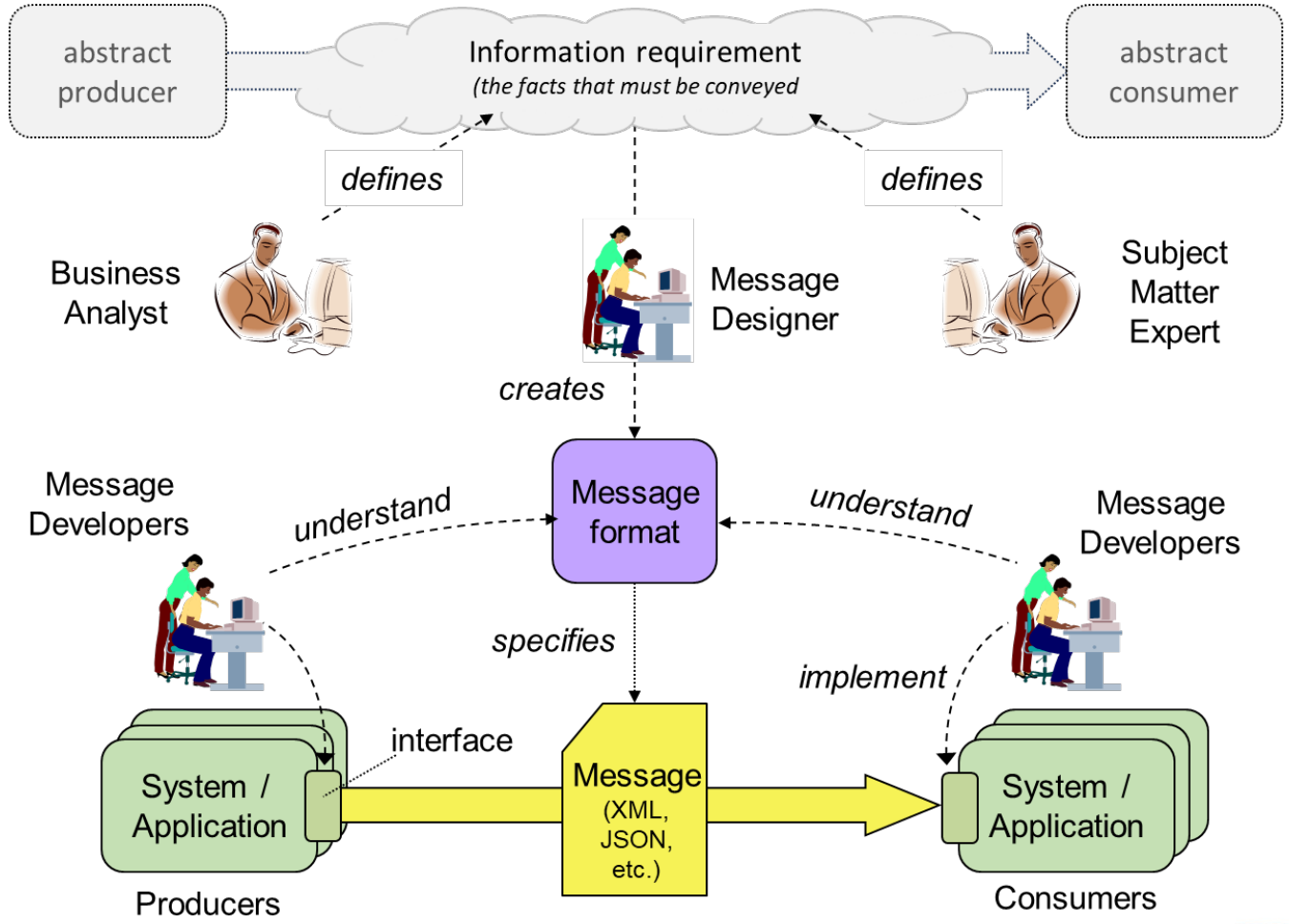
NTAC Co-Chair, NIEMOpen

Purpose Of NIEM



- A standard for data specifications
- A reusable community-agreed data model
- A tradeoff between
  - N^2 pairwise arrangements
  - Single model
- Works for
  - File transfer or message bus
  - APIs
  - Web resources
- Widely useful for machine-to-machine data sharing

NIEM 6.0: Not Your Father's NIEM...

Many new features and simplifications

- First-class support for JSON messages and JSON developers
- New technology-neutral data model format
- Pathway to artificial intelligence – ontologies and knowledge graphs
- Free and open-source developer tools

NIEM XML == NIEM JSON

Developers can work with XML, or JSON, or both

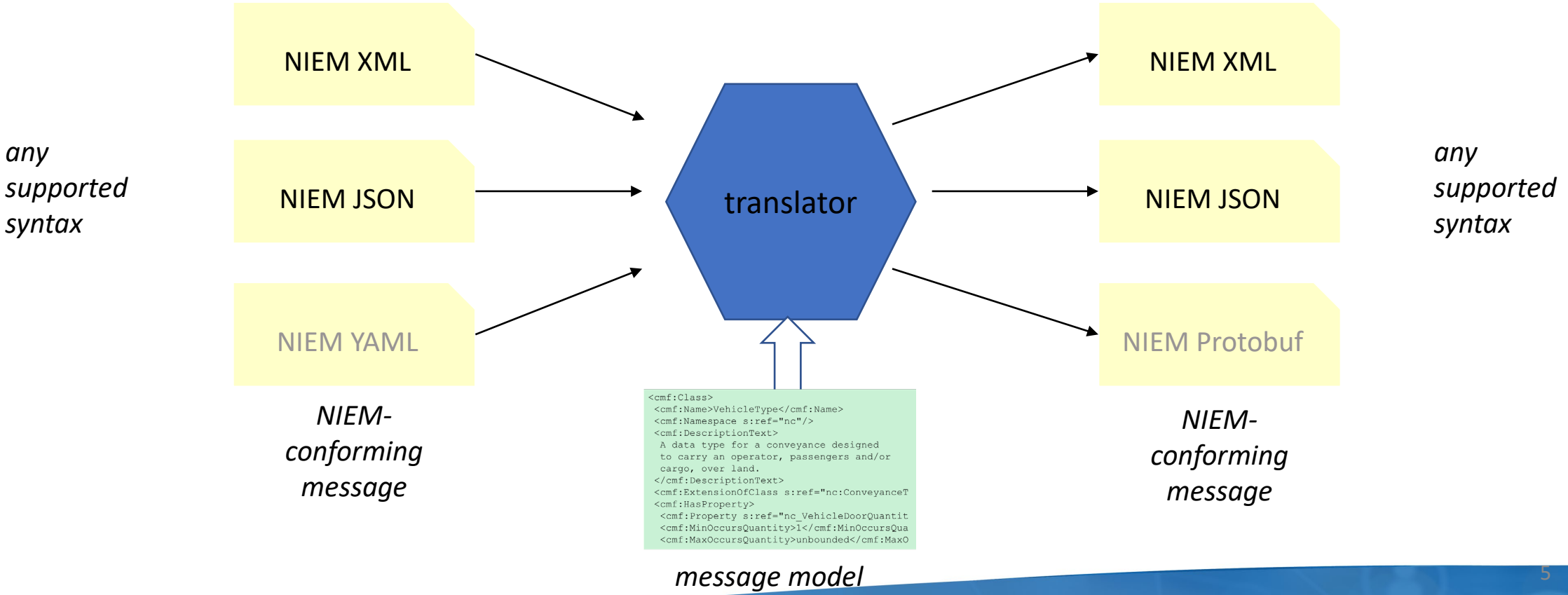
```
<ex:CrashDriverInfo>
 <j:Crash>
  <j:CrashVehicle>
   <j:CrashDriver s:id="P01">
    <nc:PersonBirthDate>
     <nc:Date>1890-05-04</nc:Date>
    </nc:PersonBirthDate>
    <nc:PersonName>
     <nc:PersonGivenName>Peter</nc:PersonGiv
     <nc:PersonMiddleName>Death</nc:PersonMi
     <nc:PersonMiddleName>Bredon</nc:PersonM
```

```
"exch:CrashDriverInfo": {
 "j:Crash": {
  "j:CrashVehicle": {
   "j:CrashDriver": {
    "@id": "#P01",
    "nc:PersonBirthDate": {
     "nc:Date": "1890-05-04"
    },
    "nc:PersonName": {
     "nc:PersonGivenName": "Peter",
     "nc:PersonMiddleName": [ "Death", "Bred
```

NIEM-based message in XML ⟵ *equivalent to* ⟶ NIEM-based message in JSON

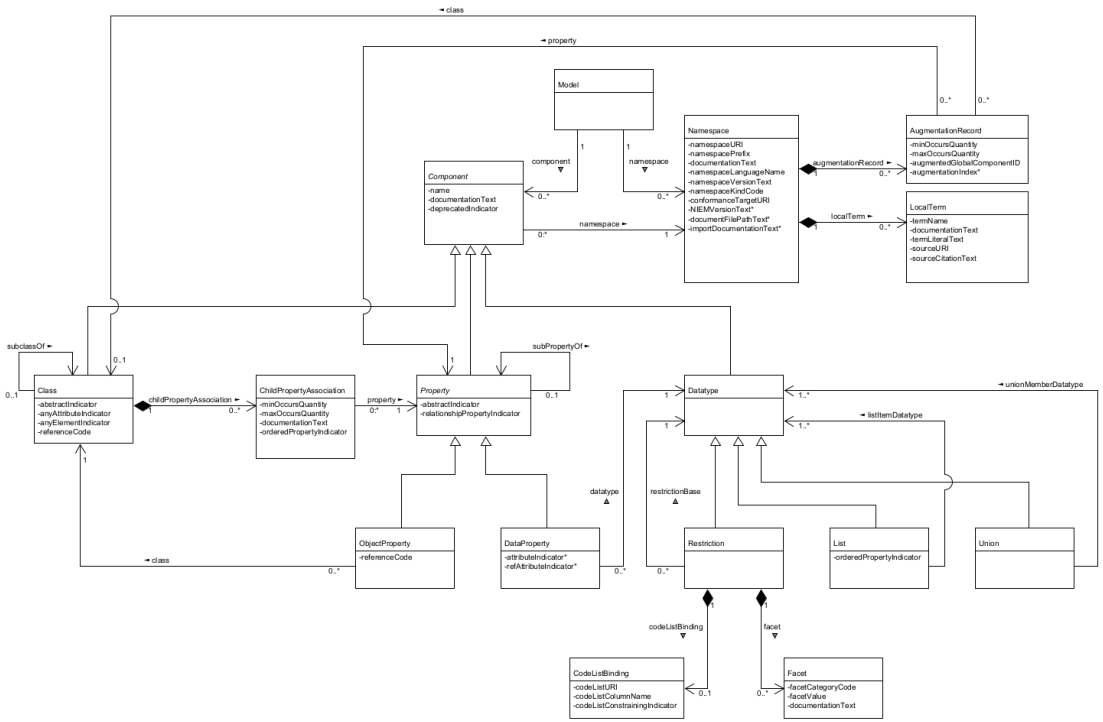
Convertible Messages

Translate messages from one format to any other – no special programming required



Technology-Neutral Model Format

- NIEM has always used XML Schema (XSD) as its data modeling language
  - Model semantics formally defined via mappings to Resource Description Framework (RDF)
  - Convenient for designers and developers implementing XML-based data exchange
- XML Schema is not convenient for JSON developers
- NIEM 6 adds the NIEM metamodel and Common Model Format
  - Metamodel: A conceptual data model for the things we want to know about data models
  - CMF: A NIEM-based implementation of the metamodel
  - Works equally for JSON and XML



NIEM metamodel

Common Model Format (CMF)

Every model has an equivalent representation in XSD and CMF

```
<xs:complexType name="VehicleType">
 <xs:annotation>
  <xs:documentation>
    A data type for a conveyance designed
    to carry an operator, passengers and/or
    cargo, over land.
  </xs:documentation>
 </xs:annotation>
<xs:complexContent>
 <xs:extension base="nc:ConveyanceType">
  <xs:sequence>
   <xs:element ref="VehicleDoorQuantity"
   <xs:element ref="VehicleIdentification"
```

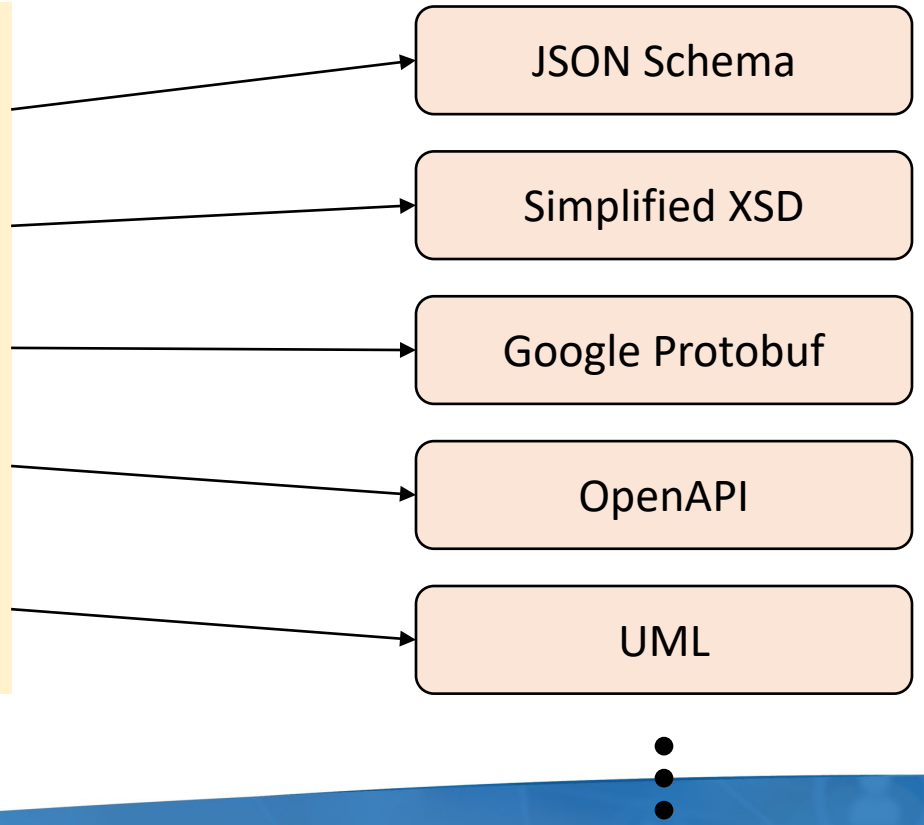
```
<cmf:Class>
 <cmf:Name>VehicleType</cmf:Name>
 <cmf:Namespace s:ref="nc"/>
 <cmf:DescriptionText>
  A data type for a conveyance designed
  to carry an operator, passengers and/or
  cargo, over land.
 </cmf:DescriptionText>
 <cmf:ExtensionOfClass s:ref="nc:ConveyanceT
 <cmf:HasProperty>
  <cmf:Property s:ref="nc_VehicleDoorQuantit
  <cmf:MinOccursQuantity>1</cmf:MinOccursQua
  <cmf:MaxOccursQuantity>unbounded</cmf:MaxO
```

XML Schema like this ⟵ *is equivalent to* ⟶ CMF like this

CMF Supports Many Developer Technologies

CMF can be converted into developer artifacts for many technologies

```
<cmf:Class>
 <cmf:Name>VehicleType</cmf:Name>
 <cmf:Namespace s:ref="nc"/>
 <cmf:DescriptionText>
  A data type for a conveyance designed
  to carry an operator, passengers and/or
  cargo, over land.
 </cmf:DescriptionText>
 <cmf:ExtensionOfClass s:ref="nc:ConveyanceT
 <cmf:HasProperty>
  <cmf:Property s:ref="nc_VehicleDoorQuantit
  <cmf:MinOccursQuantity>1</cmf:MinOccursQua
  <cmf:MaxOccursQuantity>unbounded</cmf:MaxO
```



Ontologies and Knowledge Graphs

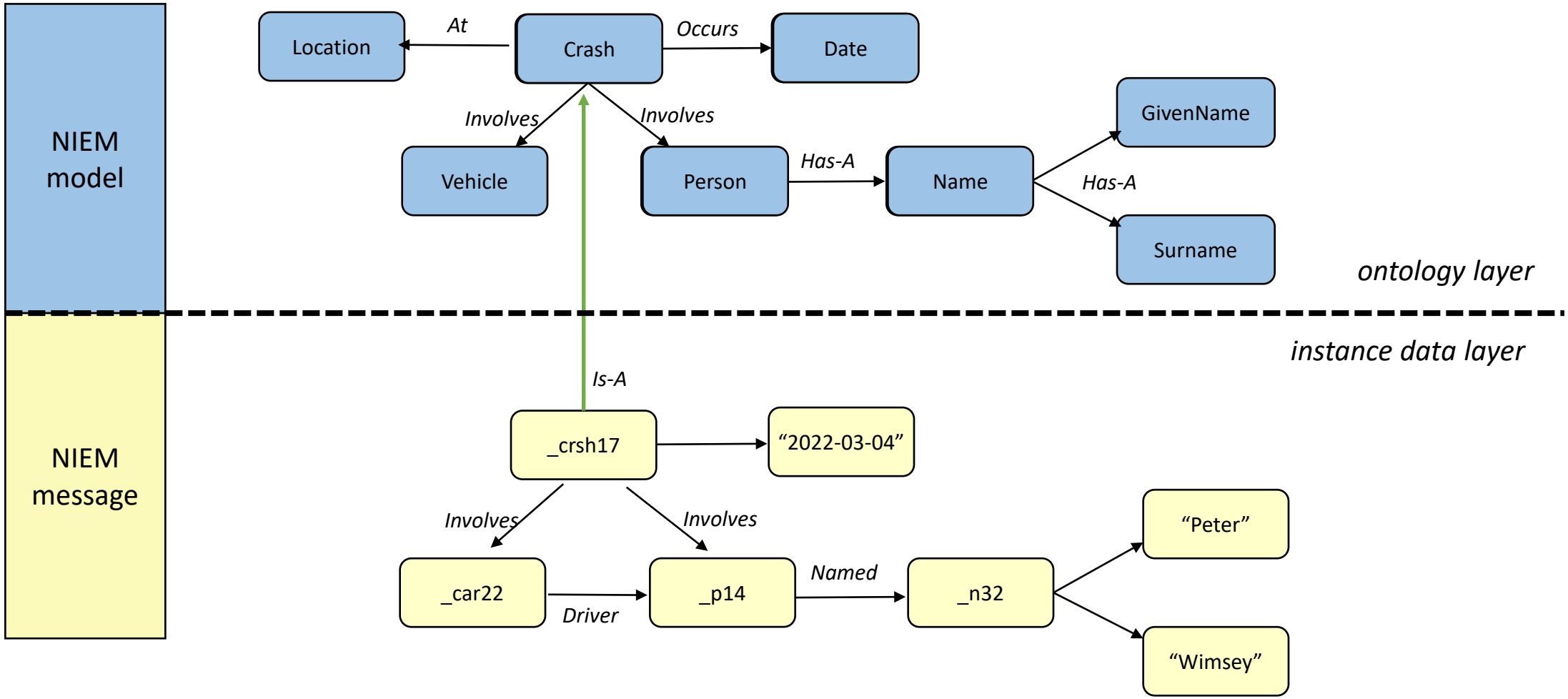
Messages and models can be converted into RDF

```
<ex:CrashDriverInfo>
 <j:Crash>
  <j:CrashVehicle>
   <j:CrashDriver>
    <nc:RoleOfPerson s:id="P1">
     <nc:PersonBirthDate>
      <nc:Date>1890-05-04</nc:Date>
     </nc:PersonBirthDate>
     <nc:PersonName>
      <nc:PersonGivenName>Peter</nc:PersonGiv
      <nc:PersonMiddleName>Death</nc:PersonMi
```

```
_:n0 a j:CrashType ;
     j:CrashVehicle _:n1 .
_:n1 a j:CrashVehicleType ;
     j:CrashDriver _:n2 .
_:n2 a j:CrashDriverType ;
     nc:RoleOfPerson _:P1 ;
_:P1 a nc:PersonType ;
     nc:PersonBirthDate _:n3 ;
     nc:PersonName _:n4 .
_:n3 a nc:DateType ;
     nc:Date "1890-05-04" .
```

NIEM-based message in XML ⟵ *equivalent to* ⟶ NIEM-based message in RDF

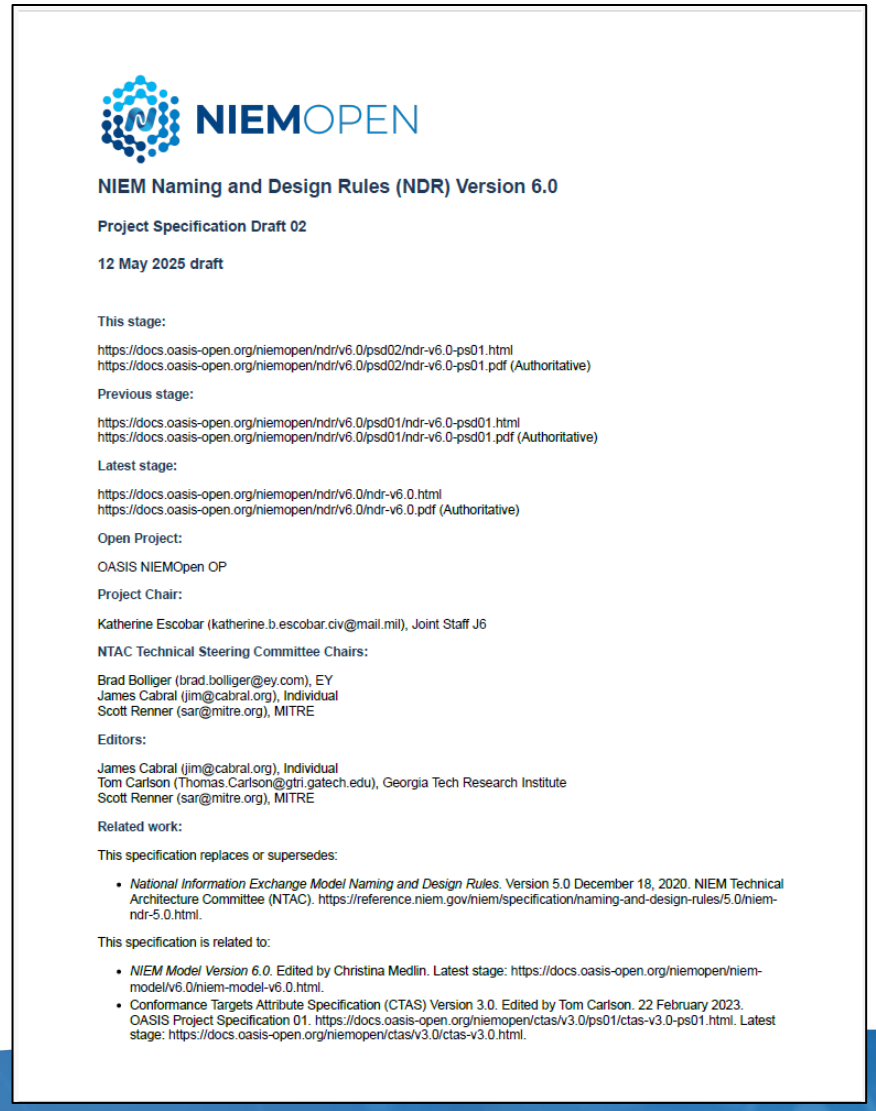
Model + Message = Knowledge Graph



New Technical Specifications

- NIEM 6 includes a complete rewrite of its key technical specification, the *Naming and Design Rules*

https://github.com/niemopen/niem-naming-design-rules



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NIEM Naming and Design Rules (NDR) Version 6.0

Project Specification Draft 02

12 May 2025 draft

This stage:

https://docs.oasis-open.org/niemopen/ndr/v6.0/psd02/ndr-v6.0-ps01.html
https://docs.oasis-open.org/niemopen/ndr/v6.0/psd02/ndr-v6.0-ps01.pdf (Authoritative)

Previous stage:

https://docs.oasis-open.org/niemopen/ndr/v6.0/psd01/ndr-v6.0-psd01.html
https://docs.oasis-open.org/niemopen/ndr/v6.0/psd01/ndr-v6.0-psd01.pdf (Authoritative)

Latest stage:

https://docs.oasis-open.org/niemopen/ndr/v6.0/ndr-v6.0.html
https://docs.oasis-open.org/niemopen/ndr/v6.0/ndr-v6.0.pdf (Authoritative)

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Related work:

This specification replaces or supersedes:

- *National Information Exchange Model Naming and Design Rules*. Version 5.0 December 18, 2020. NIEM Technical Architecture Committee (NTAC). https://reference.niem.gov/niem/specification/naming-and-design-rules/5.0/niem-ndr-5.0.html.

This specification is related to:

- *NIEM Model Version 6.0*. Edited by Christina Medlin. Latest stage: https://docs.oasis-open.org/niemopen/niem-model/v6.0/niem-model-v6.0.html.
- Conformance Targets Attribute Specification (CTAS) Version 3.0. Edited by Tom Carlson. 22 February 2023. OASIS Project Specification 01. https://docs.oasis-open.org/niemopen/ctas/v3.0/ps01/ctas-v3.0-ps01.html. Latest stage: https://docs.oasis-open.org/niemopen/ctas/v3.0/ctas-v3.0.html.

Developer Tool Support

NIEM 6 includes new free and open-source developer tools

- CMFTool
- NIEM Toolbox and API 2.0