Guidelines For The Customization of UBL v1.0 Schemas

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Abstract:

This document presents guidelines for a compatible customization of UBL schemas, and how to proceed when that is impossible.

Status:

This is a draft document and is likely to change on a regular basis.

If you are on the <ubl@lists.oasis-open.org> list for committee members, send comments there. If you are not on that list, subscribe to the <ubl-comment@lists.oasis-open.org> list and send comments there. To subscribe, send an email message to <ubl-comment-request@lists.oasis-open.org> with the word "subscribe" as the body of the message.

For information on whether any patents have been disclosed that may be essential to implementing this specification, and any offers of patent licensing terms, please refer to the Intellectual Property Rights section of the UBL TC web page (http://www.oasis-open.org/committees/ubl/).

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1. Introduction

Note

It is highly recommended that readers of the current document first consult the CCTS paper [**Reference**] before proceeding, in order to understand some of the thinking behind the concepts expressed below.

With the release of version 1.0-beta of the UBL library it is expected that subsequent changes to it will be few and far between; it contains important document types informed by the broad experience of members of the UBL Technical Committee, which includes both business and XML experts.

However, one of the most important lesson learned from previous standards is that no business library is sufficient for all purposes. Requirements differ significantly amongst companies, industries, countries, etc., and a customization mechanism is therefore needed in many cases before the document types can be used in real-world applications. A primary motivation for moving from the relatively inflexible EDI formats to a more robust XML approach is the existence of formal mechanisms for performing this customization while retaining maximum interoperability and validation.

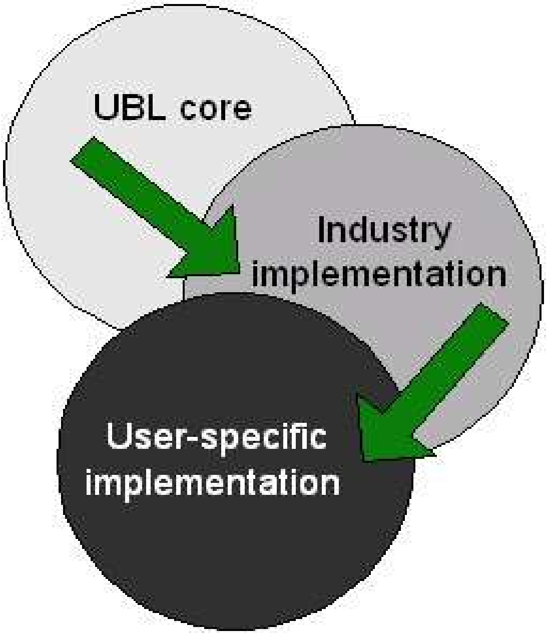
It is an UBL expectation that:

1. Customization will indeed happen,
2. It will be done by national and industry groups and smaller user communities,
3. These changes will be driven by real world needs, and
4. These needs will be expressed as context drivers.

EDI dealt with the customization issue through a subsetting mechanism that took a standard (the UN/EDIFACT standard, the ANSI X12 standard, etc.) [**References**] and subsetted it through industry Implementation Guides (IG), which were then subsetted into trading partners IGs, which were then subsetted into departamental IGs. UBL proposes dealing with this through schema derivation.

Thus UBL starts as generic as possible, with a set of schemas that supply all that's likely to be needed in the 80/20 or core case, which is UBL's primary target. Then it allows both subsetting and extension according to the needs of the user communities, industries, nations, etc., according to what is permitted in the derivation mechanism it has chosen, namely W3C XML Schema.

Figure 1.



These customizations are based on the eight context drivers identified by ebXML (see below). Any given schema component always occupies a location in this eight-space, even if not a single one has been identified (that is, if a given context driver has not been narrowed, it means that it is true for all its possible contextual values). For instance, UBL has an Address type that may have to be modified if the Geopolitical region in which it will be used is Thailand. But as long as this narrowing down of the Geopolitical context has not been done, the Address type applies to all possible values of if, thus occupying the "any" position in this particular axis of the eight-space.

In order for interoperability and validation to be achieved, care must be taken to adhere to strict guidelines when customizing UBL schemas. Although the UBL TC intends to produce a customization mechanism that can be applied as an automatic process in the future, this phase (known as Phase II, and predicted in the UBL TC's charter) has not been reached. Instead, Phase I, the current phase, offers the guidelines included in this document.

In what follows in this document, "Customization" always means "context motivated customization", or "contextualization".

1.1. Goals of this document

This document aims to describe the procedure for customizing UBL schemas, with three distinct goals.

1. The first goal is to ensure that UBL users can extend UBL schemas in a manner that:
   - allows for their particular needs,
   - can be exchanged with trading partners whose requirements for data content are different but related, and
   - is UBL compatible.
2. The second goal is to provide some canonical escape mechanisms for those whose needs extend beyond what the compatibility guidelines can offer. Although the product of these escape mechanisms cannot claim UBL compatibility, at least it can offer a clear description of its relashionship to UBL, a claim that cannot be made by other *ad hoc* methods.
3. The third goal is to gather use case data for the future UBL context extension methodology, the automatic mechanism for creating customized UBL schemas, scheduled for Phase II. To achieve this goal users are strongly encouraged to provide feedback.

The current version of this document provides general guidelines for the customization of UBL schemas. As implementation feedback is received and use cases become clearer, future versions of this document will include more specific customization guidance.

1.2. Limitations of this document

This document does not provide detailed instructions on how to customize schemas.

This document does not provide instructions on how to customize schemas for specific industries.

2. Background

The major output of the UBL TC is encapsulated in a series of UBL Schemas [**Reference**]. It is assumed that in many cases users will need to customize these schemas for their own use. In accordance with ebXML [**Reference** to CCTS] the UBL TC expects this customization to be carried out only in response to contextual needs (**see** [xxx]) and by the application of any one of the eight identified context drivers and their possible values.

It must be noted that the UBL schemas themselves are the result of a theoretical customization:

Behind every UBL Schema, a hypothetical schema exists in which all elements are optional and all types are abstract. This is what we call the "Ur-schema". As mandated in the XSD specification, abstract types cannot be used as written; they can only be used as a starting point for deriving new, concrete types. Ur-types are modelled as abstract types since they are designed for derivation. Whether the UBL TC actually produces and publishes a copy of these Ur-schemas is irrelevant, since it is possible for any one to reconstruct deterministically the appropriate Ur-schema from any of the schemas produced by the UBL TC.

2.1. The UBL Schema

The first set of derivations from the abstract Ur-types is the UBL Schema Library itself, which is assumed to be usable in 80% of business cases. These derivations contain additional restrictions to reduce ambiguity and provide a minimum set of requirements to enable interoperable trading of data by the application of one context, Business Process. The UBL schema may then be used by specific industry organizations to create their own customized schemas. When the UBL Schema is used, conformance with UBL may be claimed. When a Schema that has been customized through the UBL sanctioned derivation processs is used, conformance with UBL may also be claimed.

2.2. Customization of UBL Schemas

It is assumed that in many cases specific businesses will use customized UBL schemas. These customized schemas contain derivations of the UBL types, created through additional restrictions and/or extensions to fit more precisely the requirements of a given class of UBL users. The customized UBL Schemas may then be used by specific organizations within an industry to create their own customized schemas.

2.3. Customization of customization

Due to the extensiblilty of W3C Schema, this process can be applied over and over to refine a set of schemas more and more precisely, depending on the needs of specific data flows.

In other words, there is no theoretical limit to how many times a Schema can be derived, leading to the possible equivalent of infinite recursion. In order to avoid this, the Rule of Once-per-Context has been developed, as presented later, in "Context Chains "

3. Compatible UBL Customization

Central to the customization approach used by UBL is the notion of schema derivation. This is based on object-oriented principles, the most important of which are inheritance and polymorphism. The meaning of the latter can be gleaned from its linguistic origin: poly, meaning "many", and morph, meaning "shape". By adhering to these principles, document instances with different "shapes" (that is, that conform to different but related schemas,) can be used interchangeably.

The UBL Naming and Design Rules Subcommittee (NDRSC) has decided to use XSD, the standard XML schema language produced by the World Wide Web Consortium (W3C), to model document formats. One of the most significant advances of XSD over previous XML document description languages, such as DTDs, is that it has built-in mechanisms for handling inheritance and polymorphism, which we will refer to as "XSD derivation". It therefore fits well with the real-world requirements for business data interchange and our goal of interoperability and validation.

There are two important types of modification that XSD derivation does not allow. The first can be summarized as the deletion of required components (that is, the reduction of a component's cardinality from x..y to 0..y). The second is the *ad hoc* location of an addition to the content model through extension. There may be some cases where the user needs a different location for the addition, but XSD extension only allows addition at the end of a sequence.

Thus, there are three different scenarios covering the derivation of new types from existing ones:

- **Compatible UBL Customization**
  - An existing UBL type can be modified to fit the requirements of the customization through XSD derivation. These modifications can include extension (adding new information to an existing type), and/or refinement (restricting the set of information allowed to a subset of what is permitted by the existing type).

- **Non-compatible UBL Customization**
    - An existing UBL type could be modified to fit the requirements of the customization, but the changes needed go beyond those allowed by XSD derivation.
    - No existing UBL type is found that can be used as the basis for the new type. Nevertheless, the base library of core components that underlies UBL can be used to build up the new type so as to ensure that interoperability is at least possible at the core component level.

These Guidelines will deal with each of the above scenarios, but we will first and foremost concentrate on the first, as it is the only one that can produce UBL-compatible schemas.

3.1. Use of XSD Derivation

XSD derivation allows for type extension and restriction. These are the only means by which one can customize UBL schemas and claim UBL compatibility. Any other possible means, even if allowed by XSD itself, is not allowed by UBL. For instance, although XSD does permit the redefinition of a type to be something other than what it originally is, UBL has decided to reject this approach, because by default `<xsd:redefine>` does not leave any traces of having been used (such as a new namespace, for instance) and because of the danger of circular redefinitions.

The examples in the following sections will be based on the following complex type (and note that in all cases the `<xsd:annotation>` elements have been removed in order to achieve maximum legibility):

```
<xsd:complexType name="PartyType">
    <xsd:sequence>
      <xsd:element ref="PartyIdentification"
       minOccurs="0" maxOccurs="unbounded">
      </xsd:element>
      <xsd:element ref="PartyName"
       minOccurs="0" maxOccurs="1">
      </xsd:element>
      <xsd:element ref="Address"
       minOccurs="0" maxOccurs="1">
      </xsd:element>
      <xsd:element ref="PartyTaxScheme"
       minOccurs="0" maxOccurs="unbounded">
      </xsd:element>
      <xsd:element ref="Contact"
       minOccurs="0" maxOccurs="1">
      </xsd:element>
      <xsd:element ref="Language"
       minOccurs="0" maxOccurs="1">
      </xsd:element>
    </xsd:sequence>
  </xsd:complexType>
```

3.1.1. Extensions

XSD extension is used when additional information must be added to an existing UBL type. For example, a company might use a special identification code in relation to certain parties. This code should be included in addition to the standard information used in a Party description (PartyName, Address, etc.) This can be achieved by creating a new type that references the existing type and adds the new information:

```
        <xsd:complexType name="MyPartyType">
```

```
            <xsd:extension base="cat:PartyType">
                <xsd:element ref="MyPartyID" minOccurs="1" maxOccurs="1"/>
               </xsd:element>
            </xsd:extension>
         </xsd:complexType>
```

Some observations:

- Notice that derivation can be applied only to types and not to elements that use those types. This is not a problem: UBL uses explicit type definitions for all elements, in fact disallowing XSD use of anonymous types that define a content model directly inside an element declaration.

- This derived type, `MyPartyType`, can be used anywhere the original `PartyType` is allowed. The instance document should use the xsi:type attribute to indicate that a derived type is being used. This does not enforce the use of the new type inside a given element, however, so an `Order` instance could still be created using the standard UBL `PartyType`. If the user wishes to require the use of the derived type, blocking the possibility of using the original type in an instance, a new derived type must be created from the `Order` type using refinement and specifying that the `MyPartyType` must be used.

- UBL defines global elements for all types, and these elements, rather than the types themselves, are used in aggregate element declarations. The same procedure can be used for derived types, so a global `MyParty` element should be created based on the `MyPartyType`.

- All derived types should be created in a separate namespace (which might be tied to the user organization) and reference the UBL namespaces as appropriate. [Appropriate **reference** to UBL's namespace usage, and below]

3.1.2. Restrictions

XSD restriction is used when information in an existing UBL type must be constrained or taken away. For instance, the UBL `PartyType` permits the inclusion of any number of Party identifiers or none. If a specific organization wishes to allow exactly one identifier, this is achieved as follows (note that the annotation fields are removed from the type definition to make the example more readable):

```
<xsd:complexType name="MyPartyType">
    <xsd:restriction base="cat:PartyType">
     <xsd:sequence>
      <xsd:element ref="PartyIdentification"
       minOccurs="1" maxOccurs="1">
      </xsd:element>
      <xsd:element ref="PartyName"
       minOccurs="0" maxOccurs="1">
      </xsd:element>
      <xsd:element ref="Address"
       minOccurs="0" maxOccurs="1">
      </xsd:element>
      <xsd:element ref="PartyTaxScheme"
       minOccurs="0" maxOccurs="unbounded">
      </xsd:element>
      <xsd:element ref="Contact"
       minOccurs="0" maxOccurs="1">
      </xsd:element>
      <xsd:element ref="Language"
       minOccurs="0" maxOccurs="1">
      </xsd:element>
    </xsd:sequence>
   </xsd:restriction>
```

```
</xsd:complexType>
```

Note that the entire content model of the base type, with the appropriate changes, must be repeated when performing restriction.

A very important characteristic of XSD restriction is that it can only work within the limits substitutability, that is, the resulting type must still be valid in terms of the original type; in other words, it must be a true subset of the original such that a document that validates against the original can also validate against the changed one. Thus:

- you can reduce the number of repetitions of an element (that is, change its cardinality from 1..100 to 1..50, for instance)

- you can eliminate an optional element (that is, change its cardinality from 0..3 to 0..0)

- you cannot eliminate a required element or make it optional (that is, change its cardinality from 1..3 to 0..3)

3.2. Some observations on extensions and restrictions

- Extensions and restrictions can be applied in any order to the same Type; it is recommended, though, that they be applied close to each other to improve understanding of the resulting schema.

- Notice that derivation can be applied only to types and not to elements that use those types. This is not a problem: UBL uses explicit type definitions for all elements, in fact disallowing XSD use of anonymous types that define a content model directly inside an element declaration.

- This derived type, `MyPartyType`, can be used anywhere the original `PartyType` is allowed. The instance document should use the xsi:type attribute to indicate that a derived type is being used. This does not enforce the use of the new type inside a given element, however, so an `Order` instance could still be created using the standard UBL `PartyType`. If the user wishes to require the use of the derived type, blocking the possibility of using the original type in an instance, a new derived type must be created from the `Order` type using refinement and specifying that the `MyPartyType` must used.

- UBL defines global elements for all types, and these elements, rather than the types themselves, are used in aggregate element declarations. The same procedure can be used for derived types, so a global `MyParty` element should be created based on the `MyPartyType`.

- All derived types should be created in a separate namespace (which might be tied to the user organization) and reference the UBL namespaces as appropriate. [Appropriate **reference** to UBL's namespace usage, and below]

3.3. Documenting the Customization

Every time a derivation is performed on a UBL- or UBL-derived-Schema, the context driver and the driver value used must be documented. If this is not done, then *by definition* the derived Schema is not UBL-compliant.

Context is expressed using a set of name/value pairs (context driver, driver value), where the names are one of a limited set of context drivers established by the UBL TC on the basis of the CCTS (**Reference**):

- Business process
- Official constraint
- Product classification
- Business process role
- Industry classification
- Supporting role
- Geopolitical
- System constraint

There is no pre-set list of values for each driver. Users are free at this point to use whatever codification they choose, but they should be consistent; therefore while not obliged to do so, communities of users are strongly encouraged to always use the same values for the same context (that is, those who use "U.S.A" to indicate a country in the North American Continent, should not intermix it with "US" or "U.S." or "USA"). And if a particular standardized codification is used, it should also be identified in the documentation. (Some standard sets of values are provided in the CCTS specification.)

There is no predetermined order in which context drivers are applied.

More than one context driver might be applied to various types within the same set of schema extensions. Therefore, documentation at the root level, although desirable, is not enough. Context should be included within a <Context> child of the element <Contextualization> (in the UBL namespace) inside the documentation for each customized type, with the name of the context driver expressed as in the list above, but using the provided elements within that element. For example, if a type is to be used in the French apparel industry (shoes), the Context documentation would appear as follows:

```
<xsd:annotation>
    <xsd:documentation>
       <ubl:Contextualization>
         <ubl:Context>
            <ubl:Geopolitical>France</ubl:Geopolitical>
            <ubl:IndustryClassification>Apparel</ubl:IndustryClassification>
            <ubl:ProductClassification>Shoes</ubl:ProductClassification>
          </Context>
        </ubl:Contextualization>
    </xsd:documentation>
<xsd:annotation>
```

The <Context> element can be repeated, once for each incremental change.

If a customization is made that does not fit into any of the existing context drivers, it should be described in prose inside the <Context> element:

```
<xsd:annotation>
    <xsd:documentation>
      <ubl:Contextualization>
        <ubl:Context>Used for jobs performed on weekends to specify
                     additional data required by the trade union</ubl:Context>
      </ubl:Contextualization>
    </xsd:documentation>
<xsd:annotation>
```

Note

Any issues with the set of context drivers currently defined or the taxonomies to be used for specifying values should be communicated to the UBL Context Driver Subcommittee.

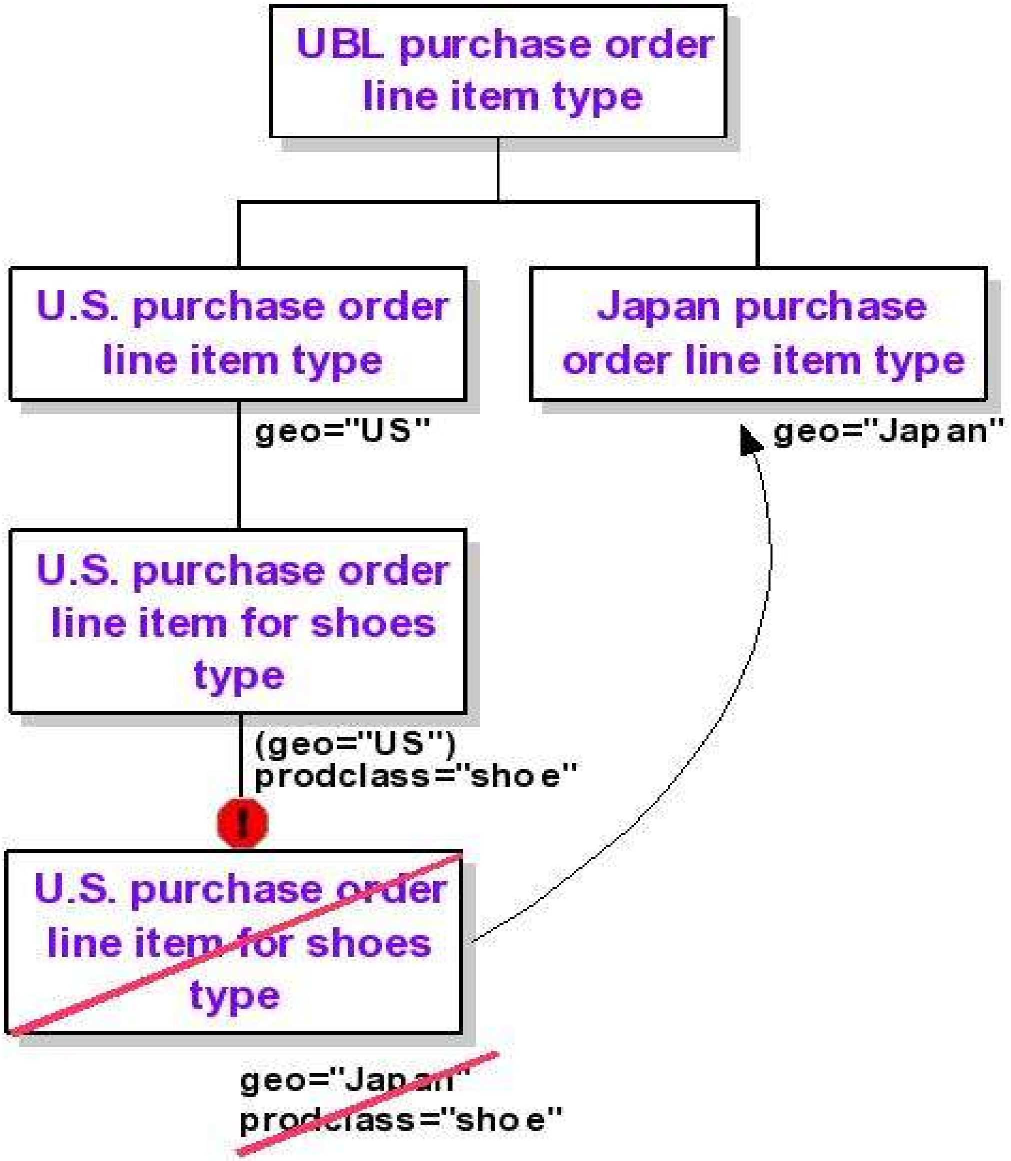
For each of the context drivers (`Geopolitical`, `IndustryClassification`, etc.) the following characteristics should also be specified (a later version will provide the requisite attributes for doing so):

- CodeListID - string: The identification of a list of codes. Can be used to identify the URL of a source that defines the set of currently approved permitted values.
- CodeListAgencyID - string: An agency that maintains one or more code lists. Defaults to the UN/EDIFACT data element 3055 code list.
- CodeListAgencyName - string: The name of the agency that maintains the code list.
- CodeListName - string: The name of a list of codes.
- CodeListVersionID - string: The Version of the code list. Identifies the Version of the UN/EDIFACT data element 3055 code list.
- languageID - string: The identifier of the language used in the corresponding text string (ISO 639: 1998)
- CodeListUniformResourceID - string: The Uniform Resource Identifier that identifies where the code list is located.
- CodeListSchemeUniformResourceID - string: The Uniform Resource Identifier that identifies where the code list scheme is located.
- Content: A value or set of values taken from the indicated code list or classification scheme.
- Text Value: A textual description of the set of values.

3.3.1. Context chains

As mentioned in "Customization of Customization", there is a risk that derivations may form extremely long and unmanageable chains. In order to avoid this problem, the Rule of Once-per-Context was formulated: no context can be applied, at a given hierarchical level of that context, more than once in a chain of derivations. Or, in other words, any given context driver can be specialized, but not reset. Thus, if the Geopolitical context driver with a value of "USA" has been applied to a type, it is possible to apply it again with a value that is a subset, or that occupies a hierarchically lower level than that of the original value, like California or New York, but it cannot be applied with a value equal or higher in the hierarchy, like Japan. In order to use that latter value, one must go up the ladder of the customization chain and derive the type from the same location as that from which the original was derived.

Figure 2.


UBL purchase order line item type
U.S. purchase order line item type
Japan purchase order line item type
geo="US"
geo="Japan"
U.S. purchase order line item for shoes type
(geo="US")
prodclass="shoe"
!
~~U.S. purchase order line item for shoes type~~
~~geo="Japan"~~
prodclass="shoe"

3.4. Use of namespaces

Every customized Schema or Schema module must have a namespace name different from the original UBL one. This may end up having an upward-moving ripple effect (a schema that includes a schema module that now has a different namespace name must change its own namespace name, for instance). However, it should be noted that all that has to change is the local part of the namespace name, not the prefix, so that XPaths in existing XSLT stylesheets, for instance, would not have to be changed except inasmuch as a particular element or type has changed.

Although there is not constraint as to what namespace name should be used for extensions, or what method should be used for constructing it, it is recommended that the method be, where appropriate, the same as the method specified in [**Reference** to NDR document, section on namespace construction]

4. Non-Compatible UBL Customization

There are two important types of customization that XSD derivation does not allow. The first can be summarized as the deletion of required components (that is, the reduction of a component's cardinality from x..y to 0..y). The second is the *ad hoc* location of an addition to a content model. There may be some cases where the user needs a different location for the addition than the one allowed by XSD extension, which is at the end of a sequence.

Because XSD derivation does not allow these types of customization, any attempts at enabling them (which in some cases simply mean rewriting the schema with the desired changes as a different schema in a different, non-UBL namespace) must by necessity produce results that are not UBL compatible. However, in order to allow users to customize their schemas in a UBL-friendly manner, the notion of an Ur-schema was invented: for each UBL Schema, an theoretical Ur-schema exists in which all elements are optional and all types are abstract. The use of abstract types is necessary because an Ur-type can never be used as is; a derived type must be created, as per the definition of abstract types in the XSD specification.

4.1. Use of Ur-Types

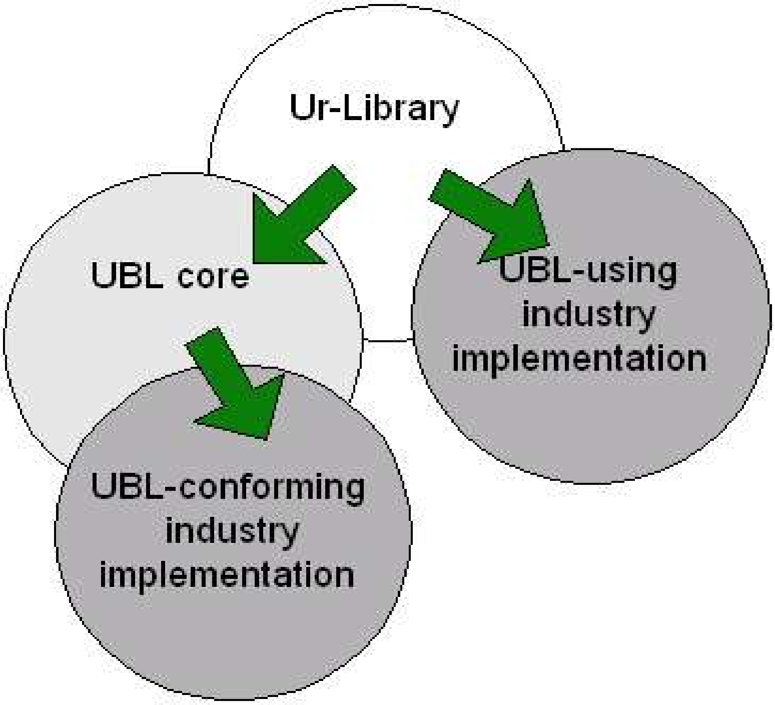
XSD derivation is sufficient for most cases, but as mentioned above, in some instances it may be necessary to perform changes to the UBL types that are not handled by standard mechanisms. In this case, the UBL Ur-types should be used. Remember, an Ur-type exists for each UBL standard type and differs only in that all elements in the content model are optional, including elements that are required in the standard type. By using the Ur-type, the user can therefore make modifications, such as eliminating a required field, that would not be possible using XSD derivation on the standard type.

For instance, suppose an organization would like to use the UBL `PartyType,` but does not want to use the required ID element. In this case, normal XSD refinement is used, but on the Ur-type rather than the standard type:

```
<xsd:complexType name="MyPartyType">
    <xsd:restriction base="ur:PartyType">
     <xsd:sequence>
      <xsd:element ref="PartyIdentification"
       minOccurs="0" maxOccurs="0">
      </xsd:element>
      <xsd:element ref="PartyName"
       minOccurs="0" maxOccurs="1">
      </xsd:element>
      <xsd:element ref="Address"
       minOccurs="0" maxOccurs="1">
      </xsd:element>
      <xsd:element ref="PartyTaxScheme"
       minOccurs="0" maxOccurs="unbounded">
      </xsd:element>
      <xsd:element ref="Contact"
       minOccurs="0" maxOccurs="1">
      </xsd:element>
      <xsd:element ref="Language"
       minOccurs="0" maxOccurs="1">
      </xsd:element>
    </xsd:sequence>
   </xsd:restriction>
  </xsd:complexType>
```

The new type is no longer compatible with the UBL `PartyType`, so standard processing engines that know about XSD derivation will not recognize the type relationship. However, some level of interoperability is still preserved, since both UBL `PartyType` and `MyPartyType` are derived from the `PartyType` Ur-type. If this additional flexibility is required, a processor can be implemented to use the Ur-type rather than the UBL type. It will then be able to process both the UBL type and the custom type, since they have a common ancestor in the Ur-type (at the expense, of course, of an added level of complexity in the implementation of the processor).

Figure 3.


Ur-Library
UBL core
UBL-using industry implementation
UBL-conforming industry implementation

Once again: changes to the Ur-type do not enforce changes in the enclosing type, so the UBL `OrderType` has to be changed as well if the user organization wants to ensure that only the new `MyPartyType` is used. In fact, the new `OrderType` will not be compatible with the UBL `OrderType`, since `MyPartyType` is no longer derived from UBL's PartyType. However, the new `OrderType` can be derived from the `OrderType` Ur-type to achieve maximum interoperability.

It is possible that at some point one ends up with a schema that contains customizations that were made in a compatible manner as well as customizations that were made in a non-compatible manner. If that is the case, then the schema must be considered non-compatible.

4.2. Building New Types Using Core Components

Sometimes no type can be found in the UBL library or Ur-type library that can be used as the basis for a new type. In this case, maximum interoperability (though not compatibility) can be achieved by building up the new type using types from the core component library that underlies UBL. (See below)

For example, suppose a user organization needs to include a specialized product description inside business documents. This description includes a unique ID, a name and the storage capacity of the product expressed as an amount. The type definition would then appear as follows:

```
<xsd:complexType name="ProductDescriptionType">
        <xsd:sequence>
                <xsd:element name="ID" type="cct:IdentifierType"/>
                <xsd:element name="Name" type="cct:NameType"/>
                <xsd:element name="Capacity" type="cct:AmountType"/>
        </xsd:sequence>
</xsd:complexType>
```

Note

The above example should belong to a clearly non-UBL namespace.

It goes without saying that all new names defined when creating custom types from scratch should also conform to the UBL Naming and Design Rules [**Reference**].

5. Customization of Codelists

The guidelines presented in this document do not include the customization of Codelists. This topic is not addressed here. It is expected that it will be addressed during the 1.1 timeframe.

6. Use of the UBL Type Library in Customization

UBL provides a large selection of types which can be extended and refined as described in the preceding sections. However, the internal structure of the UBL type library needs to be understood and respected by those doing customizations. UBL is based on the concept of compatible reuse where possible, and there are cases where it would be possible to extend different types within the library to achieve the same end. This section discusses the specifics of how namespaces should be imported into a customizer's namespace, and the preference of types for specific extension or restriction. What follows applies equally to UBL-compatible and UBL-non-compatible extensions.

6.1. The Structure of the UBL Type Library

The UBL type library is exhaustively modelled and documented as part of the standard; what is provided here is a brief overview from the perspective of the customizer.

Within the UBL type library is an implicit hierarchy, structured according to the rules provided by the UBL NDR. When customizing UBL document types, the top level of the hierarchy is represented by a specific business document. The business document schema instances are found inside the control schema modules, which consist of a global element declaration and a complex type declaraion (referenced by the global element declaration) for the document type. Also within these control schema modules are imports of the other UBL namespaces used (termed "external schema modules"), and possibly includes of schema instances specific to that module (termed "internal schema modules"). The control schema modules import the *Common Aggregate Components (CAC)* and *Common Basic Components (CBC)* namespaces, which include global element and type declarations for all of the reusable constructs within UBL. These namespace packages in turn import the *Specialized Datatype* and *Unspecialized Datatype* namespaces, which include declarations for the constructs which describe the basic business uses for data-containing elements. These namespaces in turn import the CCT namespace, which provides the primitives from which the UBL library is built.[**Reference the picture in NDR**]

This hierarchy represents the model on which the UBL library is based, and provides a type-intensive environment for the customizer. The basic structure is one of semantic qualification: as you move from the modeling primitives (CCTs) and go up the hierarchy toward the business documents, the semantics at each level become more and more completely qualified. This fact provides the fundamental guidance for using these types in customizations, as discussed more fully below.

6.2. Importing UBL Schema Modules

UBL schema modules are included for use in a customization through the importing of their namespaces. Before extending or refining a type, you must import the namespace in which that type is found directly into the customizing namespace. While inclusion may be used to express internal packaging of multiple schema instances within a customizer's namespace, the include mechanism should never be used to reference the UBL type library.

The UBL NDR provides a mechanism whereby each schema module made up of more than a single schema instance has a "control" schema instance, which performs all of the imports for that namespace. Customizers should follow this same pattern, since their customizations may well be further customized along the lines described above. In the same vein, when a UBL document type is imported, it should be the control schema module for that document type which is imported, bringing in all of the doctypespecific constructs, whether in the control schema instance for that namespace or one of the "internal" schema instances.

6.3. Selecting Modules to Import

In many cases, the customizer will have no choice about importing or not importing a specific module: if the customizer needs to extend the document-type-level complex type, there is only a single choice: the control schema for the document type must be imported. Not all cases are so clear, however. When creating lower-level elements, by extending the types found in the *CAC* and *CBC* namespaces (for example), it is possible to either extend a provided type, or to build up a new one from the types available within the *Specialized Datatypes* and *Unspecialized Datatypes* namespace packages.

UBL compatible customization always involves reuse at the highest possible level within the hierarchy described here. Thus, it is always best to reuse an existing type from a higher-level construct than to build up a new type from a lower-level one. Whenever faced with a choice about how to proceed with a customization, you should always determine if there is a customizable type within the *CAC* or *CBC* before going to the Datatype namespace packages. This rule further applies to the use of the datatype namespaces: never go directly to the CCT namespace to create a type if something is available for extension or refinement within the datatype namespaces. By the same token, it is always preferable to extend a complex datatype than to create something with reference to an XSD primitive datatype, or a custom simple type.

It is important to bear in mind that the structure of the UBL library is based around the ideas of semantic qualification and reuse. You should never introduce semantic redundancy into a customized document based on UBL. You should always further qualify existing semantics if at all possible.

6.4. Creating New Document Types with the UBL Type Library

UBL provides many useful document types for customization, but for some business processes, the needed document types will not be present. When creating a new document type, it is recommended that they be structured as similarly as possible to existing documents, in accordance with the rules in the UBL NDR. The basic structure can easily be seen in an examination of the existing document types. What is not so obvious is the approach to the use of types. The design here is to primarily use the types provided in the *CAC* and *CBC*, and only then going to the Datatypes namespace packages. This is the same approach described for modifying UBL document types in the preceding section.

7. Future Directions

It is planned that in Phase II of the development of this Context Methodology, a context extension method will be designed to enable automatic customization of UBL types based on context, as outlined in the charter of the UBL TC. This methodology will work through a formal specification of the reasons for customizing the type, i.e. the context driver and its value. By expressing the context formally and specifying rules for customizing types based on this context, most of the changes that need to be made to UBL in order for it to fit in a given usage environment can be generated by an engine rather than performed manually. In addition, significant new flexibility may be gained, since rules from two complementary contexts could perhaps be applied simultaneously, yielding types appropriate for, say, the automobile industry and the French geopolitical entity, with the appropriate documentation and context chain produced at the same time.

UBL has not yet progressed to this stage of development. For now, one of the main goals of the UBL Context Methodology Subcommittee is to gather as many use cases as possible to determined what types of customizations are performed in the real world, and on what basis. Another important goal is to ensure that types derived at this point from UBL's version 1 can be still used later on, intermixed with types derived automatically in the future.

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References

Normative

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