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Guidelines For The Customization of UBL Schemas

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15 **Abstract:**
16 This document presents guidelines for a compatible customization of UBL
17 schemas, and how to proceed when that is impossible.
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Table of Contents

33 34 35 ...

1. Introduction
1.1. Goals of this document
2. Background
2.1. The UBL Schema
2.2. Customization of UBL Schemas
2.3. Customization of customization
3. Compatible UBL Customization
3.1. Use of XSD Derivation
3.2. Some observations on extensions and restrictions
3.3. Documenting the Customization
3.4. Use of namespaces
4. Non-Compatible UBL Customization
4.1. Use of Ur-Types
4.2. Building New Types Using Core Components
5. Use and Customization of Codelists
6. Use of the UBL Type Library in Customization
6.1. The Structure of the UBL Type Library
6.2. Importing UBL Schema Modules
6.3. Selecting Modules to Import
6.4. Creating New Document Types with the UBL Type Library
7. Future Directions

Appendixes

A. Notices
B. Intellectual Property Rights
References

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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.

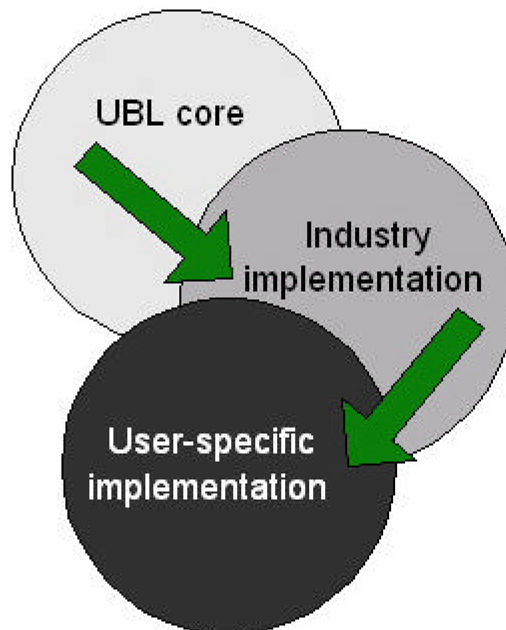
With the release of version 1.0 of the UBL library it is expected that subsequent changes to it will be few and far between; it contains important document types informed by the broad experience of members of the UBL Technical Committee, which includes both business and XML experts.

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,

73 countries, etc., and a customization mechanism is therefore needed in
74 many cases before the document types can be used in real-world
75 applications. A primary motivation for moving from the relatively inflexible
76 EDI formats to a more robust XML approach is the existence of formal
77 mechanisms for performing this customization while retaining maximum
78 interoperability and validation.
79 It is an UBL expectation that:

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

85 EDI dealt with the customization issue through a subsetting mechanism
86 that took took a standard (the UN/EDIFACT standard, the AINSI X12
87 standard, etc.) [**Reference**] and subsetted it through industry
88 Implementation Guides (IG), which were then subsetted into trading
89 partners IGs, which were then subsetted into departamental IGs. UBL
90 proposes dealing with this through schema derivation.
91 Thus UBL starts as generic as possible, with a set of schemas that supply
92 all that's likely to be needed in the 80/20 or core case, which is UBL's
93 primary target. Then it allows both subsetting and extension according to
94 the needs of the user communities, industries, nations, etc., according to
95 what is permitted in the derivation mechanism it has chosen, namely W3C
96 XML Schema.
97 **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, 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 that we have referred to as Phase II.

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

173 Due to the extensiblilty of W3C Schema, this process can be applied over
174 and over to refine a set of schemas more and more precisely, depending
175 on the needs of specific data flows.
176 In other words, there is no theoretical limit to how many times a Schema
177 can be derived, leading to the possible equivalent of infinite recursion. In
178 order to avoid this, the Rule of Once-per-Context has been developed, as
179 presented later, in "Context Chains "

180 3. Compatible UBL Customization

181 Central to the customization approach used by UBL is the notion of
182 schema derivation. This is based on object-oriented principles, the most
183 important of which are inheritance and polymorphism. The meaning of the
184 latter can be gleaned from its linguistic origin: poly, meaning "many", and
185 morph, meaning "shape". By adhering to these principles, document
186 instances with different "shapes" (that is, that conform to different but
187 related schemas,) can be used interchangeably.
188 The UBL Naming and Design Rules Subcommittee (NDRSC) has decided to
189 use XSD, the standard XML schema language produced by the World Wide
190 Web Consortium (W3C), to model document formats. One of the most
191 significant advances of XSD over previous XML document description
192 languages, such as DTDs, is that it has built-in mechanisms for handling
193 inheritance and polymorphism, which we will refer to as "XSD derivation".
194 It therefore fits well with the real-world requirements for business data
195 interchange and our goal of interoperability and validation.
196 There are two important types of modification that XSD derivation does
197 not allow. The first can be summarized as the deletion of required
198 components (that is, the reduction of a component's cardinality from x..y
199 to 0..y). The second is the ad hoc location of an addition to the content
200 model through extension. There may be some cases where the user needs
201 a different location for the addition, but XSD extension only allows
202 addition at the end of a sequence.
203 Thus, there are three different scenarios covering the derivation of new
204 types from existing ones:

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

212 - **Non-compatible UBL Customization**

213 ○ An existing UBL type could be modified to fit the
214 requirements of the customization, but the changes needed
215 go beyond those allowed by XSD derivation.
216 ○ No existing UBL type is found that can be used as the basis
217 for the new type. Nevertheless, the base library of core
218 components that underlies UBL can be used to build up the
219 new type so as to ensure that interoperability is at least
220 possible at the core component level.

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

224 3.1. Use of XSD Derivation

225 XSD derivation allows for type extension and restriction. These are the
226 only means by which one can customize UBL schemas and claim UBL
227 compatibility. Any other possible means, even if allowed by XSD itself, is
228 not allowed by UBL. For instance, although XSD does permit the
229 redefinition of a type to be something other than what it originally is, UBL
230 has decided to reject this approach, because by default <xsd:redefine> does
231 not leave any traces of having been used (such as a new namespace, for
232 instance) and because of the danger of circular redefinitions.
233 The examples in the following sections will be based on the following
234 complex type (and note that in all cases the <xsd:annotation> elements
235 have been removed in order to achieve maximum legibility):

```
236 <xsd:complexType name="PartyType">
237    <xsd:sequence>
238      <xsd:element ref="PartyIdentification"
239       minOccurs="0" maxOccurs="unbounded">
240      </xsd:element>
241      <xsd:element ref="PartyName"
242       minOccurs="0" maxOccurs="1">
243      </xsd:element>
244      <xsd:element ref="Address"
245       minOccurs="0" maxOccurs="1">
246      </xsd:element>
247      <xsd:element ref="PartyTaxScheme"
248       minOccurs="0" maxOccurs="unbounded">
249      </xsd:element>
250      <xsd:element ref="Contact"
251       minOccurs="0" maxOccurs="1">
252      </xsd:element>
253      <xsd:element ref="Language"
254       minOccurs="0" maxOccurs="1">
255      </xsd:element>
256    </xsd:sequence>
257  </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 the use of XSD 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]

3.1.2. 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

299 organization wishes to allow exactly one identifier, this is achieved as
300 follows (note that the annotation fields are removed from the type
301 definition to make the example more readable):

```
302 <xsd:complexType name="MyPartyType">
303    <xsd:restriction base="cat:PartyType">
304     <xsd:sequence>
305      <xsd:element ref="PartyIdentification"
306       minOccurs="1" maxOccurs="1">
307      </xsd:element>
308      <xsd:element ref="PartyName"
309       minOccurs="0" maxOccurs="1">
310      </xsd:element>
311      <xsd:element ref="Address"
312       minOccurs="0" maxOccurs="1">
313      </xsd:element>
314      <xsd:element ref="PartyTaxScheme"
315       minOccurs="0" maxOccurs="unbounded">
316      </xsd:element>
317      <xsd:element ref="Contact"
318       minOccurs="0" maxOccurs="1">
319      </xsd:element>
320      <xsd:element ref="Language"
321       minOccurs="0" maxOccurs="1">
322      </xsd:element>
323    </xsd:sequence>
324   </xsd:restriction>
325  </xsd:complexType>
```

326 Note that the entire content model of the base type, with the appropriate
327 changes, must be repeated when performing restriction.
328 A very important characteristic of XSD restriction is that it can only work
329 within the limits imposed by the rule that says that the resulting type must
330 still be valid in terms of the original type, that is, it must be a true subset
331 of the original such that a document that validates against the original can
332 also validate against the changed one. Thus:

333 • you can reduce the number of repetitions of an element (that is,
334 change its cardinality from 1..100 to 1..50, for instance)
335 • you can eliminate an optional element (that is, change its
336 cardinality from 0..3 to 0..0)
337 • you cannot eliminate a required element or make it optional (that
338 is, change its cardinality from 1..3 to 0..3)

339 3.2. Some observations on extensions and restrictions

340 • Extensions and restrictions can be applied in any order to the same
341 Type; it is recommended, though, that they be applied close to
342 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 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 of 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

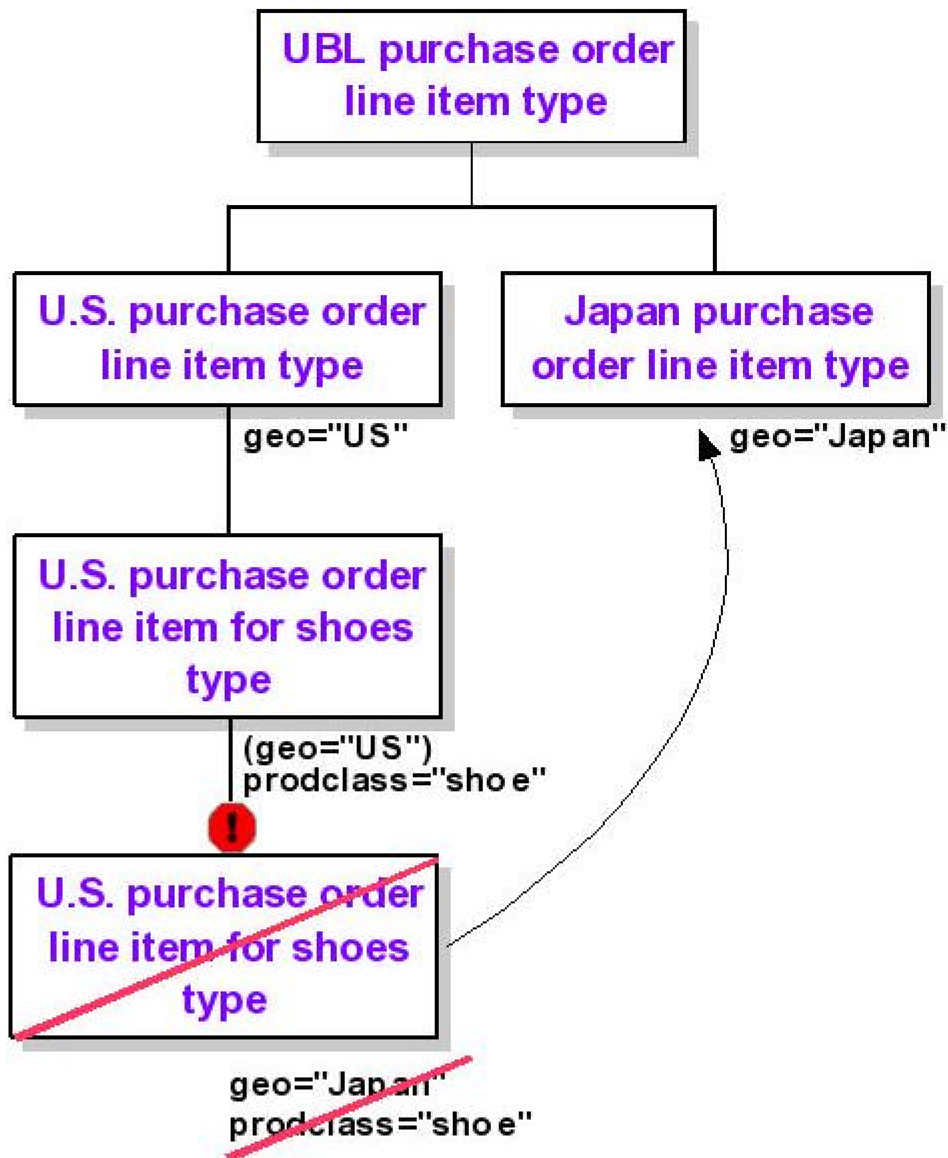
Any issues with the set of context drivers currently defined or the taxonomies to be used for specifying values should be communicated to the UBL Context Driver Subcommittee.

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

431 - listID (List Identifier) - string: The identification of a list of codes.
432 Can be used to identify the URL of a source that defines the set of
433 currently approved permitted values.
434 - listAgencyID (List Agency Identifier) - string: An agency that
435 maintains one or more code lists. Defaults to the UN/EDIFACT data
436 element 3055 code list.
437 - listAgencyName (List Agency Name) - string: The name of the
438 agency that maintains the code list.
439 - listName (List Name) - string: The name of a list of codes.
440 - listVersionID (List Version Identifier) - string: The Version of the
441 code list. Identifies the Version of the UN/EDIFACT data element
442 3055 code list.
443 - languageID (Language Identifier) - string: The identifier of the
444 language used in the corresponding text string (ISO 639: 1998)
445 - listURI (List URI) - string: The Uniform Resource Identifier that
446 identifies where the code list is located.
447 - listSchemeURI (List Scheme URI) - string: The Uniform Resource
448 Identifier that identifies where the code list scheme is located.
449 - Coded Value: A value or set of values taken from the indicated
450 code list or classification scheme.
451 - Text Value: A textual description of the set of values.

452 ### 3.3.1. Context chains

453 As mentioned in "Customization of Customization", there is a risk that
454 derivations may form extremely long and unmanageable chains. In order
455 to avoid this problem, the Rule of Once-per-Context was formulated: no
456 context can be applied, at a given hierarchical level of that context, more
457 than once in a chain of derivations. Or, in other words, any given context
458 driver can be specialized, but not reset. Thus, if the Geopolitical context
459 driver with a value of "USA" has been applied to a type, it is possible to
460 apply it again with a value that is a subset, or that occupies a
461 hierarchically lower level than that of the original value, like California or
462 New York, but it cannot be applied with a value equal or higher in the
463 hierarchy, like Japan. In order to use that latter value, one must go up the
464 ladder of the customization chain and derive the type from the same
465 location as that from which the original was derived.
466 **Figure 2.**



467

468 ## 3.4. Use of namespaces

469 Every customized Schema or Schema module must have a namespace
470 name different from the original UBL one. This may end up having an
471 upward-moving ripple effect (a schema that includes a schema module
472 that now has a different namespace name must change its own
473 namespace name, for instance). However, it should be noted that all that
474 has to change is the local part of the namespace name, not the prefix, so
475 that XPaths in existing XSLT stylesheets, for instance, would not have to
476 be changed except inasmuch as a particular element or type has changed.
477 Although there is not constraint as to what namespace name should be
478 used for extensions, or what method should be used for constructing it, it
479 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.

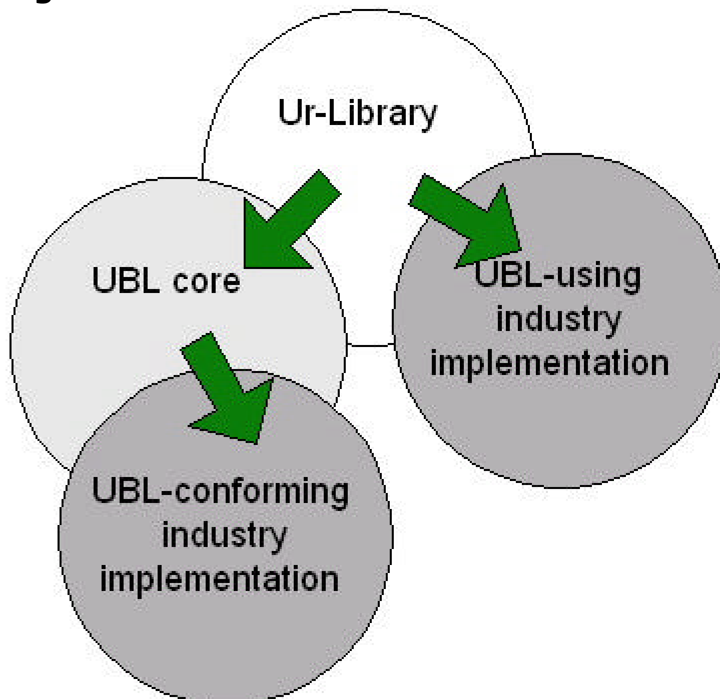
For instance, suppose an organization would like to use the UBL PartyType, but does not want to use the required ID element. In this case, normal XSD refinement is used, but on the Ur-type rather than the standard type:

```
<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.



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

551 organization wants to ensure that only the new MyPartyType is used. In
552 fact, the new OrderType will not be compatible with the UBL OrderType, since
553 MyPartyType is no longer derived from UBL's PartyType. However, the new
554 OrderType can be derived from the OrderType Ur-type to achieve maximum
555 interoperability.
556 It is possible that at some point one ends up with a schema that contains
557 customizations that were made in a compatible manner as well as
558 customizations that were made in a non-compatible manner. If that is the
559 case, then the schema must be considered non-compatible.

560 4.2. Building New Types Using Core Components

561 Sometimes no type can be found in the UBL library or Ur-type library that
562 can be used as the basis for a new type. In this case, maximum
563 interoperability (though not compatibility) can be achieved by building up
564 the new type using types from the core component library that underlies
565 UBL.
566 For example, suppose a user organization needs to include a specialized
567 product description inside business documents. This description includes a
568 unique ID, a name and the storage capacity of the product expressed as
569 an amount. The type definition would then appear as follows:

```
570 <xsd:complexType name="ProductDescriptionType">
571         <xsd:sequence>
572                 <xsd:element name="ID" type="cct:IdentifierType"/>
573                 <xsd:element name="Name" type="cct:NameType"/>
574                 <xsd:element name="Capacity" type="cct:AmountType"/>
575         </xsd:sequence>
576 </xsd:complexType>
```

577 Note

578 The above example should belong to a clearly non-UBL
579 namespace.
580 It goes without saying that all new names defined when creating custom
581 types from scratch should also conform to the UBL Naming and Design
582 Rules [**Reference**].

583 5. Use and Customization of Codelists

584 UBL has chosen to reference external codelists whenever possible, and
585 provides a mechanism for including external codelists into the business
586 document. This mechanism is described in [**REFERENCE CODELIST**
587 **PAPER]**. Consequently, this topic is not addressed here. UBL-compliant
588 customization does include the use of that mechanism for referencing
589 codelists, which may, in some cases, include the specialization of standard

590 codelists external to UBL. This is perfectly acceptable in UBL-compliant
591 customizations, provided that the use of namespaces clearly denotes the
592 owner of the standard or customized codelist.

593 6. Use of the UBL Type Library in 594 Customization

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

605 6.1. The Structure of the UBL Type Library

606 The UBL type library is exhaustively modelled and documented as part of
607 the standard; what is provided here is a brief overview from the
608 perspective of the customizer.
609 Within the UBL type library is an implicit hierarchy, structured according to the rules
610 provided by the UBL NDR. When customizing UBL document types, the top level of the
611 hierarchy is represented by a specific business document. The business document
612 schema instances are found inside the control schema modules, which consist of a global
613 element declaration and a complex type declaraion (referenced by the global element
614 declaration) for the document type. Also within these control schema modules are
615 imports of the other UBL namespaces used (termed "external schema modules"), and
616 possibly includes of schema instances specific to that module (termed "internal schema
617 modules"). The control schema modules import the Common Aggregate Components
618 (CAC) and Common Basic Components (CBC) namespaces, which include global element
619 and type declarations for all of the reusable constructs within UBL. These namespace
620 packages in turn import the Specialized Datatype and Unspecialized Datatype
621 namespaces, which include declarations for the constructs which describe the basic
622 business uses for data-containing elements. These namespaces in turn import the CCT
623 namespace, which provides the primitives from which the UBL library is built.[**Replace
624 the above with a copy or a reference of the picture in NDR**]
625 This hierarchy represents the model on which the UBL library is based,
626 and provides a type-intensive environment for the customizer. The basic
627 structure is one of semantic qualification: as you move from the modeling
628 primitives (CCTs) and go up the hierarchy toward the business
629 documents, the semantics at each level become more and more
630 completely qualified. This essential fact provides the fundamental

631 guidance for using these types in customizations, as discussed more fully
632 below.

633 ## 6.2. Importing UBL Schema Modules

634 UBL schema modules are included for use in a customization through the
635 importing of their namespaces. Before extending or refining a type, you
636 must import the namespace in which that type is found directly into the
637 customizing namespace. While inclusion may be used to express internal
638 packaging of multiple schema instances within a customizer's namespace,
639 the include mechanism should never be used to reference the UBL type
640 library.
641 The UBL NDR provides a mechanism whereby each schema module made
642 up of more than a single schema instance has a "control" schema
643 instance, which performs all of the imports for that namespace.
644 Customizers should follow this same pattern, since their customizations
645 may well be further customized, as described above. In the same vein,
646 when a UBL document type is imported, it should be the control schema
647 module for that document type which is imported, bringing in all of the
648 doctype-specific constructs, whether in the control schema instance for
649 that namespace or one of the "internal" schema instances.

650 ## 6.3. Selecting Modules to Import

651 In many cases, the customizer will have no choice about importing or not
652 importing a specific module: if they need to extend the document-type-
653 level complex type, there is only a single choice: the control schema for
654 the document type must be imported. Not all cases are so clear, however.
655 When creating lower-level elements, by extending the types found in the
656 CAC and CBC namespaces (for example), it is possible to either extend a
657 provided type, or to build up a new one from the types available within
658 the Specialized Datatypes and Unspecialized Datatypes namespace
659 packages.
660 UBL compatible customization always involves reuse at the highest
661 possible level within the hierarchy described here. Thus, it is always best
662 to reuse an existing type from a higher-level construct than to build up a
663 new type from a lower-level one. Whenever faced with a choice about
664 how to proceed with a customization, you should always determine if
665 there is a customizable type within the CAC or CBC before going to the
666 Datatype namespace packages. This rule further applies to the use of the
667 datatype namespaces: never go directly to the CCT namespace to create a
668 type if something is available for extension or refinement within the
669 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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756 the UBL TC web page.

757 References

758 Normative

759 [RFC 2119] S. Bradner. RFC 2119: Key words for use in RFCs to Indicate
760 Requirement Levels. IETF (Internet Engineering Task Force). 1997.