Universal Business Language (UBL) Naming and Design Rules

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Abstract:

This specification documents the naming and design rules and guidelines for the construction of XML components for the UBL vocabulary.

Status:

This document has been approved by the OASIS Universal Business Language Technical Committee as a Committee Draft and is submitted for consideration as an OASIS Standard

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1 Introduction

XML is often described as the lingua franca of e-commerce. The implication is that by standardizing on XML, enterprises will be able to trade with anyone, any time, without the need for the costly custom integration work that has been necessary in the past. But this vision of XML-based “plug-and-play” commerce is overly simplistic. Of course XML can be used to create electronic catalogs, purchase orders, invoices, shipping notices, and the other documents needed to conduct business. But XML by itself doesn't guarantee that these documents can be understood by any business other than the one that creates them. XML is only the foundation on which additional standards can be defined to achieve the goal of true interoperability. The Universal Business Language (UBL) initiative is the next step in achieving this goal.

The task of creating a universal XML business language is a challenging one. Most large enterprises have already invested significant time and money in an e-business infrastructure and are reluctant to change the way they conduct electronic business. Furthermore, every company has different requirements for the information exchanged in a specific business process, such as procurement or supply-chain optimization. A standard business language must strike a difficult balance, adapting to the specific needs of a given company while remaining general enough to let different companies in different industries communicate with each other.

The UBL effort addresses this problem by building on the work of the electronic business XML (ebXML) initiative. The ebXML effort, currently continuing development in the Organization for the Advancement of Structured Information Standards (OASIS), is an initiative to develop a technical framework that enables XML and other payloads to be utilized in a consistent manner for the exchange of all electronic business data. UBL is organized as an OASIS Technical Committee to guarantee a rigorous, open process for the standardization of the XML business language. The development of UBL within OASIS also helps ensure a fit with other essential ebXML specifications. UBL will be promoted to the level of international standard.

The UBL Technical Committee has established the UBL Naming and Design Rules Subcommittee with the charter to "Recommend to the TC rules and guidelines for normative-form schema design, instance design, and markup naming, and write and maintain documentation of these rules and guidelines". Accordingly, this specification documents the rules and guidelines for the naming and design of XML components for the UBL library. It contains only rules that have been agreed on by the OASIS UBL Naming and Design Rules Subcommittee (NDR SC). Proposed rules, and rationales for those that have been agreed on, appear in the accompanying NDR SC position papers, which are available at http://www.oasis-open.org/committees/ubl/ndrsc/.

1.1 Audiences

This document has several primary and secondary targets that together constitute its intended audience. Our primary target audience is the members of the UBL Technical Committee. Specifically, the UBL Technical Committee will use the rules in this document to create normative form schema for business transactions. Developers implementing ebXML Core Components may find the rules contained herein sufficiently useful to merit adoption as, or infusion into, their own approaches to ebXML Core Component based XML schema development. All other XML Schema developers may find the rules contained herein sufficiently useful to merit consideration for adoption as, or infusion into, their own approaches to XML schema development.

1.2 Scope

This specification conveys a normative set of XML schema design rules and naming conventions for the creation of business based XML schema for business documents being exchanged between two parties using XML constructs defined in accordance with the ebXML Core Components Technical Specification.

1.3 Terminology and Notation

The key words **MUST, MUST NOT, REQUIRED, SHALL, SHALL NOT, SHOULD, SHOULD NOT, RECOMMENDED, MAY,** and **OPTIONAL** in this document are to be interpreted as described in Internet Engineering Task Force (IETF) Request for Comments (RFC) 2119. Non-capitalized forms of these words are used in the regular English sense.

[Definition] – A formal definition of a term. Definitions are normative.

[Example] – A representation of a definition or a rule. Examples are informative.

[Note] – Explanatory information. Notes are informative.

[RRR*n*] – Identification of a rule that requires conformance to ensure that an XML Schema is UBL conformant. The value RRR is a prefix to categorize the type of rule where the value of RRR is as defined in Table 1 and n (1..n) indicates the sequential number of the rule within its category. In order to ensure continuity across versions of the specification, rule numbers that are deleted in future versions will not be re-issued, and any new rules will be assigned the next higher number – regardless of location in the text. Future versions will contain an appendix that lists deleted rules and the reason for their deletion. Only rules and definitions are normative; all other text is explanatory.

Figure 1 - Rule Prefix Token Value

Rule Prefix Token	Value
ATD	Attribute Declaration
ATN	Attribute Naming
CDL	Code List
CTD	ComplexType Definition
DOC	Documentation
ELD	Element Declaration
ELN	Element Naming
GNR	General Naming
GTD	General Type Definition
GXS	General XML Schema
IND	Instance Document
MDC	Modeling Constraints
NMC	Naming Constraints
NMS	Namespace
RED	Root Element Declaration
SSM	Schema Structure Modularity
STD	SimpleType Definition
VER	Versioning

Bold – The bolding of words is used to represent example names or parts of names taken from the library.

`Courier` – All words appearing in `courier font` are values, objects, and keywords.

Italics – All words appearing in italics, when not titles or used for emphasis, are special terms defined in Appendix C.

Keywords – keywords reflect concepts or constructs expressed in the language of their source standard. Keywords have been given an identifying prefix to reflect their source. The following prefixes are used:

`xsd:` – represents W3C XML Schema Definition Language. If a concept, the words will be in upper camel case, and if a construct, they will be in lower camel case.

- `xsd:` – `complexType` represents an XSD construct

- `xsd:` – `SchemaExpression` represents a concept

`ccts:` – represents ISO 15000-5 ebXML Core Components Technical Specification

`ubl:` – represents the OASIS Universal Business Language

The terms “W3C XML Schema” and “XSD” are used throughout this document. They are considered synonymous; both refer to XML Schemas that conform to Parts 1 and 2 of the W3C *XML Schema Definition Language* (XSD) Recommendations. See Appendix C for additional term definitions.

1.4 Guiding Principles

The UBL guiding principles encompass three areas:

- General UBL guiding principles
- Extensibility
- Code generation

1.4.1 Adherence to General UBL Guiding Principles

The UBL Technical Committee has approved a set of high-level guiding principles. The UBL Naming and Design Rules Subcommittee (NDRSC) has followed these high-level guiding principles for the design of UBL NDR. These UBL guiding principles are:

- Internet Use – UBL shall be straightforwardly usable over the Internet.
- Interchange and Application Use – UBL is intended for interchange and application use.
- Tool Use and Support – The design of UBL will not make any assumptions about sophisticated tools for creation, management, storage, or presentation being available. The lowest common denominator for tools is incredibly low (for example, Notepad) and the variety of tools used is staggering. We do not see this situation changing in the near term.
- Legibility – UBL documents should be human-readable and reasonably clear.
- Simplicity – The design of UBL must be as simple as possible (but no simpler).
- 80/20 Rule – The design of UBL should provide the 20% of features that accommodate 80% of the needs.
- Component Reuse –The design of UBL document types should contain as many common features as possible. The nature of e-commerce transactions is to pass along information that gets incorporated into the next transaction down the line. For example, a purchase order contains information that will be copied into the purchase order response. This forms the basis of our need for a core library of reusable components. Reuse in this context is important, not

only for the efficient development of software, but also for keeping audit trails.

- Standardization – The number of ways to express the same information in a UBL document is to be kept as close to one as possible.

- Domain Expertise – UBL will leverage expertise in a variety of domains through interaction with appropriate development efforts.

- Customization and Maintenance – The design of UBL must facilitate customization and maintenance.

- Context Sensitivity – The design of UBL must ensure that context-sensitive document types aren't precluded.

- Prescriptiveness – UBL design will balance prescriptiveness in any single usage scenario with prescriptiveness across the breadth of usage scenarios supported. Having precise, tight content models and datatypes is a good thing (and for this reason, we might want to advocate the creation of more document type "flavors" rather than less). However, in an interchange format, it is often difficult to get the prescriptiveness that would be desired in any single usage scenario.

- Content Orientation – Most UBL document types should be as "content-oriented" (as opposed to merely structural) as possible. Some document types, such as product catalogs, will likely have a place for structural material such as paragraphs, but these will be rare.

- XML Technology – UBL design will avail itself of standard XML processing technology wherever possible (XML itself, XML Schema, XSLT, XPath, and so on). However, UBL will be cautious about basing decisions on "standards" (foundational or vocabulary) that are works in progress.

- Relationship to Other Namespaces – UBL design will be cautious about making dependencies on other namespaces. UBL does not need to reuse existing namespaces wherever possible. For example, XHTML might be useful in catalogs and comments, but it brings its own kind of processing overhead, and if its use is not prescribed carefully it could harm our goals for content orientation as opposed to structural markup.

- Legacy formats – UBL is not responsible for catering to legacy formats; companies (such as ERP vendors) can compete to come up with good solutions to permanent conversion. This is not to say that mappings to and from other XML dialects or non-XML legacy formats wouldn't be very valuable.

- Relationship to xCBL – UBL will not be a strict subset of xCBL, nor will it be explicitly compatible with it in any way.[1]

1.4.2 Design For Extensibility

Many e-commerce document types are, broadly speaking, useful but require minor structural modifications for specific tasks or markets. When a truly common XML structure is to be established for e-commerce, it needs to be easy and inexpensive to modify.

Many data structures used in e-commerce are very similar to 'standard' data structures, but have some significant semantic difference native to a particular industry or process. In traditional Electronic Data Interchange (EDI), there has been a gradual increase in the number of published components to accommodate market-specific variations. Handling these variations are a requirement, and one that is not easy to meet. A related EDI phenomenon is the overloading of the meaning and use of existing elements, which greatly complicates interoperation.

To avoid the high degree of cross-application coordination required to handle structural variations common to EDI and XML based systems–it is necessary to accommodate the required variations in basic data structures without either overloading the meaning and use of existing data elements, or requiring wholesale addition of new data elements. This can be accomplished by allowing implementers to specify new element types that inherit the properties of existing elements, and to also specify exactly the structural and data content of the modifications.

This approach can be expressed by saying that extensions of core elements are driven by context.[2] Context driven extensions should be renamed to distinguish them from their parents, and designed so that only the new elements require new processing. Similarly, data structures should be designed so that processes can be easily engineered to ignore additions that are not needed. The UBL context methodology is discussed in the *Guidelines for the Customization of UBL Schemas* available as part of UBL 1.0.

1.4.3 Code Generation

The UBL NDR makes no assumptions on the availability or capabilities of tools to generate UBL conformant XSD Schemas. In conformance with UBL guiding principles, the UBL NDR design process has scrupulously avoided establishing any naming or

[1] XML Common Business Library (xCBL) is a set of XML business documents and their components.

[2] ebXML, *Core Components Technical Specification – Part 8 of the ebXML Technical Framework*, V2.01, 15 November, 2003

design rules that sub-optimize the UBL schemas in favor of tool generation. Additionally, in conformance with UBL guiding principles, the NDR is sufficiently rigorous to avoid requiring human judgment at schema generation time.

1.5 Choice of schema language

The W3C XML Schema Definition Language has become the generally accepted schema language that is experiencing the most widespread adoption. Although other schema languages exist that offer their own advantages and disadvantages, UBL has determined that the best approach for developing an international XML business standard is to base its work on W3C XSD.

[STA1]	All UBL schema design rules MUST be based on the W3C XML Schema Recommendations: XML Schema Part 1: Structures and XML Schema Part 2: Datatypes.

A W3C technical specification holding recommended status represents consensus within the W3C and has the W3C Director's stamp of approval. Recommendations are appropriate for widespread deployment and promote W3C's mission. Before the Director approves a recommendation, it must show an alignment with the W3C architecture. By aligning with W3C specifications holding recommended status, UBL can ensure that its products and deliverables are well suited for use by the widest possible audience with the best availability of common support tools.

[STA2]	All UBL schema and messages MUST be based on the W3C suite of technical specifications holding recommendation status.

2 Relationship to ebXML Core Components

UBL employs the methodology and model described in *Core Components Technical Specification, Part 8 of the ebXML Technical Framework, Version 2.01* of 15 November 2003 (CCTS) to build the UBL Component Library. The Core Components work is a continuation of work that originated in, and remains a part of, the ebXML initiative. The Core Components concept defines a new paradigm in the design and implementation of reusable syntactically neutral information building blocks. Syntax neutral Core Components are intended to form the basis of business information standardization efforts and to be realized in syntactically specific instantiations such as ANSI ASC X12, UN/EDIFACT, and XML representations such as UBL.

The essence of the Core Components specification is captured in context neutral and context specific building blocks. The context neutral components are defined as Core Components (`ccts:CoreComponents`). Context neutral `ccts:CoreComponents` are defined in CCTS as "A building block for the creation of a semantically correct and meaningful information exchange package. It contains only the information pieces necessary to describe a specific concept."[3] Figure 2-1 illustrates the various pieces of the overall `ccts:CoreComponents` metamodel.

The context specific components are defined as Business Information Entities (`ccts:BusinessInformationEntities`).[4] Context specific `ccts:Business InformationEntities` are defined in CCTS as "A piece of business data or a group of pieces of business data with a unique *Business Semantic* definition."[5] Figure 2-2 illustrates the various pieces of the overall `ccts:BusinessInformationEntity` metamodel and their relationship with the `ccts:CoreComponents` metamodel.

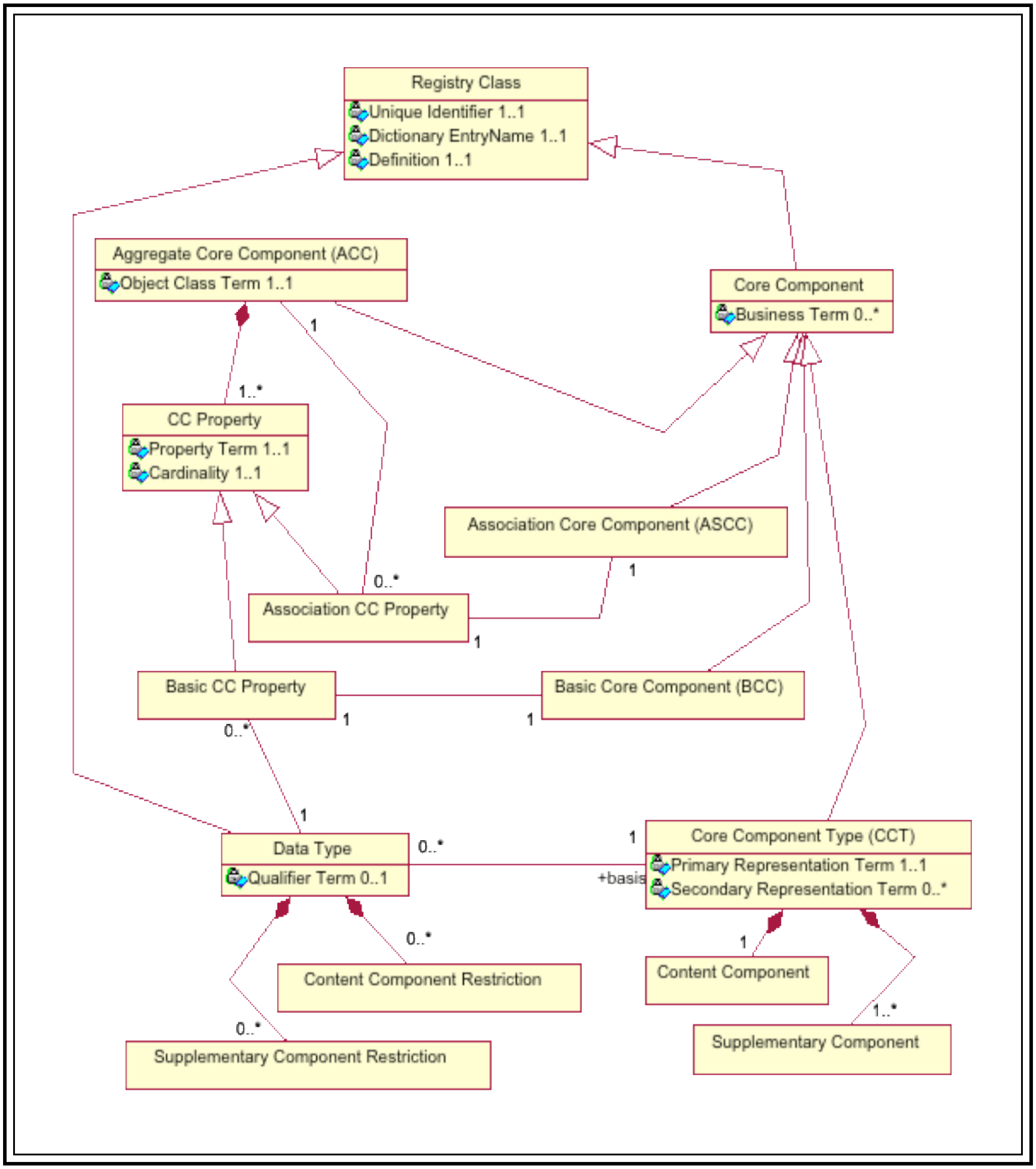
As shown in Figure 2-2, there are different types of `ccts:CoreComponents` and `ccts:BusinessInformationEntities`. Each type of `ccts:CoreComponent` and `ccts:BusinessInformationEntity` has specific relationships between and amongst the other components and entities. The context neutral `ccts:Core Components` are the linchpin that establishes the formal relationship between the various context-specific `ccts:BusinessInformationEntities`.

[3] *Core Components Technical Specification, Part 8 of the ebXML Technical Framework Version 2.0 (Second Edition),* UN/CEFACT, 15 November 2003

[4] See CCTS Section 6.2 for a detailed discussion of the ebXML context mechanism.

[5] *Core Components Technical Specification, Part 8 of the ebXML Technical Framework Version 2.0 (Second Edition),* UN/CEFACT, 15 November 2003

409 *Figure 2-1 Core Components and Datatypes Metamodel*[6]



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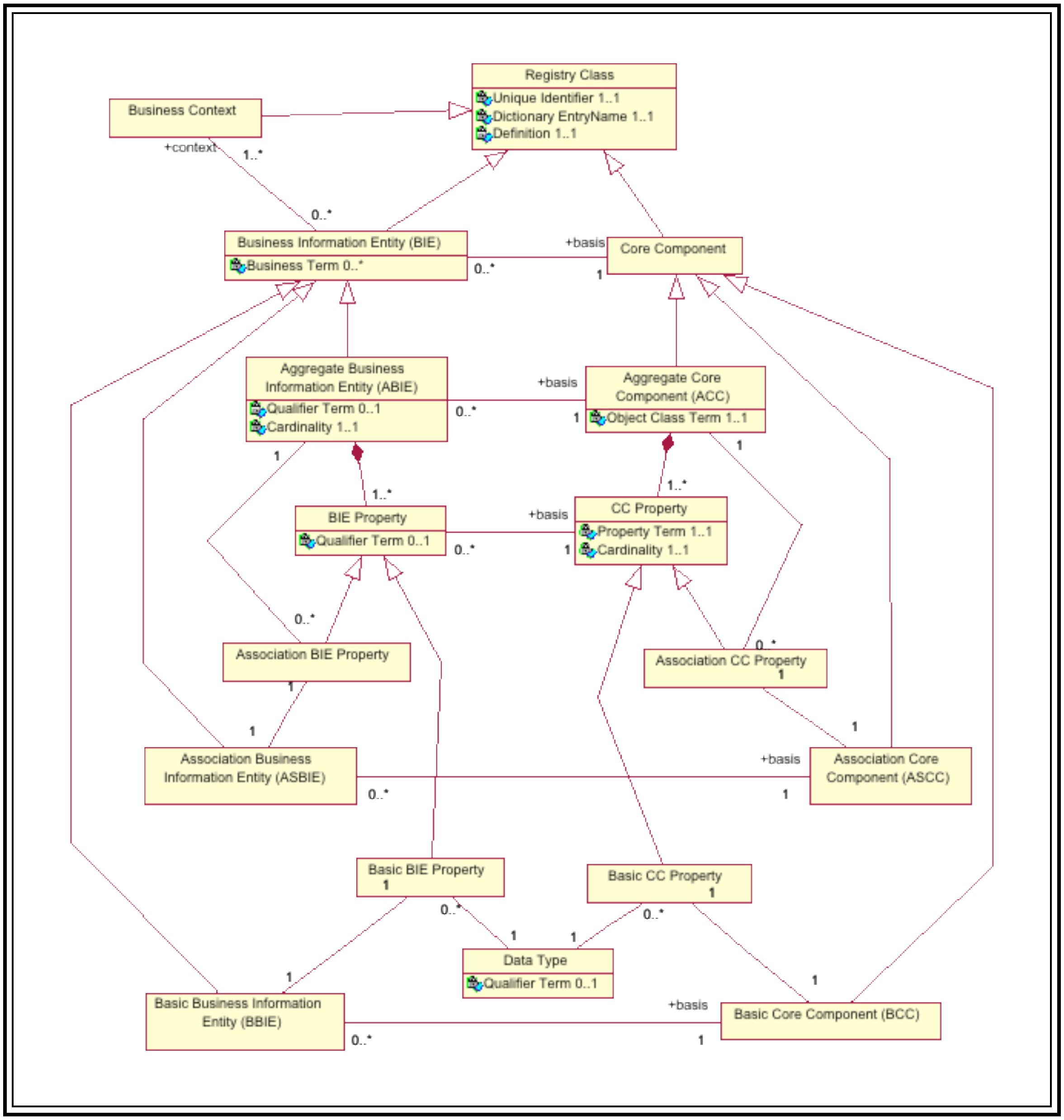
[6] *Core Components Technical Specification, Part 8 of the ebXML Technical Framework Version 2.0 (Second Edition),* UN/CEFACT, 15 November 2003

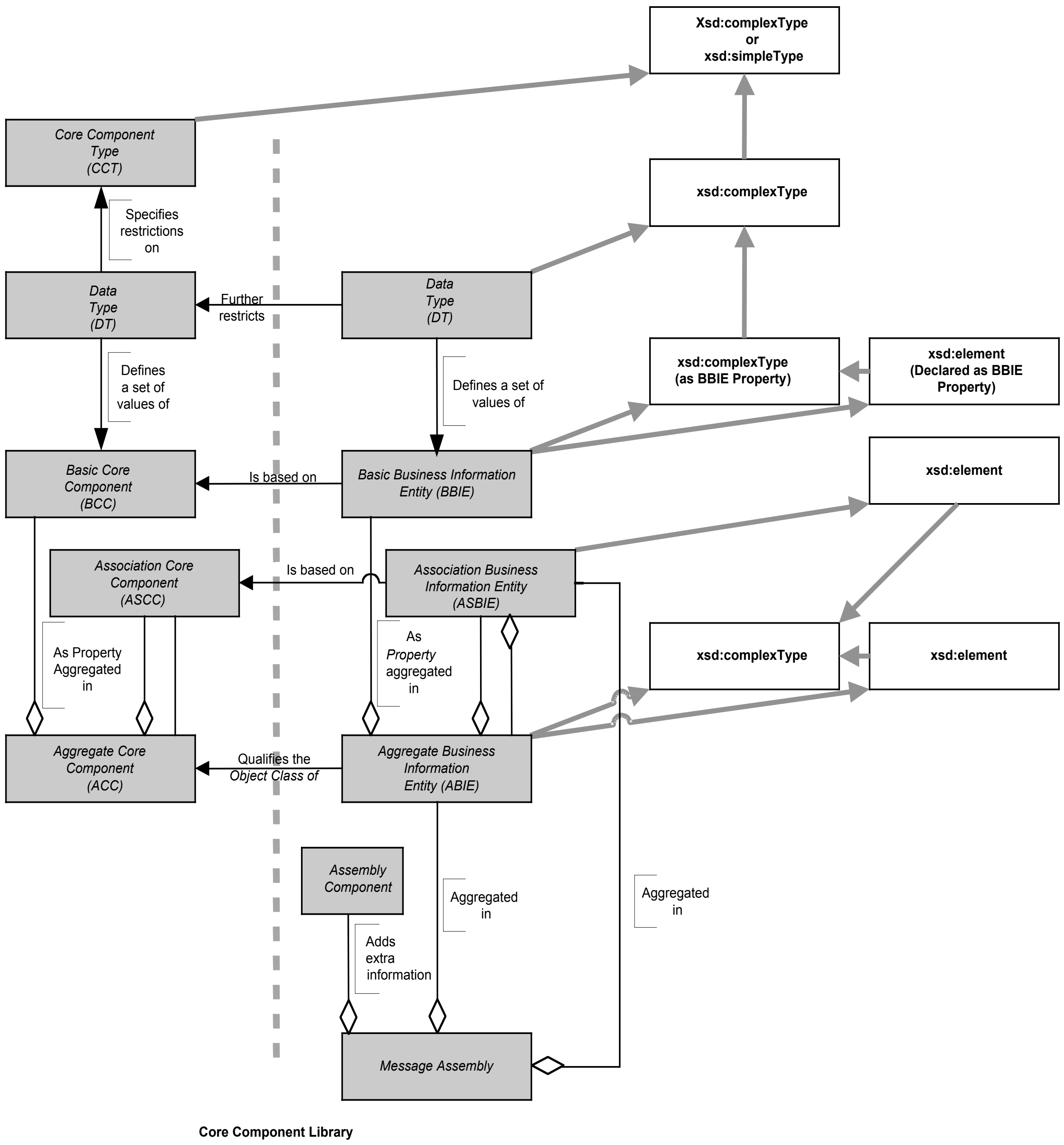
Figure 2-2. Business Information Entities Basic Definition Model



2.1 Mapping Business Information Entities to XSD

UBL consists of a library of `ccts:BusinessInformationEntities`. In creating this library, UBL has defined how each of the `ccts:BusinessInformationEntity` components map to an XSD construct (See figure 2-3). In defining this mapping, UBL has analyzed the CCTS metamodel and determined the optimal usage of XSD to express the various `ccts:BusinessInformationEntity` components. As stated above, a

Figure 2-3. UBL Document Metamodel


Xsd:complexType or xsd:simpleType
xsd:complexType
xsd:complexType (as BBIE Property)
xsd:element (Declared as BBIE Property)
xsd:element
xsd:complexType
xsd:element
Core Component Type (CCT)
Specifies restrictions on
Data Type (DT)
Further restricts
Data Type (DT)
Defines a set of values of
Defines a set of values of
Basic Core Component (BCC)
Is based on
Basic Business Information Entity (BBIE)
Association Core Component (ASCC)
Is based on
Association Business Information Entity (ASBIE)
As Property Aggregated in
As Property aggregated in
Aggregate Core Component (ACC)
Qualifies the Object Class of
Aggregate Business Information Entity (ABIE)
Assembly Component
Adds extra information
Aggregated in
Aggregated in
Message Assembly
Core Component Library

`ccts:BusinessInformationEntity` can be a `ccts:AggregateBusinessInformationEntity`, a `ccts:BasicBusinessInformationEntity`, or a `ccts:AssociationBusinessInformationEntity`. In understanding the logic of the UBL binding of `ccts:BusinessInformationEntities` to XSD expressions, it is important to understand the basic constructs of the ccts:AggregateBusiness InformationEntities and their relationships as shown in Figure 2-2.

Both Aggregate and Basic Business Information Entities must have a unique name (Dictionary Entry Name). The ccts:AggregateBusinessInformationEntities are treated as objects and are defined as xsd:complexTypes. The ccts:Basic BusinessInformationEntities are treated as attributes of the ccts:Aggregate BusinessInformationEntity and are found in the content model of the ccts:AggregateBusinessInformationEntity as a referenced xsd:element. The ccts:BasicBusinessInformationEntities are based on a reusable ccts:BasicBusinessInformationEntityProperty which are defined as xsd:complexTypes.

A Basic Business Information Entity Property represents an *intrinsic* property of an Aggregate Business Information Entity. Basic Business Information Entity properties are linked to a Datatype. UBL uses two types of Datatypes – unqualified that are provided by the UN/CEFACT Unqualified Datatype (udt) schema module, and qualified datatypes that are defined by UBL. The atg:UnqualifiedDatatypes correspond to ccts:RepresentationTerms and have no restrictions to the values of the corresponding ccts:ContentComponent or ccts:SupplementaryComponent. The ubl:QualifiedDatatypes are derived from atg:UnqualifiedDatatypes with restrictions to the allowed values or ranges of the corresponding ccts:ContentComponent or ccts:SupplementaryComponent.

CCTS defines an approved set of primary and secondary representation terms. However, these representation terms are simply naming conventions to identify the Datatype of an object, not actual constructs. These representation terms are in fact the basis for Datatypes as defined in the CCTS.

A ccts:Datatype "defines the set of valid values that can be used for a particular *Basic Core Component Property* or *Basic Business Information Entity Property Datatype*"[7] The ccts:Datatypes can be either unqualified—no restrictions applied—or qualified through the application of restrictions. The sum total of the datatypes is then instantiated as the basis for the various XSD simple and complex types defined in the UBL schemas. CCTS supports datatypes that are qualified, i.e. it enables users to define their own datatypes for their syntax neutral constructs. Thus ccts:Datatypes allow UBL to identify restrictions for elements when restrictions to the corresponding ccts:ContentComponent or ccts:SupplementaryComponent are required.

[7] *Core Components Technical Specification, Part 8 of the ebXML Technical Framework Version 2.0 (Second Edition), UN/CEFACT, 15 November 2003*

There are two kinds of Business Information Entity Properties - Basic and Association. A ccts:AssociationBusinessInformationEntityProperty represents an *extrinsic* property – in other words an association from one ccts:AggregateBusinessInformationEntityProperty instance to another ccts:AggregateBusinessInformationEntityProperty instance. It is the ccts:AggregateBusinessInformationEntityProperty that expresses the relationship between ccts:AggregateBusinessInformationEntities. Due to their unique extrinsic association role, ccts:AssociationBusinessInformationEntities are not defined as xsd:complexTypes, rather they are either declared as elements that are then bound to the xsd:complexType of the associated ccts:AggregateBusinessInformationEntity, or they are reclassified ABIEs.

As stated above, ccts:BasicBusinessInformationEntities define the intrinsic structure of a ccts:AggregateBusinessInformationEntity. These ccts:BasicBusinessInformationEntities are the “leaf” types in the system in that they contain no ccts:AssociationBusinessInformationEntity properties.

A ccts:BasicBusinessInformationEntity must have a ccts:CoreComponentType. All ccts:CoreComponentTypes are low-level types, such as Identifiers and Dates. A ccts:CoreComponentType describes these low-level types for use by ccts:CoreComponents, and (in parallel) a ccts:Datatype, corresponding to that ccts:CoreComponentType, describes these low-level types for use by ccts:BusinessInformationEntities. Every ccts:CoreComponentType has a single ccts:ContentComponent and one or more ccts:SupplementaryComponents. A ccts:ContentComponent is of some Primitive Type. All ccts:CoreComponentTypes and their corresponding content and supplementary components are pre-defined in the CCTS. UBL has developed an xsd:SchemaModule that defines each of the pre-defined ccts:CoreComponentTypes as an xsd:complexType or xsd:simpleType and declares ccts:SupplementaryComponents as an xsd:attribute or uses the predefined facets of the built-in xsd:Datatype for those that are used as the base expression for an xsd:simpleType. UBL continues to work with UN/CEFACT and the Open Applications Group to develop a single normative schema for representing ccts:CoreComponentTypes.

3 General XML Constructs

This chapter defines UBL rules related to general XML constructs to include:

- Overall Schema Structure
- Naming and Modeling Constraints
- Reusability Scheme
- Namespace Scheme
- Versioning Scheme
- Modularity Strategy
- Schema Documentation Requirements

3.1 Overall Schema Structure

A key aspect of developing standards is to ensure consistency in their development. Since UBL is envisioned to be a collaborative standards development effort, with liberal developer customization opportunities through use of the `xsd:extension` and `xsd:restriction` mechanisms, it is essential to provide a mechanism that will guarantee that each occurrence of a UBL conformant schema will have the same look and feel.

[GXS1] UBL Schema MUST conform to the following physical layout as applicable:

XML Declaration

<!-- ===== xsd:schema Element With Namespaces Declarations ===== -->

xsd:schema element to include version attribute and namespace declarations in the following order:

`xmlns:xsd`

Target namespace

Default namespace

CommonAggregateComponents

CommonBasicComponents

CoreComponentTypes

```
            Unqualified Datatypes
            Qualified Datatypes
            Identifier Schemes
            Code Lists
Attribute Declarations – elementFormDefault=”qualified”
            attributeFormDefault=”unqualified”
             Version Attribute
<!-- ===== Imports ===== -->
CommonAggregateComponents schema module
CommonBasicComponents schema module
Unqualified Types schema module
Qualified Types schema module
<!-- ===== Global Attributes ===== -->
Global Attributes and Attribute Groups
<!-- ===== Root Element ===== -->
Root Element Declaration
Root Element Type Definition
<!-- ===== Element Declarations ===== -->
alphabetized order
<!-- ===== Type Definitions ===== -->
All type definitions segregated by basic and aggregates as follows
<!-- ===== Aggregate Business Information Entity Type Definitions ===== -->
alphabetized order of ccts:AggregateBusinessInformationEntity xsd:TypeDefinitions
<!-- =====Basic Business Information Entity Type Definitions ===== -->
alphabetized order of ccts:BasicBusinessInformationEntities
<!-- ===== Copyright Notice ===== -->
Required OASIS full copyright notice.
```

3.1.1 Element declarations within document schemas

In order to facilitate the management and reuse of UBL constructs, all global elements, excluding the root element of the document schema must reside in either the CAC or CBC schema modules.

[Definition] Document schema –

The overarching schema within a specific namespace that conveys the business document functionality of that namespace. The document schema declares a target namespace and is likely to pull in by including internal schema modules or importing external schema modules. Each namespace will have one, and only one, document schema.

Example:

```
<xsd:element name="Order" type="OrderType">
  <xsd:annotation>
     <xsd:documentation>This element MUST be conveyed as the root element in any instance
document based on this Schema expression</xsd:documentation>
  </xsd:annotation>
</xsd:element>
```

[ELD10] The root element MUST be the only global element declared in document schemas.

3.2 Constraints

A key aspect of UBL is to base its work on process modeling and data analysis as precursors to developing the UBL library. In determining how best to affect this work, several constraints have been identified that directly impact both the process modeling and data analysis, and the resultant UBL Schema.

3.2.1 Naming Constraints

A primary aspect of the UBL library documentation are its spreadsheet models. The entries in these spreadsheet models fully define the constructs available for use in UBL business documents. These spreadsheet entries contain fully conformant CCTS dictionary entry names as well as truncated UBL XML element names developed in conformance with the rules in section 4. The dictionary entry name ties the information to its standardized semantics, while the name of the corresponding XML element or attribute is only shorthand for this full name. The rules for element and attribute naming and dictionary entry naming are different.

[NMC1] Each dictionary entry name MUST define one and only one fully qualified path (FQP) for an element or attribute.

The fully qualified path anchors the use of that construct to a particular location in a business message. The definition of the construct identifies any semantic dependencies that the FQP has on other elements and attributes within the UBL library that are not otherwise enforced or made explicit in its structural definition.

3.2.2 Modeling Constraints

In keeping with UBL guiding principles, modeling constraints are limited to those necessary to ensure consistency in development of the UBL library.

3.2.2.1 Defining Classes

UBL is based on instantiating ebXML `ccts:BusinessInformationEntities`. UBL models and the XML expressions of those models are class driven. Specifically, the UBL library defines classes for each `ccts:AggregateBusinessInformationEntity` and the UBL schemas instantiate those classes. The attributes of those classes consist of `ccts:BasicBusinessInformationEntities`.

3.2.2.2 Core Component Types

Each `ccts:BasicBusinessInformationEntity` has an associated `ccts:CoreComponentType`. The CCTS specifies an approved set of `ccts:CoreComponentTypes`. To ensure conformance, UBL is limited to using this approved set.

[MDC1] UBL Libraries and Schemas MUST only use ebXML Core Component approved `ccts:CoreComponentTypes`.

Customization is a key aspect of UBL's reusability across business verticals. The UBL rules have been developed in recognition of the need to support customizations. Specific UBL customization rules are detailed in the UBL customization guidelines.

3.2.2.3 Mixed Content

UBL documents are designed to effect data-centric electronic commerce. Including mixed content in business documents is undesirable because business transactions are based on exchange of discrete pieces of data that must be clearly unambiguous. The white space aspects of mixed content make processing unnecessarily difficult and add a layer of complexity not desirable in business exchanges.

[MDC2] Mixed content MUST NOT be used except where contained in an `xsd:documentation` element.

3.3 Reusability Scheme

The effective management of the UBL library requires that all element declarations are unique across the breadth of the UBL library. Consequently, UBL elements are declared globally, with the exception of Code and ID.

3.3.1.4 Reusable Elements

UBL elements are global and qualified. Hence in the example below, the `<Address>` element is directly reusable as a modular component and some software can be used without modification.

Example

```
<xsd:element name="Party" type="PartyType"/>
  <xsd:complexType name="PartyType">
    <xsd:annotation>
      <!—Documentation goes here→
    </xsd:annotation>
    <xsd:sequence>
      <xsd:element ref="cbc:MarkCareIndicator" minOccurs="0"
maxOccurs="1">
        ...
      </xsd:element>
      <xsd:element ref="cbc:MarkAttentionIndicator" minOccurs="0"
maxOccurs="1">
        ...
      </xsd:element>
      <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:sequence>
  </xsd:complexType>
<xsd:element name="Address" type="AddressType"/>
<xsd:complexType name="AddressType">
    ...
    <xsd:sequence>
      <xsd:element ref="cbc:CityName" minOccurs="0" maxOccurs="1">
       ...
      </xsd:element>
      <xsd:element ref="cbc:PostalZone" minOccurs="0" maxOccurs="1">
        ...
      </xsd:element>
        ...
  </xsd:sequence>
                </xsd:complexType>
```

Software written to work with UBL's standard library will work with new assemblies of the same components since global elements will remain consistent and unchanged. The globally declared `<Address>` element is fully reusable without regard to the reusability of types and provides a solid mechanism for ensuring that extensions to the UBL core library will provide consistency and semantic clarity regardless of its placement within a particular type.

[ELD2] All element declarations MUST be global

3.4 Namespace Scheme

The concept of XML namespaces is defined in the W3C XML namespaces technical specification.[8] The use of XML namespace is specified in the W3C XML Schema (XSD) Recommendation. A namespace is declared in the root element of a Schema using a namespace identifier. Namespace declarations can also identify an associated prefix—shorthand identifier—that allows for compression of the namespace name. For each UBL namespace, a normative token is defined as its prefix. These tokens are defined in Section 3.6. It is common for an instance document to carry namespace declarations, so that it might be validated.

3.4.1 Declaring Namespaces

Neither XML 1.0 nor XSD require the use of Namespaces. However the use of namespaces is essential to managing the complex UBL library. UBL will use UBL-defined schemas (created by UBL) and UBL-used schemas (created by external activities) and both require a consistent approach to namespace declarations.

[NMS1] Every UBL-defined –or -used schema module, except internal schema modules, MUST have a namespace declared using the `xsd:targetNamespace` attribute.

Each UBL schema module consists of a logical grouping of lower level artifacts that together comprise an association that will be able to be used in a variety of UBL schemas. These schema modules are grouped into a schema set collection. Each schema set is assigned a namespace that identifies that group of schema modules. As constructs are changed, new versions will be created. The schema set is the versioned entity, all schema modules within that package are of the same version, and each version has a unique namespace.

[Definition] Schema Set –

[8] *Tim Bray, D Hollander, A Layman, R Tobin; Namespaces in XML 1.1, W3C Recommendation, February 2004.*

A collection of schema instances that together comprise the names in a specific UBL namespace.

Schema validation ensures that an instance conforms to its declared schema. There are never two (different) schemas with the same namespace Uniform Resource Identifier (URI). In keeping with Rule NMS1, each UBL schema module will be part of a versioned namespace.

[NMS2] Every UBL-defined –r -used schema set version MUST have its own unique namespace.

UBL’s extension methodology encourages a wide variety in the number of schema modules that are created as derivations from UBL schema modules. Clarity and consistency requires that customized schema not be confused with those developed by UBL.

[NMS3] UBL namespaces MUST only contain UBL developed schema modules.

3.4.2 Namespace Uniform Resource Identifiers

A UBL namespace name must be a URI reference that conforms to RFC 2396.[9] UBL has adopted the Uniform Resource Name (URN) scheme as the standard for URIs for UBLnamespaces, in conformance with IETF’s RFC 3121, as defined in this next section.[10]

Rule NMS2 requires separate namespaces for each UBL schema set. The UBL versioning rules differentiate between committee draft and OASIS Standard status. For each schema holding draft status, a UBL namespace must be declared and named.

[NMS4] The namespace names for UBL Schemas holding committee draft status MUST be of the form:

```
urn:oasis:names:tc:ubl:schema:<subtype>:<document-id>
```

The format for `document-id` is found in the next section.

For each UBL schema holding OASIS Standard status, a UBL namespace must be declared and named using the same notation, but with the value ‘`specification”` replacing the value ‘`tc’` .

[9] *T. Berners-Lee, R. Fielding, L. Masinter; Internet Engineering Task Force (IETF) RFC 2396, Uniform Resource Identifiers (URI): Generic Syntax, Internet Society, August 1998.*

[10] Karl Best, N. Walsh,; Internet Engineering Task Force (IETF) RFC 3121, *A URN Namespace for OASIS,* June 2001.

[NMS5]	The namespace names for UBL Schemas holding OASIS Standard status MUST be of the form: `urn:oasis:names:specification:ubl:schema:<subtype>:<document-id>`

3.4.3 Schema Location

UBL schemas use a URN namespace scheme. In contrast, schema locations are typically defined as a Uniform Resource Locator (URL). UBL schemas must be available both at design time and run time. As such, the UBL schema locations will differ from the UBL namespace declarations. UBL, as an OASIS TC, will utilize an OASIS URL for hosting UBL schemas. UBL will use the committee directory http://www.oasis-open.org/committees/ubl/schema/.

3.4.4 Persistence

A key differentiator in selecting URNs to define UBL namespaces is URN persistence. UBL namespaces must never violate this functionality by subsequently changing a namespace once it has been declared. Conversely, any changes to a schema will result in a new namespace declaration. Thus a published schema version and its namespace association will always be inviolate.

[NMS6]	UBL published namespaces MUST never be changed.

3.5 Versioning Scheme

UBL namespaces conform to the OASIS namespace rules defined in RFC 3121.[11] The last field of the namespace name is called `document-id.` UBL has decided to include versioning information as part of the document-id component of the namespace. The version information is divided into `major` and `minor` fields. The `minor` field has an optional `revision` extension. For example, the namespace URI for the draft Invoice domain has this form:

```
urn:oasis:names:tc:ubl:schema:xsd:Invoice-
<major>.<minor>[.<revision>]
```

The *major-version* field is "`1`" for the first release of a namespace. Subsequent major releases increment the value by 1. For example, the first namespace URI for the first major release of the Invoice document has the form:

[11] Karl Best, N. Walsh; Internet Engineering Task Force (IETF) RFC 3121, *A URN Namespace for OASIS,* June 2001.

```
urn:oasis:names:tc:ubl:schema:xsd:Invoice-1.0
```

The second major release will have a URI of the form:

```
urn:oasis:names:tc:ubl:schema:xsd:Invoice-2.0
```

The distinguished value “0” (zero) is used in the *minor-version* position when defining a new major version. In general, the namespace URI for every major release of the Invoice domain has the form:

```
urn:oasis:names:tc:ubl:schema:xsd:Invoice:-<major-
number>.0[.<revision>]
```

[VER1] Every UBL Schema and schema module major version committee draft MUST have an RFC 3121 document-id of the form

```
<name>-<major>.0[.<revision>]
```

[VER2] Every UBL Schema and schema module major version OASIS Standard MUST have an RFC 3121 document-id of the form

```
<name>-<major>.0
```

For each document produced by the TC, the TC will determine the value of the <name> variable. In UBL, the major-version field of a namespace URI must be changed in a release that breaks compatibility with the previous release of that namespace. If a change does not break compatibility then only the minor version need change. Subsequent minor releases begin with minor-version 1.

Example

The namespace URI for the first minor release of the Invoice domain has this form:

```
urn:oasis:names:tc:ubl:schema:xsd:Invoice-<major.1>
```

[VER3] Every minor version release of a UBL schema or schema module draft MUST have an RFC 3121 document-id of the form

```
<name>-<major >.<non-zero>[.<revision>]
```

[VER4] Every minor version release of a UBL schema or schema module OASIS Standard MUST have an RFC 3121 document-id of the form

```
<name>-<major >.<non-zero>
```

Once a schema version is assigned a namespace, that schema version and that namespace will be associated in perpetuity. Any change to any schema module mandates association with a new namespace**.**

[VER5] For UBL Minor version changes `<name>` MUST not change, UBL is composed of a number of interdependent namespaces. For instance, namespaces whose URI's start with `urn:oasis:names:tc:ubl:schema:xsd:Invoice-*` are dependent upon the common basic and aggregate namespaces, whose URI's have the form `urn:oasis:names:tc:ubl:schema:xsd:CommonBasicComponents-*` and `urn:oasis:names:tc:ubl:schema:xsd:CommonAggregateComponents-*` respectively. If either of the common namespaces change then its namespace URI must change. If its namespace URI changes then any schema that imports the *new version* of the namespace must also change (to update the namespace declaration). And since the importing schema changes, its namespace URI in turn must change. The outcome is twofold:

- There should never be ambiguity at the point of reference in a namespace declaration or version identification. A dependent schema imports precisely the version of the namespace that is needed. The dependent schema never needs to account for the possibility that the imported namespace can change.

- When a dependent schema is upgraded to import a new version of a schema, the dependent schema's version (in its namespace URI) must change.

Version numbers are based on a logical progression. All major and minor version numbers will be based on positive integers. Version numbers always increment positively by one.

[VER6] Every UBL Schema and schema module major version number MUST be a sequentially assigned, incremental number greater than zero.

[VER7] Every UBL Schema and schema module minor version number MUST be a sequentially assigned, incremental non-negative integer.

In keeping with rules NMS1 and NMS2, each schema minor version will be assigned a separate namespace.

A minor revision (of a namespace) *imports* the schema module for the previous version. For instance, the schema module defining:

`urn:oasis:names:tc:ubl:schema:xsd:Invoice-1.2`

will import the namespace:

`urn:oasis:names:tc:ubl:schema:xsd:Invoice-1.1`

The `version 1.2` revision may define new complex types by extending or restricting `version 1.1` types. It may define brand new complex types and elements by composition. It must not use the XSD redefine element to change the definition of a type or element in the `1.1` version.

The opportunity exists in the `version 1.2` revision to rename derived types. For instance if `version 1.1` defines `Address` and `version 1.2` qualifies `Address` it would be possible to give the derived `Address` a new name, e.g. `NewAddress`. This is not required since namespace qualification suffices to distinguish the two distinct types. The minor revision may give a derived type a new name only if the semantics of the two types are distinct.

For a particular namespace, the minor versions of a major version form a linearly-linked family. The first minor version imports its parent major version. Each successive minor version imports the schema module of the preceding minor version.

Example

```
urn:oasis:names:tc:ubl:schema:xsd:Invoice-1.2
imports
 urn:oasis:names:tc:ubl:schema:xsd:Invoice-1.1
which imports
urn:oasis:names:tc:ubl:schema:xsd:Invoice-1.0
```

[VER8] A UBL minor version document schema MUST import its immediately preceding version document schema.

To ensure that backwards compatibility through polymorphic processing of minor versions within a major version always occurs, minor versions must be limited to certain allowed changes. This guarantee of backward compatibility is built into the `xsd:extension` mechanism. Thus, backward incompatible version changes can not be expressed using this mechanism.

[VER9] UBL Schema and schema module minor version changes MUST be limited to the use of `xsd:extension` or `xsd:restriction` to alter existing types or add new constructs.

In addition to polymorphic processing considerations, semantic compatibility across minor versions (as well as major versions) is essential. Semantic compatibility in this sense pertains to preserving the business function.

[VER10] UBL Schema and schema module minor version changes MUST not break semantic compatibility with prior versions.

3.6 Modularity

There are many possible mappings of XML schema constructs to namespaces and to files. As with other significant software artifacts, schemas can become large. In addition to the logical taming of complexity that namespaces provide, dividing the physical realization of schema into multiple files—schema modules—provides a mechanism whereby reusable components can be imported as needed without the need to import overly complex complete schema.

[SSM1] UBL Schema expressions MAY be split into multiple schema modules.

[Definition] schema module –

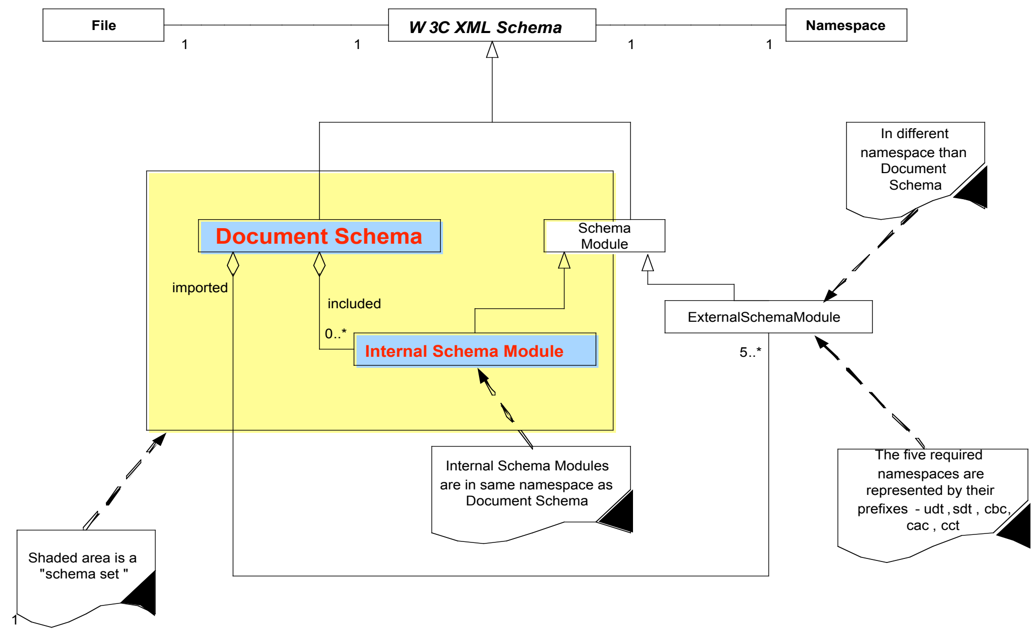
A schema document containing type definitions and element declarations intended to be reused in multiple schemas.

3.6.1 UBL Modularity Model

UBL relies extensively on modularity in schema design. There is no single UBL root schema. Rather, there are a number of UBL document schemas, each of which expresses a separate business function. The UBL modularity approach is structured so that users can reuse individual document schemas without having to import the entire UBL document schema library. Additionally, a document schema can import individual modules without having to import all UBL schema modules. Each document schema will define its own dependencies. The UBL schema modularity model ensures that logical associations exist between document and internal schema modules and that individual modules can be reused to the maximum extent possible. This is accomplished through the use of document and internal schema modules as shown in Figure 3-1.

If the contents of a namespace are small enough then they can be completely specified within the document schema.

Figure 3-1. UBL Schema Modularity Model


File
W 3C XML Schema
Namespace
1
1
1
1
In different namespace than Document Schema
Document Schema
Schema Module
imported
included
0..*
Internal Schema Module
ExternalSchemaModule
5..*
Internal Schema Modules are in same namespace as Document Schema
The five required namespaces are represented by their prefixes - udt , sdt , cbc, cac , cct
Shaded area is a "schema set "
1

udt = Unspecialized Datatype , sdt = Specialized Datatype , cbc = Common Basic Components , cac = Common Aggregate Components , cct = Core Component Type

Figure 3-1 shows the one-to-one correspondence between document schemas and namespaces. It also shows the one-to-one correspondence between files and schema modules. As shown in figure 3-1, there are two types of schema in the UBL library – document schema and schema modules. Document schemas are always in their own namespace. Schema modules may be in a document schema namespace as in the case of internal schema modules, or in a separate namespace as in the `ubl:sdt`, `ubl:cbc`, `ubl:cac`, `ubl:cl`, and `ubl:ccts` schema modules. Both types of schema modules are conformant with W3C XSD

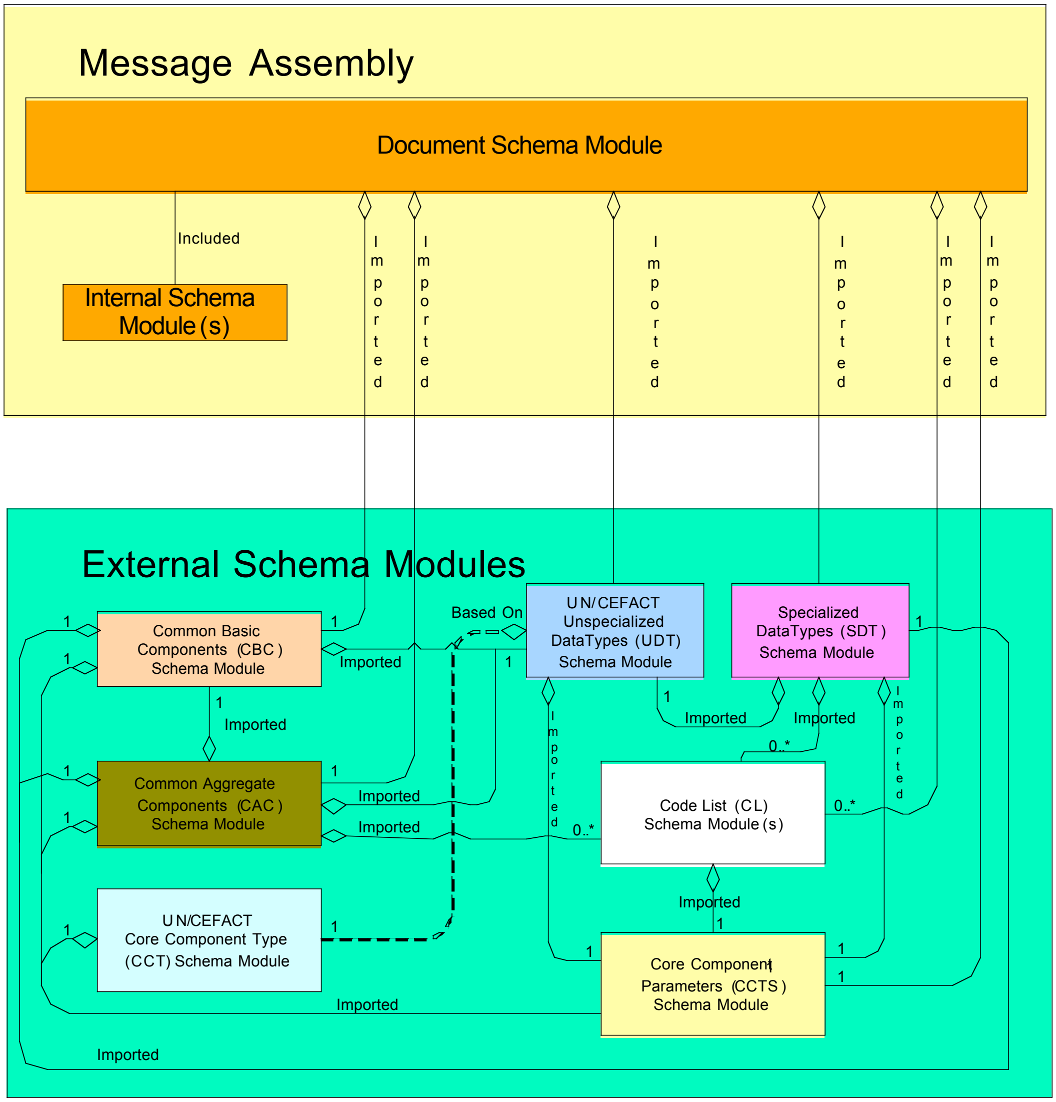
A namespace is an indivisible grouping of types. A “piece” of a namespace can never be used without all its pieces. For larger namespaces, schema modules – internal schema modules – may be defined. UBL document schemas may have zero or more internal modules that they include. The document schema for a namespace then includes those internal modules.

A namespace is an indivisible grouping of types. A “piece” of a namespace can never be used without all its pieces. For larger namespaces, schema modules – internal schema modules – may be defined. UBL document schemas may have zero or more internal modules that they include. The document schema for a namespace then includes those internal modules.

[Definition] Internal schema module –

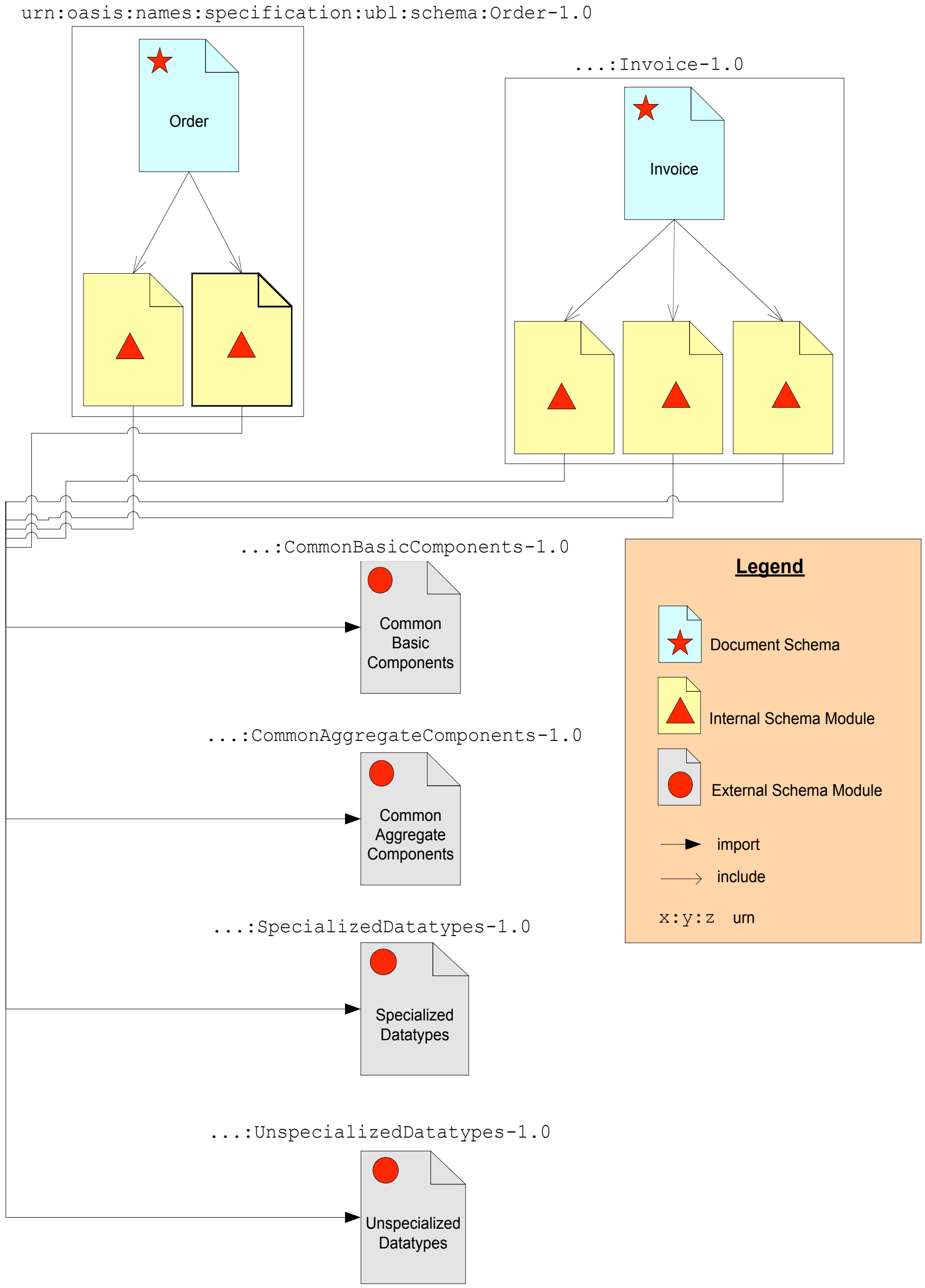
A schema that is part of a schema set within a specific namespace.

Figure 3-2 Schema Modules


Message Assembly
Document Schema Module
Included
Internal Schema Module (s)
Imported
Imported
Imported
Imported
Imported
Imported
External Schema Modules
Common Basic Components (CBC) Schema Module
Common Aggregate Components (CAC) Schema Module
UN/CEFACT Core Component Type (CCT) Schema Module
Based On
UN/CEFACT Unspecialized DataTypes (UDT) Schema Module
Specialized DataTypes (SDT) Schema Module
Code List (CL) Schema Module (s)
Core Component Parameters (CCTS) Schema Module
Imported
Imported
Imported
Imported
Imported
Imported
Imported
Imported
Imported
Imported
Imported
1
1
0..*
0..*
0..*

Another way to visualize the structure is by example. Figure 3-2 depicts instances of the various schema modules from the previous diagram.

910 *Figure 3-3 Order and Invoice Schema Import of Common Component Schema Modules*


urn:oasis:names:specification:ubl:schema:Order-1.0
Order
...:Invoice-1.0
Invoice
...:CommonBasicComponents-1.0
Common Basic Components
...:CommonAggregateComponents-1.0
Common Aggregate Components
...:SpecializedDatatypes-1.0
Specialized Datatypes
...:UnspecializedDatatypes-1.0
Unspecialized Datatypes
Legend
Document Schema
Internal Schema Module
External Schema Module
import
include
x:y:z urn

911

912 Figure 3-3 shows how the order and invoice document schemas import the
913 "CommonAggregateComponents Schema Module” and “CommonBasicComponents
914 Schema Module” external schema modules. It also shows how the order document
915 schema includes various internal modules – modules local to that namespace. The clear
916 boxes show how the various schema modules are grouped into namespaces.

Any UBL schema module, be it a document schema or an internal module, may import other document schemas from other namespaces.

3.6.1.5 Limitations on Import

If two namespaces are mutually dependent then clearly, importing one will cause the other to be imported as well. For this reason there must not exist circular dependencies between UBL schema modules. By extension, there must not exist circular dependencies between namespaces. A namespace "A" dependent upon type definitions or element declaration defined in another namespace "B" must import "B's" document schema.

[SSM2]	A document schema in one UBL namespace that is dependent upon type definitions or element declarations defined in another namespace MUST only import the document schema from that namespace.

To ensure there is no ambiguity in understanding this rule, an additional rule is necessary to address potentially circular dependencies as well – schema A must not import internal schema modules of schema B.

[SSM3]	A UBL document schema in one UBL namespace that is dependant upon type definitions or element declarations defined in another namespace MUST NOT import internal schema modules from that namespace.

3.6.1.6 Module Conformance

UBL has defined a set of naming and design rules that are carefully crafted to ensure maximum interoperability and standardization.

[SSM4]	Imported schema modules MUST be fully conformant with UBL naming and design rules.

3.6.2 Internal and External Schema Modules

UBL will create schema modules which, as illustrated in Figure 3-1 and Figure 3-2, will either be located in the same namespace as the corresponding document schema, or in a separate namespace.

[SSM5]	UBL schema modules MUST either be treated as external schema modules or as internal schema modules of the document schema.

3.6.3 Internal Schema Modules

UBL internal schema modules do not declare a target namespace, but instead reside in the namespace of their parent schema. All internal schema modules will be accessed using `xsd:include`.

[SSM6] All UBL internal schema modules MUST be in the same namespace as their corresponding document schema.

UBL internal schema modules will necessarily have semantically meaningful names. Internal schema module names will identify the parent schema module, the internal schema module function, and the schema module itself.

[SSM7] Each UBL internal schema module MUST be named `{ParentSchemaModuleName}{InternalSchemaModuleFunction}{schema module}`

3.6.4 External Schema Modules

UBL is dedicated to maximizing reuse. As the complex types and global element declarations will be reused in multiple UBL schemas, a logical modularity approach is to create UBL schema modules based on collections of reusable types and elements.

[SSM8] A UBL schema module MAY be created for reusable components.

As identified in rule SSM2, UBL will create external schema modules. These external schema modules will be based on logical groupings of contents. At a minimum, UBL schema modules will be comprised of:

- UBL CommonAggregateComponents
- UBL CommonBasicComponents
- UBL Code List(s)
- CCTS Core Component Types
- CCTS Unqualified Datatypes
- UBL Qualified Datatypes
- CCTS Core Component Parameters

3.6.4.7 UBL Common Aggregate Components Schema Module

The UBL library will also contain a wide variety of `ccts:AggregateBusinessInformationEntities`. As defined in rule CTD1, each of these `ccts:AggregateBusinessInformationEntity` classes will be defined as an `xsd:complexType`. Although some of these complex types may be used on only one UBL Schema, many will be reused in multiple UBL schema modules. An aggregation of all of the `ccts:AggregateBusinessInformationEntity` `xsd:complexType` definitions that are used in multiple UBL schema modules into a single schema module of common aggregate types will provide for maximum ease of reuse.

[SSM9] A schema module defining all UBL Common Aggregate Components MUST be created.

The normative name for this `xsd:ComplexType` schema module will be based on its `ccts:AggregateBusinessInformationEntity` content.

[SSM10] The UBL Common Aggregate Components schema module MUST be identified as *`CommonAggregateComponents`* in the document name within the schema header.

Example

Document Name: CommonAggregateComponents

3.6.4.7.1 UBL CommonAggregateComponents Schema Module Namespace

In keeping with the overall UBL namespace approach, a singular namespace must be created for storing the `ubl:CommonAggregateComponents` schema module.

[NMS7] The `ubl:CommonAggregateComponents` schema module MUST reside in its own namespace.

To ensure consistency in expressing this module, a normative token that will be used consistently in all UBL Schemas must be defined.

[NMS8] The `ubl:CommonAggregateComponents` schema module MUST be represented by the token "`cac`".

3.6.4.8 UBL CommonBasicComponents Schema Module

The UBL library will contain a wide variety of `ccts:BasicBusinessInformationEntities`. These ccts:`BasicBusinessInformationEntities` are based on `ccts:BasicBusinessInformationEntityProperties`. BBIE properties are reusable in multiple BBIEs. As defined in rule CTD1, each of these `ccts:BasicBusinessInformationEntityProperty` classes is defined as an `xsd:complexType`. Although some of these complex types may be used in only one UBL Schema, many will be reused in multiple UBL schema modules. To maximize reuse and standardization, all of the `ccts:BasicBusinessInformationEntityProperty` `xsd:ComplexType` definitions that are used in multiple UBL schema modules will be aggregated into a single schema module of common basic types.

[SSM11] A schema module defining all UBLCommon Basic Components MUST be created.

The normative name for this schema module will be based on its `ccts:BasicBusinessInformationEntityProperty` `xsd:ComplexType` content.

[SSM12] The UBL Common Basic Components schema module MUST be identified as *`CommonBasicComponents`* in the document name within the schema header.

3.6.4.8.1 UBL CommonBasicComponents Schema Module Namespace

In keeping with the overall UBL namespace approach, a singular namespace must be created for storing the `ubl:CommonBasicComponents` schema module.

[NMS9] The `ubl:CommonBasicComponents` schema module MUST reside in its own namespace.

To ensure consistency in expressing the `ubl:CommonBasicComponents` schema module, a normative token that will be used consistently in all UBL Schema must be defined.

[NMS10] The `UBL:CommonBasicComponents` schema module MUST be represented by the token “`cbc`”.

3.6.4.9 CCTS CoreComponentType Schema Module

The CCTS defines an authorized set of Core Component Types (`ccts:Core ComponentTypes`) that convey content and supplementary information related to exchanged data. As the basis for all higher level CCTS models, the `ccts:Core ComponentTypes` are reusable in every UBL schema. An external schema module consisting of a complex type definition for each `ccts:CoreComponentType` is essential to maximize reusability.

[SSM13] A schema module defining all CCTSCore Component Types MUST be created.

The normative name for the `ccts:CoreComponentType` schema module will be based on its content.

[SSM14] The CCTS Core Component Type schema module MUST be identified as *`CoreComponentTypes`*in the document name within the schema header.

By design, `ccts:CoreComponentTypes` are generic in nature. As such, restrictions are not appropriate. Such restrictions will be applied through the application of datatypes. Accordingly, the `xsd:facet` feature must not be used in the `ccts:CCT` schema module.

[SSM15] The `xsd:facet` feature MUST not be used in the `ccts:CoreComponent Type` schema module.

3.6.4.9.1 Core Component Type Schema Module Namespace

In keeping with the overall UBL namespace approach, a single namespace must be created for storing the `ccts:CoreComponentType` schema module.

[NMS11] The `ccts:CoreComponentType` schema module MUST reside in its own namespace.

To ensure consistency in expressing the `ccts:CoreComponentType` schema module, a normative token that will be used in consistently in all UBL Schema must be defined.

[NMS12] The `ccts:CoreComponentType` schema module namespace MUST be represented by the token “`cct`”.

3.6.4.10 CCTS Datatypes Schema Modules

The CCTS defines an authorized set of primary and secondary Representation Terms (`ccts:RepresentationTerms`) that describes the form of every `ccts:Business InformationEntity`. These `ccts:RepresentationTerms` are instantiated in the form of datatypes that are reusable in every UBL schema. The `ccts:Datatype` defines the set of valid values that can be used for its associated `ccts:BasicBusiness InformationEntity Property`. These datatypes may be qualified or unqualified, that is to say restricted or unrestricted. We refer to these as `ccts:Unqualified Datatypes` (even though they are technically `ccts:Datatypes)` or `ubl:QualifiedDatatypes`.

3.6.4.10.1 CCTS Unqualified Datatypes Schema Module

UBL has adopted the UN/CEFACT Unqualified Datatype schema module.This includes the four code list schema modules that are imported in to this schema module.

3.6.4.10.2 UBL Qualified Datatypes Schema Module

The `ubl:QualifiedDatatype` is defined by specifying restrictions on the ccts:CoreComponentType that forms the basis of the`ccts:UnqualifiedDatatype`. To ensure the consistency of UBL qualified Datatypes (`ubl:QualifiedDatatypes`) with the UBL modularity and reuse goals requires creating a single schema module that defines all `ubl:QualifiedDatatypes`.

[SSM18] A schema module defining all UBL Qualified Datatypes MUST be created.

The `ubl:QualifiedDatatypes` schema module name must follow the UBL module naming approach.

[SSM19] The UBL Qualified Datatypes schema module MUST be identified as `QualifiedDatatypes` in the document name in the schema header.

3.6.4.10.3 UBL Qualified Datatypes Schema Module Namespace

In keeping with the overall UBL namespace approach, a singular namespace must be created for storing the `ubl:QualifiedDatatypes` schema module.

[NMS15] The `ubl:QualifiedDatatypes` schema module MUST reside in its own namespace.

To ensure consistency in expressing the `ubl:QualifiedDatatypes` schema module, a normative token that will be used in all UBL schemas must be defined.

[NMS16] The `ubl:QualifiedDatatypes` schema module namespace MUST be represented by the token "`qdt`".

3.7 Annotation and Documentation

Annotation is an essential tool in understanding and reusing a schema. UBL, as an implementation of CCTS, requires an extensive amount of annotation to provide all necessary metadata required by the CCTS specification. Each construct declared or defined within the UBL library contains the requisite associated metadata to fully describe its nature and support the CCTS requirement. Accordingly, UBL schema metadata for each construct will be defined in the UBL core component parameters schema.

3.7.1 Schema Annotation

Although the UBL schema annotation is necessary, its volume results in a considerable increase in the size of the UBL schemas with undesirable performance impacts. To address this issue, two normative schema will be developed for each UBL schema. A fully annotated schema will be provided to facilitate greater understanding of the schema module and its components, and to meet the CCTS metadata requirements. A schema devoid of annotation will also be provided that can be used at run-time if required to meet processor resource constraints.

[GXS2] UBL MUST provide two normative schemas for each transaction. One schema shall be fully annotated. One schema shall be a run-time schema devoid of documentation.

3.7.2 Embedded documentation

The information about each UBL `ccts:BusinessInformationEntity` is in the UBL spreadsheet models. UBL spreadsheets contain all necessary information to produce fully annotated Schemas. Fully annotated Schemas are valuable tools to implementers to assist in understanding the nuances of the information contained therein. UBL annotations will consist of information currently required by Section 7 of the CCTS and supplemented by metadata from the UBL spreadsheet models.

The absence of an optional annotation inside the structured set of annotations in the documentation element implies the use of the default value. For example, there are several annotations relating to context such as `ccts:BusinessContext` or `ccts:IndustryContext` whose absence implies that their value is "`all contexts`".

The following rules describe the documentation requirements for each `ubl:QualifiedDatatype` and `atg:UnqualifiedDatatype` definition.

[DOC1] The xsd:documentation element for every Datatype MUST contain a structured set of annotations in the following sequence and pattern (as defined in CCTS Section 7):

- DictionaryEntryName (mandatory)
- Version (mandatory):
- Definition(mandatory)
- RepresentationTerm (mandatory)
- QualifierTerm(s) (mandatory, where used)
- UniqueIdentifier (mandatory)
- Usage Rule(s) (optional)
- Content Component Restriction (optional)

[DOC2] A Datatype definition MAY contain one or more Content Component Restrictions to provide additional information on the relationship between the Datatype and its corresponding Core Component Type. If used the Content Component Restrictions must contain a structured set of annotations in the following patterns:

- RestrictionType (mandatory): Defines the type of format restriction that applies to the Content Component.
- RestrictionValue (mandatory): The actual value of the format restriction that applies to the Content Component.
- ExpressionType (optional): Defines the type of the regular expression of the restriction value.

[DOC3] A Datatype definition MAY contain one or more Supplementary Component Restrictions to provide additional information on the relationship between the Datatype and its corresponding Core Component Type. If used the

Supplementary Component Restrictions must contain a structured set of annotations in the following patterns:

- `SupplementaryComponentName` (mandatory): Identifies the Supplementary Component on which the restriction applies.
- `RestrictionValue` (mandatory, repetitive): The actual value(s) that is (are) valid for the Supplementary Component

The following rule describes the documentation requirements for each `ccts:BasicBusinessInformationEntity` definition.

[DOC4] The `xsd:documentation` element for every Basic Business Information Entity MUST contain a structured set of annotations in the following patterns:

- ComponentType (mandatory): The type of component to which the object belongs. For Basic Business Information Entities this must be “BBIE”.
- DictionaryEntryName (mandatory): The official name of a Basic Business Information Entity.
- Version (optional): An indication of the evolution over time of the Basic Business Information Entity.
- Definition(mandatory): The semantic meaning of a Basic Business Information Entity.
- Cardinality(mandatory): Indication whether the Basic Business Information Entity represents a not-applicable, optional, mandatory and/or repetitive characteristic of the Aggregate Business Information Entity.
- ObjectClassQualifier (optional): The qualifier for the object class.
- ObjectClass(mandatory): The Object Class containing the Basic Business Information Entity.
- PropertyTermQualifier (optional): A qualifier is a word or words which help define and differentiate a Basic Business Information Entity.
- PropertyTerm(mandatory): Property Term represents the distinguishing characteristic or Property of the Object Class and shall occur naturally in the definition of the Basic Business Information Entity.
- RepresentationTerm (mandatory): A Representation Term describes the form in which the Basic Business Information Entity is represented.
- DataTypeQualifier (optional): semantically meaningful name that differentiates the Datatype of the Basic Business Information Entity from its underlying Core Component Type.
- DataType (mandatory): Defines the Datatype used for the Basic Business Information Entity.

- AlternativeBusinessTerms (optional): Any synonym terms under which the Basic Business Information Entity is commonly known and used in the business.
- Examples (optional): Examples of possible values for the Basic Business Information Entity.

The following rule describes the documentation requirements for each `ccts:AggregateBusinessInformationEntity` definition.

[DOC5] The `xsd:documentation` element for every Aggregate Business Information Entity MUST contain a structured set of annotations in the following sequence and pattern:

- ComponentType (mandatory): The type of component to which the object belongs. For Aggregate Business Information Entities this must be “ABIE”.
- DictionaryEntryName (mandatory): The official name of the Aggregate Business Information Entity .
- Version (optional): An indication of the evolution over time of the Aggregate Business Information Entity.
- Definition(mandatory): The semantic meaning of the Aggregate Business Information Entity.
- ObjectClassQualifier (optional): The qualifier for the object class.
- ObjectClass(mandatory): The Object Class represented by the Aggregate Business Information Entity.
- AlternativeBusinessTerms (optional): Any synonym terms under which the Aggregate Business Information Entity is commonly known and used in the business.

The following rule describes the documentation requirements for each `ccts:AssociationBusinessInformationEntity` definition.

[DOC6] The `xsd:documentation` element for every Association Business Information Entity element declaration MUST contain a structured set of annotations in the following sequence and pattern:

- ComponentType (mandatory): The type of component to which the object belongs. For Association Business Information Entities this must be “ASBIE”.
- DictionaryEntryName (mandatory): The official name of the Association Business Information Entity.
- Version (optional): An indication of the evolution over time of the Association Business Information Entity.

- Definition(mandatory): The semantic meaning of the Association Business Information Entity.
- Cardinality(mandatory): Indication whether the Association Business Information Entity represents an optional, mandatory and/or repetitive assocation.
- ObjectClass(mandatory): The Object Class containing the Association Business Information Entity.
- PropertyTermQualifier (optional): A qualifier is a word or words which help define and differentiate the Association Business Information Entity.
- PropertyTerm(mandatory): Property Term represents the Aggregate Business Information Entity contained by the Association Business Information Entity.
- AssociatedObjectClassQualifier (optional): Associated Object Class Qualifiers describe the 'context' of the relationship with another ABIE. That is, it is the role the contained Aggregate Business Information Entity plays within its association with the containing Aggregate Business Information Entity.
- AssociatedObjectClass (mandatory); Associated Object Class is the Object Class at the other end of this association. It represents the Aggregate Business Information Entity contained by the Association Business Information Entity.

The following rule describes the documentation requirements for each `ccts:CoreComponentType` definition.

[DOC8] The `xsd:documentation` element for every Supplementary Component attribute declarationMUST contain a structured set of annotations in the following sequence and pattern:

- Name (mandatory): Name in the Registry of a Supplementary Component of a Core Component Type.
- Definition (mandatory): A clear, unambiguous and complete explanation of the meaning of a Supplementary Component and its relevance for the related Core Component Type.
- Primitive type (mandatory): PrimitiveType to be used for the representation of the value of a Supplementary Component.
- Possible Value(s) (optional): one possible value of a Supplementary Component.

[DOC9] The `xsd:documentation` element for every Supplementary Component attribute declaration containing restrictions MUST include the following additional information appended to the information required by DOC8:

- Restriction Value(s) (mandatory): The actual value(s) that is (are) valid for the Supplementary Component.

4 Naming Rules

The rules in this section make use of the following special concepts related to XML elements and attributes:

- Top-level element: An element that encloses a whole UBL business message. Note that UBL business messages might be carried by messaging transport protocols that themselves have higher-level XML structure. Thus, a UBL top-level element is not necessarily the root element of the XML document that carries it.

- Lower-level element: An element that appears inside a UBL business message. Lower-level elements consist of intermediate and leaf level.

- Intermediate element: An element not at the top level that is of a complex type, only containing other elements and attributes.

- Leaf element: An element containing only character data (though it may also have attributes). Note that, because of the XSD mechanisms involved, a leaf element that has attributes must be declared as having a complex type, but a leaf element with no attributes may be declared with either a simple type or a complex type.

- Common attribute: An attribute that has identical meaning on the multiple elements on which it appears. A common attribute might or might not correspond to an XSD global attribute.

4.1 General Naming Rules

The CCTS contains specific Internal Organization for Standardization (ISO)/International Electrotechnical Commission (IEC) Technical Specification 11179 Information technolo– -- Metadata registries (MDR) based naming rules for each CCTS construct. The UBL component library, as a syntax-neutral representation, is fully conformant to those rules. The UBL syntax-specific XSD instantiation of the UBL component library—in some cases—refines the CCTS naming rules to leverage the capabilities of XML and XSD. Specifically, truncation rules are applied to allow for reuse of element names across parent element environments and to maintain brevity and clarity.

In keeping with CCTS, UBL will use English as its normative language. If the UBL Library is translated into other languages for localization purposes, these additional languages might require additional restrictions. Such restrictions are expected be formulated as additional rules and published as appropriate.

[GNR1] UBL XML element, attribute and type names MUST be in the English language, using the primary English spellings provided in the Oxford English Dictionary.

UBL fully supports the concepts of data standardization contained in ISO 11179. CCTS, as an implementation of 11179, furthers its basic tenets of data standardization into higher-level constructs as expressed by the `ccts:DictionaryEntryNames` of those constructs – such as those for `ccts:BasicBusinessInformationEntities` and `ccts:AggregateBusinessInformationEntities`. Since UBL is an implementation of CCTS, UBL uses CCTS dictionary entry names as the basis for UBL XML schema construct names. UBL converts these `ccts:DictionaryEntryNames` into UBL XML schema construct names using strict transformation rules.

[GNR2] UBL XML element, attribute and type names MUST be consistently derived from CCTS conformant dictionary entry names.

The ISO 11179 specifies—and the CCTS uses—periods, spaces, other separators, and characters not allowed by W3C XML. These separators and characters are not appropriate for UBL XML component names.

[GNR3] UBL XML element, attribute and type names constructed from `ccts:DictionaryEntryNames` MUST NOT include periods, spaces, other separators, or characters not allowed by W3C XML 1.0 for XML names.

Acronyms and abbreviations impact on semantic interoperability, and as such are to be avoided to the maximum extent practicable. Since some abbreviations will inevitably be necessary, UBL will maintain a normative list of authorized acronyms and abbreviations. Appendix B provides the current list of permissible acronyms, abbreviations and word truncations. The intent of this restriction is to facilitate the use of common semantics and greater understanding. Appendix B is a living document and will be updated to reflect growing requirements.

[GNR4] UBL XML element, attribute, and simple and complex type names MUST NOT use acronyms, abbreviations, or other word truncations, except those in the list of exceptions published in Appendix B.

UBL does not desire a proliferation of acronyms and abbreviations. Appendix B is an exception list and will be tightly controlled by UBL. Any additions will only occur after careful scrutiny to include assurance that any addition is critically necessary, and that any addition will not in any way create semantic ambiguity.

[GNR5] Acronyms and abbreviations MUST only be added to the UBL approved acronym and abbreviation list after careful consideration for maximum understanding and reuse.

Once an acronym or abbreviation has been approved, it is essential to ensuring semantic clarity and interoperability that the acronym or abbreviation is ***always*** used.

[GNR6] The acronyms and abbreviations listed in Appendix B MUST always be used.

Generally speaking, the names for UBL XML constructs must always be singular. The only exception permissible is where the concept itself is pluralized.

[GNR7] UBL XML element, attribute and type names MUST be in singular form unless the concept itself is plural.

Example:

```
Terms
```

[GNR10] Acronyms and abbreviations at the beginning of an attribute declaration MUST appear in all lower case. All other acronym and abbreviation usage in an attribute declaration must appear in upper case.

[GNR11] Acronyms MUST appear in all upper case for all element declarations and type definitions.

XML is case sensitive. Consistency in the use of case for a specific XML component (element, attribute, type) is essential to ensure every occurrence of a component is treated as the same. This is especially true in a business-based data-centric environment such as what is being addressed by UBL. Additionally, the use of visualization mechanisms such as capitalization techniques assist in ease of readability and ensure consistency in application and semantic clarity. The ebXML architecture document specifies a standard use of upper and lower camel case for expressing XML elements and attributes respectively.[12] UBL will adhere to the ebXML standard. Specifically, UBL element and type names will be in UpperCamelCase (UCC).

[GNR8] The UpperCamelCase (UCC) convention MUST be used for naming elements and types.

Example:

```
CurrencyBaseRate
CityNameType
```

UBL attribute names will be in lowerCamelCase (LCC).

[12] *ebXML, ebXML Technical Architecture Specification v1.0.4, 16 February 2001*

[GNR9] The lowerCamelCase (LCC) convention MUST be used for naming attributes.

Example:

```
amountCurrencyCodeListVersionID
characterSetCode
```

4.2 Type Naming Rules

UBL identifies several categories of naming rules for types, namely for complex types based on Aggregate Business Information Entities, Basic Business Information Entities, Primary Representation Terms, Secondary Representation Terms and the Core Component Types.

Each of these CCTS constructs have a `ccts:DictionaryEntryName` that is a fully qualified construct based on ISO 11179. As such, these names convey explicit semantic clarity with respect to the data being described. Accordingly, these `ccts:Dictionary EntryNames` provide a mechanism for ensuring that UBL xsd:complexType names are semantically unambiguous, and that there are no duplications of UBL type names for different `xsd:type` constructs.

4.2.1 Complex Type Names for CCTS Aggregate Business Information Entities

UBL `xsd:complexType` names for `ccts:AggregateBusinessInformation Entities` will be derived from their dictionary entry name by removing separators to follow general naming rules, and appending the suffix “`Type`” to replace the word “`Details`.”

[CTN1] A UBL `xsd:complexType` name based on an `ccts:Aggregate BusinessInformationEntity` MUST be the `ccts:Dictionary EntryName` with the separators removed and with the “`Details`” suffix replaced with “`Type`”.

Example:

ccts:AggregateBusiness InformationEntity	UBL xsd:complexType
Address. Details	AddressType
Financial Account. Details	FinancialAccountType

4.2.2 Complex Type Names for CCTS Basic Business Information Entity Properties

All `ccts:BasicBusinessInformationEntityProperties` are reusable across multiple `ccts:BasicBusinessInformationEntities`. The CCTS does not specify, but implies, that `ccts:BasicBusinessInformationEntityProperty` names are the reusable property term and representation term of the family of `ccts:BasicBusinessInformationEntities` that are based on it. The UBL `xsd:complexType` names for `ccts:BasicBusinessInformationEntity properties` will be derived from the shared property and representation terms portion of the dictionary entry names in which they appear by removing separators to follow general naming rules, and appending the suffix "`Type`".

[CTN2] A UBL `xsd:complexType` name based on a `ccts:BasicBusiness InformationEntityProperty` MUST be the `ccts:Dictionary EntryName` shared property term and its qualifiers and representation term of the shared `ccts:BasicBusinessInformationEntity`, with the separators removed and with the "`Type`" suffix appended after the representation term.

Example:

```
        <!--===== Basic Business Information Entity Type Definitions
=====→
        <xsd:complexType na”e="ChargeIndicatorT”pe">
                ...
        </xsd:comlextType>
```

4.2.3

4.2.4 Complex Type Names for CCTS Core Component Types

UBL `xsd:complexType` names for `ccts:CoreComponentTypes` will be derived from the dictionary entry name by removing separators to follow general naming rules, and appending the suffix "`Type`".

[CTN5] A UBL `xsd:complexType` name based on a `ccts:CoreComponentType` MUST be the Dictionary entry name of the `ccts:CoreComponentType`, with the separators removed.

Exam ple:

```
        <!-- =====  CCT: QuantityType ===== -->
        < xsd:complexType na »e="QuantityT »pe">
                ...
        </xsd:complexType>
```

4.2.5 Simple Type Names for CCTS Core Component Types

UBL `xsd:simpleType` names for `ccts:CoreComponentTypes` will be derived from the dictionary entry name by removing separators to follow general naming rules.

[STN1] Each `ccts:CCT` `xsd:simpleType` definition name MUST be the `ccts:CCT` dictionary entry name with the separators removed

4.3 Element Naming Rules

As defined in the UBL Model (See Figure 2-3), UBL elements will be created for `ccts:AggregateBusinessInformationEntities`, `ccts:BasicBusinessInformationEntities`, and `ccts:AssociationBusinessInformationEntities`. UBL element names will reflect this relationship in full conformance with ISO11179 element naming rules.

4.3.1 Element Names for CCTS Aggregate Business Information Entities

[ELN1] A UBL global element name based on a **`ccts:ABIE`** MUST be the same as the name of the corresponding **`xsd:complexType`** to which it is bound, with the word "**`Type`**" removed.

Example:

For a `ccts:AggregateBusinessInformationEntity` of `Party. Details`, Rule CTN1 states that the `Party. Details` object class becomes `PartyType` `xsd:ComplexType`. Rule ELD3 states that for the `PartyType` `xsd:complexType`, a corresponding global element must be declared. Rule ELN1 states that the name of this corresponding global element must be `Party`.

```
<xsd:element na”e="Pa”ty" ty”e="PartyT”pe"/>
 <xsd:complexType na”e="PartyT”pe">

  <xsd:annotation>

   —!--Documentation goes here-->    </xsd:annotation>

    <xsd:sequence>

      <xsd:element r”f="cbc:MarkCareIndica”or" minOccu”s”"0"
maxOccu”s”"1">

        ...

      </xsd:element>

      <xsd:element r”f="cbc:MarkAttentionIndica”or" minOccu”s”"0"
maxOccu”s”"1">

        ...
      </xsd:element>

      <xsd:element r”f="PartyIdentificat”on" minOccu”s”"0"
maxOccu”s="unboun”ed">

        ...

      </xsd:element>

      <xsd:element r”f="PartyN”me" minOccu”s”"0" maxOccu”s”"1">

        ...

      </xsd:element>

      <xsd:element r”f="Addr”ss" minOccu”s”"0" maxOccu”s”"1">

        ...
      </xsd:element>
        ...

    </xsd:sequence>
```

4.3.2 Element Names for CCTS Basic Business Information Entity Properties

The same naming concept used for `ccts:AggregateBusinessInformationEntities` applies to `ccts:BasicBusinessInformationEntityProperty`.

[ELN2]	A UBL global element name based on an unqualified `ccts:BBIEProperty` MUST be the same as the name of the corresponding `xsd:complexType` to which it is bound, with the word “`Type`” removed.

Example:

```
       <!--===== Basic Business Information Entity Type Definitions =====-
->
       <xsd:complexType na”e="ChargeIndicatorT”pe">
              ...
       </xsd:comlextType>
       ...
       <!--===== Basic Business Information Entity Property Element
Declarations =====-->
       <xsd:element na”e="ChargeIndica”or" ty”e="ChargeIndicatorT”pe"/>
```

4.3.3 Element Names for CCTS Association Business Information Entities

A `ccts:AssociationBusinessInformationEntity` is not a class like `ccts:AggregateBusinessInformationEntities` and like `ccts:BasicBusinessInformationEntityProperties` that are reused as `ccts:BasicBusinessInformationEntities`. Rather, it is an association between two classes. As such, an element representing the `ccts:AssociationBusinessInformationEntity` does not have its own unique `xsd:ComplexType`. Instead, when an element representing a `ccts:AssociationBusinessInformationEntity` is declared, the element is bound to the `xsd:complexType` of its associated `ccts:Aggregate BusinessInformationEntity.`

[ELN3] A UBL global element name based on a qualified `ccts:ASBIE` MUST be the `ccts:ASBIE` dictionary entry name property term and its qualifiers; and the object class term and qualifiers of its associated `ccts:ABIE`. All `ccts:DictionaryEntryName` separators MUST be removed. Redundant words in the `ccts:ASBIE` property term or its qualifiers and the associated `ccts:ABIE` object class term or its qualifiers MUST be dropped.

[ELN4] A UBL global element name based on a qualified `ccts:BBIEProperty` MUST be the same as the name of the corresponding `xsd:complexType` to which it is bound, with the qualifier prefixed and with the wo“d "`T”pe`" removed.

4.4 Attributes in UBL

UBL, as a transactional based XML exchange format, has chosen to significantly restrict the use of attributes. This restriction is in keeping with the fact that attribute usage is relegated to supplementary components only; all “primary” business data appears exclusively in element content. These attributes are defined in the UN/CEFACT Unqualified Datatype schema module,

5 Declarations and Definitions

In W3C XML Schema, elements are defined in terms of complex or simple types and attributes are defined in terms of simple types. The rules in this section govern the consistent structuring of these type constructs and the manner for unambiguously and thoroughly documenting them in the UBL Library.

5.1 Type Definitions

5.1.1 General Type Definitions

Since UBL elements and types are intended to be reusable, all types must be named. This permits other types to establish elements that reference these types, and also supports the use of extensions for the purposes of versioning and customization.

[GTD1] All types MUST be named.

Example:

```
        <xsd:complexType name="QuantityType">
                ...
        </xsd:complexType>
```

UBL disallows the use of xsd:anyType, because this feature permits the introduction of potentially unknown types into an XML instance. UBL intends that all constructs within the instance be described by the schemas describing that instan–e - xsd:anyType is seen as working counter to the requirements of interoperability. In consequence, particular attention is given to the need to enable meaningful validation of the UBL document instances. Were it not for this, xsd:anyType might have been allowed.

[GTD2] The xsd:anyType MUST NOT be used.

5.1.2 Simple Types

The Core Components Technical Specification provides a set of constructs for the modeling of basic data, Core Component Types. These are represented in UBL with a library of complex types, with the effect that most "simple" data is represented as property sets defined according to the CCTs, made up of content components and supplementary components. In most cases, the supplementary components are expressed as XML attributes, the content component becomes element content, and the CCT is represented with an xsd:complexType. There are exceptions to this rule in those cases where all of a CCTs properties can be expressed without the use of attributes. In these cases, an xsd:simpleType is used.

UBL does not define its own simple types. These are defined in the UN/CEFACT Unqualified Datatype schema module. UBL may define restrictions of these simple types in the UBL Qualified datatype schema module.

5.1.3 Complex Types

Since even simple datatypes are modeled as property sets in most cases, the XML expression of these models primarily employs `xsd:complexType`. To facilitate reuse, versioning, and customization, all complex types are named. In the UBL model, `ccts:AggregateBusinessInformationEntities` are considered classes(objects) .

[CTD1] For every class identified in the UBL model, a named `xsd:complexType` MUST be defined.

Example:

```
        <xsd:complexType na”e="BuildingNameT”pe">



    </xsd:complexType>
```

Every class identified in the UBL model consists of properties. These properties are either ASBIEs or BBIE properties.

[CTD20] For every BBIE property identified in the UBL model a named xsd:complexType must be defined.

5.1.3.11 Aggregate Business Information Entities

The relationship expressed by an Aggregate Business Information Entity is not directly represented with a class. Instead, this relationship is captured in UBL with a containment relationship, expressed in the content model of the parent object’s type with a sequence of elements. (Sequence facilitates the use of `xsd:extension` for versioning and customization.) The members of the sequence – elements which are themselves defined by reference to complex types – are the properties of the containing type.

[CTD2] Every `ccts:ABIE` `xsd:complexType` definition content model MUST use the `xsd:sequence` element with appropriate global element references.

Example:

```
<xsd:complexType na”e=”AddressT”pe”>

    ...

    <xsd:sequence>

      <xsd:element r”f=”cbc:CityN”me” minOccu”s””0” maxOccu”s””1”>

       ...

      </xsd:element>

      <xsd:element r”f=”cbc:PostalZ”ne” minOccu”s””0” maxOccu”s””1”>

        ...
      </xsd:elemenI...

  </xsd:sequence>

  </xsd:complexType>
```

5.1.3.12 Basic Business Information Entities

All `ccts:BasicBusinessInformationEntities`, in accordance with the Core Components Technical Specification, always have a representation term. This may be a primary or secondary representation term. Representation terms describe the structural representation of the BBIE. These representation terms are expressed in the UBL Model as Unqualified Datatypes bound to a Core Component Type that describes their structure. In addition to the unqualified Datatypes defined in CCTS, UBL has defined a set of Qualified Datatypes that are derived from the CCTS unqualified Datatypes.There are a set of rules concerning the way these relationships are expressed in the UBL XML library. As discussed above, `ccts:BasicBusinessInformation EntityProperties` are represented with complex types. Within these are simpleContent elements that extend the Datatypes.

[CTD3] Every `ccts:BBIEProperty xsd:complexType` definition content model MUST use the `xsd:simpleContent` element.

[CTD4] Every `ccts:BBIEProperty xsd:complexType` content model `xsd:simpleContent` element MUST consist of an `xsd:extension` element.

[CTD5] Every `ccts:BBIEProperty` `xsd:complexType` content model `xsd:base` attribute value MUST be the `ccts:CCT` of the Unqualified ATG Datatype or qualified UBL Datatype as appropriate.

Example:

```
<xsd:complexType name="StreetNameType”>
        <xsd:simpleContent>
                <xsd:extension base=”cct:NameType”/>
        </xsd:simpleContent>
</xsd:complexType>
```

5.1.3.13 Datatypes

There is a direct one-to-one relationship between `ccts:CoreComponentTypes` and `ccts:PrimaryRepresentationTerms`. Additionally, there are several `ccts:SecondaryRepresentationTerms` that are subsets of their parent `ccts:PrimaryRepresentationTerm`. The total set of `ccts:Representation Terms` by their nature represent `ccts:Datatypes`. Specifically, for each `ccts:PrimaryRepresentationTerm` or `ccts:SecondaryRepresentationTerm`, a `ccts:UnqualifiedDatatype` exists. In the UBL XML Library, these `ccts:UnqualifiedDatatypes` are expressed as complex or simple types that are of the type of its corresponding `ccts:CoreComponentType`.

[CTD6] For every Qualified Datatype used in the UBL model, a named `xsd:complexType` or `xsd:simpleType` MUST be defined.

5.1.3.14 Core Component Types

UBL has adopted UN/CEFACT's Core Component Type schema module.

5.2 Element Declarations

5.2.1 Elements Bound to Complex Types

The binding of UBL elements to their `xsd:complexType` is based on the associations identified in the UBL model. For the `ccts:BasicBusinessInformationEntities` and `ccts:AggregateInformationEntities`, the UBL elements will be directly associated to its corresponding `xsd:complexType`.

[ELD3] For every class identified in the UBL model, a global element bound to the corresponding `xsd:complexType` MUST be declared.

Example:

For the `Party. Details` object class, a complex type/global element declaration pair is created through the declaration of a `Party` element that is of type `PartyType`.

The element thus created is useful for reuse in the building of new business messages. The complex type thus created is useful for both reuse and customization, in the building of both new and contextualized business messages.

Example:

```
        <xsd:element”name=”Buye”Party””type=”BuyerPar”yType”/>
        <xsd:complexType”name=”BuyerPar”yTyp”I                ...
        </xsd:complexType>
```

5.2.2 Elements Representing ASBIEs

A `ccts:AssociationBusinessInformationEntity` is not a class like `ccts:AggregateBusinessInformationEntities`. Rather, it is an association between two classes. As such, the element declaration will bind the element to the xsd:complexType of the associated `ccts:AggregateBusinessInformation Entity`. There are two types of ASBIEs – those that have qualifiers in the object class, and those that do not.

[ELD4] When a `ccts:ASBIE` is unqualified, it is bound via reference to the global `ccts:ABIE` element to which it is associated. When an `ccts:ABIE` is qualified, a new element MUST be declared and bound to the `xsd:complexType` of its associated `ccts:AggregateBusiness InformationEntity`.

5.2.3 Elements Bound to Core Component Types

[ELD5] For each `ccts:CCT simpleType`, an `xsd:restriction` element MUST be declared.

5.2.4 Code List Import

[ELD6] The code list `xsd:import` element MUST contain the namespace and schema location attributes.

5.2.5 Empty Elements

[ELD7] Empty elements MUST not be declared.

5.2.6 Global Elements

The `ccts:BasicBusinessInformationEntityProperties` are reused in multiple contexts. Their reuse in a specific context is typically identified in part through the use of qualifiers. However, these qualifiers do not change the nature of the underlying concept of the `ccts:BasicBusinessInformationEntityProperties`. As such, qualified `ccts:BasicBusinessInformationEntityProperties` are always bound to the same type as that of its unqualified corresponding `ccts:BasicBusiness InformationEntityProperties`.

[ELD8]	Global elements declared for Qualified BBIE Properties must be of the same type as its corresponding Unqualified BBIE Property. (i.e. Property Term + Representation Term.)

Example:

```
<xsd:elem”nt name=”AdditionalS”reetNa”e”
type=”cbc:Stree”NameType”/>
```

5.2.7 XSD:Any Element

UBL disallows the use of `xsd:any`, because this feature permits the introduction of potentially unknown elements into an XML instance. UBL intends that all constructs within the instance be described by the schemas describing that I–nstance–- `xsd:any` is seen as working counter to the requirements of interoperability. In consequence, particular attention is given to the need to enable meaningful validation of the UBL document instances. Were it not for this, `xsd:any` might have been allowed.

[ELD9]	The `xsd:any` element MUST NOT be used.

5.2.8 Schema Location

UBL is an international standard that will be used in perpetuity by companies around the globe. It is important that these users have unfettered access to all UBL schema.

[ATD6]	Each `xsd:schemaLocation` attribute declaration MUST contain a system-resolvable URL, which at the time of release from OASIS shall be a relative URL referencing the location of the schema or schema module in the release package.

5.2.9 XSD:nil

[ATD7]	The **`xsd`** built in nillable attribute MUST NOT be used for any UBL declared element.

5.2.10 XSD:anyAttribute

UBL disallows the use of `xsd:anyAttribute`, because this feature permits the introduction of potentially unknown attributes into an XML instance. UBL intends that all constructs within the instance be described by the schemas describing that –instance–- `xsd:anyAttribute` is seen as working counter to the requirements of interoperability. In consequence, particular attention is given to the need to enable meaningful validation of the UBL document instances. Were it not for this, `xsd:anyAttribute` might have been allowed.

[ATD8]	The `xsd:anyAttribute` MUST NOT be used.

6 Code Lists

UBL has determined that the best approach for code lists is to handle them as schema modules. In recognition of the fact that most code lists are maintained by external agencies, UBL has determined that if code list owners all used the same normative form schema module, all users of those code lists could avoid a significant level of code list maintenance. By having each code list owner develop, maintain, and make available via the internet their code lists using the same normative form schema, code list users would be spared the unnecessary and duplicative efforts required for incorporation in the form of enumeration of such code lists into Schema, and would subsequently avoid the maintenance of such enumerations since code lists are handled as imported schema modules rather than cumbersome enumerations. To make this mechanism operational, UBL has defined a number of rules. To avoid enumeration of codes in the document or reusable schemas, UBL has determined that codes will be handled in their own schema modules.

[CDL1] All UBL Codes MUST be part of a UBL or externally maintained Code List.

Because the majority of code lists are owned and maintained by external agencies, UBL will make maximum use of such external code lists where they exist.

[CDL2] The UBL Library SHOULD identify and use external standardized code lists rather than develop its own UBL-native code lists.

In some cases the UBL Library may extend an existing code list to meet specific business requirements. In others cases the UBL Library may have to create and maintain a code list where a suitable code list does not exist in the public domain. Both of these types of code lists would be considered UBL-internal code lists.

[CDL3] The UBL Library MAY design and use an internal code list where an existing external code list needs to be extended, or where no suitable external code list exists.

UBL-internal code lists will be designed with maximum re-use in mind to facilitate maximum use by others.

If a UBL code list is created, the lists should be globally scoped (designed for reuse and sharing, using named types and namespaced Schema Modules) rather than locally scoped (not designed for others to use and therefore hidden from their use).

To guarantee consistency within all code list schema modules all ubl-internal code lists and externally used code lists will use the UBL Code List Schema Module. This schema module will contain an enumeration of code list values.

[CDL4] All UBL maintained or used Code Lists MUST be enumerated using the UBL Code List Schema Module.

To guarantee consistency of code list schema module naming, the name of each UBL Code List Schema Module will adhere to a prescribed form.

[CDL5] The name of each UBL Code List Schema Module MUST be of the form:

`{Owning Organization}{Code List Name}{Code List Schema Module}`

Example

```
ISO 8601 Country Code Code List Schema Module
ISO 3055 Kitchen equipment-- Coordinating sizes Code Code List
Schema Module
```

Each code list used in the UBL schema MUST be imported individually.

[CDL6] An **xsd**:`import` element MUST be declared for every code list required in a UBL schema.

The UBL library allows partial implementations of code lists which may required by customizers.

[CDL7] Users of the UBL Library MAY identify any subset they wish from an identified code list for their own trading community conformance requirements.

The following rule describes the requirements for the xsd:schemaLocation for the importation of the code lists into a UBL business document.

[CDL8] The `xsd:schemaLocation` MUST include the complete URI used to identify the relevant code list schema.

7 Miscellaneous XSD Rules

UBL, as a business standard vocabulary, requires consistency in its development. The number of UBL Schema developers will expand over time. To ensure consistency, it is necessary to address the optional features in XSD that are not addressed elsewhere.

7.1 xsd:simpleType

UBL guiding principles require maximum reuse. XSD provides for forty four built-in Datatypes expressed as simple types. In keeping with the maximize re-use guiding principle, these built-in simple types should be used wherever possible.

[GXS3] Built-in XSD Simple Types SHOULD be used wherever possible.

7.2 Namespace Declaration

The W3C XSD specification allows for the use of any token to represent its location. To ensure consistency, UBL has adopted the generally accepted convention of using the “xsd” token for all UBL schema and schema modules.

[GXS4] All W3C XML Schema constructs in UBL Schema and schema modules MUST contain the following namespace declaration on the xsd schema element:

```
    x”lns:xsd”"http://www.w3.org/2001/XMLSchema”
```

7.3 xsd:substitutionGroup

The xsd:substitutionGroup feature enables a type definition to identify substitution elements in a group. Although a useful feature in document centric XML applications, this feature is not used by UBL.

[GXS5] The `xsd:substitutionGroup` feature MUST NOT be used.

7.4 xsd:final

UBL does not use extensions in its normative schema. Extensions are allowed by customizers as outlined in the Guidelines for Customization. UBL may determine that certain type definitions are innapropriate for any customization. In those instances, the xsd:final attribute will be used.

[GXS6] The `xsd:final` attribute MUST be used to control extensions where there is a desire to prohibit further extensions.

7.5 xsd: notation

The `xsd:notation` attribute identifies a notation. Notation declarations corresponding to all the `<notation>` element information items in the `[children]`, if any, plus any included or imported declarations. Per XSD Part 2, “It is an ·error· for NOTATION to be used directly in a schema. Only Datatypes that are ·derived· from NOTATION by specifying a value for ·enumeration· can be used in a schema.” The UBL schema model does not require or support the use of this feature.

[GXS7] `xsd:notation` MUST NOT be used.

7.6 xsd:all

The `xsd:all` compositor requires occurrence indicators of `minOccurs = 0` and `maxOccurs = 1`. The `xsd:all` compositor allows for elements to occur in any order. The result is that in an instance document, elements can occur in any order, are always optional, and never occur more than once. Such restrictions are inconsistent with data-centric scenarios such as UBL.

[GXS8] The `xsd:all` element MUST NOT be used.

7.7 xsd:choice

The `xsd:choice` compositor allows for any element declared inside it to occur in the instance document, but only one. As with the `xsd:all` compositor, this feature is inconsistent with business transaction exchanges and is not allowed in UBL. While `xsd:choice` is a very useful construct in situations where customization and extensibility are not a concern, UBL does not use it because `xsd:choice` cannot be extended.

[GXS9] The `xsd:choice` element SHOULD NOT be used where customisation and extensibility are a concern.

7.8 xsd:include

The `xsd:include` feature provides a mechanism for bringing in schemas that reside in the same namespace. UBL employs multiple schema modules within a namespace. To avoid circular references, this feature will not be used except by the document schema.

[GXS10] The `xsd:include` feature MUST only be used within a document schema.

7.9 xsd:union

The `xsd:union` feature provides a mechanism whereby a datatype is created as a union of two or more existing datatypes. With UBL's strict adherence to the use of `ccts:Datatypes` that are explicitly declared in the UBL library, this feature is inappropriate except for codelists. In some cases external customizers may choose to use this technique for codelists and as such the use of the union technique may prove beneficial for customizers.

[GXS11]	The `xsd:union` technique MUST NOT be used except for Code Lists. The `xsd:union` technique MAY be used for Code Lists.

7.10 xsd:appinfo

The `xsd:appinfo` feature is used by schema to convey processing instructions to a processing application, Stylesheet, or other tool. Some users of UBL have determined that this technique poses a security risk and have employed techniques for stripping `xsd:appinfo` from schemas. As UBL is committed to ensuring the widest possible target audience for its XML library, this feature is not used – except to convey non-normative information.

[GXS12]	UBL designed schema SHOULD NOT use `xsd:appinfo`. If used, `xsd:appinfo` MUST only be used to convey non-normative information.

7.11 Extension and Restriction

UBL fully recognizes the value of supporting extension and restriction of its core library by customizers. The UBL extension and restriction recommendations are discussed in the *Guidelines for the Customization of UBL Schemas* available as part of UBL 1.0.

[GXS13]	Complex Type extension or restriction MAY be used where appropriate.

8 Instance Documents

Consistency in UBL instance documents is essential in a trade environment. UBL has defined several rules to help affect this consistency.

8.1 Root Element

UBL has chosen a global element approach.Inside a UBL document schema only a single global element is declared. Because all UBL instance documents conform to a UBL document schema, the single global element declared in that document schema will be the root element of the instance.

[RED1]	Every UBL instance document MUST use a UBL document schema.

8.2 Validation

The UBL library and supporting schema are targeted at supporting business information exchanges. Business information exchanges require a high degree of precision to ensure that application processing and corresponding business cycle actions are reflective of the purpose, intent, and information content agreed to by both trading partners. Schemas provide the necessary mechanism for ensuring that instance documents do in fact support these requirements.

[IND1]	All UBL instance documents MUST validate to a corresponding schema.

8.3 Character Encoding

XML supports a wide variety of character encodings. Processors must understand which character encoding is employed in each XML document. XML 1.0 supports a default value of UTF-8 for character encoding, but best practice is to always identify the character encoding being employed.

[IND2]	All UBL instance documents MUST always identify their character encoding with the XML declaration.

Example:

```
xml expression: UTF-8
```

UBL, as an OASIS TC, is obligated to conform to agreements OASIS has entered into. OASIS is a liaison member of the ISO/IETF/ITU/UNCEFACT Memorandum of Understanding Management Group (MOUMG). Resolution 01/08 (MOU/MG01n83) requires the use of UTF-8.

[IND3] In conformance with ISO/IETF/ITU/UNCEFACT Memorandum of Understanding Management Group (MOUMG) Resolution 01/08 (MOU/MG01n83) as agreed to by OASIS, all UBL XML SHOULD be expressed using UTF-8.

Example:

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

8.4 Schema Instance Namespace Declaration

[IND4] All UBL instance documents MUST contain the following namespace declaration in the root element:

```
xmlns:xsi=”http://www.w3.org/2001/XMLSchema-instance”
```

8.5 Empty Content.

Usage of empty elements within XML instance documents are a source of controversy for a variety of reasons. An empty element does not simply represent data that is missing. It may express data that is not applicable for some reason, trigger the expression of an attribute, denote all possible values instead of just one, mark the end of a series of data, or appear as a result of an error in XML file generation. Conversely, missing data elements can also have–meaning–- data not provided by a trading partner. In information exchange environments, different trading partners may allow, require or ban empty elements. UBL has determined that empty elements do not provide the level of assurance necessary for business information exchanges and as such will not be used.

[IND5] UBL conformant instance documents MUST NOT contain an element devoid of content or null values.

To ensure that no attempt is made to circumvent rule IND5, UBL also prohibits attempting to convey meaning by not conveying an element.

[IND6] The absence of a construct or data in a UBL instance document MUST NOT carry meaning.

Ed Note: This checklist will be reinserted when the NDRs are finalized.

Appendix A. Approved Acronyms and Abbreviations

The following Acronyms and Abbreviations have been approved by the UBL NDR Subcommittee for UBL use:

- A Dun & Bradstreet Data Universal Numbering System (DUNS) number *must* appear as "DUNS".

- "Identifier" *must* appear as "ID".

- "Uniform Resource Identifier" *must* appear as "URI"

- [Example] the "Uniform Resource. Identifier" portion of the **Binary Object. Uniform Resource. Identifier** supplementary component becomes "URI" in the resulting XML name). The use of URI for Uniform Resource Identifier takes precedence over the use of "ID" for "Identifier".

This list will henceforth be maintained by the UBL TC as a committee of the whole, and additions included in current and future versions of the UBL standard will be maintained and published separately.

Appendix B. Technical Terminology

Ad hoc schema processing	Doing partial schema processing, but not with official schema validator software; e.g., reading through schema to get the default values out of it.
Aggregate Business Information Entity (ABIE)	A collection of related pieces of business information that together convey a distinct business meaning in a specific Business Context. Expressed in modelling terms, it is the representation of an Object Class, in a specific Business Context.
Application-level validation	Adherence to business requirements, such as valid account numbers.
Assembly	Using parts of the library of reusable UBL components to create a new kind of business document type.
Business Context	Defines a context in which a business has chosen to employ an information entity. The formal description of a specific business circumstance as identified by the values of a set of *Context Categories*, allowing different business circumstances to be uniquely distinguished.

Business Object	An unambiguously identified, specified, referenceable, registerable and re-useable scenario or scenario component of a business transaction. The term business object is used in two distinct but related ways, with slightly different meanings for each usage: In a business model, business objects describe a business itself, and its business context. The business objects capture business concepts and express an abstract view of the business's "real world". The term "modeling business object" is used to designate this usage. In a design for a software system or in program code, business objects reflects how business concepts are represented in software. The abstraction here reflects the transformation of business ideas into a software realization. The term "systems business objects" is used to designate this usage.
business semantic(s)	A precise meaning of words from a business perspective.
Business Term	This is a synonym under which the Core Component or Business Information Entity is commonly known and used in the business. A Core Component or Business Information Entity may have several business terms or synonyms.
class	A description of a set of objects that share the same attributes, operations, methods, relationships, and semantics. A class may use a set of interfaces to specify collections of operations it provides to its environment. See interface.

class diagram	Shows static structure of concepts, types, and classes. Concepts show how users think about the world; types show interfaces of software components; classes show implementation of software components. (OMG Distilled) A diagram that shows a collection of declarative (static) model elements, such as classes, types, and their contents and relationships. (Rational Unified Process)
classification scheme	This is an officially supported scheme to describe a given *Context Category*
Common attribute	An attribute that has identical meaning on the multiple elements on which it appears. A common attribute might or might not correspond to an XSD global attribute.
component	One of the individual entities contributing to a whole.
context	Defines the circumstances in which a Business Process may be used. This is specified by a set of Context Categories known as Business Context. (See Business Context.)
context category	A group of one or more related values used to express a characteristic of a business circumstance.
Document schema	A schema document corresponding to a single namespace, which is likely to pull in (by including or importing) schema modules.
Core Component	A building block for the creation of a semantically correct and meaningful information exchange package. It contains only the information pieces necessary to describe a specific concept.

Core Component Type	A Core Component which consists of one and only one Content Component that carries the actual content plus one or more Supplementary Components giving an essential extra definition to the Content Component. Core Component Types do not have business semantics.
Datatype	A descriptor of a set of values that lack identity and whose operations do not have side effects. Datatypes include primitive pre-defined types and user-definable types. Pre-defined types include numbers, string and time. User-definable types include enumerations. (XSD) Defines the set of valid values that can be used for a particular *Basic Core Component Property* or *Basic Business Information Entity Property*. It is defined by specifying restrictions on the *Core Component Type* that forms the basis of the *Datatype*. (CCTS)
Generic BIE	A semantic model that has a "zeroed" context. We are assuming that it covers the requirements of 80% of business uses, and therefore is useful in that state.
instance	An individual entity satisfying the description of a class or type.
Instance constraint checking	Additional validation checking of an instance, beyond what XSD makes available, that relies only on constraints describable in terms of the instance and not additional business knowledge; e.g., checking co-occurrence constraints across elements and attributes. Such constraints might be able to be described in terms of Schematron.
Instance root/doctype	This is still mushy. The transitive closure of all the declarations imported from whatever namespaces are necessary. A doctype may have several namespaces used within it.
Intermediate element	An element not at the top level that is of a complex type, only containing other elements and attributes.

Internal schema module:	A schema module that does not declare a target namespace.
Leaf element	An element containing only character data (though it may also have attributes). Note that, because of the XSD mechanisms involved, a leaf element that has attributes must be declared as having a complex type, but a leaf element with no attributes may be declared with either a simple type or a complex type.
Lower-level element	An element that appears inside a business message. Lower-level elements consist of intermediate and leaf level.
Object Class	The logical data grouping (in a logical data model) to which a data element belongs (ISO11179). The *Object Class* is the part of a *Core Component*'s *Dictionary Entry Name* that represents an activity or object in a specific *Context*.
Namespace schema module:	A schema module that declares a target namespace and is likely to pull in (by including or importing) schema modules.
Naming Convention	The set of rules that together comprise how the dictionary entry name for *Core Components* and *Business Information Entities* are constructed.
(XML) Schema	An XML Schema consists of components such as type definitions and element declarations. These can be used to assess the validity of well-formed element and attribute information items (as defined in [XML-Infoset]), and furthermore may specify augmentations to those items and their descendants.
Schema module	A collection of XML constructs that together constitute an XSD conformant schema. Schema modules are intended to be used in combination with other XSD conformant schema.

Schema Processing	Schema validation checking plus provision of default values and provision of new infoset properties.
Schema Validation	Adherence to an XSD schema.
semantic	Relating to meaning in language; relating to the connotations of words.
Top-level element	An element that encloses a whole UBL business message. Note that UBL business messages might be carried by messaging transport protocols that themselves have higher-level XML structure. Thus, a UBL top-level element is not necessarily the root element of the XML document that carries it.
type	Description of a set of entities that share common characteristics, relations, attributes, and semantics. A stereotype of class that is used to specify an area of instances (objects) together with the operations applicable to the objects. A type may not contain any methods. See class, instance. Contrast interface.

Appendix C. References

[CCTS] ISO 15000-5 ebXML Core Components Technical Specification

[ISONaming] *ISO/IEC 11179,* Final committee draft, Parts 1-6.

(RFC) 2119 S. Bradner, *Key words for use in RFCs to Indicate Requirement Levels*, http://www.ietf.org/rfc/rfc2119.txt, IETF RFC 2119, March 1997.

[UBLChart] UBL TC Charter, http://oasis-open.org/committees/ubl/charter/ubl.htm

[XML] *Extensible Markup Language (XML) 1.0* (Second Edition), W3C Recommendation, October 6, 2000

(XSD) *XML Schema*, W3C Recommendations Parts 0, 1, and 2. 2 May 2001.

(XHTML) *XHTML™ Basic*, W3C Recommendation 19 December 2000: http://www.w3.org/TR/2000/REC-xhtml-basic-20001219

Appendix D. Notices

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