Message Development Guide for Agriculture and Horticulture

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Composition of Message Development Guide for Agriculture and Horticulture Working Group

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1. Background

1.1. Who is this document for?

This document is intended for anyone involved in the development and implementation of standard messages for electronic data interchange in the agricultural and horticultural sectors. Depending on their role in the project, this could include principals, project leaders or standardisation specialists. This is the final document produced by the working group.

1.2. Background to the project

Message standards are specified and documented in different ways in the various sectors and domains. For example, Frugicom bases its data transfer activity closely on GS1 ('subsets' of UNCEFACT[1]); Florecom uses the UNCEFACT Core Components Library (UNCCL) as a basis; Edibulb messages are based on ebXML and the Datatuin data dictionary; AgroConnect follows the EDIFACT, ADIS and ADED standards for the animal sectors. Digipoort, the Dutch government information exchange system, Digipoort for eInvoicing, is based on the UBL standards from Oasis[2]. In addition, the government uses data elements in its regulations and grant schemes which are not fully aligned with those used by the industry or the international field. For an analysis of the differences in message standardisation in agriculture and horticulture, reference is made to the Annex 'Analysis of agricultural and horticultural message standardisation'.

The uncontrolled growth in standards is an undesirable development which impedes robust growth in EDI applications in the sector and creates extra work in the form of analysis, definition, implementation, conversion and maintenance. There is a need for harmonisation, a single methodology for modelling information flows, the development of data models (ontology/semantics) and the definition of standard messages. A methodology, in other words, which is in line with international message standardisation.

The Dutch Ministry of the Environment, Agriculture & Infrastructure (EL&I)[3] therefore commissioned the Message Development Guide for Agriculture and Horticulture Working Group (LBL working group) at the start of 2011 to develop a guideline for new standards for data interchange in the agrofeed, agrofood and flower sectors. This initiative is part of the broader EL&I initiative 'Agricultural Standards'.

Apart from fleshing out the Guide, this report also looks at the selection of tools to support the development and management of message standards and at the organisational structure needed for the management and maintenance of those standards in a national and international context.

1.3. Purpose and scope of the Guide

The Guide is intended for the specification of standard messages for electronic data interchange in agriculture and horticulture. This is intended to lead to:
- a more uniform approach, working method and documentation of messaging standards;
- harmonisation of message development and improved interoperability within agriculture and horticulture;
- the creation of a 'family' of standard messages for exchanging information in agriculture and horticulture.
- better interchangeability of standard messages between the various sectors and domains, and the reuse of messages and standard components already defined.

In short, the aim is a more efficient development and implementation of new data interchange applications in which less time needs to be spent on selecting the right standard and energy can be invested primarily to analysing and optimising the linkage of business processes (business information demand).;

[1] GS1 XML messages are not subsets of UN XML messages; they are constructed according to the XML Design Rules for GS1, which are partly based on the UNCEFACT XML Naming and Design Rules and makes use of the applicable data definitions in the GS1 GDD (Global Data Dictionary), which is partly aligned with the UNCEFACT CCL, This is also the case for TDED versus the data elements used in EANCOM.
[2] NESUBL2, Nothern European Subset of UBL, mandatory bylaw in the Netherlands, Denmark, Sweden, Norway, Iceland and Turkey.
[3] Designated contacts on behalf of EL&I: Ms Puck Bonnier, Mr Tony Nolde and Mr Aart Monster.

The development of standards for data interchange protocols (Web-based services, FTP, e-mail, etc.) falls outside the scope of this Guide.

1.4. Definition of a message

A message in this context is a formalised, structured digital representation of information that can be exchanged by computer between and within companies. The content of a message may correspond with an existing document (e.g. an invoice), but may also comprise a limited dataset which is used in a Web-service request/response routine.

A standard message is a message that is widely used for exchanging information between and within companies, for which the specifications are freely available via standardisation organisation to interested parties and stakeholders (i.e. no or limited conditions for use).

Standard messages are important because of:
- the positive network effects (more valuable as the number of users increases);
- the prevention of vendor lock-ins (standards form a decoupling point);
- the encouragement of innovation, increased variety of products and services (as soon as the interface is known, third parties can link up with it);
- the lowering of transaction costs (no need to maintain lots of bilateral connections);
- the encouragement of and support for virtual (global) trade;
- increased efficiency in commercial chains in agriculture and horticulture.

2. Positioning of UNCEFACT

It is important that the Message Guide should as far as possible be aligned with international developments.

2.1. Standardisation organisations

Several organisations are active at global, European and national level in developing and managing standards for data interchange. Each organisation has its own applications domain and geographical area of operation. These organisations have entered into cooperation agreements and reuse (parts of) each other's standards.

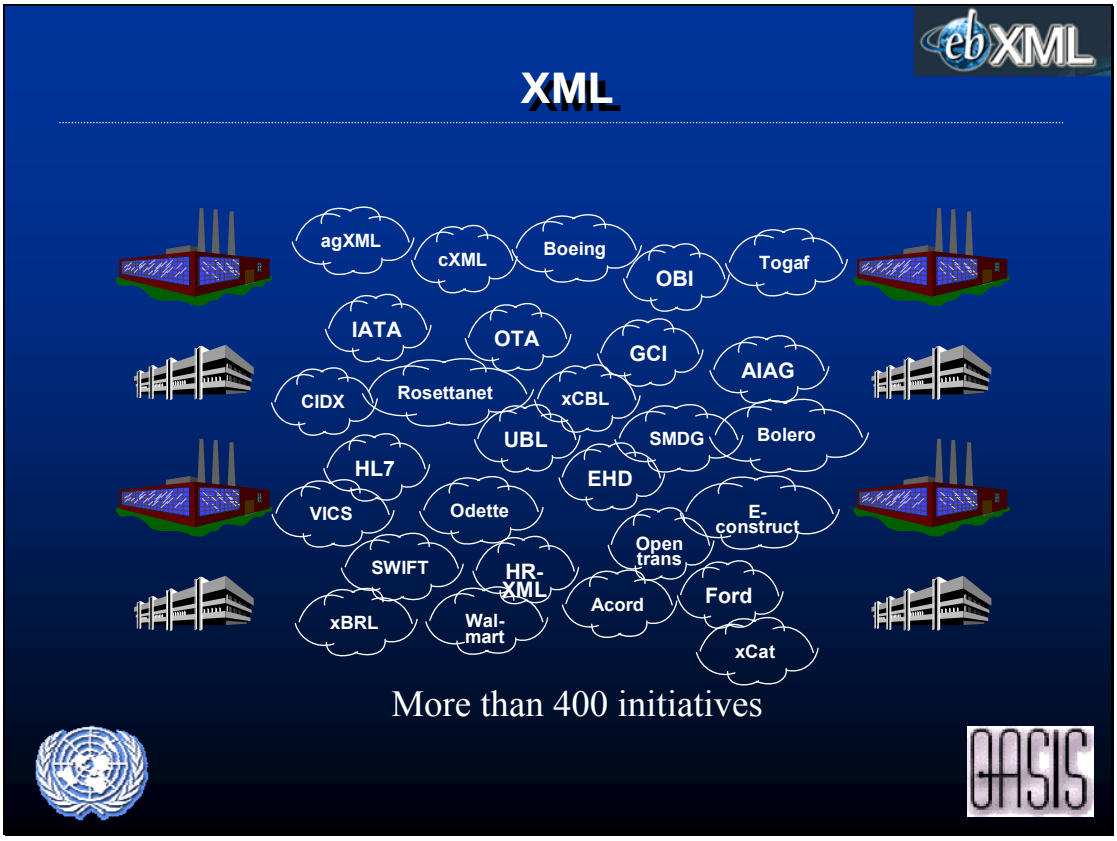


Figure 2.1.1: There is a large number of standardisation organisations, each with its own domain.

2.2. UNCEFACT standard messages

UNCEFACT is the message standardisation organisation of the United Nations. UNCEFACT administers and maintains both the 'old' EDIFACT messages and the ‘new’ UNCEFACT XML messages. The message standards are based on the UNCEFACT Core Components Library (UNCCL). GS1 also aligns as closely as possible with UNCCL in its message protocols.

A UNCEFACT standard message is an electronic message which meets the requirements set by UNCEFACT, which is built from UNCEFACT core components and which has been compiled on the basis of an XSD published by UNCEFACT.

The LBL working group proposes that as far as possible, the development of new message standards should be aligned with the UNCEFACT standards. To prevent the proliferation of all manner of XML dialects based on the Core Components Technical Specifications (CCTS), it is important that newly defined messages and Core Components are registered with UNCEFACT (UNCCL); this is essential for harmonisation and improved interoperability.

To date, UNCEFACT standard messages have been used mainly for exchanging commercial, logistical and financial information in the B2B, B2G and G2G domains.

References:
- Homepage of the UN Centre for Trade Facilitation and E-business (UNCEFACT): http://www.unece.org/cefact/
- Overview and archive of the different versions of the Core Components Library (UN/CCL): http://www.unece.org/cefact/codesfortrade/unccl/CCL_index.htm
- Overview and archive of the available UNCEFACT XML schemas (XSDs): http://www.unece.org/cefact/xml_schemas/index.html.

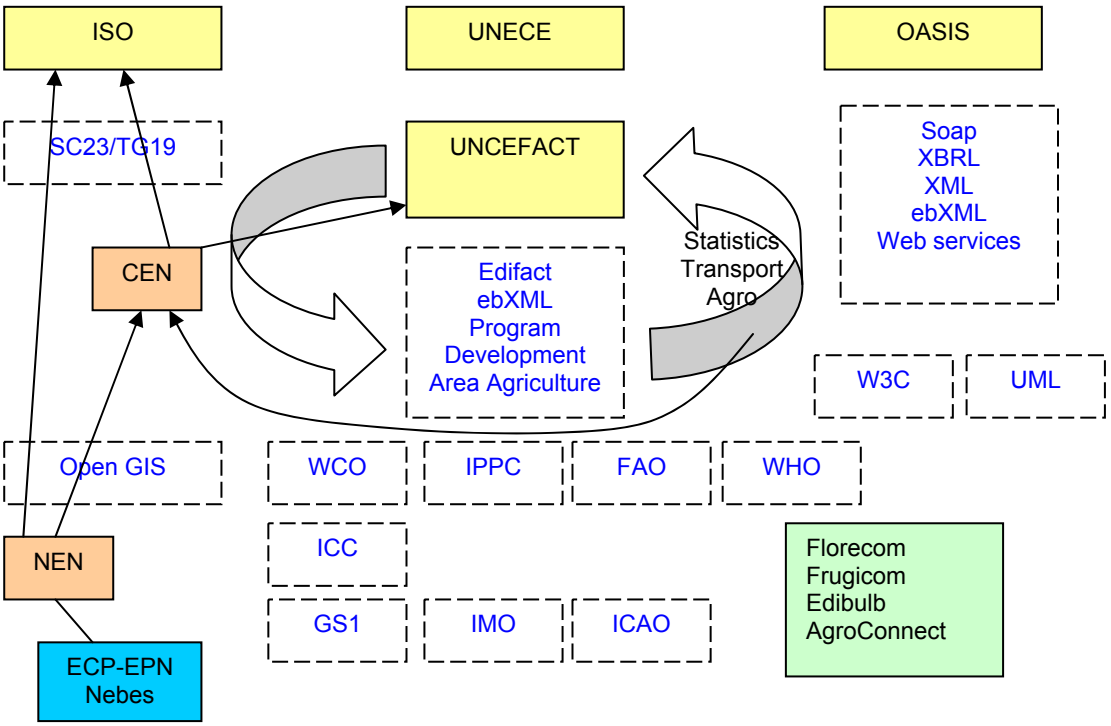


Figure 2.2.2.: Positioning of national and international standardisation organisations.

For further information on the interface with other standardisation organisations and initiatives, please refer to the Annex 'Interfaces between UNCEFACT and other standards'. UNCEFACT and ISO try to align with each other as far as possible; see Annexes 'Alignment of TDED, CCL and EDIFACT' and 'ISO standards'.

3. The standardisation process

Before discussing the development of a UNCEFACT standard message, this chapter looks at the standardisation process and the level of standardisation, and at the choices that can be made in this regard.

3.1. Layered message standards

When introducing standard message exchange systems, a host of semantic, syntactic and technical standards come into play. The Interoperability Matrix below shows the layering of standards. The Message Development Guide for Agriculture and Horticulture is concerned mainly with the layer 'Semantic Interoperability'.

<table>
<tr><td rowspan="2">Common Semantics</td><td>Vertical Industry Language: Human Resource (HR-XML)</td><td>Vertical Industry Language: (more than 100)</td><td>Vertical Industry Language: Healthcare (HL7)</td><td rowspan="2">Semantic Interoperability</td></tr>
<tr><td colspan="3">Horizontal Language (OASIS, UBL)</td></tr>
<tr><td colspan="4">Common Syntax (XML)</td><td>Syntactic Interoperability (often part of technical interoperability)</td></tr>
<tr><td rowspan="4">Common Message Mechanism (Web Services)</td><td colspan="3">Service Composition (WS-BPEL)</td><td rowspan="6">Technical Interoperability</td></tr>
<tr><td colspan="3">Service Discovery (UDDI)</td></tr>
<tr><td colspan="3">Service Description (WSDL)</td></tr>
<tr><td colspan="3">XML Messaging (SOAP)</td></tr>
<tr><td rowspan="2">Common Communication Mechanism (Internet)</td><td colspan="3">Transport (HTTP, SMTP, FTP, BEEP)</td></tr>
<tr><td colspan="3">Common Networking (TCP/IP)</td></tr>
</table>

Figure 3.1.1.: Interoperability matrix[4].

For the semantic standards, a distinction is made between horizontal and vertical standards. Horizontal standards cover several sectors and segments, while vertical standards apply for a specific production column.

International vertical standards often require specific definition, for example to ensure that they match perfectly with the business processes in a given country (in this case the Netherlands).*Standards, also referred to as agreements or application profiles, are set at national level to translate the international standard for national application. This results in the following classification of standards:

- International horizontal standard.
- International vertical standard.
- National standard/application profile/agreement/taxonomy.
- National vocabulary/coding lists/etc.

Within this layered structure, the aim is to make use of existing standards as far as possible rather than constantly reinventing the wheel.

Standardisation organisations use different strategies when developing standards. These strategies are shown in the figure below. To ensure optimum interoperability, it is wise to keep to the international standards as far as possible and to choose a strategy on the right-hand side of the figure.

[4] Source: BOMOS, Beheer- en OntwikkelModel voor Open Standaarden, by Erwin Folmer, Nederland Open in Verbinding (NOiV), TNO-Informatie- & communicatietechnologie.

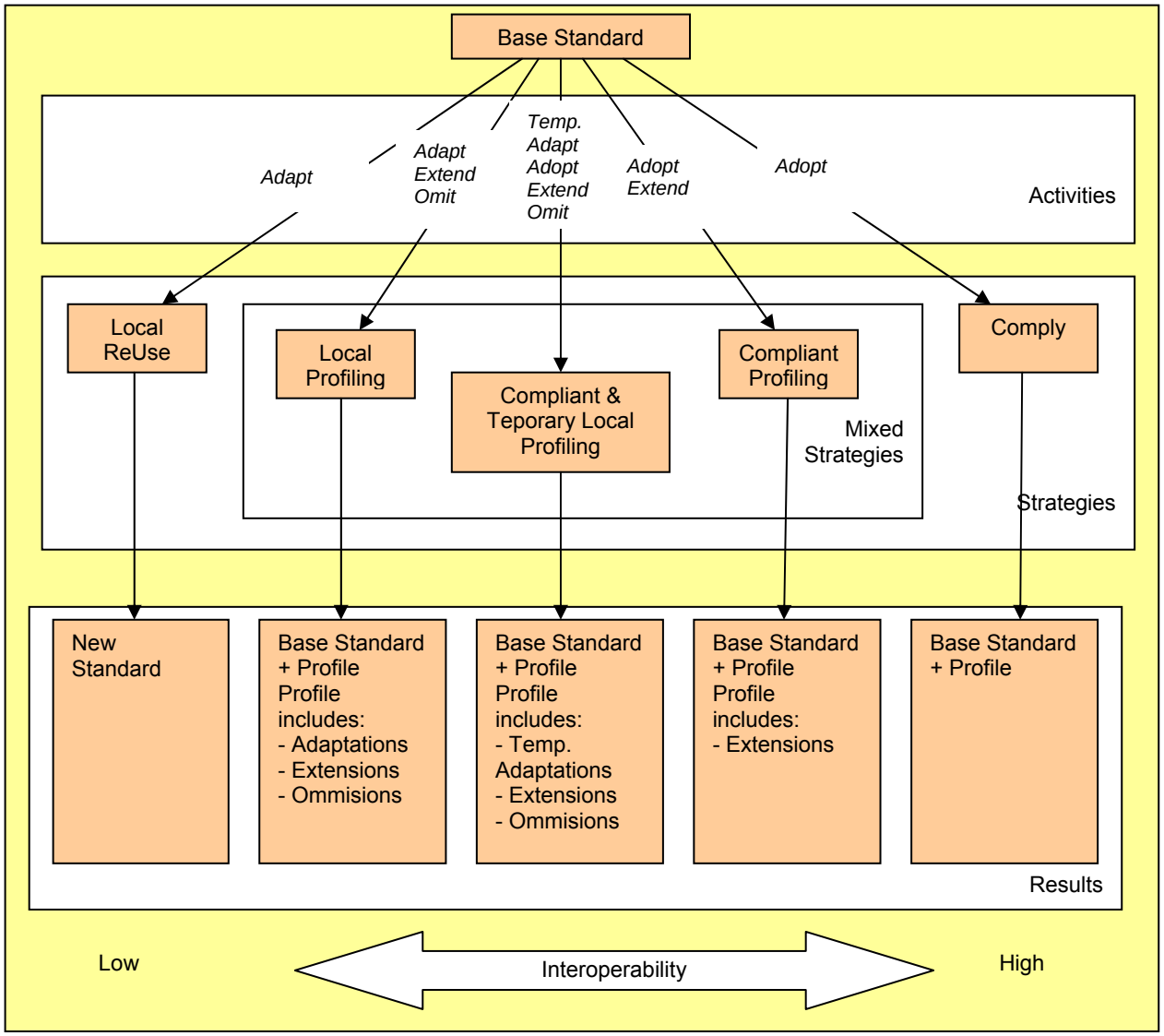


Figure 3.1.2.: Development strategies for standards[5].

Explanation of strategies:

Strategy	Features
Local Re-Use	Reuse of international standard, adaptation to needs and creation of new standard.
Local Profiling	A profile (which does not comply with the international standard) on top of the international standard, in which all adaptations have been incorporated.
Compliant & Temporary Local Profiling	A profile to which, in principle, only permitted additions have been made, but which also includes temporary solutions to issues introduced at international level for which a temporary solution is justified. This temporary solution does not comply with the international standard.
Compliant Profiling	The profile only contains additions that comply with international standards.
Comply	100% adoption of international standard without modifications or additions.

[5] Source: BOMOS, Beheer- en OntwikkelModel voor Open Standaarden, by Erwin Folmer, Nederland Open in Verbinding (NOiV), TNO-Informatie- & communicatietechnologie.

4. Development of UNCEFACT standard messages

When defining a new standard message for electronic data interchange, alignment should as far as possible be sought with the UNCEFACT standards and methods. The process for defining a new UNCEFACT data interchange standard comprises three steps:

Step 1: Formulate Business Requirement Specifications (BRS).
Step 2: Formulate Requirement Specification Mapping (RSM).
Step 3: Formulate Implementation Guideline (IG).

The different process steps and documents needed to create an electronic message are described in the Annex 'Message development flow chart'.

As a minimum, a BRS and RSM must be supplied in order to create a UNCEFACT standard (the IG is not mandatory for a UNCEFACT standard).

4.1. Formulating Business Requirement Specifications

The BRS describes one or more use cases in company-specific terminology. A use case is an application of the message. The BRS describes which data are exchanged between which actors and how the dialogue (sequence of message exchanges) proceeds. The BRS is formulated by the initiators, is specific and is recognisable for experts from the application domain, and is written in understandable (domain-specific) language.

UML (Unified Modelling Language)[6] is used for the modelling. UML offers the following diagram techniques for describing the application.

1. Use case diagram
2. Class diagram
3. Object diagram
4. Sequence diagram
5. Collaboration diagram
6. Statechart diagram
7. Activity diagram
8. Component diagram
9. Deployment diagram

It is not mandatory to use all diagrams when describing the use cases, but it is recommended that the following diagrams should in any event be used:

1. Use case diagram: provides an insight into the information exchange between the actors.
2. Class diagram: shows the relationship between the data to be exchanged (the data structure).
4. Sequence diagram: provides an insight into the dialogue (message sequence) between the actors.
7. Activity diagram: provides an insight into the logic of the data-processing.

Where it is preferable to use Entity Relation Diagrams (ERDs) instead of Class Diagrams, this is permitted.

The BRS describes the relevant actors, processes, information flows and data elements in a way that is understandable for the business. The user defines the BIEs (Business Information Entities), ABIEs (Aggregate Business Information Entities) and ASBIEs (Associated Business Information Entities) in the BRS. The pre-defined core data types from the Core Component Library (the UNCCL) are used for defining the business entities (see figure 4.1.1 and table 4.1.3).

For a detailed description of BIEs, ABIEs and ASBIEs, reference is made to the document ‘Core Components Technical Specification’ (see below under 'References').

[6] UMM is part of UML. UML is used to describe UMM components, i.e. components which describe the entire business process.

The BIEs, ABIEs and ASBIEs are described in the terminology and context of the domain in question (e.g. 'horticulture' or 'dairy farming'). BIEs, ABIEs and ASBIEs relate to the data model, which forms part of the BRS. The data model describes the semantics (definitions of entity types, attributes and data types). By way of illustration, figure 4.1.1 shows the Class Diagram of the Business Information Entities for the animal passport. Tables 4.1.1 and 4.1.2 show the associated ABIEs, BBIEs and ASBIEs.

If a standard UNCEFACT XML message is used, it is based on the Core Components, not on the Business Entities. The relationship between the Business Entities and the Core Components is described in the Requirement Specification Mapping (see section 4.2)

The Core Components Library (UNCCL) contains both the Core Components (CCs) and the Business Entities. It is advisable when describing the BIEs, ABIEs and ASBIEs to use available BIEs which have already been used in existing message definitions. The BIEs, ABIEs and ASBIEs are included in the UNCCL BIE section. They are formulated by the expert group which also compiles the message. The proposals are validated by experts from other domains, who look mainly at the overlap and interaction with other domains. The specification of the Business Entities is drawn up in accordance with the UNCEFACT NDR (XML Naming and Design Rules).

The UNCCL is described in the 'UNCEFACT Core Components Technical Specification'. This document explains what a core component is, what types of core components there are and how they relate to each other.

References:
- Brief introduction to UML: 'Practical UML™: A Hands-On Introduction for Developers': http://edn.embarcadero.com/article/31863
- UNCEFACT Business Requirement Specification Document Template (CEFACT/ICG/005): www.unece.org/cefact/brs/TBG18-BRS-Proxy-Sep09.pdf
- Core Components Technical Specification, Version 3.0, 29 September 2009: http://www.unece.org/cefact/codesfortrade/CCTS/CCTS-Version3.pdf
- UNCEFACT Core Components directory: http://www.unece.org/cefact/codesfortrade/unccl/CCL_index.html
- UNCEFACT XML schemas (XSDs): http://www.unece.org/cefact/xml_schemas/index.html
- Example of a BRS: 'BRS Cattle registration and movement data exchange and animal passport': http://www.unece.org/fileadmin/DAM/cefact/brs/TBG18-BRSCattleRegistrationAnimalPassport.doc
- UNCEFACT Modelling Methodology User Guide (CEFACT/TMG/N093) http://www.unece.org/cefact/umm/umm_index.html
  UNCEFACT XML Naming and Design Rules http://www.unece.org/cefact/xml/xml_index.html

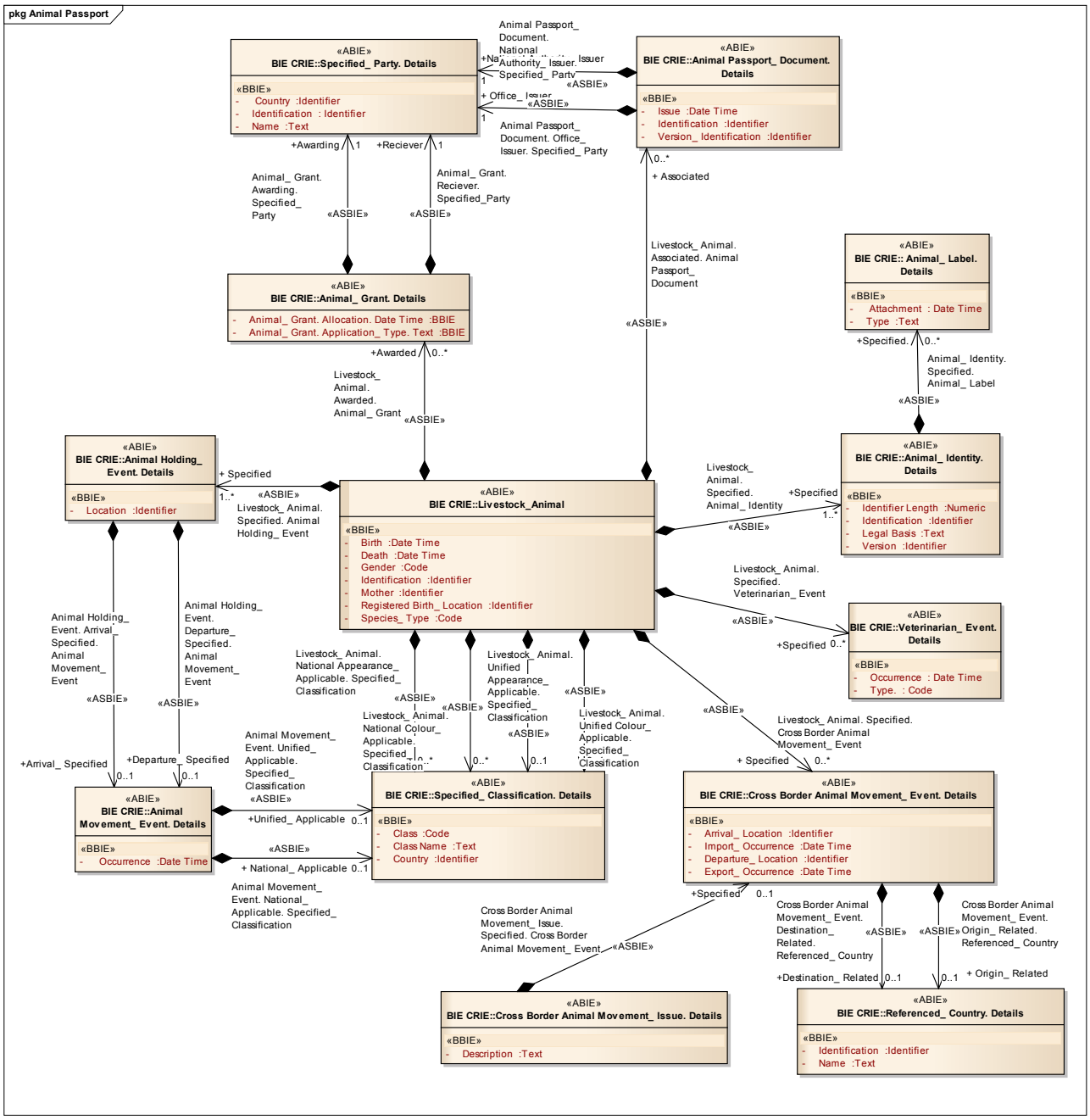


Figure 4.1.1.: Example of Class Diagram for animal passport, with Business Information Entities[7].

[7] Source: UNCEFACT , RSM cattle registration information exchange, Frans van Diepen (EL&I-DR).

Unique UN Assigned ID	ABIE/ BBIE/ ASBIE/ACC/BCC/ASCC/DT/CC/ SC	Dictionary Entry Name (auto generated)	Definition Mandatory	Object Class Term Qualifier (s)	Object Class Term	Property Term	Representation Term	Occurrence Min	Occurrence Max
UN01007642	**ABIE**	Livestock_ Animal. Details	A domesticated creature kept or raised on a farm or ranch.	Livestock	Animal				
UN01007643	**BBIE**	Livestock_ Animal. Identification. Identifier	The identifier for this livestock animal, such as the number appearing on its ear tag.	Livestock	Animal	Identification	Identifier	1	1
UN01007644	**BBIE**	Livestock_ Animal. Birth. Date Time	The date of birth for this livestock animal.	Livestock	Animal	Birth	Date Time	1	1
UN01007645	**BBIE**	Livestock_ Animal. Death. Date Time	The date of death for this livestock animal.	Livestock	Animal	Death	Date Time	0	1
UN01007646	**BBIE**	Livestock_ Animal. Gender. Code	The code specifying the gender of this livestock animal, such as male, female or castrated.	Livestock	Animal	Gender	Code	1	1
UN01007647	**BBIE**	Livestock_ Animal. Mother. Identifier	The identifier of the mother of this livestock animal.	Livestock	Animal	Mother	Identifier	0	1
UN01007648	**BBIE**	Livestock_ Animal. Registered Birth_ Location. Identifier	The identifier of the registered location of the birth of this livestock animal.	Livestock	Animal	Location	Identifier	0	1
UN01007649	**BBIE**	Livestock_ Animal. Species_ Type. Code	The code specifying the type of species for this livestock animal, such as bovine, sheep or goat.	Livestock	Animal	Type	Code	1	1

Table 4.1.1: Core Components: Aggregate Business Information Entity (ABIE) and Basic Business Information Entities (BBIE) [8].

Unique UN Assigned ID	ABIE/ BBIE/ ASBIE/ ACC BCC /ASCC/ DT/CC/ SC	Dictionary Entry Name (auto generated)	Definition Mandatory	Object Class Term Qualifier(s)	Object Class Term	Property Term Qualifier(s)	Property Term	Associated Object Class Term Qualifier(s)	Associated Object Class	Occurrence Min	Occurrence Max
UN01007650	**ASBIE**	Livestock_ Animal. National Appearance_ Applicable. Specified_ Classification	A national appearance classification applicable to this livestock animal.	Livestock	Animal	National Appearance	Applicable	Specified	Classification	0	unbounded
UN01007651	**ASBIE**	Livestock_ Animal. Unified Appearance_ Applicable. Specified_ Classification	The unified appearance classification applicable to this livestock animal.	Livestock	Animal	Unified Appearance	Applicable	Specified	Classification	0	1
UN01007652	**ASBIE**	Livestock_ Animal. National Colour_ Applicable. Specified_ Classification	A national colour or pattern classification applicable to this livestock animal.	Livestock	Animal	National Colour	Applicable	Specified	Classification	0	unbounded
UN01007653	**ASBIE**	Livestock_ Animal. Unified Colour_ Applicable. Specified_ Classification	The unified colour or pattern classification applicable to this livestock animal.	Livestock	Animal	Unified Colour	Applicable	Specified	Classification	0	1
UN01007654	**ASBIE**	Livestock_ Animal. Specified. Animal_ Identity	Identifying information specified for this livestock animal.	Livestock	Animal		Specified	Animal	Identity	1	unbounded
UN01007655	**ASBIE**	Livestock_ Animal. Specified. Veterinarian_ Event	A veterinarian event specified for this livestock animal.	Livestock	Animal		Specified	Veterinarian	Event	0	unbounded
UN01007656	**ASBIE**	Livestock_ Animal. Specified. Animal Holding_ Event	An animal holding event specified for this livestock animal.	Livestock	Animal		Specified	Animal Holding	Event	1	unbounded
UN01007657	**ASBIE**	Livestock_ Animal. Specified. Cross Border Animal Movement_ Event	A cross border movement event specified for this livestock animal.	Livestock	Animal		Specified	Cross Border Animal Movement	Event	0	unbounded
UN01007658	**ASBIE**	Livestock_ Animal. Awarded. Animal_ Grant	A grant awarded for this livestock animal.	Livestock	Animal		Awarded	Animal	Grant	0	unbounded
UN01007659	**ASBIE**	Livestock_ Animal. Associated. Animal Passport_ Document	An animal passport associated with this livestock animal.	Livestock	Animal		Associated	Animal Passport	Document	0	unbounded

Table 4.1.2 : Core Components: Associated Aggregate Business Information Entity (ASBIE) [9].

[8] Source: UNCEFACT CCL11a.

[9] Source: UNCEFACT CCL11a.

4.2. Requirement Specification Mapping

With support from UNCEFACT, the Requirement Specification Mapping (RSM) is used to map the company-specific data model from the BRS (Business Requirements Specifications) to the UNCEFACT Core Components, using the UNCEFACT Core Components Library (UNCCL)[10]. New data elements that have not yet been incorporated in the UNCCL are added to a new version of the UNCCL. The Core Components are classified in accordance with the data types and Naming and Design Rules (NDR).

The business objects, defined as BIEs, ABIEs and ASBIEs, are mapped onto generic objects from the UNCCL in the RSM (Requirement Specification Mapping) using the business-specific language. Each BIE is linked to an existing or newly created Core Component element (CC):
- ABIEs -> ACCs (Aggregate Core Component, entity types)
- BBIEs -> BCCs (Basic Core Component, attributes)
- ASBIEs -> ASCCs (Association Core Component, relationships)

The BCCs, ACCs and ASCCs are incorporated in the CC section of the UNCCL. In addition, if a message schema (XSD) is also defined, Core Components are entered in the 'message CC' section of the UNCCL.

Figures 4.2.1 and 4.2.2 show the structural relationship between the Business Information Entities (BIEs) and the Core Components (CCs). Figure 4.2.3 presents a Class Diagram of the Core Components for the animal passport. This figure shows the mapping of the BIEs on to the CCs.

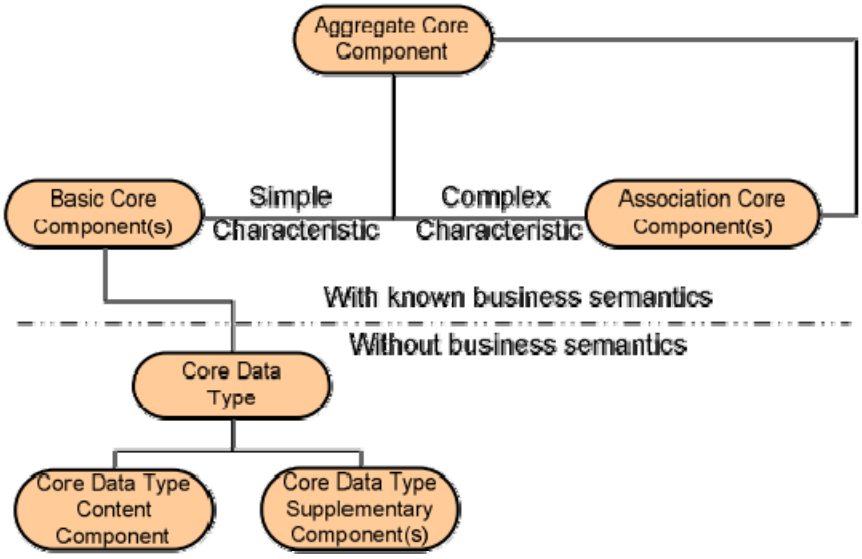


Figure 4.2.1 : Position of UN Core Components[11].

10 Documents can also be found in programme development areas on the UNCEFACT website under the menu option 'About us'': http://www.unece.org/tradewelcome/areas-of-work/un-centre-for-trade-facilitation-and-e-business-uncefact/about-us/programme-development-areas-pdas/supply-chain.html and/or work in progress by the UNCEFACT harmonisation working group on Programme Development Area Methodology and Technology (https://sites.google.com/a/documentengineeringservices.com/methodology-and-technology-website/).

11 Source: Core Components Technical Specification, Version 3.0, 29 September 2009.

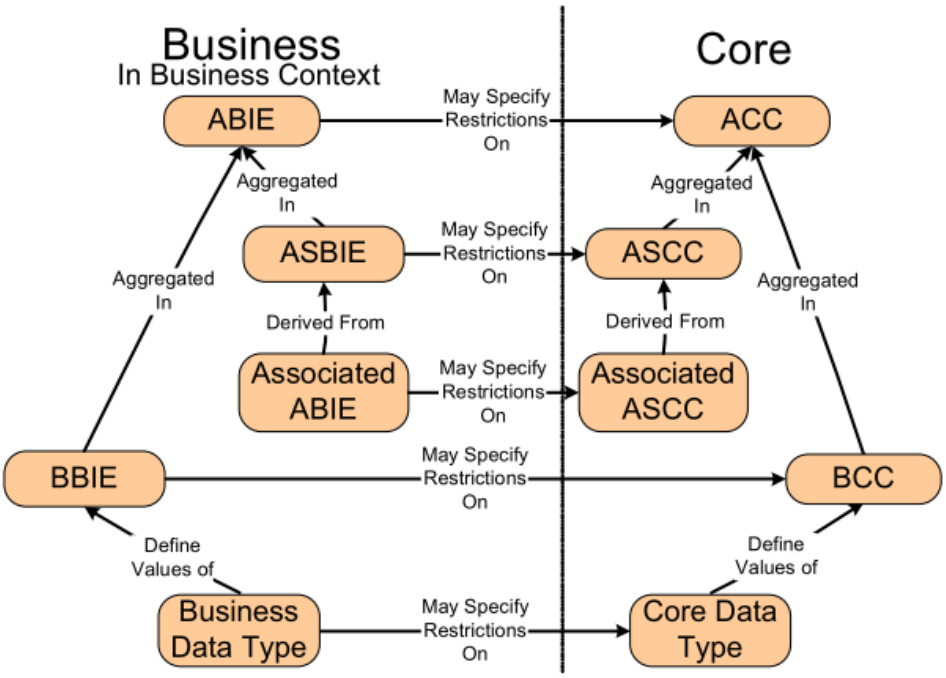


Figure 4.2.2 : Relationship between Business Information Entities and Core Components[12].

Translation of BIEs to CCs is carried out by the business experts who compile the message. The proposal for new or amended Core Components is then submitted to the UNCEFACT harmonisation group (TBG17), which consists of experts from other domains. This group tests whether the proposals are indeed new, whether there is any overlap with existing CCs and whether the elements meet the correct technical specifications (naming, definition, cardinality, etc.).

When a standard message is compiled, a schema model (XSD) is created for each individual message. A Class Diagram is used to show the message structure. The definitions of the BIEs and the mapping to CCs is laid down in tables (including Excel sheets; see tables 4.2.1, 4.2.2 and 4.2.3).

The BIEs and CCs approved by the expert group are published in the next UNCCL. Publication of the UNCCL takes place after approval by the UNCEFACT Plenary on the following website:
- http://www.unece.org/cefact/codesfortrade/unccl/CCL_index.htm

Based on the RSM and UNCCL finally, a standard message schema can be compiled and published on the UNCEFACT website:
- http://www.unece.org/cefact/xml_schemas/index.html

References:
- Example of an RSM: 'RMS annex Cattle registration and movement data exchange and animal passport':
  http://www.agroconnect.nl/LinkClick.aspx?fileticket=EyUiStmXzQM%3d&tabid=1764

[12] Source: Core Components Technical Specification, Version 3.0, 29 September 2009.

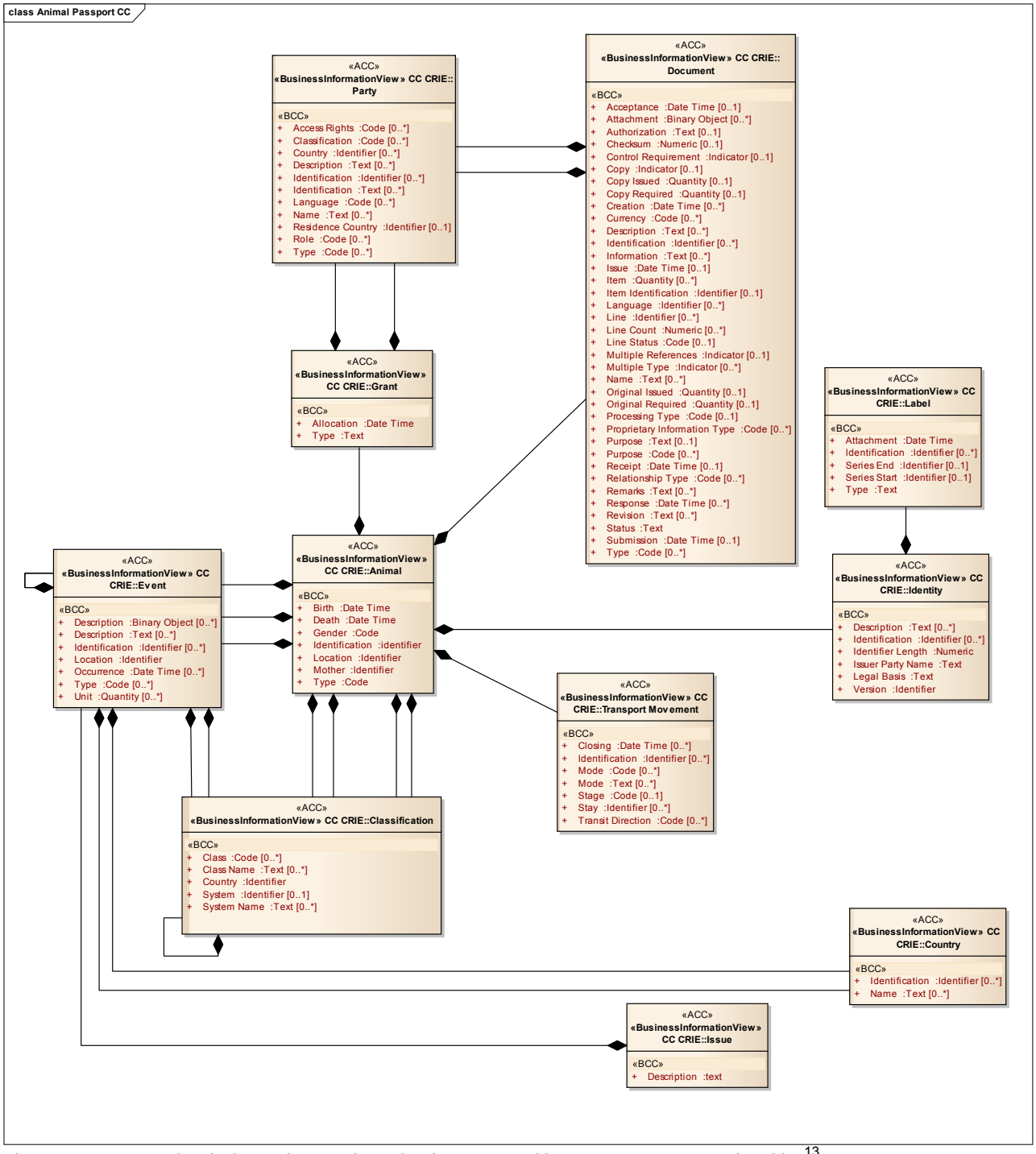


Figure 4.2.3: Example of Class Diagram for animal passport with Core Components of entities[13].

[13] Source: UNCEFACT , Cattle registration information exchange, Frans van Diepen.

Unique UN Assigned ID	ABIE/ BBIE/ ASBIE/ACC/BCC/ASCC/DT/CC/ SC	Dictionary Entry Name (auto generated)	Definition Mandatory	Object Class Term	Property Term	Representation Term	Occurrence Min	Occurrence Max
UN00005201	**ACC**	Animal. Details	A living creature which is not a human being.	Animal				
UN00005206	**BCC**	Animal. Birth. Date Time	A date, time, date time or other date time value for the birth of this animal.	Animal	Birth	Date Time	0	unbounded
UN00006000	**BCC**	Animal. Death. Date Time	A date, time, date time or other date time value for the death of this animal.	Animal	Death	Date Time	0	unbounded
UN00005207	**BCC**	Animal. Gender. Code	The code specifying the gender of the animal.	Animal	Gender	Code	0	1
UN00005999	**BCC**	Animal. Identification. Identifier	An identifier for this animal.	Animal	Identification	Identifier	0	unbounded
UN00006002	**BCC**	Animal. Location. Identifier	An identifier of a location for this animal.	Animal	Location	Identifier	0	unbounded
UN00006001	**BCC**	Animal. Mother. Identifier	An identifier of the mother of this animal.	Animal	Mother	Identifier	0	unbounded
UN00005203	**BCC**	Animal. Type. Code	The code specifying the type of animal, such as horse, dog, bull.	Animal	Type	Code	0	1

Table 4.2.1: Core Components: Aggregate Core Component (ACC) and Basic Core Components (BCC) [14].

Unique UN Assigned ID	ABIE/ BBIE/ ASBIE/ ACC/ BCC /ASCC/ DT/CC/ SC	Dictionary Entry Name (auto generated)	Definition Mandatory	Object Class Term	Property Term	Associated Object Class	Occurrence Min	Occurrence Max
UN00006003	**ASCC**	Animal. Applicable. Classification	A classification applicable to this animal.	Animal	Applicable	Classification	0	unbounded
UN00006004	**ASCC**	Animal. Specified. Identity	Identifying information specified for this animal.	Animal	Specified	Identity	0	unbounded
UN00006005	**ASCC**	Animal. Specified. Event	An event specified for this animal.	Animal	Specified	Event	0	unbounded
UN00006006	**ASCC**	Animal. Specified. Transport Movement	A transport movement specified for this animal.	Animal	Specified	Transport Movement	0	unbounded
UN00006007	**ASCC**	Animal. Associated. Document	A document associated with this animal.	Animal	Associated	Document	0	unbounded
UN00006008	**ASCC**	Animal. Awarded. Grant	A grant awarded for this animal.	Animal	Awarded	Grant	0	unbounded

Table 4.2.2: Core Components: Associated Aggregate Core Component (AACC).

UDT000007	**DT**	Code. Type	
	CC	Code. Content	A character string (letters, figures or symbols) that for brevity and/or language independence may be used to represent or replace a definitive value or text of an attribute.
	SC	Code List. Identifier	The identification of a list of codes.
	SC	Code List. Agency. Identifier	An agency that maintains one or more code lists.
	SC	Code List. Agency Name. Text	The name of the agency that maintains the code list.
	SC	Code List. Name. Text	The name of a list of codes.
	SC	Code List. Version. Identifier	The version of the code list.
	SC	Code. Name. Text	The textual equivalent of the code content.
	SC	Language. Identifier	The identifier of the language used in the corresponding text string.
	SC	Code List. Uniform Resource. Identifier	The Uniform Resource Identifier that identifies where the code list is located.
	SC	Code List Scheme. Uniform Resource. Identifier	The Uniform Resource identifier that identifies where the code list scheme is located.

Table 4.2.3 : Data type component: Basis Data Type (DT).

[14] Source: *UNCEFACT CCL11a*.

4.3. Formulation of Implementation Guideline

The UNCEFACT documentation is fairly technical. Moreover, UNCEFACT messages are often fairly generic in nature (e.g. e-LAB messages for exchanging analysis results). Using them in a specific domain (e.g. sharing soil sample analysis results) requires supplementary agreements and explanations. These are laid down in an Implementation Guideline. Whereas the RSM is in English, the Implementation Guideline may be written in Dutch (depending on the target group).

The Implementation Guideline may be more or less extensive, depending on the situation (the actors involved, the processes being supported, the data to be shared) and the protocol selected for exchanging data (Web services, FTP, e-mail, etc.). The standard message is separate from the technology (the protocol) used to send and receive it. Where standard messages are exchanged via a Web servers, for example, the Web service should also be described in a separate annex (endpoints, requests, responses, WSDL, etc.).

The Implementation Guideline comprises:

1. English-language or Dutch-language instruction for using the standard message.
2. XSDs (XML schemas) which describe the standard message.
3. In the case of a Web service, the WSDL.
4. The code lists used.
5. Sample XML messages.
6. Instructions for using the test environment.

4.4. Points to note concerning UNCEFACT

The UNCEFACT approach is not a panacea in all cases. The harmonisation process (coordinating the Core Components Library) is labour-intensive and time-consuming. In the past, it has been found that agreement between all parties has not always been easy to reach and that individual parties have then added their own variants to existing core components to the library. This is of course not the intention.

Arguments in favour of the UNCEFACT approach are as follows:
- messages must be capable of being used internationally (cross-border);
- elements of the message interface with other domains (there are many logistical and financial components, for example);
- the messages used for n-to-n message traffic (lots of players in a complex environment demands far-reaching standardisation);
- important elements have already been defined in the UNCEFACT Core Components Library and are available for reuse.

Even where the full UNCEFACT harmonisation process is not completed, it is still advisable to make maximum use of the Core Components Library when defining new messages[15].

If the aim is international standardisation and interoperability, it is sensible when developing the message standards to seek alignment with the UNCEFACT 'Program Development Area' (PDA) Agriculture, and also to inform the other PDAs about the new initiative. The PDA 'Methodology and Technology' (MenT) provides a facilitating service for the other PDAs and provides support in mapping the supported entity's business information model to the Core Components Library. This can be achieved either through physical attendance at the meetings of the PDA-MenT harmonisation working group or through special teleconferencing sessions.

The UNCEFACT PDA groups have their own site for publishing work in hand, progress and results; see: https://sites.google.com/a/documentengineeringservices.com/sectoral-projects/. Frans van Diepen is Coordinator of the Agriculture domain within UNCEFACT. If it is decided to opt for an international UNCEFACT standard, it is suggested that this process be routed from the start via the PDA Sectoral - Agriculture. If it is decided to opt for an international UNCEFACT standard, it is suggested that this process be routed from the start via TBG18. If it is decided to opt for a domain-specific national standard, without harmonisation with

[15] In the next version of this Guide report, an indication could be given for each process step in the development of a new standard of the minimum that must be done in order to create a good domain-specific standard, and what is the maximum that can be done to create an international UNCEFACT standard.

UNCEFACT, this should be organised within the domain in question (e.g. across the horticulture sector).

Based on the Guide, it is important that the representation vis-à-vis TBG18 and other TBG groups is properly organised (who represents the Netherlands, how are things prepared within the Netherlands, etc.). This is discussed further in the chapter on organisational structure.

As regards coordination with UBL, it is worth noting that UBL is gradually migrating towards UNCEFACT. UBL is based on the same core components technique as the UN CCL, and can be used as a frame of reference in determining whether a component is necessary. This also applies for the GS1 XML library.

An important element in electronic data interchange is the unique identification of objects. This is discussed in more detail in the Annex *Reference and identification techniques'.

The quality of standards and the standardisation process can be measured. For the horticultural sector, this topic has been developed further under the supervision of the TNO research institute. Reference is made to the Annexes 'Quality of standards' and 'Quality, Checklists (QMSS)'. By way of illustration, the Annex 'Florecom Documentation Method' describes how Florecom sought alignment with UNCEFACT when developing standard messages.

5. Support tools

In compiling the Guide, a study was carried out of the tools that support the UNCEFACT system. There are several tools on the market which support the development of standard messages; the following criteria are important in making a selection:

1. Aimed at standardisation of business information exchanges.
2. Clear relationship between model, core components and schema.
3. Management of business requirements, business terms, business information entities.
4. Documenting, publishing of community documentation (IGs).
5. Management of implementation versions.
6. Support for modelling in accordance with UML/UMM.
7. Support for XML standards (especially UNCEFACT).
8. Support for EDI standards (specially EDIFACT).
9. Testing of the syntax and business logic.
10. Support for the user (help, training, FAQ).
11. New versions of the tool (maintenance).
12. Supplier (reliability, installed base, etc.).
13. Licence structure and costs.

It was not possible to find a support tool which meets all criteria[16]. Some tools are strong in managing a library with business information entities (BIEs) and building schemas on the basis of them. Other tools are strong in information modelling. Lastly, there are tools which emphasise the technical aspects, the implementation of XML (creating and maintaining XSDs).

Since there is no one tool available which offers all these capabilities, consideration was given to the interchangeability of data between selected tools. This means that models, schemas, etc., can be reused. Based on this approach, a choice was made for three support tools, each of which meet key criteria.

1. Enterprise Architect
   Process supported: modelling.
   Enterprise Architect is also used in the development of the Agriculture Information Model. The tool enables different views (profiles, filters) to be defined in the basic model. Third parties wishing to base a new application on the Agriculture Information Model can start with a view of the total model and build on it further themselves.

2. GEFEG.FX
   Processes supported: management, testing, documentation, publishing.

3. Altova MissionKit (including XMLspy)
   Processes supported: development, testing, implementation.

Please refer to the following annexes for a detailed description of the tool selection:
- Tool selection criteria
- Tool selection result: GEFEG.FX 6.1
- Tool selection result: Altova MissionKit 2011
- Tool selection result: Enterprise Architect Ultimate 9.1

[16] The scores for each tool are contained in the document Tool selection results GEFEG.fx 61 XMLSpyMissionKit 2012 EnterpriseArchitect 9'

6. Organisation of standardisation process

Standardisation is not an end in itself. Its primary purpose is to improve interoperability in the agricultural and horticultural sector. This goes beyond merely defining message standards, and among other things includes the organisation of authentication and authorisation, arranging access to master databases of veterinary medicines, crop protection agents, etc., and creating unique identifications for fields, legal entities, etc.

Standardisation in this broad perspective requires broad-based and widely supported control and organisation. It is proposed that a special 'Standards Board' be set up which can give direction in this regard. The organisational structure could be as follows:

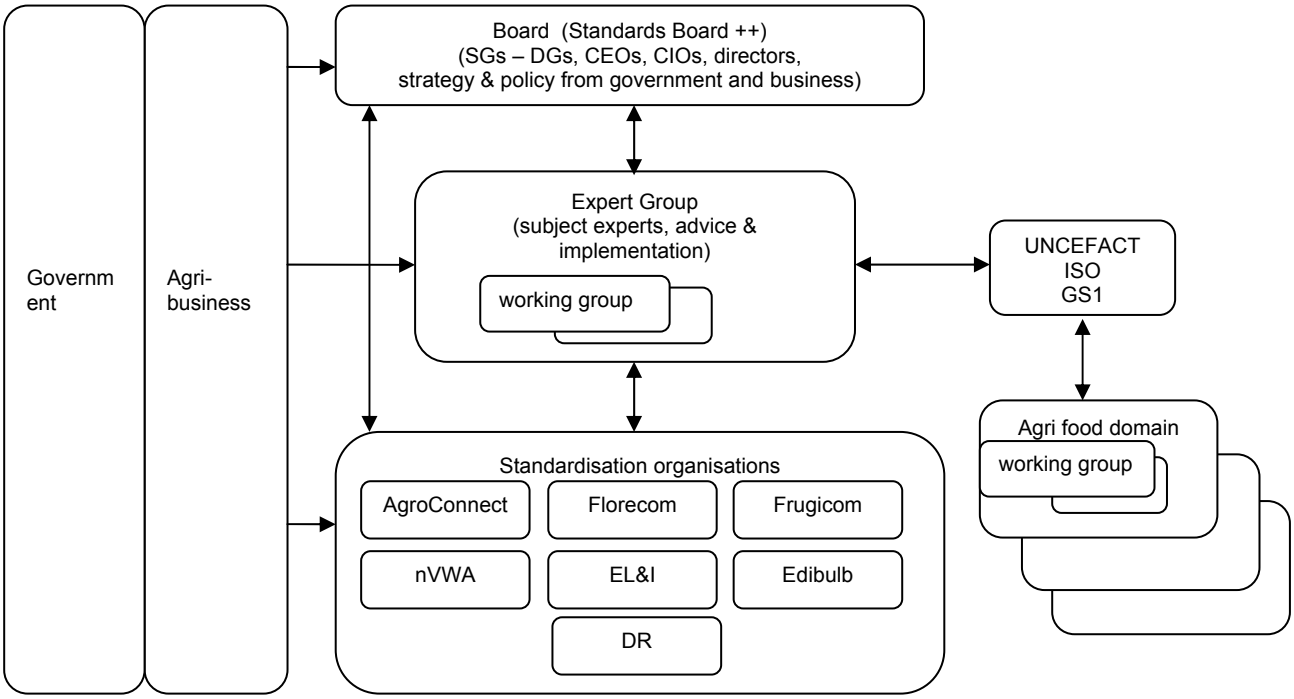


Figure 6.1: Organisational structure for management of agricultural and horticultural message standards.

Standards Board
The Standards Board is made up of CEOs and directors from the agribusiness, government and research world. The Board develops a vision, strategy and policy for improving interoperability within the sector (in other words, this is a much broader approach than purely message standards).

The standardisation organisations are represented on the Board at management level, analogous to the recently set up Greenport Digital Community (Tuinbouw Digitaal) project: management delegates a person or persons to the Board and decides itself whether this should be one or more board members and/or the director/project manager.

The Standards Board takes advice from the Expert Group, which can also be brought in for the implementation of the policy. The Board provides the mandate (and possibly funding) for the Expert Group. The scope covers both B2G and B2B. ECP-EPN could also be represented on the Board. The Board meets a minimum of twice and a maximum of four times per year.

Expert Group
The Expert Group is made up of subject experts from the field (agribusiness, solution providers, research). These are the more technical and methodologically oriented people who are put forward by the standardisation organisations.
The Expert Group derives its mandate from the Standards Board.
The Expert Group delegates representatives to UNCEFACT and ISO.
The Expert Group manages the Message Development Guide for Agriculture and Horticulture and ensures liaison between the standardisation organisations as well as the necessary coordination and harmonisation.
The Expert Group does not develop message standards.

The Expert Group can create (temporary) working groups which focus on a specific, domain-overarching topic.
The Expert Group meets a minimum of three times and a maximum of six times per year.
Working groups may meet more frequently.

Standardisation organisations
These are the standardisation organisations with which we are already familiar for the agriculture and horticulture domain (AgroConnect, Frugicom, Florecom, Edibulb).They may be supplemented with new standardisation organisations for specific domains (e.g. the Netherlands Food and Consumer Product Safety Authority (nVWA) for Client Export), GEONOVUM for geo-information, etc.). They are responsible for developing and managing standards and for encouraging and supporting their implementation within the specific domain.

The chairs/directors of the standardisation organisations are represented on the Standards Board. The implementing experts are represented in the Expert Group.

7. e-LAB: lessons learned

The proof of the pudding is in the eating. With this in mind, even whilst this Guide was being compiled it was used for the development of a new standard message for exchanging laboratory analysis results. This message was given the working name e-LAB.

The main findings in relation to the usability of the Guide and its use in the development of the e-LAB message are set out below.

Reference is made for the draft BRS of the e-LAB message to:

- 120224, Specs e-LAB-bericht v0.1.zip

The draft XML schemas of the e-LAB message can be found at:
- http://schemas.florecom.org/dev/agro/elab/data/draft/ANL_ReusableAggregateBusinessInformationEntity_9p0.xsd
- http://schemas.florecom.org/dev/agro/elab/data/draft/LaboratoryObservation_0p1.xsd
- http://schemas.florecom.org/dev/agro/elab/services/elab_0p1.wsdl
- http://schemas.florecom.org/dev/agro/elab/services/Laboratory_elab_0p1.wsdl

7.1. Comments by Frans van Diepen

On the use of Enterprise Architect (EA)
It is a good idea to use the right profiles for UML UNCEFACT UMM specifications. For generally useful tools, see http://umm-dev.org/, under 'PAGES / Tools' on the right of the homepage: http://umm-dev.org/tools/uml-profiles-for-umm/.
This UMM profile tool is used to make a dedicated toolset available within the toolbox, which can be used to create CC, ACC and ASCC, as well as BIE, ABIE and ASBIE. The ASCC and ASBIE are created in the form of an association with the characteristic 'composite'.
The profile also generates a specific toolset for the other business collaboration, sequence and use cases.
Data definitions can be created correctly in a labelled field with class properties tagged values (it is therefore not necessary to add definitions as a note to a class).
The UMM profile tool 'Vienna Add-in' is useful for processing EAP files to create reports. See: http://code.google.com/p/vienna-add-in.
The documentation on this useful UMM profile and the Vienna add-in is unfortunately minimal.

On modelling the Business Process
Determining the scope of the business process that is supported with the e-message is crucial. What does and does not belong to the message? What is the message about? Who are the parties involved and what are their roles in the message? What is the definition of the objects used in the message?
Mapping the business objects and the nomenclature used on to the UNCEFACT CCL is a good aid in creating clear definitions of the business entities (BIE, ABIE and ASBIE).
Make direct use of the standard UML use cases diagram, collaboration diagram, sequence diagram and the class diagrams. This simplifies the discussions with the parties concerned. Use standard tools from the start, such as EA and the UMM profiles. Align with the UNCEFACT CCL from the beginning. Using standard tools such as EA simplifies the information exchange during the process.

On e-LAB
In developing e-LAB, EA was used for the modelling and XMLspy for the schema generation (standalone versions). A common repository with versioning software was not used. Monitoring the progress of the work and sharing information (EA .eap files, *.doc, *.exe and*.PDF) took place by e-mail. Given the small size of the working group, this was a workable scenario. In a somewhat more complex environment, use of versioning software (TortoiseSVN) and a central repository is recommended. This makes the use of standard components in developing new messages and maintaining existing ones a good deal simpler..

7.2. Comments by Gerhard van Heemskerk

Choice of code list as enumeration or as entry instruction

The decision on whether to use code lists as the enumeration of an element or as a code list outside a message schema (instruction) depends on:

1. Frequency of changes within the code list (e.g. high).
2. The size of the code list (e.g. product code list of 30,000 items).
3. Whether the code list is sector-specific (e.g. product list).
4. Alignment with the existing code lists (the developed message is used for an existing application and is not a new development for the sector). The international code lists can therefore deviate significantly from the private code lists.
5. Technical code lists (e.g. a code list with code list administrators) are more suitable as enumerations than functional code lists (e.g. new status code).

Where the code turnover rate is high, it is not advisable to use the code list as enumeration. UNCEFACT only publishes a new library twice a year. A very large enumeration will considerably slow down the process of generating and processing messages. These kinds of sector-related code lists will definitely not be incorporated in a sector-overarching message, such as the e-LAB message. If a sector uses codes that differ from the international codes, it is not advisable to include the international codes in a first version of the message, especially with existing applications. An example is INCOTERMS, which are difficult to map onto the price delivery terms of Florecom.

External code lists
Codes are used to support the electronic exchange of data. If codes have been created externally (outside the schema), it can make sense to include the code value in the message. If the recipient has not updated their code lists, they can still use the code value to derive its meaning. This is especially useful during a pilot phase.

Cohesion of the tools
The class diagram for developing the message was developed in Enterprise Architect. Logging the definitions of the classes and attributes involves a considerable amount of work. The definitions are stored as a note and are not saved in separate fields. This means that it is not consistently mandatory to note all data elements (name, definition, description), and as a result it is of course impossible to generate a RABIE[17] XSD with the requisite annotations. The tool is unfamiliar with stereotypes such as ABIE, BBIE, ASBIE. These therefore have to be added to the existing lists. It is also not possible to establish a relationship with a core component. The XML files generated by EA cannot be used in XMLspy. The XMI export and XSD transformation are only included in the more expensive versions of the package, and the package used to re-import these, XMLspy, therefore requires the addition of an extra module, U-model. Use of a GEFEG tool is indispensable. This tool takes account of the UNCCL, with includes, imports of schemas and namespaces, and can accurately record business information entities, including full annotations like those we are used to from the RABIE list produced by UNCEFACT.

Cardinalities
Several laboratories from different sectors will use the laboratory report message. It transpires that the cardinality of a component or element is not 100% certain in all cases. For complete certainty, all data structures within all laboratories would have to be investigated. Therefore, many elements from the initial class diagram have been made optional, and are sometimes given in several forms. This design means it is necessary to write an Implementation Guideline for the message. Although the message does not force the entry of data, it must still be capable of being used by several laboratories. This also prevents messages being sent which contain meaningless elements with a value of ‘0’ or Null, which would not help the information exchange.

Extra information in the message (in addition to core purpose)
In addition to the report on the results of the investigation, the e-LAB message also contains information on the research contract and detailed information on the sampled object, in separate classes. This may seem unnecessary, because the client already knows all the information about the sampled object. Yet in practice, including the detailed information about the sample supplied in the report can be useful, especially if the message is sent to third parties.

Building in flexibility
If there is uncertainty about the number of class attributes needed, it can be useful to add a free text element to the class. This has been done for several classes. Sometimes the choice is left to the user to add things

[17] RABIE: Reusable Business Information Entities

such as research result characteristics as free text, or to use characteristic components to provide structured information about characteristics.

Future-proof
The GPC code is being or will be used for classification in the AGF and Ornamentals sectors. In the Crop class, the element 'classification ‘ has therefore already been added.

Readability of class diagram
Early class diagrams were cluttered and unclear, because classes were placed close together and connecting lines crisscrossed each other through the diagram. The classes have now been placed further apart, grouped better and the lines made straight or rectangular. Although the diagram now covers more pages, it is more pleasant to read for the target group. It is a matter of applying the quality criteria.

Conversion of Dutch class diagram to UK class diagram
The use of a Dutch class diagram makes sense when it is being presented to a Dutch target group. Converting Dutch classes and attributes to an English variant is fairly labour-intensive and susceptible to error. In the GEFEG tool, entities can be logged as standard in two languages. I therefore expect that the class diagram in GEFEG can also be presented in either a Dutch or UK version.

Requirement Mapping Specification
Compiling a list of the new components or elements needed in the UNCCL as a result of the BIE list e-LAB message involves a considerable amount of work. Not only do the BIE names have to be entered again, but also the definitions, and so on. A BIE list can be generated in EA, and in GEFEG FX, except that the format does not meet the design required by UNCEFACT in applying for a new Core Components and Elements. Research is needed on producing an RMS list for applications to UNCEFACT. Logically, a tool such as GEFEG FX should be able to do this. This tool imports the Excel files from UNCEFACT TBG17, and after creating a new message, it should therefore not be difficult to export a list of the ADD, CHG and DEL Core Components or BIEs.

Naming and Design Rules
If the right tool is not used, it is difficult to record the right name. The BIEs are recorded in EA, but this tool does not support NDR, whereas the GEFEG tool does. An XMI import is only possible in the U-model version of XMLspy, not in the basic version. The U-model tool was not available to us during the development process. One thing that is in any event clear is that, without good tools and integration, it is very time-consuming to develop messages in a good, standardised way.

ANNEX: List of definitions and abbreviations

ABIE	Aggregated Business Information Entity
ACC	Aggregated Core Component
ADED	Agricultural Data Elements Directory
ADIS	Agricultural Data Interchange Syntax
AGF	Potato, Vegetable and Fruit sector
ASBIE	Associated Business Information Entity
ASCC	Associated Core Component
B2B	Business to Business
B2G	Business to Government
BAG	Basisregister Adressen en Gebouwen (Basic Address and Buildings Register)
BBIE	Basic Business Information Entity
BCC	Basic Core Component
BIE	Business Information Entity
BRS	Business Requirements Specifications
CC	Core Component
CCTS	Core Component Technical Specifications
CEN	European Committee for Standardisation
CMMi	Capability Maturity Model Integration
Digipoort	Facilitates digital information exchange between government and businesses
DR	Dienst Regelingen (National Service for the Implementation of Regulations)
E&LI	Ministry of Economic Affairs, Agriculture and Innovation
EANCOM	Subset of UN EDIFACT messages, managed by GS1
ebXML	Electronic Business XML
ECP	Electronic Commerce Platform
EDI	Electronic Data Interchange
EPGS	European Petroleum Survey Group
ERD	Entity Relation Diagram
ETRS89	European Terrestrial Reference System 1989
FAO	Food & Agricultural Organisation of the United Nations
FAQ	Frequently Asked Questions
G2G	Government to Government
GDD	GS1 Data Dictionary
Gen2	Generation 2 RFID tag
GIS	Geo Information System
GLN	Global Location Number
GPS	Global Positioning System
GS1	Global Standards One
GTIN	Global Trade Item Number
HL7	Health Level Seven International
HR-XML	Human Resources XML
IC	Introduction convention
ICAO	International Civil Aviation Organization (ICAO)
ICC	International Chamber of Commerce
IETF	Internet Engineering Task Force
IG	Implementation Guide

IMGEO	Information model GEO
IMKAD	Land Registry Information Model
IMLG	Rural Area Information Model
IMNA	Nature Information Model
IMO	International Maritime Organization
IMWAT	Water Management Information Model
IPPC	International Plant Protection Convention
IRU	International Road Transport Union
ISA	International Society of Automation
ISO	International Standards Organisation
ITU	International Telecommunication Union
NDR	Naming and Design Rules
NEN	Dutch Standardisation Institute
NESUBL	Northern European subset of UBL
NMEA	National Marine Electronics Association
NORA	Dutch Government Reference Architecture
OASIS	Organization for the Advancement of Structured Information Standards
QMSS	Quality model of Semantic Standards
RD-New	Dutch National Grid
RFID	Radio Frequency Identification
RSM	Requirement Specification Mapping
SGLN	Serialised Global Location Number
SGTIN	Serialised Global Trade Item Number
SOAP	Simple Object Access Protocol
SSCC	Serial Shipment Container Code
SWIFT	Society for Worldwide Interbank Financial Telecommunication
TBG17	Harmonization Team Submission Guidelines and Procedures
TBG18	Team for Business Process and Transaction Models Agro – Food
TNO	Netherlands Org. For Applied Natural Science Research
TQM	Total Quality Management
UBL	Universal Business Language
UCR	Unified Carrier Registration
UDDI	Universal Description Discovery Integration
UHF	Ultra High Frequency
UML	Unified Modelling Language
UMM	UNCEFACT Modeling Methodology (UMM)
UN	United Nations
UN/ECE	United Nation Economic Commission for Europe (ECE).
UNCCL	United Nations Core Component Library
UNCEFACT	United Nations Centre for Trade Facilitation and Electronic Business
UNCTAD	United Nations Conference on Trade and Development.
UNEDIFACT	United Nations/Electronic Data Interchange For Administration, Commerce and Transport
UNLOCODE	United Nations Location Codes
UNTDED	United Nations Data Element Directory
URI	Uniform Resource Identifier
URN	Uniform Resource Name
W3C	Word Wide Web Consortium
WCO	World Customs Organization

WGS-84	World Geodetic System 1984
WHO	World Health Organisation
WMS	Web Map Services
WS-BPEL	Web Service Business Process Execution Language
WSDL	Web Service Definition Language
XBRL	EXtensible Business Reporting Language
XML	EXtensible Markup Language
XSD	XML Schema Definition

ANNEX: Interfaces between UNCEFACT and other standards

Interface with GS1 standard messages
The GS1 standards are subsets of the UNCEFACT standards. GS1, OASIS (UBL) and SWIFT participate intensively in the UNCEFACT technical working groups. The GS1 introduction conventions (ICs) are geared more to the specific actions/business processes of the Dutch chain partners.

Frugicom uses GS1 standards, whereas Florecom and Edibulb look for a more direct connection to UNCEFACT. However, the differences between Florecom and Frugicom are smaller than they appear. The main difference lies in the momentum; the standard messages for the AGF (Frugicom) are more retail-oriented, whereas the ornamentals sector (Florecom) is focused more on the auction process; the processes are therefore slightly different.

Reference is made to the relevant annex for a detailed analysis of the differences in the development of message standards for the horticultural sector.

References:
- Overview of the standard message specifications offered by GS1: http://www.gs1.org/gsmp/kc/ecom/xml/xml_bms

Interface with ISO
Standard ISO protocols are mainly used for the technical linking of process computers and board computers on machines and equipment.

A standard has been developed for process control in primary agriculture for communications between mobile equipment on tractors and farm machinery(ISOBUS specification ISO 11783). The standard for data exchange with fixed hardware (automatic feeders, climate control units, etc.) has been laid down in ISO 11787.

Standards have also been defined in this ISO series for wireless information carriers in particular for animal transponders, which can contain information for animal identification as well as supplementary information about the animal (temperature, movement, etc.). These Radio Frequency Identification chips (RFIDs) are attached outside the animal's body using neck bands, or implanted as ruminal boluses or subcutaneous chips. The code structure is logged in ISO 11784, the technical concept in ISO 11785.

For the data interchange between process computers and management systems, a data dictionary has been defined with generic and specific data elements for dairy farming and the pig farming industry. This data dictionary structure has been laid down in ISO 11788.

The electronic information exchange within and around the farming industry (the farm management system) is closely related to these ISO standards. The ISO standards form the basis for the data definitions of the information exchange in the total production chain.

In addition to the animal identification purposes as set out in ISO 11784 and 11785, RFID chips are also used for the identification of goods at the level of individual containers, pallets, boxes and crates as well as at individual product level. These chips differ markedly from the animal identification chips, since they have to be simple to affix to a product and need to be much cheaper to purchase because they are often used only once.

For tracking and tracing agricultural products using RFIDs, GS1 has worked with Frugicom to develop a standard in the AGF sector for substantive information exchange. This standard is part of the GS1 standards, and is a specific development within the family of GS1 barcodes. The technical hardware specifications of the RFID[18] standards, the GS1 ‘ECP RFID UHF Class1 Gen2 standard, are used for read-in, read-out and security.

A crucial step in the development of electronic messages is the coordination between the ISO data dictionaries and the UNCEFACT Core Components Library. Even though these are used in two different domains and application areas, the mapping of the ISO data dictionary to the CCL and vice versa must be

[18] ISO 18000

supported. This requires harmonisation of object types and definitions. UNTDED/ ISO 7372[19] is a joint publication of UNECE and ISO, and international standardisation organisations and international interest organisations such as WCO, IMO, IRU, etc., also work together in the joint UNTDED/ISO Maintenance organisation (MA). Each organisation is responsible for the link to the information component.

Interface with ISA-95
This standard is concerned mainly with process automation and the linking of production processes. ISA stands for International Society of Automation. It is based in America but is active worldwide in the development of industry standards (see: www.isa.org).

Full application of the ISA-95 standard makes it possible to configure production lines flexibly across several locations and even to control the production lines of suppliers directly.

ISA-95 is separate from UNCEFACT. ISA-95 is widely used for the integration of production processes in the horticultural sector. Please refer to the relevant annex for more detailed information on ISA-95.

Interface with ebXML
ebXML was developed to enable control information about further processing to be included in electronic messages. The exchange of documents between organisations involves initiating one or more processors. The same types of documents May be used in different processes; an indication is given with the message in ebXML of how the message should be dealt with; an Electronic Business component has been added.

The primary purpose of ebXML is to create an open technical framework for the exchange of electronic business messages, from application to application, from application to person and from person to application. ebXML makes it possible for small and medium-sized enterprises to engage in e-business simply and cheaply.

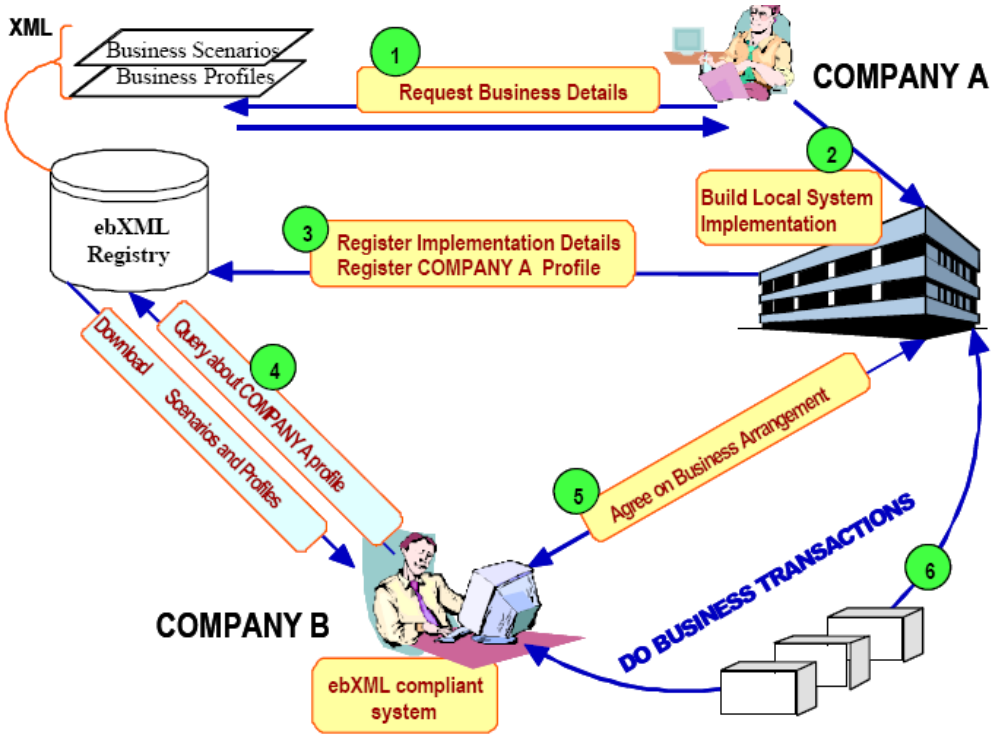


Figure 3.4.1.: ebXML system overview.

The above schema shows an ebXML scenario between two trading partners. To ensure that this functions properly, the trading partners must make clear arrangements in advance about the data and process flow.

The ebXML[20] framework is built up in layers:

[19] See Annex: Alignment of TDED, CCL and EDIFACT

[20] ISO 15000

- Business Process Specification Schema (BPSS)
- Core Components (CC)
- Company profiles and agreements (CPP and CPA)
- Register and Repository
- Messaging Service (ebMS)

BBPS

A Business Process Specification can be seen as the encapsulation of all possible business scenarios. It describes a number of activities and the sequence (choreography) that determines the relationship between them. It answers the questions of who (partners) what (product), when (sequence), where (location) and how (logistics). A Business Process Specification can be represented in several ways, for example in an abstract UML model or in a more tangible description in the form of an XML DTD or W3C schema. The BBPS of the ebXML framework aligns with the Business Requirement Specifications of the Guide; UML/UMM plays an important role in this process.

CC

Like the Guide, the ebXML framework uses the UNCEFACT Core Components .

CPP and CPA

The Guide is aimed at mapping business processes and building standard messages based on the UNCEFACT Core Components or components built by CCTS itself, and is not concerned with the method of recording profiles and agreements of and between trading partners. One point where ebXML differs from other standards is in the ability for an organisation to specify its profile (CPP) and to enter this in a public register. Part of this profile is a description of the processes supported by an organisation. The profile contains a reference to the partnership agreement (CPA).

Register and Repository

Without the ebXML Register/Repository trading partners cannot share information. It is therefore an essential part of the ebXML architecture. The Register and the Repository can be seen as a single database. The ebXML Register will consist of different distributed databases, with local organisations possibly having responsibility for making the entries. The Guide is not concerned with the publication of information about trading partners in relation to electronic data interchange.

ebMS

The ebXML messaging service (ebMS) is a framework for communication between trading partners, ebMS is an open standard for exchanging commercial documents securely and reliably. It is based on existing standards and incorporates a Web Service technology called ‘SOAP, which was developed for exchanging XML messages and for ‘remote procedure call’ (RPC). SOAP is the tool for exchanging data over the Internet; it provides the means for sending a payload.

The work in relation to ebXML is supported and coordinated by members of UNCEFACT and OASIS:
- UNCEFACT takes care of the substantive/commercial side of ebXML: core components and business process specifications.
- OASIS takes care of the (technical) infrastructural aspects of ebXML: messaging service, register/repository and profiles and agreements.

This Message Development Guide focuses mainly on the first two elements of the ebXML framework (BPSS and CC).

ANNEX: Analysis of agricultural and horticultural message standardisation

Situation in horticulture

The ornamentals sector most frequently reuses the UNCEFACT Library and UMM/UML, but lags behind somewhat when it comes to descriptions in the area of definitions and information models, followed by the bulb and AGF sectors. The agrosector lags behind on XML (only one XML message). The sectors which use XML work exclusively to the Core Component technical specification or intend to do so. Although according to the Naming and Design Rules the same information entities should come out of the development process, this is not always the case in practice.

The picture is reasonably good when it comes to the specification of processes in accordance with UMM/UML. The AGF sector takes GS1 XML, published internationally by GS1, as a basis. It is possible that GS1 will in time create a subset of the Cross Industry standard schemas as published by UNCEFACT. If parties use their own libraries, this is very noticeable, and it is recommended that more focus is placed on the use of the UN library and the UMM/UML description method (templates).

Specifications

The specifications of the standards in the AGF sector are close to the UNCEFACT templates. This is largely because the AGF sector uses GS1 standards (GS1 had a major input into the creation of the BRS and RSM templates). The ornamentals and flower bulb sectors use their own templates, the main components of which are described. What is striking is that the RSM is used less across the board. In fact, this is a description of the business information entities (BIE) used, with an information model (a description of the BIEs used from the UN Core Components Library). The bulb sector describes the BIEs in detail (with the emphasis on a list of definitions). The ornamentals sector does not employ an extensive description of BIEs; by contrast, there is a list of definitions. The specifications in the bulb sector are entirely in Dutch.

Library

UNCEFACT makes a schema available in which ABIEs (reusable business information components) are incorporated. Unlike the other organisations, the ornamentals sector uses its own Florecom library plus that from UNCEFACT(UN RABIE). The AGF and flower bulb sectors have their own libraries. All libraries are built up in accordance with the Core Components Technical Specification published by UNCEFACT. In individual libraries, there are differences in the naming of information entities and data typologies. It can be concluded from this that there is as yet no consistent registration of business information entities. As a result, individual libraries are growing, but part of that growth overlaps with newer versions of the UNCEFACT library.

Schema

All sectors have based their schemas on the principle of reusable components from a library. In many cases, the library is built from the company's own business information entities and own data typologies. In 2011, UNCEFACT published horizontal Cross Industry schemas. All sectors have built up their own schemas containing their own and/or reused components from the UNCEFACT library. In the ornamentals sector, some components and data types from the UNCEFACT library are imported. Interoperability between the sectors will not be high. The only XML message in the agrosector (for animal registration and movements) makes full use of the UNCEFACT library and documentation structure (BRS and RMS) – clearly the result of close cooperation between the government and the agrosector. The table below gives the impression that other sectors have an RMS. This is not the case; the table shows that they describe components of an RMS. This depends on whether or not they use UNCEFACT templates for the BRS and RMS.

Codes

The ornamentals, AGF and flower bulb sectors use GS1 codes. Although the classification code is the lead code in the ornamentals sector, traders use the GS1 code and messages frequently for sales to the retail sector. Within the ornamentals sector, the GS1 product coding system can be used as an ‘alternative identification’ for the classification code (including product characteristics). In the AGF sector, the GS1 GTIN product code is used as standard (in combination with the GPC code, (Global Product Classification code). In the ornamentals sector, a study is under way of the usability of the de GS1 GTIN standard for products to replace or supplement the classification code system. The bulb sector mainly uses the classification codes and the codes issued by the Stichting Beurshal foundation for perennials. UN codes are only used in the bulb sector for currency and country codes. These code lists are not embedded as enumerations in the schemas in this sector, but stand outside them.

	UNCEFACT (target)	Ornamentals sector (actual)	AGF sector (actual)	Bulb sector (actual)	Agro-sector (actual)
Specifications					
Business Requirements Specification (BRS)	Business Process Elaboration (process, scope principles)	System Diagram Subsystem Diagram	Business Domain View Business Context	Focus area	Business Process Elaboration (process, scope principles)
	Business Transaction - Use case diagram BRS - Use case descript. - Activity diagram - Sequence diagram	Scenario description - Use case diagram	Business Transaction View - Use case diagram - Use case descript. - Activity diagram - Sequence diagram	Business Transaction - Use case diagram - Use case descript. - Activity diagram - Business Collaboration	Business Transaction (Information flow definition) - Use case diagram - Use case descript. - Activity diagram - Sequence diagram
	Information Model - Entity relationship - Business docum.	-	Information Model (Including GDD Report) - Class diagram - Business docum.	- ERD	Information Model -Class diagram docum.
	Business rules	Functional requirements Message Guide	Business Rules & Requirements	Business Requirements View	Business rules
Requirement Specification Mapping (RSM)	Definition of terms	Glossary (definitions	Terms (definitions)	-	Definition of terms
	Information Payload - business message model (Class diagram)	Information analysis	-	Class diagram	Information Payload - business message model (Class diagram)
	Basic Business Information Entities	-	-	Business Information Objects Glossary	Basic Business Information Entities
	Aggregated Business Information Entities	-	-	Business Information Objects Glossary	Aggregated Business Information Entities
	Core Component Registry version	UN RABIE 3.0 FE RABIE 3.0	GS1 RABIE 2.x	ebXMLCC 2.01 EdibulbCC.1.03	CCL 09B (UN RABIE?)
Library					
Library (UNRABIE)	UN RABIE	Large part of FE library (derived UNCEFACT/UBL RABIE) + UNCEFACT RABIE library	Own GS1 RABIE Library built up in accordance with UNCEFACT CCTS/Core Comp.	PT (data garden) in accordance with **UNCEFACT** CCTS. EdiBulb (in accordance with UNCEFACT CCTS)	-
Schema	**Imports:** UN Qualif.DataE UN UnQualifDataE CI Despatch Advice CI Invoice	**Imports:** UN Qualif.DataE UN UnQualifDataE UN RABE we use: UN CI Invoice	**Imports:** Own library (no data types) Own development (GS1 XML): Despatch Advice Order	**Imports:** EdibulbCC ebXmlCC Own development: Order OrderConfirm	-

	UNCEFACT (target)	Ornamentals sector (actual)	AGF sector (actual)	Bulb sector (actual)	Agro-sector (actual)
	CI Order CI Order Change CI Order Response	Own development Line orientated! FE Delivery FE Order/Order resp - FE Order/Order resp FE Image FE Label FE Supply	Order response Invoice	Delivery Delivery Confirm Invoice Logistics Order	
Codes					
Codes	Mainly UN/ISO and other codes.	GS1 codes (companies/locations) UN codes (document types, delivery terms) UN/ISO codes (language, currency, country) Sector codes (product, packaging, etc..)	GS1 codes (companies/locations shipping units, products) UN codes (document types, delivery terms) ISO codes (language, currency, country)	UN/ISO codes (currency, country) Sector codes (cultivar, packaging, etc.)	UN/ISO codes (document status code, country code and country name) Sector codes Animal ID code Cattle regist. office

ANNEX: The ISA-95 standard

The ISA organisation
ISA stands for International Society of Automation. ISA is based in the United States but is active worldwide in the development of industry standards (see: www.isa.org).

The ISA-95 standard
Full application of the ISA-95 standard makes it possible to configure production lines flexibly across several locations and even to control the production lines of suppliers directly.

ISA-95 background
The ISA-95 standard is in reality five separate standards, each with its own application:

1. ISA95.01 comprises 31 information flows for controlling production, quality, stocks and maintenance
2. ISA95.02 consists of a data model which defines the information flows
3. ISA95.03 consists of information areas for the links
4. ISA95.04 consists of the interface description for the links
5. ISA95.05 consists of the interface description for the data model

The process automation is built up of the following layers:

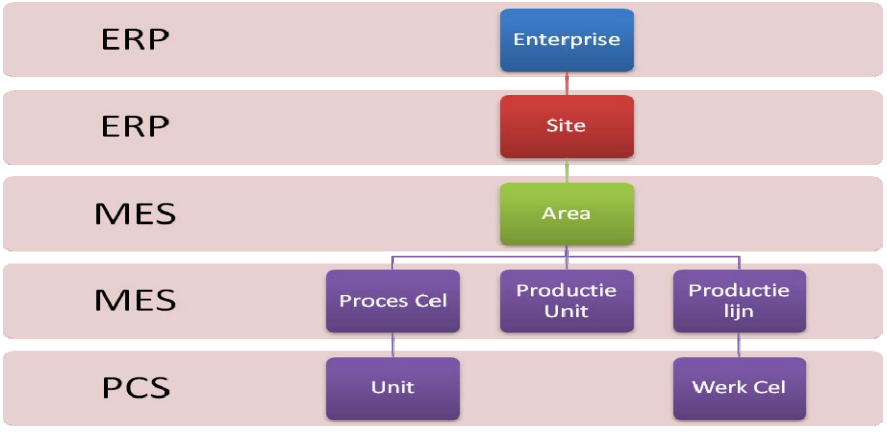
- Layer 5 – Business control - ERP (Enterprise Resource Planning)
- Layer 4 – Company control
- Layer 3 – Work floor control - MES (Manufacturing Execution System)
- Layer 2 – Process control - PCS (Process Control System)
- Layer 1 – Machine control - PLC control
- Layer 0 – Machine component control

ISA-95-01, 02 and 05 define the communication between layers 3 and 4.
ISA-95-03 and 04 specify the communication that can be used within layer 3.
ISA-88 is used to go from layer 3 to layer 2.

Process control according to ISA-95

Step 1: Enterprise structure
Each enterprise where an interface must be realised is mapped in a standard way in accordance with the ISA-95 definition.

An enterprise is subdivided as follows:



Proces Cel = Process Cell
Productie = Production
Lijn = line
Werk Cel = Work Cell

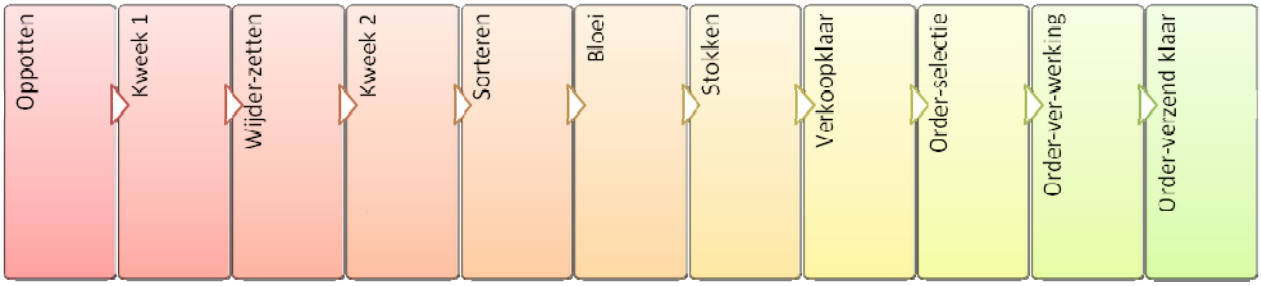
A Site can be seen as one or more gardens, controlled from one Enterprise ERP system. An Area corresponds with a ‘Shed’ or ‘Glasshouse’, each with its own logistical MES system. Processes in the Areas are divided into the following categories:

- Process Cell: a uniform process that performs one task, for example packing.
- Production Unit: a process consisting of successive tasks, for example potting up and containerising.
- Production Line: a process consisting of several work cells, for example automated removal from containers, sorting, staking and re-containerising.

The interfaces described here serve for communication between ERP and MES.

Step 2: Process steps

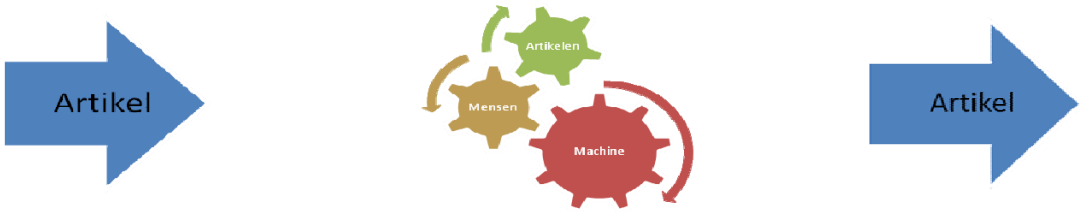
Each enterprise has a certain process structure which is geared to the production and sale of articles. A typical structure could be as follows:



The sequence of these process segments is determined for each structure in the cultivation and sales programmes in the Plantform Planning Module.

Step 3: Process segment description

Each process step in the enterprise can be described uniquely in terms of people, machines and materials. This can be represented schematically as follows
:



Cuttings (Article)

Potting machine (Machine)
Potting compost bunker (Machine)
Potting compost (Article and the if you live in a de)
Pops (Article)
Potting operative (Person)

Potting batch (Article)

All articles, people and machines are defined in terms of

- Identification (what do we call it).
- Location (where is it).
- Numbers (how much is available/ used/needed).
- Composition (what are the components of which it is made).
- Properties (characteristics, properties, qualities).

Using a modular structure of process segments means that an end product (article to be produced) is uniquely identified in each process step in terms of class and quantity. This has the advantage that every semi-manufacture can be included in the sales plan and can be sold or purchased at the best time to derive the best return from the available space and production facilities.

Interfaces with ERP/MES and MES/MES

The ISA/95 standard provides for four categories of message exchange

1. Definition
2. Planning
3. Execution
4. Executed

These can be exchanged between ERP (Enterprise Management) and MES (Logistics) , but also between different logistical systems (MES).

Definition

What is needed for a process step; this informs the logistical system about the combination of personnel, machines, articles and process steps.

Planning

This enables the enterprise management layer to interrogate the logistical layer to ascertain what is available in terms of personnel, machines and articles.

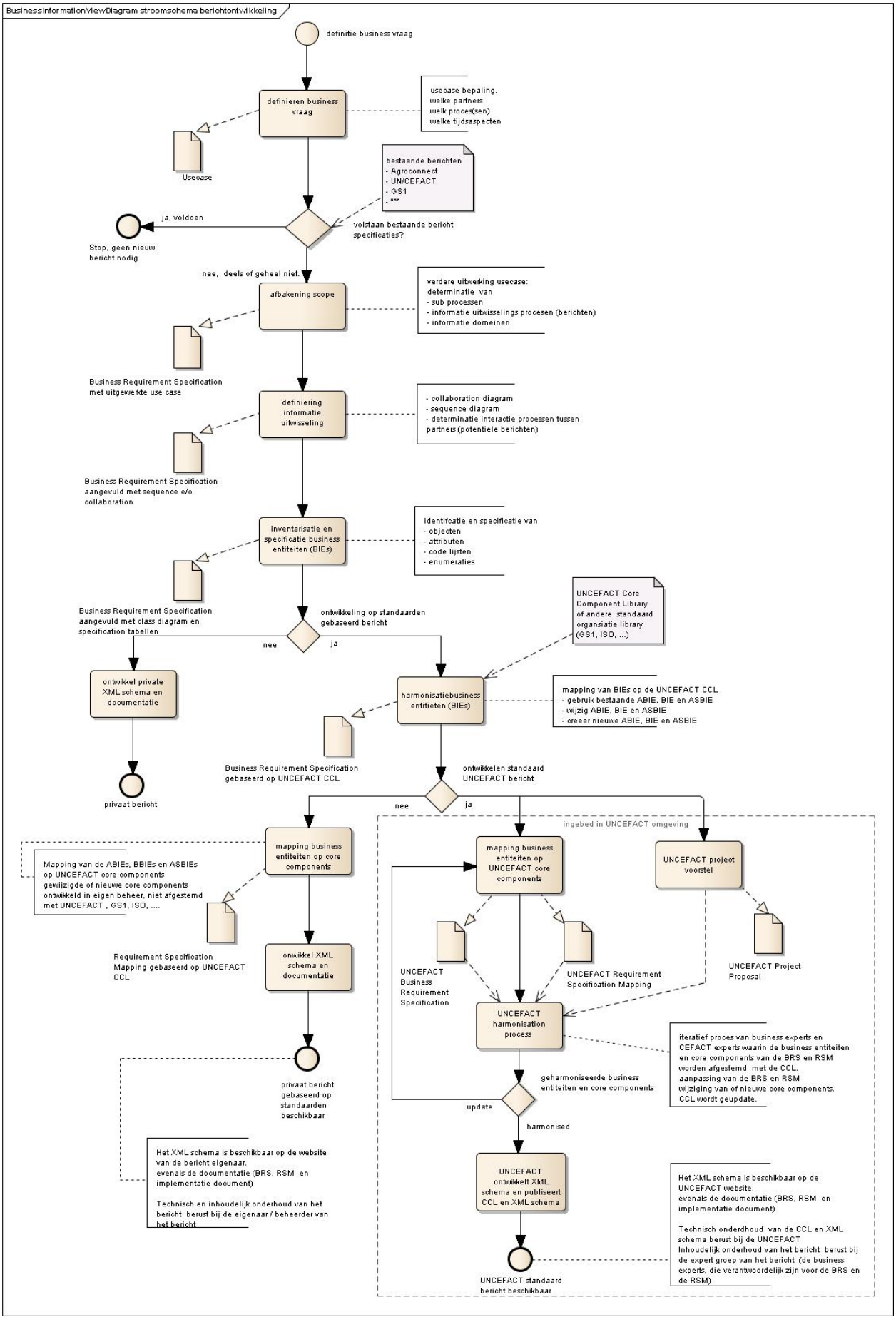
Execution

Here, the enterprise management layer instructs the logistical layer to execute process segments, stating the personnel, machines and articles used.

Executed

Here, the logistical layer feeds the completed processes back to the enterprise management layer, specifying the resources used and articles produced.

ANNEX: Message development flow chart



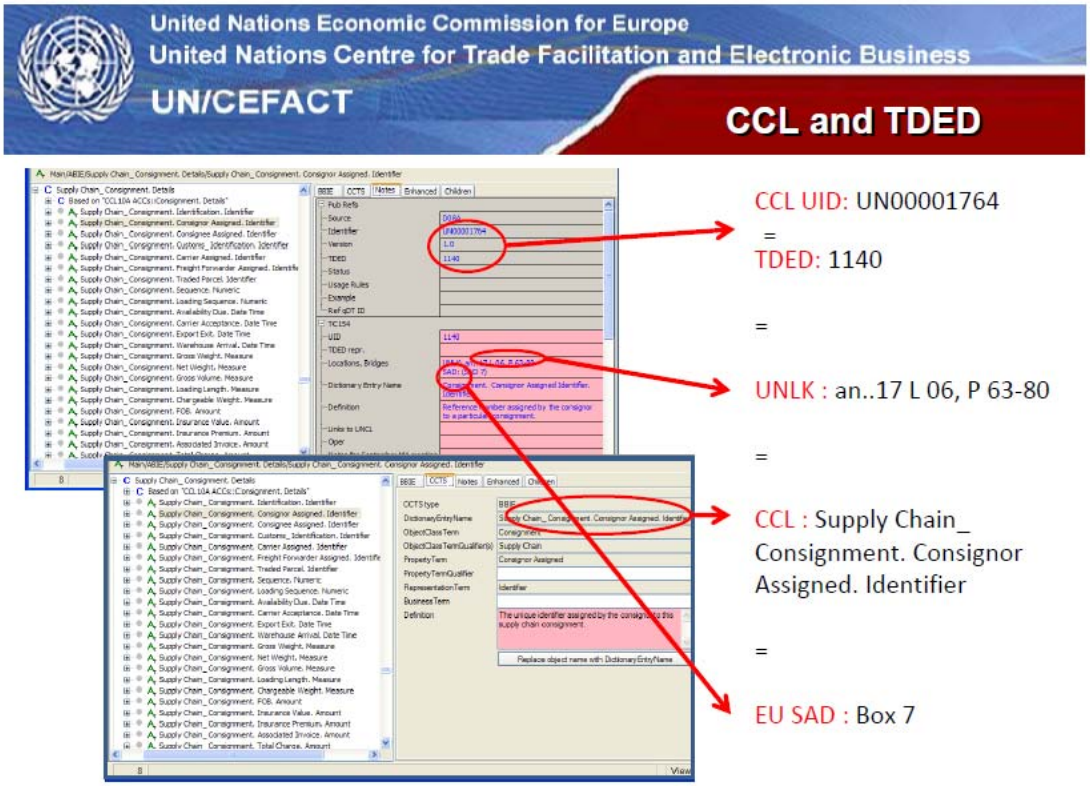
ANNEX: Alignment of TDED, CCL and EDIFACT

ISO and the UN have a joint project for the alignment of:
- TDED
- Core Component Library
- EDIFACT

UNTDED/ISO 7372:2005 lists standard data elements intended to facilitate open interchange of data in international trade. The standard data elements listed can be used with any method for data interchange on paper documents as well as with other means of data processing and communication.

TDED is a joint publication of UNECE and ISO (three editions: 1990, 1990 and 2005). There is a joint UNECE/ISO Maintenance Agency (MA) which includes international organisations and international convention holders such as WCO, IMO, IRU etc. who are responsible for their respective informative bridge content The four-digit ID is shared with EDIFACT and is subject to TDED formatting rules.

In EDIFACT the data are defined in the TDED (Trade Data Element Directory); logical groupings thereof (e.g. how to construct an address out of street name, house number, zip code, town, etc) in the EDCD (EDIFACT Composite Data Element Directory) and EDSD (EDIFACT Segment Directory).



The data definitions of similar data elements in the UNCEFACT CCL (Core Components Library) and the UN/EDIFACT TDED (Trade Data Elements Directory) are not fully identical. The CCL has not been designed as an upgrade of the TDED and hence these are not fully compatible.

ANNEX: ISO standards

ISO 11783	Tractors and machinery for agriculture and forestry -- Serial control and communications data network --
ISO 11784	Radio frequency identification of animals -- Code structure
ISO 11785	Radio frequency identification of animals -- Technical concept
ISO 11787	Machinery for agriculture and forestry -- Data interchange between management computer and process computers -- Data interchange syntax
ISO 11788	Electronic data interchange between information systems in agriculture -- Agricultural data element dictionary
ISO 13407	Human-centred design processes for interactive systems
ISO 14825	Intelligent transport systems -- Geographic Data Files (GDF) -- GDF5.0
ISO 15459	Information technology -- Unique identifiers
ISO 15000	Electronic business eXtensible Markup Language (ebXML)
ISO 18000	Information technology -- Radio frequency identification for item management
ISO 19101	Geographic information -- Reference model
ISO 19103	Geographic information -- Conceptual schema language
ISO 19104	Geographic information -- Terminology
ISO 19105	Geographic information -- Conformance and testing
ISO 19106	Geographic information -- Profiles
ISO 19107	Geographic information – Spatial schema
ISO 19108	Geographic information -- Temporal schema
ISO 19109	Geographic information -- Rules for application schema
ISO 19110	Geographic information -- Methodology for feature cataloguing
ISO 19111	Geographic information -- Spatial referencing by coordinates
ISO 19112	Geographic information -- Spatial referencing by geographic identifiers
ISO 19113	Geographic information -- Quality principles
ISO 19114	Geographic information -- Quality evaluation procedures
ISO 19115	Geographic information -- Metadata
ISO 19116	Geographic information -- Positioning services
ISO 19117	Geographic information -- Portrayal
ISO 19118	Geographic information -- Encoding
ISO 19119	Geographic information -- Services
ISO 19120	Geographic information -- Functional standards
ISO 19121	Geographic information -- Imagery and gridded data
ISO 19122	Geographic information / Geomatics -- Qualification and certification of personnel
ISO 19123	Geographic information -- Schema for coverage geometry and functions
ISO 19125	Geographic information -- Simple feature access
ISO 19126	Geographic information -- Feature concept dictionaries and registers
ISO 19127	Geographic information -- Geodetic codes and parameters
ISO 19128	Geographic information -- Web map server interface
ISO 19129	Geographic information -- Imagery, gridded and coverage data framework
ISO 19130	Geographic information - Imagery sensor models for geopositioning
ISO 19131	Geographic information -- Data product specifications
ISO 19132	Geographic information -- Location-based services -- Reference model
ISO 19133	Geographic information -- Location-based services -- Tracking and navigation
ISO 19134	Geographic information -- Location-based services -- Multimodal routing and navigation
ISO 19135	Geographic information -- Procedures for item registration
ISO 19136	Geographic information -- Geography Markup Language (GML)
ISO 19137	Geographic information -- Core profile of the spatial schema
ISO 19138	Geographic information -- Data quality measures
ISO 25000	Software product Quality Requirements and Evaluation (SQuaRE)
ISO 3166-1	Codes for the representation of names of countries and their subdivisions -- Part 1: Country codes
ISO 3610	Modular units for machine tool construction -- Support brackets
ISO 6523	Information technology -- Structure for the identification of organizations and organization parts
ISO 6709	Standard representation of latitude, longitude and altitude for geographic point locations
ISO 7372	Trade data interchange -- Trade data elements directory
ISO 9001	Quality management systems -- Requirements
ISO 9126	Software engineering -- Product quality
ISO 9241	Ergonomics of human-system

ANNEX: Reference and identification techniques

An important aspect of electronic data interchange is the unique identification of the objects concerned. Examples of objects are persons, locations, establishments, product batches, individual products, events, etc.

An identification is used to give an object a unique identification or to classify an object. An identification can be unique within a given sector at national or international level. An identifier has a scope. It can be used by several chain parties (e.g. PartyID, ProductID, DocumentID). These identifiers often take the form of a code list. It is strongly recommended that the manager (or publisher) and the code list number be mentioned in the data interchange. The aim is to use globally unique identifiers.

Codes
A code represents a series of characters that is as an abbreviation and/or language dependency to represent or replace a certain value or text. It is usual for the code manager and code list number to be included with the data interchange. Codes can come from external organisations[21] (ISO, UN, etc.) or sector organisations (Florecom, Edibulb, GS1).

In the case of information entities, code lists can be enumerations (using 'qualified data types') or they may be called up. Codes that do not occur in the enumeration must be requested from UNCEFACT. Code lists which are only used in a given context are defined in the namespace of the schema document that uses the codes. The code lists that are used in all contexts, the enumeration of the data type in question will have to be extended. The information entity in question will have to be incorporated in the sector library until the new UNCCL version is released. Where a code list has undergone many changes, for example for a horticultural product, the code list should be kept outside the schema. This means it is not necessary to publish a new version of the schema for every extension of a code list.

References in the agricultural and horticultural sector
Batch references are used within each process phase in the agricultural and horticultural sector. The batch reference is the batch number of a given batch of products. A batch may be a number of units of the same product, for example, which have been produced simultaneously or within a certain period. The batch number can be used to determine when the products were produced and what they consist of. Batch references are also used in the logistics operation to determine the status of goods throughout the entire transportation process. this makes it possible to ascertain where certain goods are at any time and at any given point in the chain. Traceability of the provenance of raw materials and product supplies is mandatory in certain domains (General Food Law). References may also refer to objects, such as an image or certificate.

GS1 identification standards
GS1 sets the worldwide standard for product, enterprise and location codes within the retail sector:
- GTIN (for products)
- SGTIN (serialised, for products)
- SSCC (for shipping units)
- GLN (for enterprises and locations)
- SGLN (serialised, mainly for locations within a warehouse bin a or geographical location, for example).
- GRAI (for reusable packaging and means of transport)

Individual products, batches of products, packaging units (cartons, crates, trolleys, pallets, etc.) and transportation units (trolleys, pallets, cases, containers) can all be identified with a GTIN code (Global Trade Item Number) and/or an SSCC (Serial Shipping Container Code).

GS1 uses the Global Location Number (GLN). This is a code that is unique to GS1 throughout the world and is applied to a person, enterprise, location or object. It can be used to call up information at the level of the enterprise number. Detailed information for each GLN can be searched in the national registers, such as the GS1 AdresCodeBoek (Address Code Book) for the Netherlands. If an enterprise relocates, it takes the GLN

[21] UNCEFACT publishes the List of Trade Facilitation Recommendations. Among other things, this list contains recommendations for code lists for countries, currencies, trade terms, etc.. It is important to take note of these recommendations before generating codes yourself.

codes with it to the new location; the physical location details of the location then change[22].Use of the GLN is now common practice in retail and transportation.

The GLN (Global Location Number) is a 13-digit code for identifying a company or location. The 13-digit code comprises a seven-digit numerical code which refers to the globally unique GS1 company number that identifies the company, followed by a five-digit code which the company itself has assigned to a specific location. The 13th position comprises a check digit. The GLN can be called up from a global database. It is recognised by the UN/EDIFACT standard and by ISO 6523.

It is recommended that the GLN be introduced on a wide scale as a unique identification number for actors, production locations and other types of object for which it is important to record their location. For B2G data traffic, it is advisable to create a link between industry and government systems so that the various registers (e.g. at Florecom and the digital Chambers of Commerce records) can be directly consulted electronically. The National Service for the Implementation of Regulations at the Ministry (EL&I-DR) could add the GLN as an extra identifier in addition to the Citizen Service Number (BSN) and the Chamber of Commerce number in its registers. Frugicom and Florecom are now using the GLN.

References:
- http://www.gtin.info/
- http://www.gs1.org
- http://www.gs1.org/barcodes/technical/idkeys/gtin
- http://www.gs1.org/barcodes/technical/idkeys/sscc
- http://www.gs1.org/barcodes/technical/idkeys/grai
- http://www.gs1.org/glnrules

Geostandards for location identification

Geo-information and location identification

Geographical information occupies a separate place in the electronic information exchange process. Digital geographical information can be divided into four categories:

1. Positioning, e.g. using GPS, expressed in coordinates.
2. Representation of geographical location using coordinates.
3. Representation of geographical location other than using coordinates (e.g. address, postcode, UN/LOCODE, GLN).
4. Geographical information processing systems (GIS).

1: Positioning, e.g. using GPS

All electronic positioning hardware can produce results in NMEA 0183 format, the coordinates in degrees, minutes and seconds, projected using a given projection method – the map date. The WGS-84 reference system is often used for this in the Netherlands. On Dutch (topographical) maps, the Dutch projection of the National Grid (RD-New, EPGS:18992) is used. On new maps, the ETRS89, or European Terrestrial Reference System, is also used. For national applications, data are presented in accordance with RD-NEW (EGPS:28992). The standard for European application is ETRS 89. There are no standard processes or methods relating to the method and accuracy of electronic positioning.

2: Representation of geographical location using coordinates

This is laid down in NEN 3610, CEN 15449, and ISO 6709, 14825, 19100 to 19138 inclusive for the coordinates, map projection, coordinate system, date, time and time zone.

3: Representation of geographical location other than using cord's

A variety of options are available for geo-information - representation of geographical location other than in coordinates. For addresses, house numbers and place names, the Dutch public authorities use the entries from the Basic Register of Addresses and Buildings (BAG) for official purposes.
The standard for international address notations is described in the UNTDED publication by the WCO and UNCEFACT, also published as ISO 7372.

For international trade, there is the UN/LOCODE, a list of internationally important transport locations and hubs – a transhipment sites for transportation by rail, road, inland waterways, maritime transportation and air.

Geo-information processing systems (GIS)

[22] This does not apply for the locations registered by Florecom, because the location codes are published by Florecom.

Geo-information processing systems (GIS) use lines, planes, points, groups, images and maps from a variety of sources. The Open GIS Consortium has developed a system of standards for exchanging this information, known as Open GIS Format. This is the universal format for exchanging digital geographical information (GML 3.1, NEN 3610 and ISO 19100 to 19138).

GeoNovum has published a ‘framework of standards' for geo-information. This framework is aligned with Inspire and NORA. GeoNovum has created a Dutch WMS profile for Web Map Services. Elementary objects are described in the IMGEO (Information Model Geo), which forms the basis for the geo-information models used in the various sectors.

A number of sector models have been constructed to complement the NEN 3610 standards as well as the Dutch WMS profile and IMGEO, which make it possible to exchange information within a domain in a standardised way (e.g. land registry info using the IMKAD model, or water management information using IMWAT). A geo-information model has also been developed for the agricultural and horticultural sector, the IMLB. An information model for nature (IMNA) and a model for the rural area (IMLG) are also being developed.

The IMGEO 2.0 and IMGEO-plus models are being developed for the large-scale basic topographical map. These models provide a detailed description of the geo-objects in the urban and rural area. IMGEO 2.0 and IMGEO-plus are intended for the exchange of large-scale geo-information such as that which can be represented on a large-scale topographical map. This does not meet all the geo-information needs of the agricultural and horticultural sector, however; additional specifications are needed for this, such as those contained in the EDI-Teelt 4.0 cultivation model and the Agriculture information model.

The nature of the geo-information exchanged depends on the type of process supported. In many cases, information exchange at 'point-location level' is sufficient, for example using address, postcode, GLN or UN/LOCODE. For other processes, point-location information is not enough. In these processes, it is important to be able to exchange geometries, planes or polygons, lines and arcs or a collection of individual points. This is the case, for example in field treatment, cultivation advice, cultivation processing instructions and registrations. This information exchange takes place on the basis of the NEN 3610 standard and the specific schemas.

The match between geo-information based on point-location and geometries needs to be secured because this information is reused in different processes.

The NEN 3610 standard assigns a unique identification to a geo-object. NEN 3610ID assigns a universal unique identification to an object. The combination of the namespace of the registration, local identification and version information make an object uniquely identifiable. This information means reference can be made precisely to the identified object.

Identification of animals

Cattle, sheep and goats are identified with an animal identification label carrying a unique reference number (EU Regulation 1760/2000/EC). For cattle, this is a 13-character code consisting of a two-letter country code (ISO 3166-1) and a unique 13-digit number (in RFID animal identification chips, the three-digit (numeric3) ISO country code is used (ISO 3166).

Different types of animal identification labels are used, for example yellow plastic ear tags and internal RFID chips (ruminal bolus, subcutaneous transponders). Pigs are often marked by group (usually not at unique, individual level). Horses are marked individually, but no unique code is used. There is no uniformity in identification labels. Poultry are not individually marked and identified.

Identification of vegetable products and articles

In the horticultural and arable farming sectors, it must be possible to identify products and articles uniquely in electronic message interchange – sometimes at the level of the genus (crop), but frequently right down to the level of the cultivar. Different trading codes are used in the various segments, such as that used by the Dutch Flower Auctions Association (VBN) for flowers and plants and the Edibulb codes for flower bulbs. These codes are largely linked to the official registration of cultivars is maintained by the Dutch registration authorities (VKC for flowers and plants, NAKT for fruit and vegetable species and KAVB for flower bulbs). A link to the Plant Breeders Rights register is also desirable. It is becoming increasingly important in the world of 'virtual trade' to ensure that the item offered/sold really is the item in question. This can be achieved by linking trading systems to the central registers via Web services.

For retail, a classification code for the articles is usually sufficient. In the horticultural sector, Frugicom and Florecom are currently working together with GS1 on the development of a GPC code for all horticultural products.

Unique field number

There is currently no unique identification code for geometric objects. Unique identification numbers are however available for specific domains, such as the land registry, the Basic Address and Buildings Register, etc. The Inspire programme assigns a unique identification to all objects in a database which fall within the scope of the Inspire directive.

NEN 3610 provides a unique identifier for each geo-object URI. This does not however provide a solution for the unique identification of agricultural or horticultural fields or plots.

ANNEX: Tool selection criteria

1	Product orientation	Weighting ***
1.01	Focus on modelling information exchange business processes	***
1.02	Focus on world standards	***
1.03	Focus on XML	***
1.04	Focus on migration from EDI to XML	**
1.05	Focus on documenting and testing	***
	Maximum score	14*3 = 42
2	**Modelling**	**Weighting *** **
2.01	Object orientation in accordance with UML /UMM	***
2.02	Use Case Diagrams	***
2.03	UML class diagrams CCTS Object (ACCs, ABIEs)	***
2.04	UML class diagrams CCTS Object (CCs)	***
2.05	Object diagrams	*
2.06	Sequence diagrams	***
2.07	Collaboration diagrams	**
2.08	Statechart diagrams	*
2.09	Activity diagrams	***
2.10	Component diagrams	*
2.11	Deployment diagrams	*
2.12	Relational modelling	***
2.13	Simple search/browse functionality	***
2.14	Import data model (XMI/Rational Rose)	**
2.15	Export data model (XMI/Rational Rose)	**
2.16	Export data models to XML schema	***
	Maximum score	37*3 = 111
3	**EDI Standard**	**Weighting ** **
3.01	Support UN/EDIFACT message standards	***
3.02	Support EDI standards code lists	***
3.03	Limit standard code lists	***
3.04	Own code lists	***
3.05	Import code lists	*
3.06	Call up external functions for elements	***
3.07	Support descriptions	*
3.08	Support multilingual guide	***
3.09	Modify standard	***
3.10	Build own standard	***
3.11	Record business rules	***
3.12	Import extra standards (e.g. EANCOM)	**
3.13	Compare standards and versions of standards	***
3.14	Version management in accordance with SVN	***
3.15	Support notes on segment/element	***
3.16	Support internal comments	*
3.17	Include example entry per segment	*
3.18	Show elements that will lapse in the future	*
3.19	EDI to XML in accordance with ISO/TS 20625	*
3.20	Import iDOC, SEF, text file	***
3.21	Support fixed or variable record length data formats	*
	Maximum score	48*2 = 96
4	**XML standard**	**Weighting *** **
4.01	Support UNCEFACT Core Components	***
4.02	Generate XML schemas in accordance with NDRs from UNCEFACT-ATG-2	***
4.03	Support modular schema structure includes / import namespaces.	***
4.04	Modify XML dialect	***
4.05	Record business rules	***

4.06	Import other XML dialects (e.g. UBL)	*
4.07	Support descriptions	*
4.08	Support multilingual guide	***
4.09	Call up external functions for elements	***
4.10	Limit code lists at schema/guide level	***
4.11	Own code lists at schema/guide level	***
4.12	Schema development in accordance with W3C rules	***
4.13	Design of own schema dialect and structures	***
4.14	Display references to UN TDED element, UN Identifier	*
4.15	Schema browser	**
4.16	Add comments, annotations to elements	***
4.17	Support internal comments	*
4.18	Import iDOC, SEF, text file, XML schema,	*
	Maximum score	43*3 = 129
5	**Documentation**	**Weighting *** **
5.01	Copy guides (several guides on same standard)	***
5.02	Update new, changed, removed in guide	***
5.03	Compare guides	***
5.04	Combine guides	*
5.05	Test guides	***
5.06	Multilingual (notes)	***
5.07	Search within guide	*
5.08	Standard layouts	***
5.09	Modify layouts	***
5.10	Construct own layouts	***
5.11	Export to PDF, RTF	***
5.12	Export to HTML incl. hyperlinks	*
5.13	User-specified documentation components	***
5.14	Documentation in accordance with BRS and RSM UNCEFACT	***
	Maximum score	36*3 = 108
6	**Version management**	**Weighting *** **
6.01	Support good version management (e.g. SVN)	***
6.02	Central repository in the local network or on the Internet	**
6.03	Collaboration between several users	*
	Maximum score	6*3 = 18
7	**Testing**	**Weighting ** **
7.01	Syntactic and semantic testing	***
7.02	Testing of business logic (business rules)	***
7.03	Forward/backward checks in the message	**
7.04	Picking up test messages from a mailbox	*
7.05	Generating error messages	*
7.06	Error reports	***
7.07	Validation of message at guide level	***
7.08	Creation of example messages	***
7.09	Manual processing of test files	*
7.10	Migration from test files to new version	***
7.11	Jump to error location	**
7.12	Test tool - local	*
7.13	Test tool - Internet	***
7.14	Community management (progress testing by end users)	***
	Maximum score	32*2 = 64
8	**Mapping**	**Weighting * **
8.01	Recording mapping for translators	*
8.02	Map 1-to-1, 1-to-many, many-to-1	*
8.03	Model->EDI-Guide, Schema, Schema -> Schema, Schema ->EDI guide, EDI-Guide -> EDI-Guide	*
8.04	Mapping reports	*
8.05	Export mapping as CSV file, XML schema	*
8.06	Interfaces EDI Translators: BizTalk server, Harbinger, IBM WebSphere, Seeburger, SAP, Mercator	*

	Maximum score	5*1 = 5
9	**Help**	**Weighting ***
9.01	Context-sensitive help text	***
9.02	Training in use of application	**
9.03	Workshops	*
	Maximum score	7*1 = 7
10	**Maintenance and support contract**	**Weighting ***
10.01	Free recovery from errors	*
10.02	Supply of new versions of standards and code lists	***
10.03	Response time to support request (maximum one day)	*
10.04	Error repair time (in the event of a showstopper: maximum one day)	***
10.05	Availability of helpdesk on workdays 9.00 – 17.00 hrs	***
	Maximum score	11*1 = 11
11	**Supplier**	**Weighting ** **
11.01	Size of company (staff), certainty of continuity	***
11.02	Long experience with EDI and XML	***
11.03	Size of client base	**
11.04	Diversity of client base	**
11.05	Global spread of client base	***
11.06	Use of product by clients (standards organisations versus end-users)	***
11.07	Future product development plans	***
11.08	Contacts of suppliers with standardisation organisations such as GS1, UNCEFACT	*
	Maximum score	20x2 = 40
12	**Product licences**	**Weighting ***
12.01	Modular structure of licences (number of users)	*
12.02	Licence for use on a network	**
12.03	Licence for use on the Internet	***
	Maximum score	6*1 = 6
13	**Product price**	**Weighting ** **
13.01	1 user, 1 licence	***
12.02	4 users, 1 licence	**
13.03	4 users, 4 licences	***
13.04	Maintenance & support contract	**
	Maximum score	10*2 = 20
14	**Total score**	
	Total score	657
	Percentage	100%

Weighting:
Each criterion and focus area (14 areas) are weighted. An * is 1 point.

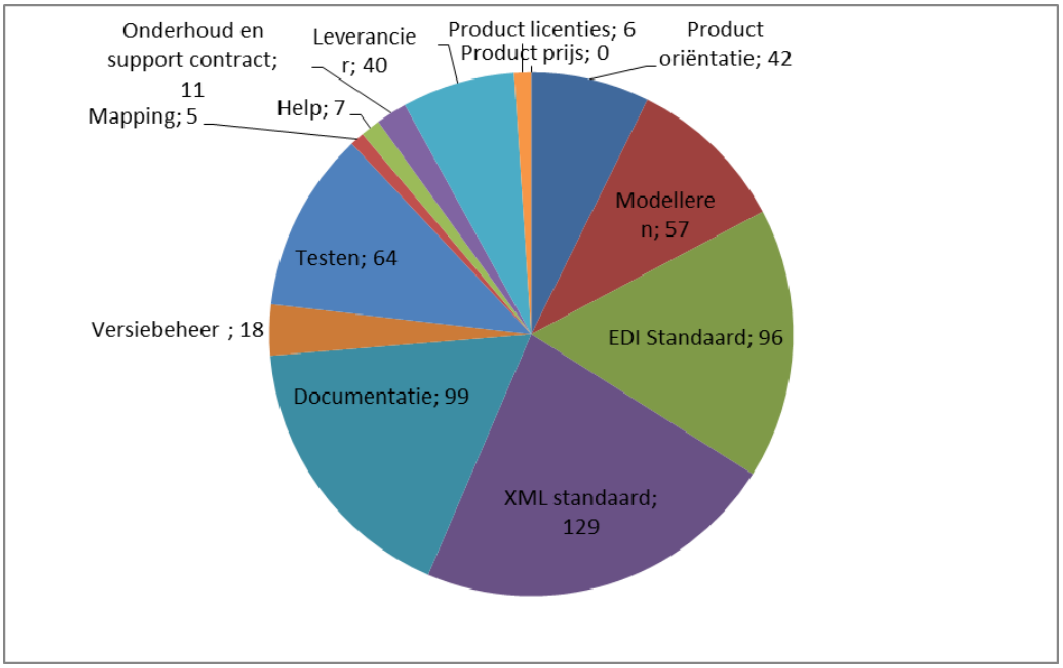
ANNEX: Tool selection result: GEFEG.FX 6.1

Strengths : EDI/XML standard in accordance with e.g. EDIFACT/CCTS,
Testing and documentation
Emphasis on semantic standards
Modular schemas (i.e. includes, namespaces)
Direct relationship with organisations such as UNCEFACT, WCO, GS1
Internet validation portal
Present/future focus: XML, support for eCommunities with collaboration solutions such as Dynamic Collaboration Framework

Weaknesses : Modelling based on UML (several diagrams in addition to Class Diagrams)
Price on the high side

The focus of the GEFEG.FX tool is mainly on modelling components (in accordance with CCTS and NDR) and building message structures and schemas (in addition to the presence of standards, templates). The tool also offers ample opportunities for maintaining and documenting EDI standards (the original task of the tool). The tool is able to import and export included and imported namespaces. The tool can also import SEF files from EDIFACT standards which are recorded in another EDI tool. The tool is used by GS1, UNCEFACT working groups, nVWA and WCO.

Selection criteria results[23]:
Processes supported: managing, testing, documenting, publishing



GEFEG.FX 6.1

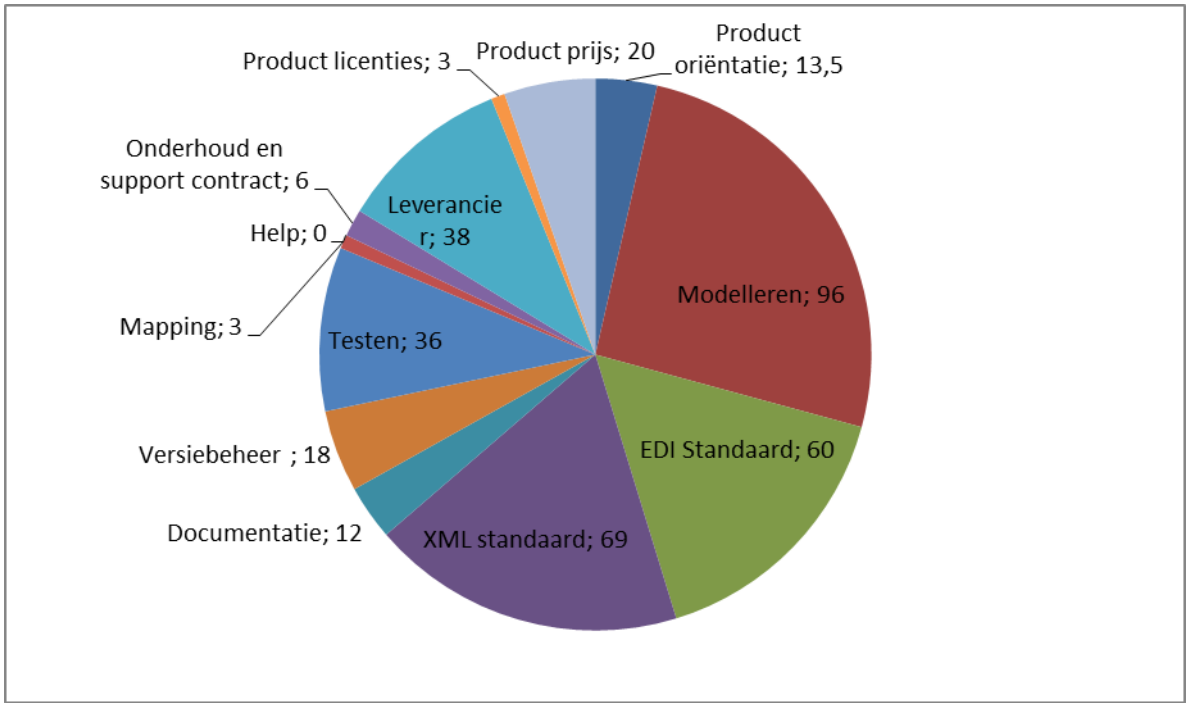
[23] The detailed results per criterion are set out in the document Tool selection results: GEFEG.fx 61 XMLSpyMissionKit 2012 EnterpriseArchitect 9

ANNEX: Tool selection result: ALTOVA MISSIONKIT 2011

Strengths	:	Modelling in accordance with all UML diagrams Good support for EDI standards (various templates) Extensive options in the modules offered Modular schemas (i.e. includes, namespaces) A lot for a low price.
Weaknesses	:	No support for CCTS/NDR Migration of EDI documentation to XML (import SEF, etc.) not possible No relationships with organisations such as UNCEFACT, WCO, GS1 No exports to well-known translators such as BizzTalk, Harbinger, etc. Documentation mainly for community guides, no emphasis on semantics Technical: Web & Web services development, Data mapping & integration No Internet portal

MissionKit is a suite of modules produced by Altova, comprising eight XML tools, a database tool and UML tools. The emphasis is mainly on self-build XML schemas and modelling. There is a clear focus on the technical development of schemas and mapping from EDI to XML (implementation), and much less focus on documenting the importance of information and the use of semantic standards. The tool is therefore less suitable for standardisation organisations, though it can complement a package in which UML modelling is in its infancy, such as GEFEG.FX. In that case, however, MissionKit is too extensive; the Umodel module would be enough. This tool has a module for XBRL and an XBRL validation module. No relationship was found with UNCEFACT, GS1, or UBL XML standards. Altova is a very popular and widely used tool for developing XML schemas and modelling processes. Use of the product can often be derived from the diagrams used in various documentation about standards (e.g. SETU (Foundation for electronic transactions in the staffing industry)).

Selection criteria results[24]:
Processes supported: developing, testing, implementing.



ALTOVA MISSION KIT 2011

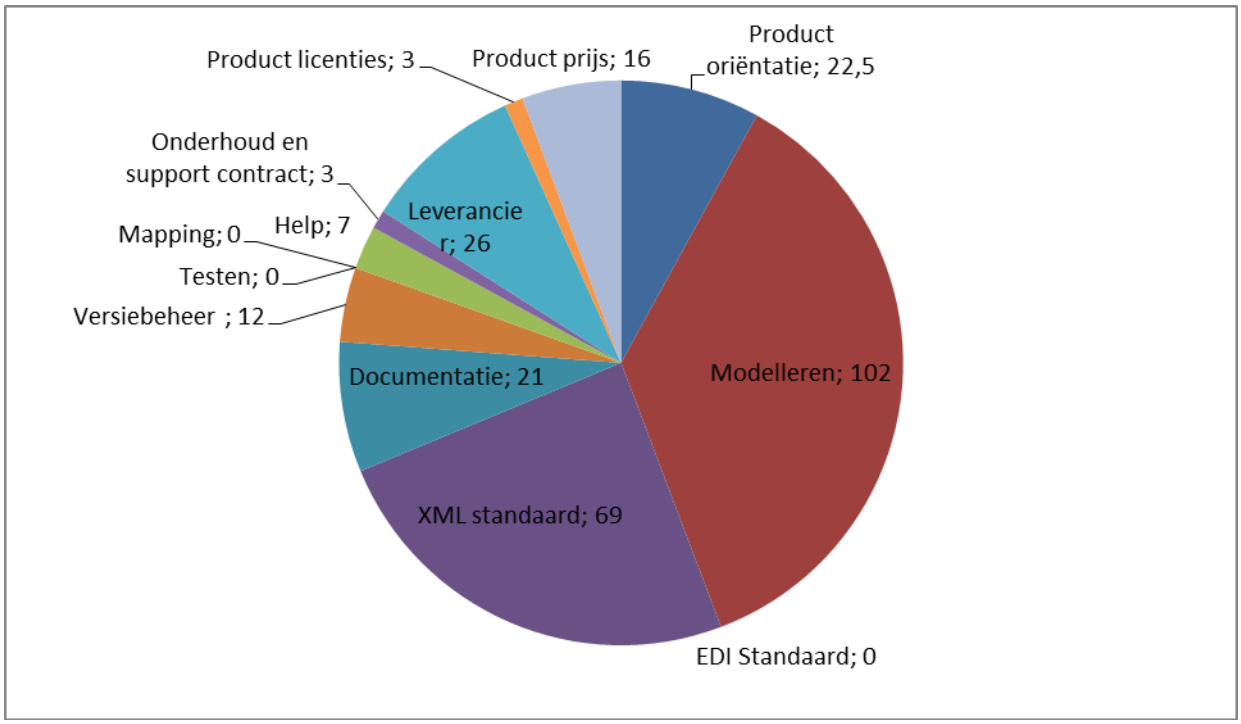
[24] The detailed results per criterion are set out in the document Tool selection results: GEFEG.fx 61 XMLSpyMissionKit 2012 EnterpriseArchitect 9

ANNEX: Tool selection result: Enterprise Architect Ultimate 9.1

Strengths	:	Modelling in accordance with all UML diagrams UMM UNCEFACT'S MODELING METHODOLOGY Extensive options in the editions offered A lot for a low price.
Weaknesses	:	No support for CCTS/NDR No support for EDI standards No support for modular schemas (with includes, namespaces) Migration of EDI documentation to XML (import SEF, etc.) not possible No relationships with organisations such as UNCEFACT, WCO, GS1 No exports to well-known translators such as BizzTalk, Harbinger, etc. Documentation mainly for community guides, no emphasis on semantics Technical: mainly for designing software systems

Enterprise Architect is available in several editions: Ultimate, Systems Engineering, Business & Software Engineering, Corporate, Professional, Desktop. Ultimate is the most extensive version. The two latter versions offer fewer or no functionalities in the area of DBMS Repository, BPEL, Scripting with JScript, VBScript and Javascript, etc. Even the simplest version meets the selection criteria, since we are concerned with modelling business processes in accordance with UML. The focus in Enterprise Architect is on designing software and less or not at all on data interchange between organisations based on shared semantics. The package contains little functionality in this regard, although a UMM plug-in has been added on top of UML. However, that is not enough to describe this as a tool with a central repository of core components that can be reused in schemas. The product is less suited to information exchange than Altova, which supports EDI standards, XBRL and mapping of EDI to XML, etc.

Selection criteria results[25]:
Process supported: modelling



Enterprise Architect Ultimate 9.1

[25] The detailed results per criterion are set out in the document Tool selection results: GEFEG.fx 61 XMLSpyMissionKit 2012 EnterpriseArchitect 9

ANNEX: Quality of standards

There is little information in the literature about quality in relation to standards. Basic principles about quality for physical products have been established by leading figures such as Deming, Juran and Crosby. Since the 1990s, quality standards for processes have also been described (ISO 9001, 9241, 13407, TQM, SixSigma). Process-orientated quality standards are very popular in the development of software (CMMi). Data quality plays a key role in Information Systems (ISO 9126, 25000 family). CMMi and ISO 9126 are the most frequently applied quality concepts in software development. Parts of these concepts are usable in the development of standards.

The focus with regard to the quality of standards is on evaluating the match between the requirements in a certain context and the standard. The suitability of the standard for use in a given context is described as its quality. Often, the degree to which a standard is adopted is also used as a yardstick for measuring the quality of standards, but this is at odds with the principle that a standard should be suitable within a given context ('fitness for use').

It is important that stakeholders share the same view of quality. It is often the users of standard who have to bear the costs of any shortfalls in quality. Misuse of standards is exacerbated by lack of quality.
The quality of a standard, the product of the standardisation process, is described in this chapter. The approach taken is in line with that of TNO researcher E. Folmer. The quality of a standard in turn influences its dissemination (adoption).

Quality in the standardisation process

The focus in the standardisation process is on the procedures of the standardisation organisation. The quality of standards is largely influenced by the function, quality and working group members, as well as the management process. Although members of the working group can have different backgrounds, they must possess certain qualities (e.g. familiarity with technical aspects), motivation and commitment. The standardisation process must be accessible and transparent with regard to obtaining information about the progress and quality of the standards being developed. Commitment on the part of the chain partners (consensus, obligation to use best efforts) must be established before the standard is developed. This avoids standards not being used in practice, or being used only partially.

Quality concepts as a starting point
The following table shows the three quality dimensions proposed by McCall, on which the present CMMi and ISO standards are based. As stated earlier, little or no literature is available on quality concepts in relation to standards developed by standardisation organisations. The basic principles of the different quality concepts can be used in the development of standards.

Product Transition	Product Revision	Product operations
Portability	Maintainability	Correctness
Reusability	Flexibility	Reliability
Interoperability	Testability	Efficiency
		Integrity
		Usability

Quality concepts 'Conformance to requirements' and 'Fitness for purpose'
The quality of a standard is intended to avoid costs being incurred because specifications have not been laid down in accordance with the user requirements or as a result of incorrect implementations. The quality of a standard is also improved by incorporating feedback from the field. By involving the market closely in the development of new releases, the standard will be more in line with the market. An evaluation should be carried out after each development, for example supported by a quality evaluation form
.

Demands on standard	Result
Use of standards	Interoperability.
Documentation	Readable for the target public, without language or translation errors.
Conformity	User requirements have been recorded as requested.
Simple	The standard is easy to implement (not too complex).
Consistent	Definitions/application methods are consistent.

Demands on standard	Result
Unambiguous	No differences of interpretation. Be clear with regard to recommendations.
Accountability	Judgments made and design choices support perceived quality.
Backwards compatibility	Retention of existing functionality.
Release policy	Certainty as to when which release is active, in production and at end of life.
Continuity	Change policy: access/insight into the change management process.
Consensus	Supported standard, not requested by just one company
Commitment	Full implementation, not partial implementation because of costs.
Risk aversion	Use less risky alternative if possible
Maintainability	Dividing line between functionality and technology (syntax XML/EDIFACT).
Efficiency	Not too many options, parameters; describe when to use options.
Effectiveness	Precisely serves the purpose for which it was created.
Testing pilot/draft versions	Error elimination. Gain experience with users/developers.
Review	Error elimination. Trust among reviewers (users, developers).
Test facilities	Certainty about conformity with the standard.
Certification	Clarity, certainty about capability of trading partner.

Quality of documentation

The documentation of the standard must meet certain requirements, including with regard to readability. However, quality must not be restricted to the specifications alone. In order to make effective use of a standard, additional documentation is needed such as a tutorial,, FAQ, test facilities, etc.. Documentation in English should be checked by native speakers to improve the quality. Use of standards and methods improves the quality of the documentation:

- As far as possible, follow the UNCEFACT Business Requirement Specifications (BRS).
- As far as possible, follow the UNCEFACT Requirements Specification Mappings (RSM).
- Build domain components CCTS, including the XML Naming and Design Rules. Each concept and data element must have a unique semantic value.
- Use the right tool for the documentation. The tool must be able to describe information and processes in accordance with UML. It is important that the tool recognises entities such as ‘BCC’, ‘ABIE‘, ‘Transactions‘, ‘Roles‘, etc. (not always the case, because these entities are not part of the UML).
- Use the UML profile for CCTS as described in the UMM (UNCEFACT Modeling Methodology) (http://www.unece.org/cefact/umm/umm_index.html and http://www.unece.org/fileadmin/DAM/cefact/codesfortrade/UPCC_UML-CoreComponent.pdf). This resolves the issues in relation to ‘BCC’,‘ABIE‘, ‘Transactions‘, ‘Roles‘, etc.

Quality of schemas

The quality of a schema is measurable (ISO 9126). A large number of declarations of particular types in a schema is an indication that the schema is complex, while lots of annotations suggests a well-documented schema. The risk of uncertainty and superfluousness will be lower with vertical standards.

- Number of complex type declarations, simple type declarations, annotations, derived complex types, global type declarations, unbounded elements.
- Average number of attributes per complex type declaration, bounded element multiplicity size, number of restrictions per simple type declaration and element fanning.
- The number of distinct data containers that exist for a single specific type of information in a document (possible alternatives to specify the same information in a schema). Causes uncertainly.
- The total number of possible distinct data containers in a document to support a specific business example. Causes redundancy.

The next section looks at the relationship between horizontal and vertical standards in relation to schema quality.

Quality in relation to horizontal and vertical standards

Using the UNCEFACT CCL improves interoperability (a quality aspect). Core Components which are used in a certain context are called Business Information Entities (BIEs). These entities are horizontal (sector-overarching) or vertical (sector-specific). According to ISO 9126, the quality of a schema is determined by the number of components used and the average number of attributes per element. Reusing UNCEFACT BIEs, more specifically the Reusable Aggregate Business Information Entities, will lead to low schema

quality, but the interoperability also determines the quality, and this is high. In order to increase the schema quality, it is tempting to adapt ABIEs and incorporate them in a sector library. This increases interoperability within the sector but is in conflict with the notion of a unique component/element for each information entity. A solution is to use fill-in instructions. These function as a profile for these sector-overarching components, for ruling out or refining certain information in the schema; the context of the component must not be forgotten here.

Quality model

Finally, reference can be made to the doctoral study by Erwin Folmer (University of Twente), and specifically to the 'Quality Models of Semantic Standards' (QMSS).

Erwin Folmer has developed a framework for testing:
- the quality of the product (the standard)
- the quality of the process (the standardisation process)
- the quality of the organisation (the standardisation organisation).

The criteria for each quality aspect are included in the annex in the form of checklists. These checklists do not form part of the QMSS, but should be seen as an aid to checking the quality of standards. The criteria on this list are derived from the QMSS.

ANNEX: Quality, Checklists (QMSS) [26]

Checklist Product Quality	
A1. Functionality	
A1.1 Completeness	
A1.1.1. Covered functions	**Status**
1. Functionality in BRS (Business Requirements Specification) corresponds with that described in RFC (change request)	
2. Functionality is described in BRS document	
3. Functionality solves a problem as described in the RFC	
A.1.1.2 Covered information	**Status**
1. All information elements for the function are described	
2. There are no superfluous elements (these do not contribute to the function)	
A1.2 Accuracy	
A.1.2.1 Specificness	**Status**
1. Functionality is not too specific or generic (limiting/too wide)	
2. The context of the function is included in the description	
A.1.2.2 Precision	**Status**
1. Consideration has been given to precision (name, decimals, currency, language, length, typology)	
A1.3 Consistency	
A.1.3.1 Information ambiguity	**Status**
1. A definition has been established for the component/element	
2. There are no information elements which overlap with other elements	
3. There are no element values which could overlap with code values	
A.1.3.2 Function ambiguity	**Status**
1. The function does not exist elsewhere in the message	
2. There are no business rules which impinge on or constrain the function	
3. The function is used in the same way as in other processes	
A1.3 Compliancy	
A1.4.1. External Compliance	**Status**
1. The function complies with interoperability aspects (regulations, legislation, technical)	
A1.4.2. Compliance Defined	**Status**
1. There is a strict formulation with which the implementation must comply	
A2. Usability	
A2.1 Understandability	
A2.1.1 Availability of knowledge representations	**Status**
1. (Help) documentation is available: 'how to's', 'for dummies', training, etc.	
A2.1.2 Structure of specification	**Status**
1. The specifications are complete and described in a clearly structured way: class diagrams, use case diagrams, activity diagrams, sequence diagrams	
A2.1.3 Readability of specification	**Status**
1. The specifications have been assessed by software developers	
2. The specifications have been assessed by business people	
3. The translations have been checked (preferably by native speakers)	
4. The references to sections, documents, etc. are accurate	
5. Texts have been kept as concise as possible	
6. The functional specification uses the language of the sector(s) concerned.	
A2.1.4 Conditions specified	**Status**
1. The specifications are tailored to the target readership	
A2.1.5 Learning time	**Status**
1. The time needed to go through the standard can be determined for each role (software developer, user). Some implementations require a greater insight.	
A2.2 Testability	
A2.2.1 Test services	**Status**

[26] The 'checklists of measurable concepts' have been compiled on the basis of QMSS 0.7 by Erwin Folmer, University of Twente, (erwin.folmer@tno.nl).

1. Test services have been configured, example messages created and tested. A test procedure has been described.	
A2.3 Openness	
A2.3.1 One world	**Status**
1. Other standards have been examined to see whether they have resolved the same interoperability problem (e.g.GS1, UBL, etc)	
A2.3.2 Availability	**Status**
1. The standards (specifications, etc.) are made available to all those who wish to see them (published, submitted for review)	
A2.3.3 Use / Re-Use	**Status**
1. The user may reuse the described standard in his environment for any purpose (the standard or parts of it are open)	
A2.4 Technical complexity	
A2.4.1 Proven technology	**Status**
1. The most suitable technological solution has been used for the requested functionality. The technology has proved itself elsewhere.	
A3.4.2 XML Design	**Status**
1. The design meets the design requirements of the Guide (e.g. W3C compliant, etc)	
2. The design has been developed on the principle of 'keep it as simple as possible'.	
A3. Durability	
A3.1 Adaptability	
A3.1.1 Modularity	**Status**
1. The described standard meets the separation of functionality (e.g. commercial, logistical and financial). EDI and XML messages are logically structured	
A3.1.2 Dynamic content	**Status**
1. The specification design is flexible. The number of occurrences, enumerations is large, so that. It will not be necessary to amend the standard in the very next version	
A3.1.3 Extensibility	**Status**
1. The standard has been extended in such a way that it does not impinge on the existing implementations (e.g. by adding new components to the end).	
A3.2 Maintainability	
A3.2.1 Separation of concerns	**Status**
1. There is a clear separation between a functional and a technical description (no technical matters in a functional description).	
A3.2.2 Localisations	**Status**
1. There is support for local aspects (e.g. sector product code, VAT rates, etc.)	
A3.2.3 Dependability	**Status**
1. The functionality, the component or the elements are not dependent on developments in other standards.	
A3.2.4 Version Continuance	**Status**
1. The new version contains the same functionality as the previous version. There is backward compatibility.	
A3.3.1 Installed base	**Status**
1. The standard fits in with the existing ICT landscape of the stakeholders.	
A3.3 Advancedness	
A3.3.2 Technical Advancedness	**Status**
1. The selected technical solution is sufficiently mature.	
A3.3.3 Business processes	**Status**
1. The business function is not too specific. The process being standardised is not unusual for the sector as a whole.	
A3.3.4 Conceptual Advancedness	**Status**
1. The proposed function and associated solution can be applied for a long time (the expected life span of the conceptual solution).	

Checklist Process Quality	
B1. Development & Maintenance	
B1.1 D&M Process	
B1.1.1. Documented Process	**Status**
1. A check has been run to ensure that certain copyrights, patents are not being infringed	
2. A Change Management Procedure has been drawn up.	

3. A procedure has been formulated for launching new developments.	
B.1.1.2 Time for changes	**Status**
1. The number of releases for the standard has been checked (must not be too many).	
2. The number of change requests for the standard has been checked (lots of requests could indicate poor quality of the present standard).	
B.1.1.3 Unplanned changes	**Status**
1. There is a procedure for resolving bugs rapidly	
2. The period between error discovery and resolution is short	
B.1.1.4 Review procedure	**Status**
1. The number of review cycles has been established and is sufficient.	
2. The number of reviewers is known and they are invited.	
3. The composition of the reviewer team is representative for the stakeholders.	
4. There is scope for carrying out an active review (testing).	
5. There is scope for a public review	
B.1.1.5 Use of Methodology	**Status**
1. The methods to be used have been established.	
2. Methods are used where possible.	
B.1.1.6 Use of Tooling	**Status**
1. Tools used must be recorded in the development process.	
B.1.1.7 Open Process	**Status**
1. All stakeholders have access to the development process.	
2. The calendar for the release process has been published.	
3. Meetings are accessible (location, free entry if possible).	
B1.2 Versioning	
B.1.2.1 Version Management	**Status**
1. The version policy has been established.	
2. It has been established what constitutes a minor and major release.	
3. It has been established what constitutes the trigger for a new release (e.g. : one ‘must’ RFC, five ‘should’ RFCs, one ‘should’ RFC goes with a ‘must’ RFC)	
4. The maximum number of releases within a given time window has been established.	
5. The development tool supports version management.	
6. The version policy makes allowance for backwards compatibility.	
B.1.2.2 Maintenance Requests	**Status**
1. The website contains a list of RFCs (Requests For Change).	
2. The history of the RFCs can be followed.	
3. A list can be made of the number of RFCs granted that lead to a new release.	
B2. Communication	
B2.1 Support	
B2.1.1. Helpdesk	**Status**
1. There is a helpdesk available staffed by expert personnel.	
2. There are enough channels for asking questions (telephone, email, forum, face-to-face)	
B2.1.2. Champion	**Status**
1. There are ambassadors for the standard (companies with successful implementations of the standard who are willing to champion it).	
B2.2. Adoption strategy	
B2.2.1 Adoption plan	**Status**
1. A promotional strategy has been established to ensure successful adoption of the standard in practice.	
2. There is an adoption plan specifying adoption-enhancing activities.	
3. The effect of the activities can be measured.	
B2.2.2 Certification	**Status**
1. There is a certification programme with guidelines.	
2. The certification programme is intended to improve adoption and interoperability	
3. It has been established to which aspects of the certificate relates.	
4. It has been established for which version the certificate has been drawn up and for how long it is valid	
B3. Organization	
B3.1 Governance	**Status**
1. The decision-making by the management of the organisation is clear.	
B3.1.1. Decision Making	**Status**

1. It is clear which decisions are taken by management and the standards working group.	
2. It is clear how decisions are made (consensus, majority or weighting).	
3. No stakeholders are excluded.	
B3.2 Fitness	**Status**
1. The organisation is powerful enough to develop and market standards.	
B3.2.1. Reputation Development Organization	**Status**
1. The development organisation is not influenced by stakeholders, except through the usual decision-making process.	
2. The development organisation enjoys the confidence of the market.	
3. The development organisation is known in the market.	
B3.2.2. Expertise of Development Organization	**Status**
1. The development organisation is familiar with modelling.	
2. The development organisation is familiar with standardisation procedures.	
3. The development organisation is familiar with logging data definitions.	
4. The development organisation is familiar with transformation to other technologies (migration, etc.).	
5. The development organisation has good substantive knowledge as well as knowledge of standardisation procedures.	
B3.2.3. Quality of Active Community	**Status**
1. There is sufficient knowledge in the community to address problem areas.	
2. The community is committed and determined to resolve problems together.	
B3.3 Financial	**Status**
B3.3.1. Profit Orientation	**Status**
1. There is no profit motive (not-for-profit)	
B3.3.2. Revenue Model	**Status**
1. There is a stable income source for the development of standards.	

Checklist Quality in Practice	
C1. Acceptance	
C1.1 Solution Providers	**Status**
1. There are sufficient solution providers in the market.	
C1.1.1 Implementations in End User Products/Services	**Status**
1. Ready-made modules can be purchased for the standard.	
2. Ready-made modules can be purchased from the top five software suppliers in the market.	
C1.1.2 Availability of Support Tools for Implementation	**Status**
1. There are tools and components which simplify implementation (e.g. open source components).	
C.1.1.4 Availability Support for Implementation	**Status**
1. There are sufficient companies that can support the standard (outside the development organisation).	
C.1.2 End Users	
C1.2.1 Market penetration	**Status**
1. End users apply the standard to a sufficient degree.	
2. The percentage using the standard is high in terms of transactions and number of companies.	
3. The user group is highly differentiated.	
C.1.3. Recognition	**Status**
1. The standard receives high external recognition.	
C.1.3.1 Recognition Achievements	**Status**
1. The standard has been formally recognised (e.g. by ISO, UNCEFACT)	
C2. Interoperability	**Status**
1. The standard makes a meaningful contribution to the communication between systems.	
C2.1 Maturity	**Status**
1. The standard is stable and is a proven solution.	
C2.1.1 Stability	**Status**
1. There is a stable release schedule with sufficient time (recommended: one year) between successive releases.	
C2.1.2 Changes per Release	**Status**
1. The number of changes per release is low (a high number can indicate low quality of	

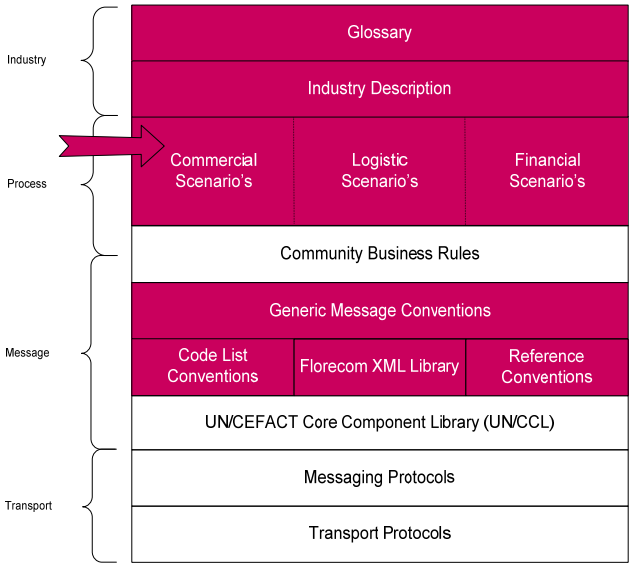
the standard).	
2. The number of functional changes within the software is low.	
C2.1.3 Versions in Use	**Status**
1. The number of versions of a standard in use is low (one or two).	
C2.1.3 Life Cycle	**Status**
1. The life cycle of the standard is known (creation, fixes (changes), maintenance (changes), availability (no changes), rescission)	
2. The standard is introduced to the market in good time.	
C2.2 Correctness	
C2.2.1 Interoperable Implementation	**Status**
1. The standard has contributed to the interoperability of systems in the market.	
C2.2.2 Fault Tolerance	**Status**
1. The standard is robust, performs well and reliably according to users and software developers.	
C2.2.3 Completeness Elements	**Status**
1. The number of self-developed elements or additions is small.	
C2.2.4 Relevancy Elements	**Status**
1. There are virtually no elements that are not used.	
C2.3. Cost & Benefits	
C2.3.1 Value Added	**Status**
1. The benefits of standardisation in practice outweigh the costs.	
2. Expectations about the benefits of standardisation have been met according to users.	
C2.3.1 Cost-Effectiveness	**Status**
1. There is a clear relationship between standardisation and the effect on profits.	

ANNEX: Florecom Documentation Method[27]

The Florecom documentation method is used to describe the XML standards in the ornamental horticultural sector. This method does not describe how Florecom develops messages itself. The aims of this method are to create:

1. Documentation for every type of user (technical and non-technical).
2. Documentation from different perspectives and with different levels of detail.
3. Unambiguous terminology and modelling techniques.
4. A clear relationship between the different documents.
5. A clear structure for finding the right documents.
6. A good basis for quality and certification of software suppliers.

Florecom documentation structure:



The first three layers describe the context and business processes. The UNCEFACT Business Requirements Specifications (BRS) already contain these components. The Community Business Rules are an implementation of the standard by a particular community; general conventions apply for the message which must be followed by every community. Together with the agreements, code lists, XML schemas (Library) and the reference technology, exchangeable documents are created. Florecom uses Core Components from the UNCEFACT CCL for structuring its messages (schema), as well as its own reusable components. Florecom uses standard protocols (WSDL, SOAP, SMTP) for the technical exchange of documents.

Interfaces between Florecom and UNCEFACT[28] BRS & RSM and Codes.

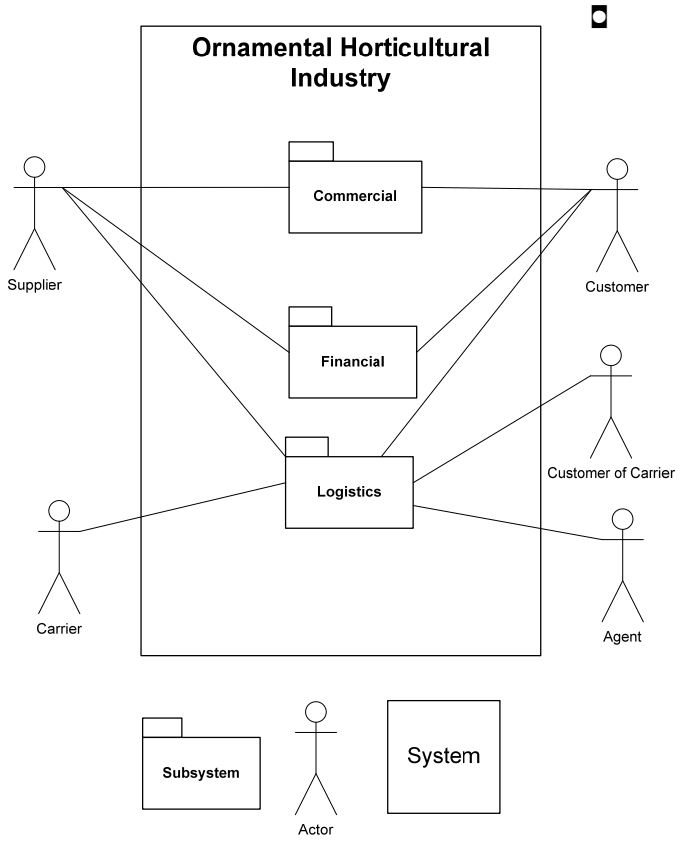
1. Business Process Elaboration (process, scope principles) (BRS)
   Florecom → System Diagram, Subsystem Diagram
2. Business Transaction (BRS)
   Florecom → Use case diagram, Use case descript., Activity diagram, Sequence diagram
3. Information Model - Entity relationship (BRS)
   Florecom → Class Diagram
4. Business Rules (BRS)
   Florecom → Community documentation
5. Information Payload (RMS)
   Florecom → Information Analysis, Message Guide
6. Reusable Business Information Entities (Library)
   Florecom → FEC RABIE and UN RABIE, list of definitions
7. Schemas (Schema)

[27] The complete documentation may be found on the Florecom SDK site.
[28] See also Annex 'Analysis of message standardisation for agriculture and horticulture'.

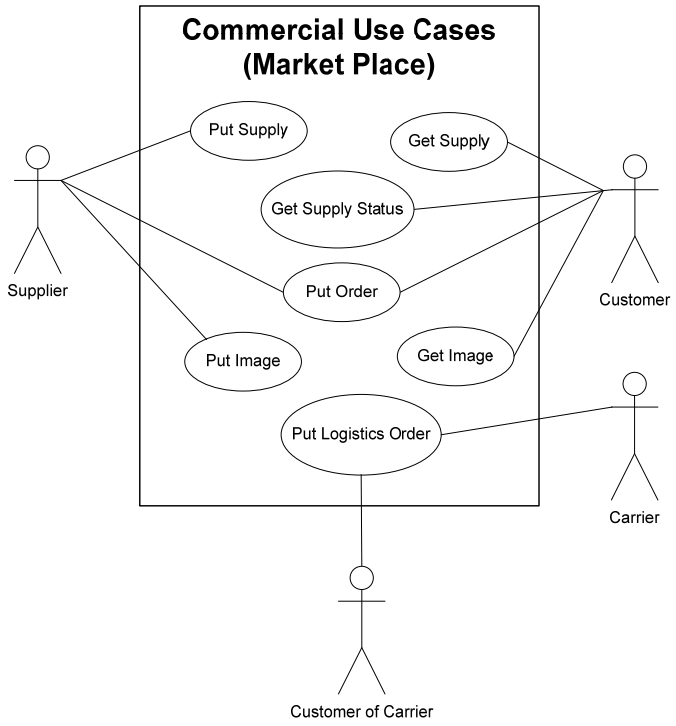
Florecom (based on Core Components or partly adopted (Cross Industry Invoice)

8. Codes
   Florecom → Florecom Codes, Sector Codes, UN Codes, ISO codes

(1) System diagram



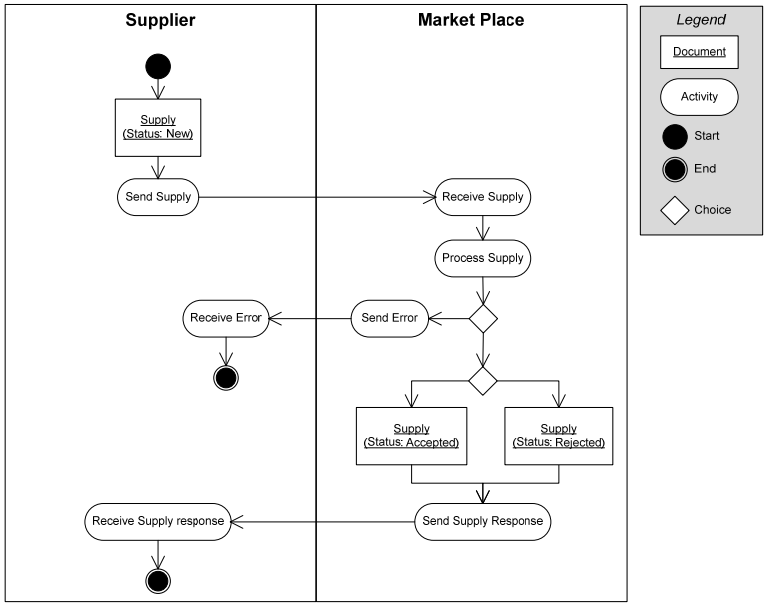
(1) Subsystem diagram commercial



(2) Use Case description

#	Use Case	Description
2.1	Put Supply	Supply offered by a supplier to a marketplace for trading purposes. Supply is typically a batch of one or more products with similar characteristics (a so called 'Item'). Batches can be sold in whole or in parts at the marketplace.
2.2	Get Supply	A customer requests supply from the marketplace. This supply can be offered exclusively to this customer or it can be offered to more customers at the marketplace.
2.3	Get Supply Status	Supply can be sold (in parts) to many customers. Once the supply is requested at a marketplace it is being processed by the customer. In the mean time the supply can be (partly) sold to another customer. This use case is used to retrieve the status (e.g. availability, location or trade sequence) of a specific supply line.
2.4	Put Order	The actual ordering process of one or more trade line items.
2.5	Put Image	Supply can be accompanied by images that represent the offered supply. Images can be submitted to the marketplace by the supplier or can be provided by the marketplace based on general images.
2.6	Get Image	Images can be requested for each supply line once they are made available by the marketplace or by the supplier.
2.7	Put Logistics Order	The process of ordering the transportation of a specific amount of transport units.

(3) Activity diagram Put Supply



(6) Definitions

B

Buyer

The company that purchases the goods or services on behalf of the Customer

Inkoper

Het bedrijf dat namens de afnemer goederen of diensten inkoopt.

C

Carrier Party

The authority that carries out the external transport (carrier) or internal transport, (auction distribution).

Vervoerder

De instantie die het externe transport (transporteur) of interne transport (veilingdistributie) verzorgt.

Characteristic

A characteristic is a property of a product or item, expressed as a coded Characteristic Value of a coded Characteristic Type.

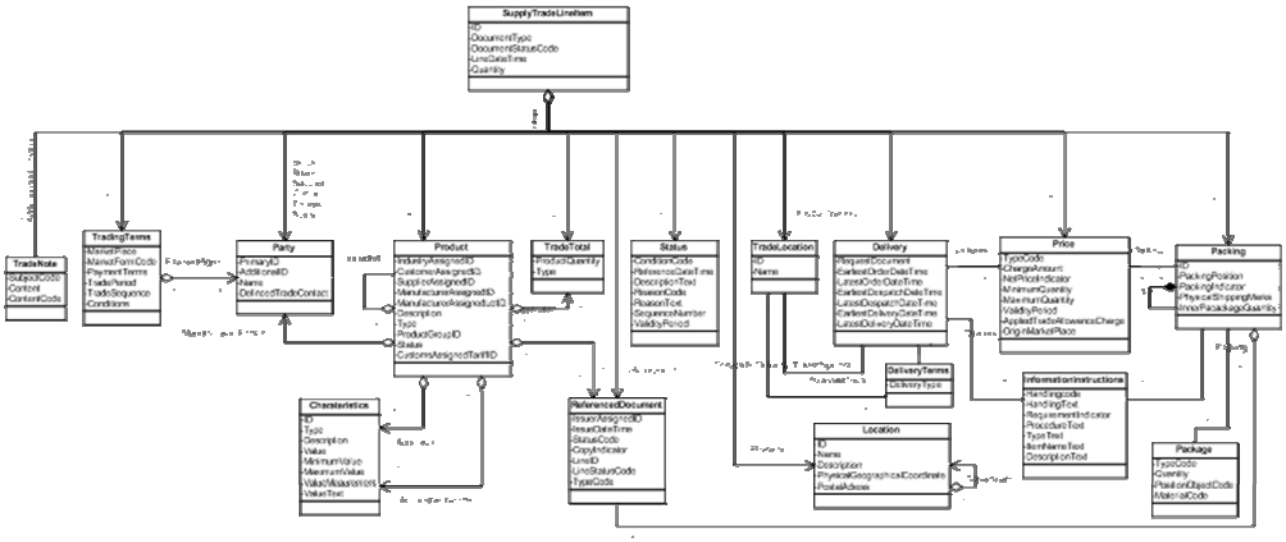
Kenmerk

Een kenmerk is een eigenschap van een product, uitgedrukt als de kenmerkwaarde van een kenmerktype.

(5) Information analysis

#	Name	Description	
1	Agent	Identification (GLN) of the agent that receives the supply	□
2	Identification	Unique identification of the supply line.	■
3	Document type	The document type gives the information flow a further meaning (e.g. general supply or selective supply).	■
4	DocumentStatus	A code specifying a status of a document such as provisional, incomplete, information only (this information status, is not a goods status wich is specified within the status element)	□
5	Date.time	Creation date and time of this supply line	■

(3) Class Diagram



(5) Message guide

Line	Element	Component	XSD	Supply	FEC Format	Functional
1	Supply	SupplyType	M	M		Supply message
2	AgentParty	AgentPartyType	C	C		Agent
3	PrimaryID	IDType	M	M	N13	GLN Company code
4	schemeID				AN..35	"1"
5	schemeAgencyName				AN..35	"FEC"
6	SupplyTradeLineItem	SupplyTradeLineItemType	M	M		Supply line item
7	ID	IDType	M	M	AN..26	Supply line item ID
8	schemeName				AN..3	Reference type "AAG"
9	schemeDataURI				N13	GLN company code source, owner ID
10	schemeURI				N13	GLN company code source, issuer ID
11	DocumentType	DocumentCodeType	M	M	AN..3	Ref. doc. Type (9 general offer, 310 selective offer, 35 Inventory
12	DocumentStatusCode	DocumentStatusCodeType	C	C	AN..3	A code specifying a status of a document, such as 29 provisional, 35 incomplete, 37 complete, 6 information only (this code provides a information status, not a goods status wich is specified within
13	LineDateTime	DateTimeType	M	M	AN..35	Line date/time (YYYY-MM-DDTHH:MM:SS.szzzzzz)