White Paper

Reference Data Model

Version 1

Note

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Acknowledgement

The United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT)

Simple, Transparent and Effective Processes for Global Commerce

UN/CEFACT's mission is to improve the ability of business, trade and administrative organizations, from developed, developing and transitional economies, to exchange products and relevant services effectively. Its principal focus is on facilitating national and international transactions, through the simplification and harmonization of processes, procedures and information flows, and so contribute to the growth of global commerce.

Participation in UN/CEFACT is open to experts from United Nations Member States, Intergovernmental Organizations and Non-Governmental Organizations recognised by the United Nations Economic and Social Council (ECOSOC). Through this participation of government and business representatives from around the world, UN/CEFACT has developed a range of trade facilitation and e-business standards, recommendations and tools that are approved within a broad intergovernmental process and implemented globally.

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Foreword

In the current era of real-time supply chain collaboration and real-time standard data exchange structures using cloud-based services, a more flexible and interoperable way of standardizing business semantics is required for information exchange throughout supply chains. The development of the UN/CEFACT Reference Data Models (RDMS) paves the way for the required new approach.

The purpose of this White Paper is to support an understanding at the executive and management level of the use and benefits of UN/CEFACT RDMs. In particular, this document aims at providing an insight into how, from the perspective of those accountable in the private and governement sectors, information interoperability could be improved throughout the international supply chain.

Specific RDMs have been developed within UN/CEFACT to support specific industry views of information exchange. We would encourage all entities to consider using these clear semantic models as described in this paper and we would encourage government agencies to facilitate the use of these standards in their economies and to allow data interaction with regulatory systems.

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Table of Contents

1   About this Document

This document provides insight into a new approach to the well-known and wide-spread problems created by the lack of information interoperability between applications in the e-business arena. Traditionally, standards for the exchange of business data, including international trade data, have been focused on static message definitions, reflecting historical paper-based trade documents and related business processes. Such static message definitions have not enabled a sufficient degree of interoperability or flexibility. The era of reliance on static message definitions (documents) for information exchange throughout supply chains is being complemented or replaced with real-time supply chain collaboration and real-time standard data exchange structures which use cloud-based services.

A more flexible and interoperable way of standardizing business semantics is required. The development by the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) of Reference Data Models (RDMs) paves the way for this required new approach. The RDMs being developed by UN/CEFACT are applicable to specific segments of the e-business arena and are based on UN/CEFACT standardized business semantics. In summary, "*an RDM provides a consolidated list of standardized data and processes for use in a particular business domain, which are globally understandable and exchangeable between parties using common standard data exchange structures*."

1.1   Executive Summary

The advantage of the RDM approach is that an RDM draws on the overall available Business Information Entities (BIEs) within the United Nations Core Component Library (UN/CCL) creating a complete and focused subset specific to the needs of a particular domain. Examples include the Supply Chain RDM (SCRDM) covering contracts for the supply of the goods, and the Multi Modal Transport RDM (MMT RDM)[1] covering contracts for the supply of transport and related services.

The benefit of RDMs is that they provide business process analysts, modelers, software designers and builders a base To Be Architecture[2] to be achieved.

Work by the International Network of Customs Universities, the World Customs Organization (WCO), the European Union (EU) and the United Nations Economic Commission for Europe (UNECE) describes the concept of "seamless integrated data pipelines". This concept enables actors to build up data progressively. Trade data is input only once by each data originator participating in a transaction, with the data being progressively captured, as it becomes available, and associated with the transaction. The end result being that all necessary trade data is available to those who need it.

Such research describes the concept of waypoints in trade data exchange, and agreements between the private sector and government. The supporting legislation for the EU's Union Customs Code (UCC) requires that global trade strives for transparency, and that accurate trade data precede the physical movement of trade goods. This legislation allows for a transition period from 2016 to 2020.

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[1] Under development

[2] A "To Be Architecture" is a defined set of future data, applications, and technology to be used to support future business needs. An "As Is Architecture" is a defined set of existing data, applications, and technology used to support existing business needs.

UN/CEFACT standards-based RDMs provide the base To Be Architecture to be delivered over seamless integrated data pipelines servicing supply chain traders and service providers at the level of interoperability and flexibility required by the UCC (and by others on a global basis) and, specifically, by 2020.

1.2 Related Documents

- UN/CEFACT Reference Data Model Guideline (Draft v1.0.0.2);

- UN/CEFACT Supply Chain Reference Data Model Business Requirement Specification
(SCRDM-BRS) (Draft v1.0.0.2);

- UN/CEFACT Supply Chain Reference Data Model Requirement Specification Mapping
(SCRDM-RSM) (Draft v1.0.0.2);

- UN/CEFACT SCRDM Master Structure and Subset of CCL D16B (Context CCL) (Draft v1.0.0.2);

- UN/CEFACT Core Component Library D16B[3];

- UN/CEFACT Techniques and Methodologies Group (TMG) UN/CEFACT's Modelling Methodology (UMM): UMM Meta Model Foundation Module (Candidate for 2.0) 2009-01-30;

- UN/CEFACT Core Components Technical Specification – Part 8 of the ebXML Framework dated 15 November 2003 Version 2.01 - (CCTS 2.01);

- UN/CEFACT Core Component Technical Specification Technical Corrigendum Version 2.01
(Corr. 1) dated 12 February 2007 (CCTS 2.01 Corr.1);

- UN/CEFACT XML Naming and Design Rules Version 2.1, dated 27 May 2014 (NDR 2.1);

- UN/CEFACT Core Components Business Document Assembly Technical Specification (CCBDA) version 1.0, dated 27 June 2012;

- UN/ESCAP UNNExT UNECE Data Harmonization and Modelling Guide for Single Window environment, version 2012, ST/ESCAP/2619;

- UNTDED United Nations Trade Data Elements Directory 2005;

- UNECE Recommendation n°1 United Nations Layout Key for Trade Documents;

- UNECE Recommendation n°33
Recommendation and Guidelines on establishing a Single Window; and

- UNECE Recommendation n°34 Data Simplification and Standardization for International Trade.

In this document the set of CCTS 2.01 / CCTS 2.01 Corr.1 / NDR 2 / CCDTC 2.1 specifications are referred to as "UN/CEFACT Technical Specifications Version 2".

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[3]   For the initial publication, the latest published CCL is D16B.

Formal definitions of many of the technical terms used in this White Paper may be found in the above references but for convenience some key definitions are included in Chapter VI.

1.3 Purpose and Scope

The business goals of this White Paper are:

- To support an understanding at the executive and management level of the use and benefits of UN/CEFACT RDMs, as a key tool for beginning to overcome the current level of lack of information interoperability between applications in the e-business arena; and

- To provide insight into how, from the perspective of those accountable in the private and government sectors, information interoperability could be improved throughout the international supply chain.

2 Reference Data Model

2.1 Definition

A Reference Data Model (RDM) is an abstract model that organizes Business Information Entities (BIEs) and standardizes how they relate to one another and to the real world. The model provides a standard means by which data may be described, categorized and also shared. An RDM can be employed whenever business information is being shared or exchanged amongst and between enterprises, governmental agencies, and/or other organizations in an open, worldwide environment.

2.2 Concept

The users of an RDM achieve interoperability of business information. This interoperability covers both interactive and batch exchanges of business data between applications through the use of the Internet and web-based information exchanges as well as traditional Electronic Data Interchange (EDI) systems. The business information in an RDM is ideally represented in both human-readable and machine-processable forms.

All of the relevant Business Information Entities (BIEs) are identified within each RDM standardization area. The library in which all existing BIEs are kept as well as additional information used in the RDMs is called the United Nations Core Components Library (UN/CCL). The content of an RDM contains the following (see Figure 1):

- Data Descriptions: For an RDM, the data descriptions, such as the BIEs mentioned earlier, are taken from the United Nations Core Components Library (UN/CCL) which provides a means to uniformly describe data, thereby supporting its searchability, identification and sharing;

- Data Context: This information for the RDM is taken from the Context subset of the UN/CCL (called the Context CCL) which provides formal descriptions of the specific business circumstances under which data will be used based on a set of Context Categories, which allow different business circumstances to be uniquely distinguished; and

- Data Sharing: Within an RDM, the "rules" for data sharing are established by the Master Data Exchange Structure and Business Data Exchange Structures. These supports the access and exchange of data where "access" consists of ad hoc

requests (such as a query to a data asset); and "exchange" consists of fixed, recurring transactions (standard data exchange structures) between parties.

An RDM explicitly determines the structure of data by means of a Master Data Exchange Structure[4] and is complemented by Business Requirement Specifications (BRSs) for a particular business context such as invoicing. Each business transaction is carried out through an exchange of data following a standardized data exchange structure (also called documents, messages and snippets).

The sequences in which these data exchanges are used compose a particular instance of a scenario and are presented as activity diagrams in a Business Requirement Specification (BRS) document. The exchange of data will be based on a "Business Document Exchange Structure".

Figure 1: Concept of a UN/CEFACT Reference Data Model
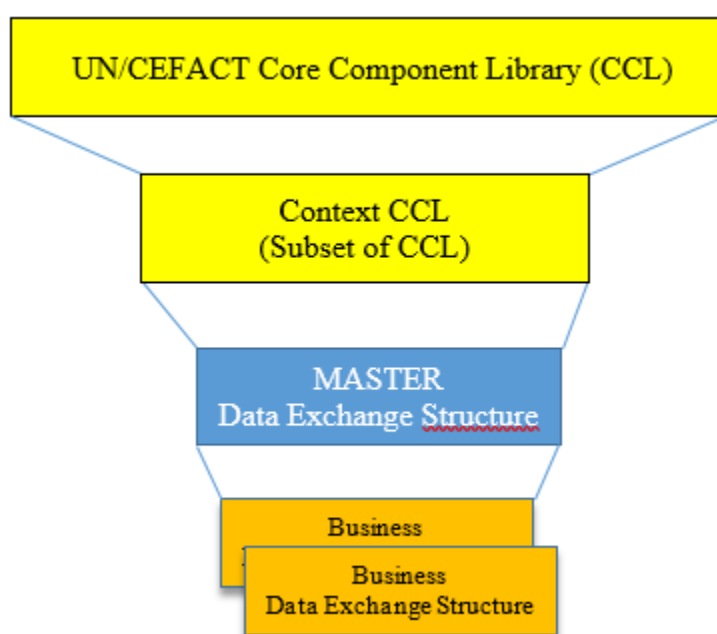
2.3 Philosophy behind the Concept

The conceptual design is based on the assumption that exchanged information tends to have a large degree of similarity. Therefore, rather than linking the information to document-specific entities (such as an order) each RDM, for its domain, represents the "Master Data Exchange Structure" which is then used for creating specific "Business Data Exchange Structures" for exchanging information within a business process. In other words, the "Master Data Exchange Structure" contains the complete information exchange suite required for the domain.

An RDM, based on the UN/CCL, can bring together the data exchange requirements of international trade, procurement, insurance, customs and other regulatory data exchanges based upon the integration of best practices in both trade facilitation and e-Business. UNECE Recommendation n°1, which defines the United Nations Layout Key for documents, provides a list of key documents prepared and used by stakeholders at different stages of the international supply chain. These United Nations Layout Key (UNLK) documents are

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[4]   Also referred as "Master".

categorized into document families. These document families, although separated in the Supply Chain Process by their functionality, have a similar structure which helps to ensure that all documents are aligned. Business Data Exchange Structures derived from a UN/CEFACT RDM follow the concepts described in UNECE Recommendation n°1. This ensures that trading partners can choose the type of document or data exchange structure and use the technology that best meets their business requirements and technology capabilities, while also providing a migration path for the adoption of newer technologies.

2.4 Master and Business Data Exchange Structures

Master Data Exchange Structure

A collection of information structured in such a way that it covers the data exchange structures required by users within the Reference Data Model domain, such as Supply Chain. From the Master Data Exchange Structure, different Business Data Exchange Structures can be derived.

Business Data Exchange Structure

A collection of information used within a particular business process and structured in such a way that it covers the business data exchange needs. These structures can be a complete business document, such as an invoice, or a mini document (snippet) as a result of a query (e.g. on master data).

2.5 Relationships between Semantic Data Models

Business information is shared and exchanged within a business community or between business communities. The RDMs published by UN/CEFACT are being harmonized within the business community and between RDMs by the UN/CEFACT Library Maintenance experts. In addition, referencing exists between the BIEs and other semantic data models such as the WCO Data Model, the European Committee for Standardization (CEN) Semantic Data Model and the United Nations Trade Data Elements Directory (UNTDED) v2005. Referencing between the BIEs of these semantic data models will increase the level of interoperability and flexibility required by governments and traders, and therefore supports the Single Window approach as described in UNECE Recommendation n°34.

3   Benefits of UN/CEFACT Reference Data Models

3.1 Semantic Interoperability of Data

A UN/CEFACT Reference Data Model (RDM) is all about standardization of data requirements, formalized definitions and representation format of data elements used by a business community. Clear definitions of data elements enhance the way in which data elements are interpreted. A clear representation format and a Master Data Exchange Structure serve as guidance for providing accurate data. They contribute to the use of better quality data in the business process and reduce the risk of errors, costs and delays. They ensure data compatibility and enable data interoperability among stakeholders, resulting in the further facilitation of trade procedures.

3.2 Reduction of Costs

A UN/CEFACT Reference Data Model (RDM) reflects the simplification and harmonization of trade data and standard data exchange structure requirements, which can contribute significantly to reducing the time and costs of international trade transactions. Harmonizing

trade data exchanges and aligning them with international standards also ensures data interoperability and avoids inconsistencies in the business processes of the various parties engaged in the international supply chain.

3.3 Supports Single Window

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3.4 Supports United Nations Layout Key "Master Form principle"

Master Forms were first used with typewriters for paper-based trade documents. A set of trade "paper" documents with carbon sheeted back sides could be put into a typewriter, with the Master Form on the top. The information would be printed on the Master Form and, through the carbon copy process, copied into the relevant fields of the underlying set of trade documents. By filling in the Master Form, one would establish a "one-run system" in which the whole set of documents for the trade transaction would be produced at the same time. An example of an aligned series of export documents, based on a Master Form and intended to be completed by the "one-run" method, is explained in the "United Nations Layout Key for Trade Documents Guidelines for Application".

3.5 Provides Links to the United Nations Trade Data Element Directory

A UN/CEFACT Reference Data Model (RDM) has valuable references to the UNTDED. To provide clear meaning to the information in the trade documents, the UNLK "headings" are recorded in a dictionary that is published as the UNTDED. UNTDED elements mainly consist of a data element tag in the form of a four-digit number to identify the data element, a data element name and a description that provides its definition. Over the years, the UNTDED has been continuously expanded. Today it provides an internationally accepted standard repository for the semantics of trade data elements used in international trade. UNTDED definitions describe information from the point of view of a business expert, such as a trader or a government official. The UNTDED has also been integrated into the latest standards for electronic trade, such as the UN/CCL and the United Nations rules for Electronic Data Interchange for Administration, Commerce and Transport (UN/EDIFACT). The definition of data elements based on an internationally accepted standards also simplifies the cross-border exchange of data and the harmonization of procedures.

3.6 Supports Subsetting of International Recommended Code Lists

A UN/CEFACT Reference Data Model (RDM) element of data may use a subset of a UN/CEFACT code list. The reuse of existing standard code lists allows implementers of UN/CEFACT standards to avoid mapping different code values from different code lists representing the same information. Subsets of code lists are published as qualified code lists (e.g. non-restricted as "adjustment reason code" and—for use in finance-related data exchanges—restricted as "financial adjustment reason code").

3.7 Common Basis for Code Lists

A UN/CEFACT Reference Data Model (RDM) data element may use code lists that were created when trade information was exchanged almost exclusively via paper documents (and

may still be used in some paper documents). The RDM reuses and/or refers to existing code lists whenever possible. This ensures that a data element used in one or more RDMs will use or refer to the same code list.

3.8 Syntax Neutral

A UN/CEFACT Reference Data Model (RDM) is based on the United Nations Core Components Library (UN/CCL). RDMs are in themselves a subset of the UN/CCL. The UN/CCL is itself based on the United Nations Core Component Technical Specification (UN/CCTS) which provides a methodology to describe the semantic and the logical structure of trade information, independently from the implementation of a specific syntax for data interchange. This means that electronic data exchanges can be produced using many different syntax implementation tools, such as UN/EDIFACT, EXtensible Mark-up Language (XML) or other syntaxes. This openness to different technical implementations is important because, for example, a Single Window may need to provide interconnectivity to many proprietary systems in a country.

3.9 Common Basis for Standardizing Data

A UN/CEFACT Reference Data Model (RDM) can serve as a basis for developing business data exchanges. It sets out a semantic standard (data definitions) which different development teams within the trade community can adopt as a basis for developing different information systems. If all the information systems in the supply chain use the same set of standardized data attributes and semantic rules, they can interpret, in a common way, the exchanged data and automatically process it to achieve their intended business objectives. The UN/CEFACT RDMs provide a common basis for standardizing data for import, export and logistics information. An RDM is a key tool in the development of modern Information and Communication Technology (ICT) applications that need to interchange data with other applications.

4   Definition of Terms

Term	Definition
Reference Data Model (RDM)	A Reference Data Model (RDM) is a framework whose primary purpose is to enable information sharing and reuse within a particular domain (e.g. Supply Chain) via the standard data description and standard data exchange structure(s).
United Nations Core Components Library (UN/CCL)	The United Nations Core Component Library (UN/CCL) is a library of business semantics in a data model which is harmonized, audited and published by UN/CEFACT. The UN/CCL uses United Nations Core Component Technical Specifications (UN/CCTS) to ensure consistency and interoperability.
Business Information Entity (BIE)	A Business Information Entity (BIE) is based on core components which can be reused in many scenarios. Business entities are the basis of documents which are restricted by context to a specific domain.
Master Data Exchange Structure	A collection of information structured in such a way that it covers the data exchange structures required by users within the Reference Data Model domain, such as the Supply Chain. From the Master Data Exchange Structure different Business Data Exchange Structures can be derived.
Business Data Exchange Structure	A collection of information used within a particular business process, structured in such a way that it covers the business data exchange needs. These structures can be a complete business document, such as an invoice, or a mini document (snippet) as a result of a query (e.g. on master data).
UNECE Recommendation n°1	United Nations Layout Key for Trade Documents.
UNECE Recommendation n°33	A Single Window is defined as a facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfil all import, export, and transit-related regulatory requirements. If information is electronic, then individual data elements should only be submitted once.
UNECE Recommendation n°34	Data Simplification and Standardization for International Trade.