

How to Solve the Business Standards Dilemma – The CCTS Standards Stack

Applies to: SAP NetWeaver

Summary

The United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) Core Components Technical Specification (CCTS)¹ provides a new paradigm in semantic modeling methodologies for business information. This article describes the CCTS standards stack from two perspectives – a business expert’s top-down perspective and a more technical ISO 14462-based “Business Operational View and Functional Service View” perspective.

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¹ The CCTS project is a joint project between the UN/CEFACT and TC154 of the International Organization for Standardization (ISO). CCTS is listed as "ISO 15000-5:2005."

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Introduction

Achieving B2B interoperability does not simply mean achieving a technical realization of connectivity between systems – that is readily addressed through the use of existing technical standards and support middleware such as Web services.² The biggest remaining challenge for achieving B2B interoperability is the lack of common understanding at the collaborative business process and data level. This lack of common understanding is caused by the use of different representations, different purposes, different contexts, and different syntax-dependent approaches in solving the problem.³

For more than 30 years, different B2B standardization approaches have only considered their own specific requirements, at a syntax-dependent level, without consideration of adopting a common approach at the semantic level. This lack of a common approach has automatically led to significant interoperability issues when attempting to use the resultant solutions outside of the very narrow scope for which they were developed.

Fortunately, the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) is addressing this issue through Core Components Technical Specification (CCTS)⁴. CCTS offers a new paradigm in syntax-independent semantic data modeling. CCTS is agnostic of organization and business process, and as a result, it is usable across multiple standardization solutions. CCTS is emerging as the solution of choice for establishing a cross-sector framework and for achieving data interoperability at the semantic level.

² Web services represent the state-of-the-art technology for Web-based service-oriented architectures, and should be the first choice for achieving technical connectivity on service level.

³ A syntax-dependent approach is one in which the syntax controls the semantics with a resultant loss of understanding and comprehension of the underlying data by all but the most advanced experts in the syntax-dependent solution. An example is the syntax-dependent EDIFACT vocabulary, which requires a thorough knowledge of the syntax and standard to determine the semantic value of a simple data element.

⁴ ISO 15000-5:2005 Core Components Technical specification

CCTS Standards Stack – Building Blocks for Interfaces of Enterprise Services

CCTS is a methodology for developing semantic-based business data structures through conceptual, physical, and logical models on a syntax-independent level. CCTS is gaining widespread adoption by private and public sector organizations, as well as horizontal and vertical standards organizations.

CCTS moves the concept of data interoperability to a new level. However, syntax-independent

CCTS itself is not enough to solve the business standards problem. Rather, CCTS is part of a larger set of standards. These standards collectively form the CCTS standards stack, which is required for realizing robust and commonly understandable business data at the semantic and technical syntax level. Figure 1 shows this CCTS stack from the perspective of developing XML-based interfaces for enterprise services. The CCTS standards stack consists of six major components:

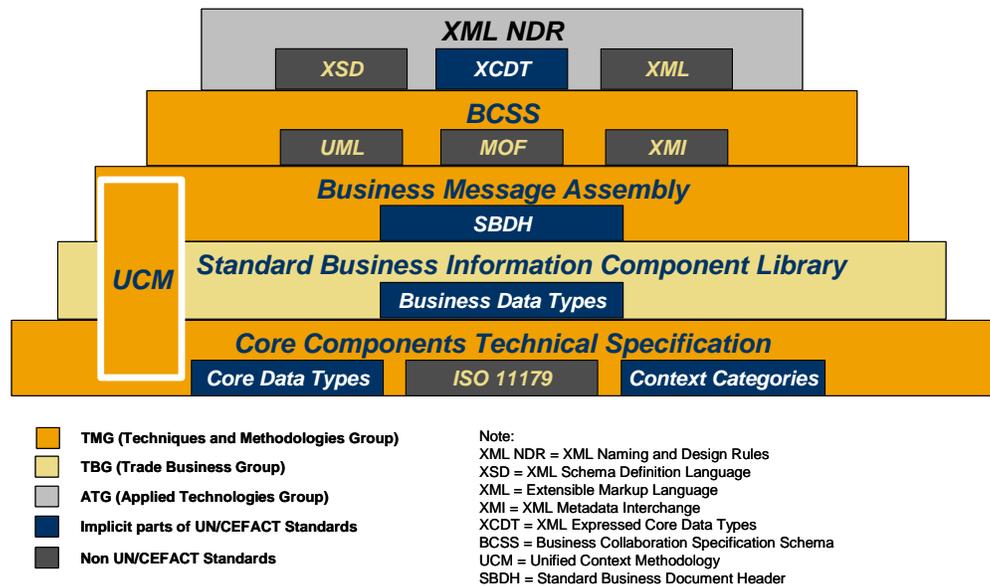


Figure 1 - Building Blocks for Interfaces of Enterprise Services

The Core Standard – Core Component Technical Specification

The CCTS standard is the core semantic data modeling specification and the heart of the CCTS standards stack. CCTS describes the technical syntax-independent model, conventions, and methodology for semantically based modeling of reusable business information. The key aspects of CCTS are: conceptual and context-specific model views, naming, structuring, storage, and discovery. Current and future versions are:

- [V2.01 – ISO Technical Standard \(ISO 15000-5\) and UN/CEFACT Technical Specification](#)
- [V3.0 – Draft Version, developed by joint WG – UN/CEFACT Open Development Process \(ODP\) Step 5 \(Initial Public Review\)](#)

The Core Component Technical Specification also considers the following standard components:

- **Syntax Neutral Core Data Types**– These are the smallest and most generic pieces of information in a business data model. Core Data Types are an intermediate data type that are a level above primitive types – such as Decimal, String, Boolean, Binary, and Numeric. Core Data Types differ from primitives because they carry relevant characteristics, which further define and refine the CDT value domain. The Core Data Type library currently consists of 22 discrete types such as **Amount. Type, Binary Object. Type, Code. Type, Date. Type, Date Time. Type, Identifier. Type,**

Indicator. Type, Measure. Type, Text. Type.⁵ The current working version of the Core Data Type catalogue is:

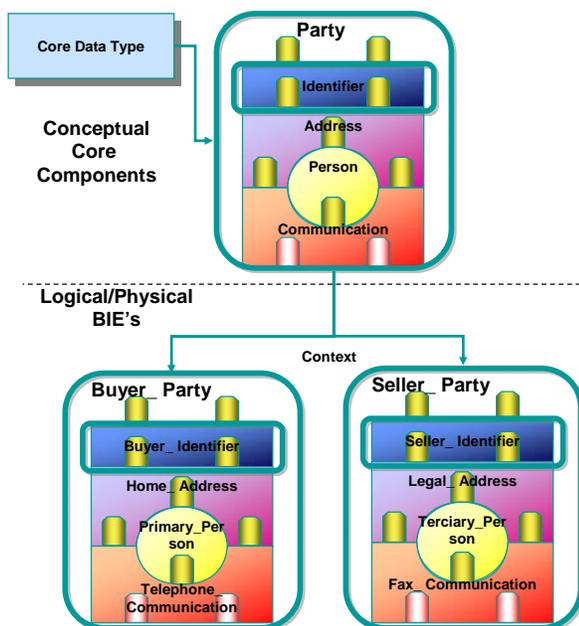
- o [V2.2 –Annex B of CCTS – Draft version](#) – ODP Step 5 (Public Review)
- **Context Categories** – CCTS defines eight unique and orthogonal context categories. These context categories – **business process, product classification, industry classification, geopolitical, official constraints, business process role, supporting role, system capabilities** – form an eight-space that is used for defining and describing the context of business data. Context defines the circumstances in which a business collaboration or data use takes place. For example, the context of a business address in England, Germany, and the US will all result in slightly different names, content models, and data typing. The CCTS context mechanism makes these differences transparent by uniquely identifying the specific context for a particular use of data. The assignment of context values and their value in using data uniquely allow for automatically storing, retrieving, and mapping the correct piece of business data at design and runtime. Future work in this area will be handled by the emerging Unified Context Methodology specification (see below).

The Core Component Technical Specification is based on the following supporting standards:

- [International Organization for Standardization \(ISO\) 11179 Metadata Registries](#) – a comprehensive, six-part data and metadata standard that focuses on the common sharing of data elements across systems both within an enterprise and between enterprises. The standard defines what a metadata registry is, how a data element can be classified, and how the data can be semantically described, named, identified, stored, retrieved, and managed. CCTS uses Parts 1 - Overview, 2 - Classification, and 4 - Definitions, with special emphasis on Part 5, [Naming and Identification Principles](#).

Part 5 describes how to form conventions for naming data elements and their component parts. It includes specific guidance for developing naming and identification of data element concepts,

conceptual and value domain components. It details the structure and component parts of data element naming that supports a more lingual syntax and grammar to achieve greater human comprehension through significantly improved semantic meaning.



Unified Context Methodology

The emerging Unified Context Methodology specification expands on the eight core context categories defined in CCTS to provide a detailed approach to identifying, assigning, documenting, and using context to differentiate the specific purpose, understanding, and value domain of business data. When the Unified Context Methodology specification is complete, it will contain an updated context assembly mechanism to allow for both design-time and run-time application. The current version is:

Figure 2 - Core Component and Business Information Entity

⁵ CCTS naming rules require appending a dot, a space character, and the word **type** after all CDTs.

- V1.0 – Draft Version by UN/CEFACT TMG CCWG – ODP Step 2 (Requirement List)⁶

Standard Business Information Component Library

The Business Information Component Library, formally published as the UN/CEFACT Core Component Library, is the first published set of generic, CCTS-based semantic building blocks for defining contextualized business information. As shown in Figure 2, the BICL data model consists of harmonized, standardized, and reusable building blocks known as Business Information Entities. Future versions of the BICL will also contain the context categorization being defined in the Unified Context Methodology. The current version of the Business Information Component Library is:

- [V06A – First official audited and published version by UN/CEFACT](#)

As defined in CCTS V3.0, additional components defined in the BICL include:

- **Business Data Types** – Business Data Types (formerly unqualified and qualified data types) are CDTs with restricted value domains. Business Data Types will be defined as part of the normal process of adding Business Information Entity components to the Business Information Component Library.

Business Message Assembly

The Business Message Assembly specification is a syntax-neutral expression of how to assemble CCTS-defined business information into business message structures. It defines the generic structure of a UN/CEFACT business message, the role of the Standard Business Document Header (see below), the naming and versioning mechanisms for the message, additional non-CCTS structures such as logical and list containers of business information, generic information for message handling such as update, delete, create, the role of empty elements, and what customization is allowed beyond the agreed-upon process model and harmonized Business Information Entities.⁷

The current version is:

- V1.0 – Draft Version by UN/CEFACT TMG CCWG – ODP Step 2 (Requirement List)

As mentioned above, the Business Message Assembly specification will also define how to use the Standard Business Document Header specification:

- **Standard Business Document Header** – This specification provides application-to-application information necessary to receive and process business messages. It is conveyed as the first part (header) of a business message to easily enable routing and contact information through key data elements such as document type identifier, sender, recipient, and contact identifiers, and related metadata information. The current version is:
 - [V1.3 – Technical Specification by UN/CEFACT ATG](#) – ODP Step 7 (Final Standard)

⁶ Readers interested in obtaining a copy of the UCM draft before public release, or interested in joining Unified Context Methodology, should contact Gunther Stuhec (gunther.stuhec@sap.com).

⁷ Business messages are usually agreed upon between business partners to be used in the context of information flows supporting business processes. These information flows consist of groups of information such as product, contract, or location. The business message must be based on a consistent structure that clearly and unambiguously synchronizes the states of those business entities for the involved business partners.

Business Collaboration Schema Specification

The Business Collaboration Schema Specification is designed to create XML Metadata Interchange-based instances for all UN/CEFACT methodologies that provide UML profiles.⁸

The first published part of BCSS provides Unified Modeling Language profiles of CCTS. This profile defines CCTS-based stereotypes, tagged values and Object Constraint Language expressions that have been developed through careful analysis of the CCTS specification. This profile will enable Unified Modeling Language-based tools to generate XML Metadata Interchanges for exchanging metadata information between Unified Modeling Language tools and the generation of XML Schema expressions conformant to the UN/CEFACT XML Naming and Design Rules. A pre-requisite for this approach is that all CCTS-based Unified Modeling Language artifacts must also be compliant with Meta-Object Facility. The XMI template will be capable of referencing the Business Information Component Library to generate a CCTS-compliant Unified Modeling Language model that can then generate a deployment schema that is fully compliant with the CCTS XML Naming and Design Rules. The current version is:

- [V1.0 – Second Draft Version by UN/CEFACT TMG BPWG](#) – ODP Step 5 (Public Review)

Supporting Specifications:

- [Unified Modeling Language \(UML\)](#) – Business Collaboration Schema Specification is based on the Object Management Group UML. The UML standard is published by the [Object Management Group \(OMG\)](#). UML grew out of the merger of object-oriented analysis and design, and has become the most widely adopted object-oriented modeling methodology for software development, business process modeling, and model-driven architectures.
- [Meta-Object Facility](#) – a set of standards that enables metadata management. The Meta-Object Facility core standard specifies a language used to model metadata by usage of UML's class modeling language. A Meta-Object Facility-compliant UML model guarantees an unambiguous representation of XML Metadata Infrastructure instances, which is required for error-free exchanging of metadata information.
- [XML Metadata Interchange](#) – The XML Metadata Interchange is also developed by the OMG. It is an XML-based standard format for exchanging metadata between UML-based modeling tools and Meta-Object Facility-based metadata repositories in distributed, heterogeneous development environments. XML Metadata Interchange is the OMG specification for physically exchanging UML-based model information between UML-based modeling tools and repositories.

XML Naming and Design Rules for CCTS

The [UN/CEFACT XML Naming and Design Rules Technical Specification](#) (XML NDR) is a CCTS implementation profile of the World Wide Web Consortium (W3C) XML Schema Definition Language Recommendation. This specification describes how CCTS syntax-independent components are systematically represented as XML Schema artifacts. This specification also includes rules for XML-based instance representation of CCTS-based artifacts. The current version is:

- [V2.0 – Technical Specification by UN/CEFACT](#) (comp. with Technical Standard)

Standard components defined in the XML NDR specification include:

- **XML Core Data Types** – The CCTS core data types are defined in CCTS as a fixed set of syntax neutral constructs. The application of the XML/XML Schema Definition syntax creates syntax-specific

⁸ The original concept for BCSS was to create an XMI representation of UN/CEFACT Modeling Methodology-based Unified Modeling Language artifacts. For more information, refer to the documentation [here](#).

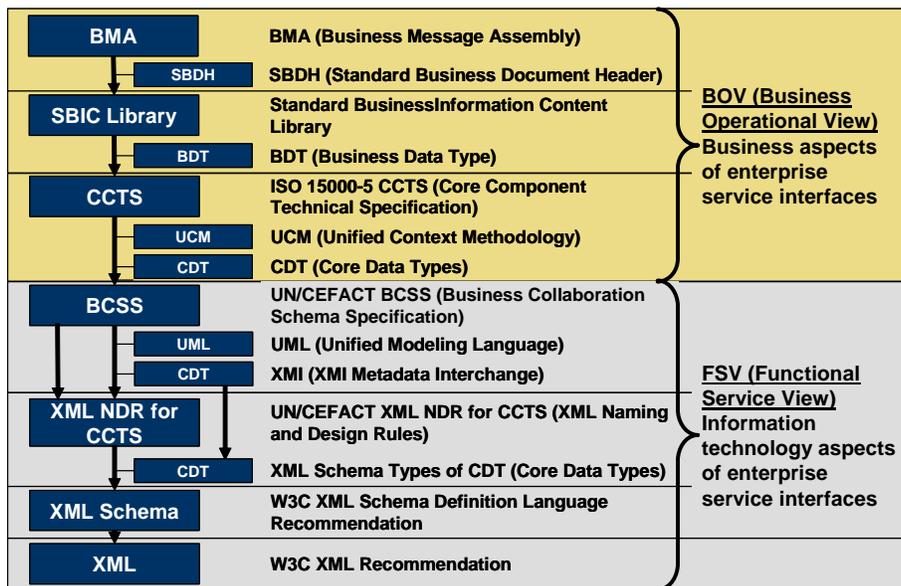
expressions of these data types in a fixed structure for XML-specific reuse. In some cases, Core Data Types have been expressed using data types built in to XML Schema Definition, and the Core Data Types supplementary components have been replaced using the facets of the XML Schema Definition data type. In other cases, the Core Data Types are defined as complex types and the supplementary components have been expressed as user defined attributes. The XML Core Data Types are published by UN/CEFACT as a single, importable [schema](#) freely usable by any interested party. Corresponding XML expressions of Business Data Types will be published in a separate schema. The current version is:

- o [V2.0 – Unqualified Data Type](#)

Specifications supporting XML Naming and Design Rules include:

- [W3C XML Schema Definition Language](#) – The W3C XML Schema Definition specification defines rules for the structure and content of XML instances. XML Schema Definition introduces strong data typing and other functionality not found in traditional XML Document Type Definitions. Part one of the specification addresses schema structures and part two deals with data types.
- [W3C Extensible Markup Language \(XML\) 1.0](#) – The W3C XML specification defines a subset of ISO 8879 Standard Generalized Markup Language that is suitable for ease of use on the Web.⁹ The XML specification includes a description of XML documents and defines processing application behavior.

Aligning the CCTS standards stack to ISO 14662 – Open-EDI Reference Model



The [ISO 14662 Open-Electronic Data Interchange \(EDI\) Reference Model](#) standard was originally developed during the heyday of the electronic data interchange (EDI) B2B business period. Although the specification precedes the current B2B globalization being created by the Internet, its reference model contains still-valid concepts of standards necessary to achieve interoperability. Specifically, ISO 14662 identifies the requirements for standards that are necessary to achieve interoperability between organizations through interconnected information technology systems. It

Figure 3 - ISO 14662-based CCTS Standards Stack

identifies required views and standards for electronic processing of enterprise service interfaces among

⁹ ISO (International Organization for Standardization). *ISO 8879:1986(E). Information processing — Text and Office Systems — Standard Generalized Markup Language (SGML)*. First edition — 1986-10-15. [Geneva]: International Organization for Standardization, 1986.

autonomous multiple organizations, authorities or individuals within and across business sectors. It provides a framework for this coordination, conceptual integration of the various connectivity standards, and a description of the relevant aspects of enterprise service interfaces. The framework consists of two separate views – Business Operational View and Functional Services View. Figure 3 illustrates how specific members of the CCTS standards stack align to the BOV and FSV.

Business Operational View

The Business Operational View describes the semantics of business data in enterprise service interfaces and associated data interchanges. It includes rules for business transactions that are described by enterprise service interfaces, such as operational conventions, agreements, and mutual obligations. In terms of CCTS, the Business Operational View consists of the following syntax-independent and business semantic-oriented CCTS-based standards that are required for modeling enterprise service interfaces on a semantic level:

- The Business Message Assembly approach, including Standard Business Document Headers for modeling business messages that are used in enterprise service interfaces.
- The business context-specific Business Information Component Library, including the business context-specific Business Data Types that are re-used for assembly of business messages.
- The CCTS, including the Unified Context Methodology and catalogue of Core Data Types, which is used for the semantically unambiguous and commonly understood definition of business information.

Functional Service View

The Functional Service View addresses the supporting services required to meet the functional needs of Open-EDI. The Functional Service View focuses on requisite functional capabilities, service interfaces, and protocols. In terms of CCTS specifications, the CCTS Functional Service View includes the syntax-dependent and functional service-oriented standards required for actual implementation in applications and creation of B2B technical exchange interfaces:

- The Business Collaboration Schema Specification (UN/CEFACT BCSS) that describes the UML specific representation of CCTS artifacts and its XMI-based transformation
- The XML Naming and Design Rules for CCTS, including XML Schema-specific Core Data Types that provide rules for transforming CCTS-based artifacts into syntax-specific XML Schema
- The basis standards for XML syntax-specific representation, including the W3C XML Schema Definition and W3C XML Recommendations

The Functional Service View also considers the relevant Web services standards that are required for describing services and exchanging messages that are defined for enterprise service interfaces in a reliable and secure manner. In a future article we will explain the relationship between the CCTS stack and the Web services stack.

Web service technology is applicable to almost any programming language, platform, or hardware device. Coupled with the CCTS standards stack, it is the ideal candidate for addressing the B2B interoperability challenge between heterogeneous IT system landscapes. For more on Web services, see the SDN article [An Overview of Web Service Interoperability](#).

SAP Implementation Strategies

As part of its overarching effort to leverage industry standards to improve the functionality and value of SAP solutions for customers and partners, SAP has established implementation strategies which incorporate the CCTS standards stack. Figure 4 relates the SAP enterprise Service-Oriented Architecture (SOA) stack to the ISO 14662-based CCTS stack.

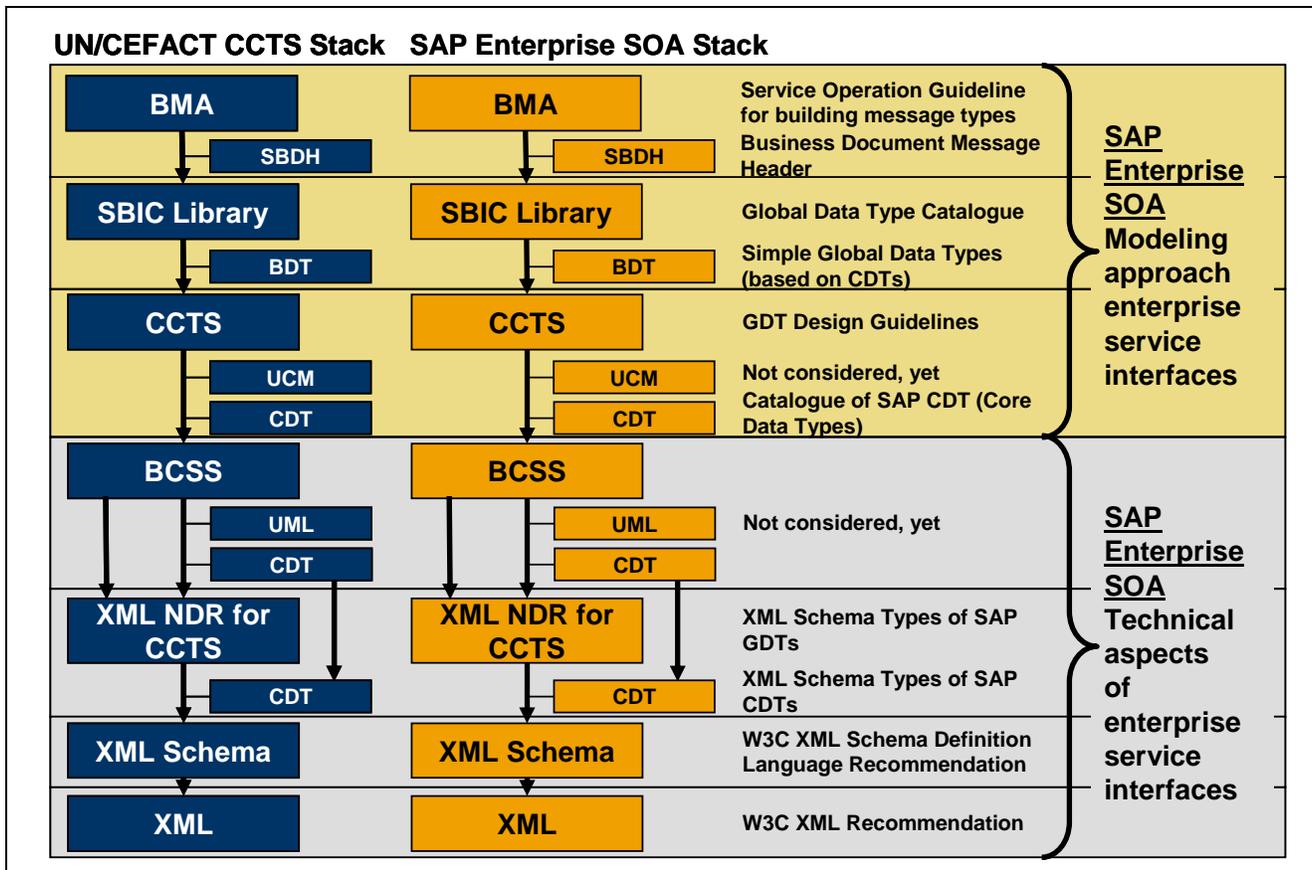


Figure 4 – SAP-specific Specifications and Implementations

The key principle of the SAP enterprise SOA is the development of highly reusable enterprise service interfaces provided by service operations. These service interfaces are based on reusable data constructs developed by SAP known as SAP Global Data Types. The SAP Global Data Types are normalized and reconciled with business-related content that is used across all solutions based on SAP enterprise SOA. This SAP approach leverages the following rules contained in the CCTS stack:

- The rules for assembling a business message according to a specific guideline of service operations. An SAP message type includes an SAP defined Business Document Message Header, which is based on aspects of the CCTS Standard Business Document Header.
- The concept of a SAP Global Data Type Catalogue is comparable with the concept of the Business Information Component Library. SAP Global Data Types are created using the CCTS approach and rule set. The actual content and structure of all SAP Global Data Types are based on SAP application-specific business requirements that reflect an initial level of contextualization of CCTS core components, and as such are equivalent to CCTS Business Information Entities. SAP Global Data Types reflect extension and restriction to the CCTS core data types, and as such are comparable to the CCTS Business Data Types.
- SAP Global Data Type creation follows specific SAP design guidelines. These guidelines represent both an adoption of, and extension to, the core CCTS specification. Additionally, the catalogue of SAP Core Data Types that are used to create the Global Data Types aligns with the CCTS Core Data Types.
- SAP does not currently implement the Unified Modeling Language-specific representation and XML Metadata Interchange transformation of SAP Global Data Types, however this is under evaluation and we are closely following this work in UN/CEFACT.

- The XML Schema-specific representation of SAP Global Data Types and Core Data Types is directly implemented in SAP NetWeaver Enterprise Service Repository. An XSD-Editor Guideline describes the XSD specific definition of SAP Global Data Types and Core Data Types following the SAP implementation profile of the CCTS XML NDR specification.

Although CCTS is syntax-neutral, since SAP deals with the implementation layer, all SAP Global Data Types and Core Data Types are expressed as XML Schema artifacts that are fully conformant to the W3C XML Schema Definition Language and XML Recommendations.

Related Content

- [Getting Started with Cross-Industry Standards](#)
- [Getting Started with UN/CEFACT](#)
- [From EDI to UN/CEFACT: An Evolutionary Path Towards a Next Generation e-Business Framework](#)
- [Overview of ISO 15000-5 / UN/CEFACT Core Components Technical Specification \(UN/CEFACT CCTS\)](#)
- [How to Solve the Business Standards Dilemma - CCTS Key Model Concepts](#)
- [How to Solve the Business Standards Dilemma - The Context Driven Business Exchange](#)
- [ISO 15000-5 - CCTS \(Core Component Technical Specification\) Version 2.01](#)
- [ISO 15000-5:2006 - CCTS \(Core Component Technical Specification\) Version 2.2 \(draft version\)](#)
- [ISO 15000-5:2006 - CCTS \(Core Component Technical Specification\) Version 2.2 \(draft version\) - Part B Core Data Types](#)
- [Getting Started with UN/CEFACT XMLNDR for CCTS](#)
- [UN/CEFACT XML Naming and Design Rules for CCTS - Version 2.0](#)
- [UN/CEFACT XML Naming and Design Rules for CCTS - Version 2.0 - XML Schemas](#)
- [UN/CEFACT TMG \(Technology & Methodologies Group\) - Core Components Working Group](#)
- [Getting Started with ISO 11179](#)

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