



GS1 System Landscape

a comprehensive inventory and classification of the GS1 standards

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1 Introduction

1.1 The objective

Worldwide, hundreds of thousands of organisations use GS1 standards to support the movement of goods, supply of services and exchange of information. All these organisations need to be confident that the GS1 system is coherent and consistent and that their investment in GS1 compliant systems will bring them the benefits of a genuinely common approach to managing their interwoven value chains.

It is therefore vital that the various parts of the GS1 system fit together and that they are able to support interoperability between organisations with a wide variety of processes based on many different technology platforms. This is what is meant by GS1 system integrity. A comprehensive, clear and documented description of the GS1 architecture is a necessary starting point for the protection and promotion of this system integrity.

The objective of the *GS1 System Landscape* document is to provide a structured, complete catalogue of all GS1 standards, including a synopsis of each. It is complemented by the [GS1 System Architecture](#) document, which provides an architectural view of how the components of the GS1 system fit together and the foundations that underlie the entire system.

1.2 How the objective is achieved

The *GS1 System Landscape* document exists so that all involved in standards development may better understand what standards make up the system, the nature of the different types of standards and the dependencies between them. Through a shared understanding of what the system is and of the interrelationships between its components, standards developers will be able to ensure that new and modified standards fit properly into the framework and standards users will be more likely to recognise opportunities to adopt the standards and to implement them in a system compliant way.

The *GS1 System Landscape* is also intended to serve as a reference point to help navigation towards an improved GS1 system. By describing the current system of standards it will be possible to identify gaps that might be filled, duplications that might be removed and inconsistencies that might be corrected. Here it should be emphasised that these improvements do not have the goal of producing perfection, symmetry or elegance, but of meeting user needs. Gaps will be filled to the extent that they represent a failure to deliver against user need; duplications will be eliminated and inconsistencies corrected when they cause unjustifiable cost to users. Changes to the GS1 system are made when the cost of change is justified by the expected benefits and are developed and approved through an open, user-driven process.

1.3 Who is the audience?

This document is intended to be read by those involved in the development and maintenance of GS1 standards and those developing business functionality and checking where standards can be used.

It will also be of interest to a broader audience including people who have chosen not to be involved in the Global Standards Management Process and staff of Member Organisations (MOs), user organisations and solution providers who develop and decide policies for GS1 or who work with the standards but are not deeply involved in their operational aspects.

1.4 What the GS1 System Landscape does

There are different GS1 standards which are designed to work together to support the processes of user organisations. This document provides a comprehensive inventory of the GS1 standards and catalogues and classifies them into topic areas. At a high level, this shows how the broad areas of standard fit together. For example, data is organised according to a syntax and carried in a message which is subject to a choreography. In other words, it provides a logically structured overview of GS1 standards.

Dependencies between the standards are explicitly called out, thus suggesting how system components fit together. In this way the *GS1 System Landscape* goes some way to showing how changes to one part of the system might affect or lead to change in another.

This *GS1 System Landscape* is not intended to replace any of GS1’s published specifications or guidelines. It is not in itself a normative document but includes numerous references (links) to normative materials.

The *GS1 System Landscape* is organised into sections, each of which describes a topic area for standards: identification, supplementary data, data representation, physical data carriers, business data, information distribution/discovery and communication. It will be revised periodically to remain current as the GS1 system evolves.

Business Objective	Section	Note
Identify	2. Identification	Standards for the identification of items, locations, shipments, assets, etc. and its associated data
Capture	4. Data representation 5. Physical data carriers	Standards for encoding and capturing data in physical data carriers
Share	3. Supplementary data 6. Business data 7. Information distribution and discovery 8. Communication	Standards for sharing data between parties

1.5 In Brief

The *GS1 System Landscape* is designed to promote a greater understanding of what the GS1 system is and the way it is intended to work. Mutual understanding of the system throughout the GS1 community will maximise consistency and coherence, both in development and implementation of the standards.

2 Identification

Identification is the foundation of the GS1 system. The architectural basis for identification in the GS1 system is fully described in Section 4 of the [GS1 System Architecture](#).

In line with the [GS1 Architecture Principles](#) the Identification standards are defined independently of carrier technology. Technology never alters the meaning of the GS1 data.

The following classification of identifiers is used:

- Class 1: Keys administered by GS1 and fully under its control
- Class 2: Keys whose framework is controlled by GS1 by means of portion of the GS1 numbering capacity that is allocated for an identification scheme administered by an external agency
- Class 3: Keys fully administered and controlled outside GS1 but which are supported in some part or parts of the GS1 system
- Class 4: Keys that are entirely outside the GS1 system.

See the [GS1 System Architecture](#) for a fuller discussion of these classes.

The remainder of this section enumerates the Class 1, 2, and 3 keys defined in GS1 standards, along with related concepts of key extensions and restricted circulation numbers.

2.1 GS1 identification keys (class 1 and class 2)

The purpose of a GS1 identification key is to identify something. They have the following characteristics:

- They are globally unique in the sense that each value is used once only within each key type and within specified timeframes.
- Once its type is established (e.g., from a GS1 Application Identifier), the key is capable of serving its purpose of identification on its own, without additional qualifiers, attributes, or extensions.
- Some keys identify a class (e.g., a GTIN) while others identify a specific instance (e.g., SSCC).
- When it is read from a physical entity the key gives the message that this entity (or one of this class of entity, as appropriate to the key type) is present at the read point.
- All GS1 identification keys are unique and unambiguous within their domain. The domain is broadly defined as the intended area of application of the key. For example:
 - Trade Items: any item (product or service) upon which there is a need to retrieve pre-defined information and that may be priced, or ordered, or invoiced at any point in any supply chain.
 - Logistic Units: an item of any composition established for transport and/or storage that needs to be managed through the supply chain.
 - Assets: physical entities of some value or importance treated as an inventory item.
 - Locations: any location that needs to be uniquely identified for use in the supply chain or has meaning within a business scenario.

Generally speaking each GS1 identification key is associated with a concept in the real world. The GS1 identification keys may then be used in an electronic record or file, in a database, in an electronic message, on the item, or any other data context. Thus the GS1 identification keys can be used in Electronic Commerce to link database information to the physical entity unambiguously within their defined domain.

- When used in support of business applications all GS1 identification keys require the appropriate syntax for correct storage and transfer, and to ensure they are interpreted correctly (see section [4.1](#)).

A GS1 Company Prefix assigned to a user company shall entitle that user company to create any of the GS1 identification keys. The single exception is when a GS1 Member Organisation issues complete GS1 identification keys, one by one. In these circumstances a complete GS1 identification key shall not be considered as a GS1 Company Prefix.

2.1.1 GTIN (Global Trade Item Number)

Normative References:

- The [GS1 General Specifications](#)
- [GS1 GTIN Management Standard](#)

Abstract:

GTINs are numeric and are terminated with a Check Digit. They are composed using one of the four data structures: GTIN-8; GTIN-12; GTIN-13; or GTIN-14. When any of these GTINs is used in a data carrier or other application requiring a fixed-length data string of 14-digits, the GTINs less than 14-digits in length must be prefixed by one or more leading zeroes. These leading zeroes simply act as filler characters. The presence or lack of these leading zeroes does not change the GTIN concerned.

The GTIN identifies items that are traded and usually links to information about those items. Trading Partners use GTINs to communicate about items that they price, order or invoice and this supports the automation of business processes.

Trade Items are those that are always produced in the same version and composition (e.g., type, size, weight, contents, and design) that may be sold at any point in the supply chain.

Allocation rules for the GTIN are specified in the GS1 GTIN Management Standard.

Dependencies:

- None:
 - The business context is, of course, required. For example if a product needs to be identified, syntax is required to denote the GTIN. The party that allocated the GTIN has to provide trading partners with the pre-defined characteristics of the trade item to which the GTIN is assigned (e.g., the product name, product brand, net quantity (weight, volume, or other dimension), logistic measures, etc.)

Supplementary or attribute data:

- Supplementary or attribute data that cannot be looked up by reference to the GTIN, may also be associated with a GTIN and encoded in a physical data carrier (barcode or RFID tag); see section [3.1](#). Examples include Batch Number and Expiry Date.

See also:

- Section [2.2.1](#) for information on the Serialised GTIN.

2.1.1.1 Special case of GTIN-14 using indicator digit 9

A Variable Measure Trade Item is an item with pre-defined characteristics, such as the nature of the product or its contents, but, unlike a Fixed Measure Trade Item, it has at least one characteristic that varies. The variable characteristic could be weight, dimension, number of items contained or volume information.

The Variable Measure Trade Item is identified by a GTIN together with information about the variable data. The GTIN is a special application of the GTIN-14 Data Structure which has the digit 9 in the Indicator position to denote that the item identified is a Variable Measure Trade Item. This must be processed together with the variable information of the same trade item (see section [3.1](#)).

Dependencies:

- When carried in a physical data carrier GTINs assigned to Variable Measure Trade items have a mandatory association with a GS1 Application Identifier for Trade Measures (see section [3.1](#)).

2.1.2 GLN (Global Location Number)

Normative References:

- The [GS1 General Specifications](#)

Abstract:

GLNs are a fixed length 13-digit numbers composed of a GS1 Company Prefix, a Location Reference and a Check Digit.

The Global Location Number (GLN) provides a unique and unambiguous identification of:

1. Physical Locations - A site (an area, a structure or group of structures) or an area within the site where something was, is, or will be located.

- The identification of physical locations is an essential element for supply chain visibility. A GLN assigned to a physical location always has a permanent and identifiable geographical address regardless of any business process roles conducted at the site.

2. Digital Locations - A digital location represents an electronic (non-physical) address that is used for communication between computer systems.

- Just as the exchange of physical goods is a transaction between companies, the exchange of data is a transaction between systems, for example the delivery of an invoice by EDI or email to an accounting system.

3. Legal Entities - Any business, government body, department, charity, individual or institution that has standing in the eyes of the law and has the capacity to enter into agreements or contracts.

4. Functions - An organisational subdivision or department based on the specific tasks being performed, as defined by the organisation.

Legal entities and functions can engage as **parties** in business processes. The use of Global Location Numbers (GLNs) in these areas is driven by the exact role of each party within a given business process.

Dependencies:

- None.
 - The business context is, of course, required. For example if a location needs to be identified, syntax is required to represent the GLN. The GLN is usually assigned by the party owning or controlling the location who should also provide trading partners the required information associated with each GLN so that the relevant information can be retrieved from a database by reference to the GLN.

Supplementary or attribute data:

- Supplementary, or attribute data that cannot be looked up by reference to the GLN, may be associated with a GLN when encoded in a physical data carrier (barcode or RFID tag) see section [3.1](#).

See also:

- Section [2.2.2](#) for information on the Extended GLN.

2.1.3 SSCC (Serial Shipping Container Code)

Normative References:

- The [GS1 General Specifications](#)

Abstract:

SSCCs are a fixed length 18-digit number composed of an Extension Digit, GS1 Company Prefix, a Serial Reference and a Check Digit.

The SSCC supports the identification of logistic units, for example the identification of a pallet of goods, combined with the use of the Despatch Advice for automated goods receipt.

Dependencies:

- None.
 - The business context is, of course, required. For example if a logistic unit needs to be identified, syntax is required to represent the SSCC.

Supplementary or attribute data:

- In principle, the SSCC provides a unique reference number that can be used as the key to access information regarding the logistic unit in computer files. However, attributes relating to the logistic unit (e.g., ship to information, logistic weights) are also available and may be associated with an SSCC when encoded in a physical data carrier (barcode or RFID tag) see section [3.1](#).

2.1.4 GIAI (Global Individual Asset Identifier)

Normative References:

- The [GS1 General Specifications](#)

Abstract:

GIAs are variable length up to 30 alpha numeric characters composed of a GS1 Company Prefix and an Individual Asset Reference. They support a diverse range of business applications (e.g., recording the life-cycle history of aircraft parts).

Dependencies:

- None.
 - The business context is, of course, required. For example if an asset needs to be identified, syntax is required to represent the GIAI. The organisation who issues the GIAI can normally

be expected to provide the required database information regarding the item to which the GIAI is attached, etc.

Supplementary or attribute data:

- There are no GS1 Application Identifiers for supplementary data that may be associated with a GIAI when encoded in a physical data carrier (barcode or RFID tag).

2.1.5 GRAI (Global Returnable Asset Identifier)

Normative References:

- The [GS1 General Specifications](#)

Abstract:

GRAI has an overall structure variable length up to 29 alpha numeric characters which is comprised of a mandatory, fixed length, asset type identification and optional, variable length, serial number. The GRAI supports the identification of Returnable Assets. The GRAI is often used to identify a container of products identified with GTINs. (For example, product is traded at a unit-load pallet level and is identified with a GTIN, the physical pallet upon which the product is transported is not traded but acts as a returnable transport item and is identified with a GRAI. The GTIN supports the trading process of the product and the GRAI supports applications related to the returnable pallet such as pallet-pooling.)

A Returnable Asset is a reusable package or transport equipment of a certain value, such as a beer keg, a gas cylinder, a plastic pallet, or a crate. The GS1 system identification of a Returnable Asset, the Global Returnable Asset Identifier (GRAI), enables tracking as well as recording of all relevant data.

Dependencies:

- None.
 - The business context is, of course, required. For example if an asset needs to be identified, syntax is required to represent the GRAI. The organisation who issues the GRAI can normally be expected to provide the required database information regarding the item to which the GRAI is attached.

Supplementary or attribute data:

- There are no GS1 Application Identifiers for supplementary data that may be associated with a GRAI when encoded in a physical data carrier (barcode or RFID tag).

2.1.6 GSRN (Global Service Relationship Number)

Normative References:

- The [GS1 General Specifications](#)

Abstract:

GSRNs are fixed length 18 digit numbers composed of a GS1 Company Prefix, a Service Reference Number and a Check Digit.

The GSRN is a non-significant number used to identify the relationship between an organisation offering services and the individual entities providing or benefitting from the services. For example, the GSRN can be used for patient identification enabling hospitals to store information about the medical characteristics of the individual together with details of treatment they have received.

Dependencies:

- None.
 - The business context is, of course, required. For example where a service relationship needs to be identified, syntax is required to represent the GSRN. The organisation who issues the GSRN can normally be expected to provide the required database information regarding the service relationship which the GSRN identifies.

Supplementary or attribute data:

- The Service Relation Instance Number (SRIN) may be used when the identification of a Subject of Care Global Service Relation Number for the Service Recipient (GSRN) needs to be further identified with a sequence indicator corresponding to each encounter during the episode of care.

2.1.7 GDTI (Global Document Type Identifier)

Normative References:

- The [GS1 General Specifications](#)

Abstract:

GDTIs are a variable length up to 30 alphanumeric characters which is comprised of a mandatory, fixed length, document type identification and optional, variable length, serial component. They are used to identify *documents* that cover any official or private papers that infer a right (e.g., proof of ownership) or obligation (e.g., notification of a call for military service) upon the bearer. The first part of the GDTI identifies the type of document (e.g., military service paper) and the optional serial number the individual instance (e.g., the details of an individual military service paper addressed to a person).

Dependencies:

- None.
 - The business context is, of course, required. For example where a document type needs to be identified, syntax is required to represent the GDTI. The organisation who issues the GDTI can normally be expected to provide the required database information regarding the document to which the GDTI is attached.

Supplementary or attribute data:

- There are no GS1 Application Identifiers for supplementary data that may be associated with a GDTI when encoded in a physical data carrier (barcode or RFID tag).

2.1.8 GINC (Global Identification Number for Consignments)

Normative References:

- The [GS1 General Specifications](#)

Abstract:

GINCs are a variable length up to 30 alpha-numeric characters composed of a GS1 Company Prefix and a Consignment Reference. They may be used to identify a logical grouping of goods (one or more physical entities) intended to be transported as a whole. The GINC is allocated by a freight forwarder (or a carrier acting as a freight forwarder). Typically it encodes a House Way Bill Number.

Dependencies:

- The SSCCs used to identify the physical entities that make up the logical grouping of goods that has been consigned to a freight forwarder and is intended to be transported as a whole.
- The organisation who issues the GINC can normally be expected to provide the required database information regarding the shipping information.

Supplementary or attribute data:

- There are no GS1 Application Identifiers for supplementary data that may be associated with a GINC.

2.1.9 GSIN (Global Shipment Identification Number)

Normative References:

- The [GS1 General Specifications](#)

Abstract:

GSINs are a fixed length 17-digit number composed of a GS1 Company Prefix, a Shipper Reference and a Check Digit. They provide a globally unique number that identifies a logical grouping of

logistic units (one or more physical entities) for the purpose of a transport shipment from that consignor (seller) to the consignee (buyer). The GSIN is a number assigned by a consignor (seller) of goods.

Dependencies:

- The SSCCs used to identify the physical entities that make up the logical grouping of logistic units transported as a shipment from one seller to one buyer.
- The organisation who issues the GSIN can normally be expected to provide the required database information regarding the shipment information.

Supplementary or attribute data:

- There are no GS1 Application Identifiers for supplementary data that may be associated with a GSIN.

2.1.10 GCN (Global Coupon Number)

Normative References:

- The [GS1 General Specifications](#)

Abstract:

GCN has an overall structure variable length up to 25 digits which is comprised of a mandatory, fixed length, coupon number and an optional, variable length, serial number. The GCN supports the identification of coupons. A digital coupon is an electronic presentation, that is distributed and presented without manifesting as “paper” or in other hard-copy form, and that can be exchanged for a financial discount or for loyalty points when making a purchase. The GCN provides a globally unique identification for a coupon, with an optional serial number.

Dependencies:

- None

Supplementary or attribute data:

- Supplementary, or attribute data that cannot be looked up by reference to the GCN, may be associated with a GCN when encoded in a physical data carrier (barcode or RFID tag). See section [3.1](#).

2.1.11 CPID (Component / Part Identifier)

Normative References:

- The [GS1 General Specifications](#)

Abstract:

A Component/Part (C/P) is defined as an item that is intended to undergo at least one further transformation process to create finished goods for the purpose of downstream consumption. The Component & Part identifier is available for business processes where products are identified by the buyer. The buyer instructs his suppliers on how to identify and mark the products delivered to him. The identifier shall not be used in open supply chains. It is restricted to use by mutual agreement; The GTIN is the only GS1 standard identifier for trade items in open supply chains, and is the mandatory solution for items crossing aftermarket retail points of sale.

Dependencies:

- None

Supplementary or attribute data:

- The CPID may be accompanied by an optional serial number. Apart from this, there are no GS1 Application Identifiers for supplementary data that may be associated with a CPID.

See also:

- Section [2.2.3](#) for information on the Serialised CPID.

2.1.12 Global Model Number (GMN)

Normative References:

- The [GS1 General Specifications](#)

Abstract:

The Global Model Number is the GS1 identification key used to identify a product model. The key comprises a GS1 Company Prefix and a model reference. The GMN must be processed in its entirety and not broken down into its constituent elements.

Dependencies:

- None

Supplementary or attribute data:

- There are no GS1 Application Identifiers for supplementary data that may be associated with a GMN.

2.2 Key extensions

Normative References:

- The [GS1 General Specifications](#)
- The [EPCglobal Tag Data Standard](#)

2.2.1 SGTIN (Serialised GTIN)

Abstract:

The Serialised GTIN is a context-dependent feature of the GTIN that is used to identify a specific instance of a product or service identified by a GTIN. In most contexts (e.g. retail point-of-sale), the serial number is not a requirement of the GTIN, but in RFID and in environments when an EPC Uniform Resource Identifier (URI) representing a GTIN is required, a serial number is required to ensure that the object is uniquely identified.

The Serialised GTIN is semantically equivalent to the concatenation of GS1 Application Identifier (see section [3.1](#)) AI 01 and AI 21.

2.2.2 Extended GLN

Abstract:

The Extended GLN is an optional feature of the GLN that may be used to subdivide a physical location according to rules internal to the location itself. For example, a warehouse identified by a GLN may map its internal storage locations (shelves, bins, lockers, etc.) to Extended GLNs. An Extended GLN is the combination of a physical location GLN (AI 414) and a GLN Extension (AI 254).

The Extended GLN's purpose is to increase the capacity of the GLN; locations may be identified by a normal GLN or Extended GLN at the discretion of the identifying organisation. An Extended GLN by definition is a sub-location within the GLN that precedes its extension.

The GLN Extension is not communicated to external trading partners except by mutual agreement. For example, a manufacturer that requires that its products be stored in a regulated temperature environment may acquire a warehouse map from its distributor so that it can validate that the storage location recorded by the distributor is in fact in the temperature-controlled area. Doing so would require that the distributor share the Extended GLN with the manufacturer.

In barcodes, the combination of AI 414 and AI 254 is used to represent an Extended GLN. In RFID and in the EPC Uniform Resource Identifier (URI), the SGLN EPC URI scheme is used to represent either an Extended GLN or a GLN without extension.

2.2.3 SCPID (Serialised CPID)

Abstract:

The Serialised CPID is a context-dependent feature of the CPID that is used to identify a specific instance of a component or part identified by a CPID.

The Serialised CPID is semantically equivalent to the concatenation of Application Identifier (see section [3.1](#)) AI 8010 and AI 8011.

2.3 Class 3 keys

A Class 3 key has its structure and its rules for use defined, administered and managed by an agency external to GS1. However this agency enters into an agreement with GS1 that enables its keys to be used in selected GS1 standards; for example, within an EPC header.

2.3.1 GID (General Identifier)

Normative References:

- The [EPCglobal Tag Data Standard](#)

Abstract:

The General Identifier (GID) is a general-purpose object identifier that does not imply any specific application. It may be used in circumstances where none of the existing identification keys are sufficient and where other GS1 standards are not required.

2.3.2 US DoD Identifier

Normative References:

- The [EPCglobal Tag Data Standard](#)

Abstract:

The US Department of Defense identifier is defined by the United States Department of Defense. This identifier may be encoded in 96-bit Class 1 RFID tags for shipping goods to the United States Department of Defense by a supplier who has already been assigned a CAGE (Commercial and Government Entity) code.

2.3.3 ADI (Aerospace and Defense Identifier)

Normative References:

- The [EPCglobal Tag Data Standard](#)
- Air Transport Association, "Spec 2000 E-Business Specification for Materials Management," May 2009, <http://www.spec2000.com>
- "United States Department of Defense Guide to Uniquely Identifying Items" v2.0 (1st October 2008), <http://www.acq.osd.mil/dpap/UID/attachments/DoDUIDGuide.pdf>

Abstract:

The Aerospace and Defense EPC identifier is designed for use by the aerospace and defense sector for the unique identification of parts or items. The existing unique identifier constructs are defined in the Air Transport Association (ATA) Spec 2000 standard, and the US Department of Defense Guide to Uniquely Identifying items. The ADI EPC construct provides a mechanism to directly encode such unique identifiers in RFID tags and to use the URI representations at other layers of the EPCglobal architecture.

2.4 RCN (Restricted Circulation Numbers)

Normative References:

- The [GS1 General Specifications](#)

A portion of the numbers that might have been used as GTINs is reserved by GS1 for use in restricted areas. These Restricted Circulation Numbers (RCNs) are identification numbers that look like GTINs, and are completely compatible with GTINs, but are strictly for use only in closed

environments. They provide a convenient resource for “closed loop” applications in which GTINs might also be present.

Some of these RCNs are specified by GS1 as being for internal company use. Most, however, are controlled by the local GS1 Member Organisation which restricts designated ranges for use in a country, territory, company etc. RCNs might be used, for example, for identification of money-off coupons in one country or retail products prepared to a particular customer order (e.g., several slices of cheese).



Important: Restricted Circulation Numbers are not GS1 identification keys. However, they can be used alongside GS1 identification keys without clashes as long as the goods to which they are attached do not leave the Restricted Circulation Area.

2.4.1 Variable measure trade items sold at point-of-sale

Variable measure trade items that are sold at point-of-sale using a fixed price per unit of measure or quantity sold (e.g., apples sold at a fixed price per kilogram).

These items are either marked in the store by the retailer or are marked at the source by the supplier normally based upon national solutions using Restricted Circulation Numbers. The *GS1 AIDC Fresh Foods Sold at Point-of-Sale Implementation Guide* recommends migration from Restricted Circulation Numbers to the use of GTIN with additional Application Identifiers for variable-measure fresh food products.

3 Supplementary data

3.1 GS1 Application Identifiers

Normative References:

- The [GS1 General Specifications](#)

Abstract:

All GS1 identification keys have a GS1Application Identifier.

Supplementary data is generally associated with a GS1 identification key¹.

In the GS1 system the intention is that the minimum data is carried in physical data carriers (GS1 barcodes or GS1 RFID tags) attached to the object being identified. Instead, the identification keys are expected to find information about the identified object in a database.

Ideally, the supplementary data encoded in physical data carriers will only encode information that cannot be looked up in a database by reference to the key. This could happen if data is needed when connection to a database is not available or when the key identifies a class of objects but the supplementary data relates to a batch or individual instance of the object. For example, the SSCC provides a unique reference number that can be used as the key to access all relevant information regarding the logistic unit in computer files. However, supplementary data relating to the logistic unit (e.g., ship to information, logistic weights) are also available as standardised supplementary data because access to this data might be needed when the goods are in transit and connection to a network is impracticable.

The list of AIs representing supplementary data in Appendix [A](#), while complete as of this writing, may not be updated in tandem with the GS1 General Specifications.

Dependencies:

- The Physical Data Carriers capable of encoding Supplementary Data (GS1-128 barcodes, GS1 DataMatrix barcodes, GS1 QR Code, GS1 DataBar Expanded barcodes, GS1 DataBar Expanded Stacked barcodes, GS1 Composite barcodes and GS1 RFID Tags)

¹In some special applications supplementary data is associated with another identifier or, in the case of AIs starting with '9', has meaning only internally or as previously agreed among trading partners.

- Supplementary data are dependent on the GS1 identification key to which they are attributed.
- The GS1 system requires that only characters defined in the subset of ISO/IEC 646 International Reference Version of the GS1 General Specifications be used for GS1 Application Identifier (AI) data.

3.2 Global Product Classification

Normative References:

- Product Classification (GPC) <http://www.gs1.org/gpc>

Abstract:

To ensure products are classified correctly and uniformly, GS1 developed the Global Product Classification (GPC) as a system that gives trading partners a common language for grouping products in the same way, everywhere in the world.

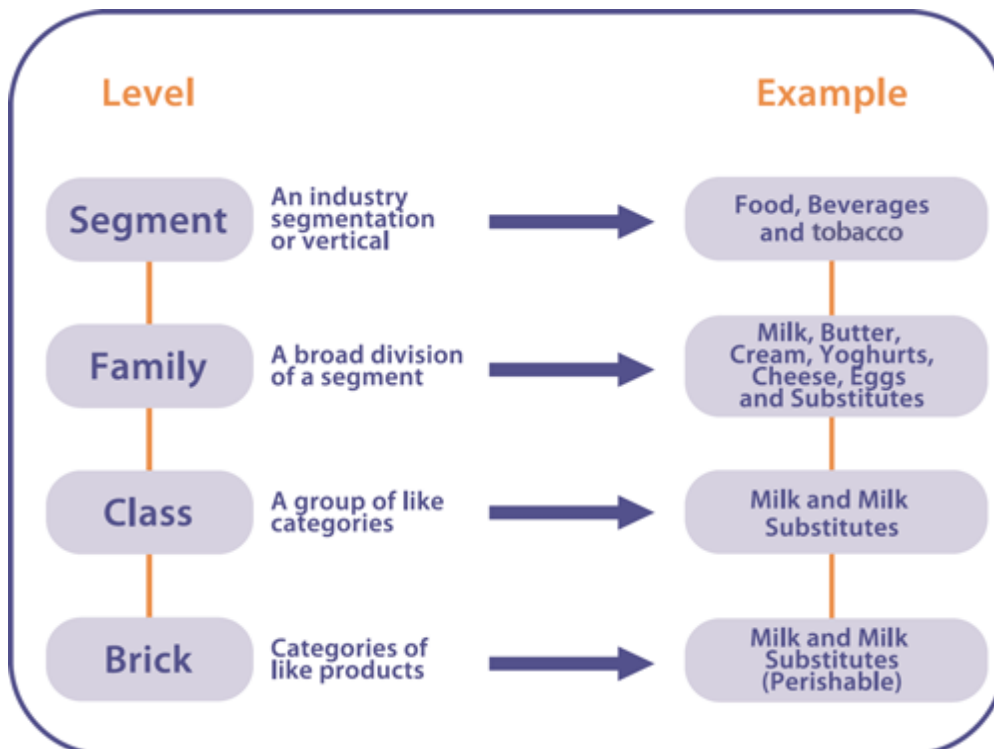
This improves accuracy and integrity of product master data, speeds up the supply chain's ability to react to consumer needs, and contributes to breaking down language barriers. It also facilitates the reporting process across product silos.

The foundation of GPC is called a "Brick;" GPC Bricks define categories of similar products. Using the GPC Brick for classification ensures the correct recognition of the product category across the extended supply chain, from seller to buyer. Bricks can be further characterised by Brick Attributes.

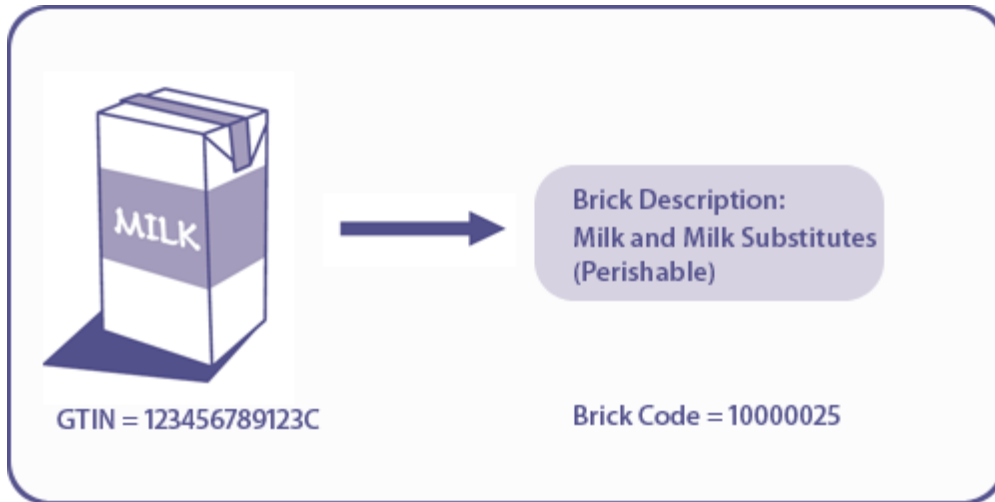
To simplify storage and retrieval and to support multiple human languages, all elements of GPC (Segments, Families, Classes, Bricks, Attributes, and Attribute Values) are numerically encoded.

3.2.1 Structure

The GPC structure is hierarchical, starting with an industry segment or vertical ("Segment"), then a broad division of a segment ("Family"), then a group of like categories ("Class"), and ending with a category of like products ("Brick"). See the diagram below.



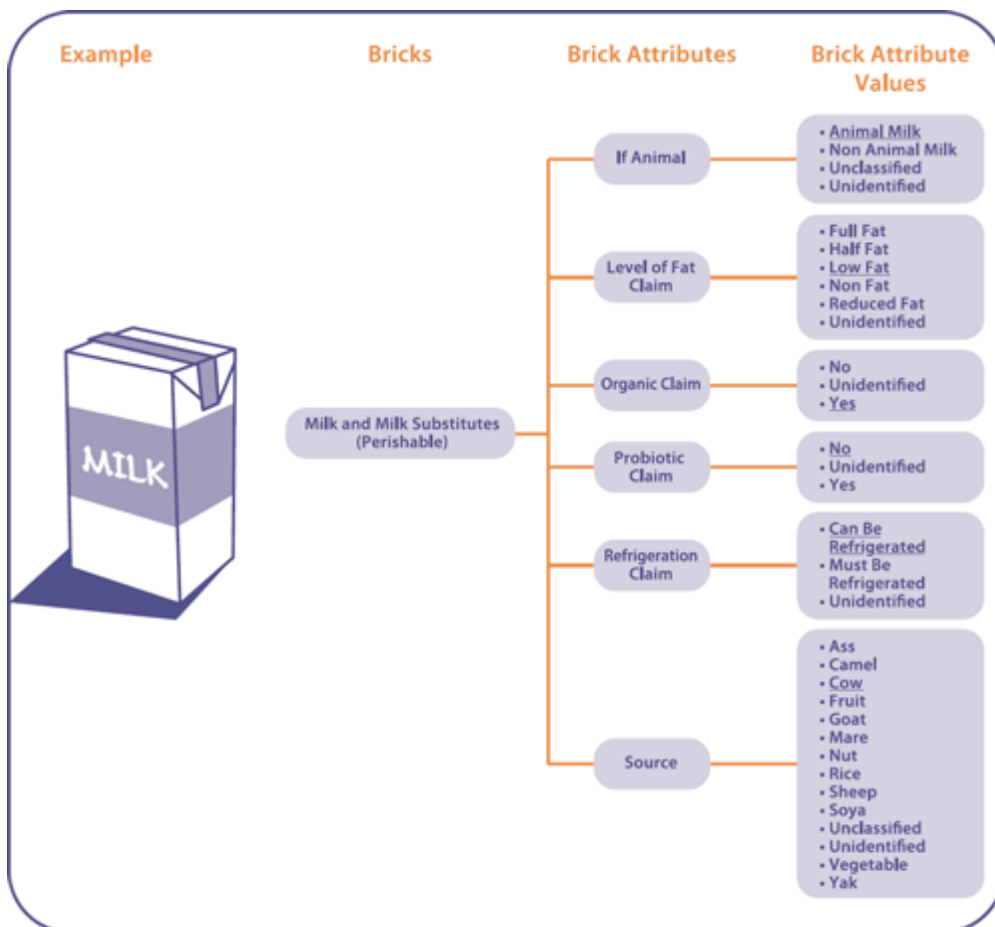
In the Global Data Synchronisation Network (GDSN), a Global Trade Item Number (GTIN) can be assigned only one Brick.



3.2.2 Attributes

Products can be further characterised using Attributes associated with the Bricks where required. Attributes are specific to a Brick, though multiple Bricks may define the same Attribute (e.g. “Organic Claim”).

Each Product belonging to a Brick may have different values for the Attributes defined by that Brick as a way of further refining the classification of the Product.



3.3 Rules

The GS1 set of standards contain rules intended for specific purposes.

3.3.1 Package measurement

Normative References:

- The [GDSN Package Measurement Rules](#).

Abstract:

The GDSN Package Measurement Rules contains rules for the global, unambiguous definition of nominal measurement attributes of product packaging to facilitate communication of the same for retail and non-retail products from the consumer unit to the case level and all intermediate packaging levels in between.

The rules are intended to provide a consistent, repeatable process to determine measurements within defined tolerances for a given product package. When a new GTIN is assigned to a trade item, it is essential that the party allocating the number, normally the manufacturer, provide detailed information to trading partners about the characteristics of the new trade item. This information should be provided as soon as possible before the product is actually traded and should include details such as brand name, height, width, depth, gross weight, and packaging materials etc.

Dependencies:

- Information about trade items in which the package measurement rules are used is specified in the GDSN Package Measurement Rules.
- The GS1 GTIN Management Standard specifies which changes that may be applied to a trade item without allocating a new GTIN and which changes that require a new GTIN. Many of the attributes to which these rules apply are defined in the Package Measurement Rules.
- The GDSN Validation Rules specifies any validations that are required to by the different actors in the GDSN.

3.3.2 Cardinality

Normative References:

- None - Syntax (GS1 XML or EANCOM) dependent

Abstract:

Cardinality is used in GS1 EDI messages to describe rules relating to which data elements that must be populated in a GS1 EDI message/document, which data elements that are optional, and which data elements that must be populated depending on the population of other data elements.

Depending on syntax (EANCOM or GS1 XML) cardinality is specified in different ways but indicates whether the data is:

- Mandatory (e.g., order number in an order message)
- Optional (e.g., additional internal product code in an order message)
- Has a Dependency (e.g., if you do this, you must also do that)

Dependencies:

- GS1 XML standards
- EANCOM standards

3.3.3 Validation

Normative References:

The [GDSN Validation Rules](#)

Abstract:

Distributed global validation rules are required to support the Global Data Synchronisation process. The validation rules lists the set of rules that actors in the GDSN must perform. The GDSN Validation Rules are the foundation to ensure that Item data passed within the Global Data Synchronisation Network conforms to a common structure and complies with global standards.

The GDSN Validation Rules are used as a complement to the validations that are performed based on the GDSN XML standard schemas. Whereas the schema validations perform syntax and format checks, validation rules are applied to all other logic quality checks that are needed to verify high quality master data.

Dependencies:

- The [GTIN Management Standard](#) specifies which changes may be applied to a trade item without allocating a new GTIN and which changes require a new GTIN. Many of the attributes to which these rules apply are defined in the Package Measurement Rules.
- The [GLN Allocation Rules](#) specify when a new GLN is required for a given business application. These are relevant to the GDSN validation rules in terms of information provider and production locations.
- Validation rules are to be contextualised so they apply to a context-based commercial scenario, e.g. a specific target-market or regulatory restriction

4 Data representation

4.1 Use of syntax

A syntax is a set of rules that defines permissible sequences of characters and connections between them so that a recognisable structure results. Then knowledge of the syntax rules enables strings of characters to be separated and interpreted in the way intended. There are many and various types of syntax.

To take a very simple example, the characters 121212 need something more to provide context:

- \$ 121,212
- Tel: 121212
- Best before 12-12-12

The conventions for representing the data in this example are a simple form of syntax. There is a character or characters to denote the type of data and conventions for organising the data.

Different syntaxes are used in different parts of the GS1 system. Nonetheless the important point is that the GS1 standards for data representation and syntax always make it possible to extract the data from the carrier and convert it to an abstract form which can then be associated with its business meaning by reference to the Global Data Dictionary.

This is especially important for the GS1 identification keys as they are always available for use in all four carrier technologies specified in the GS1 system for conveying data (barcodes, EPC RFID, GS1 XML and EANCOM) and the type of carrier employed must never alter the meaning of the data (this is the principle of carrier independence).

There is currently no generally applied standard to represent the GS1 identification keys abstracted from their carriers but the pure identity URI representation is specified in the EPC standards (see section [4.1.2](#)).

4.1.1 Barcode syntax

The GS1 barcode types used to represent the data are in themselves a kind of syntax (see section 5.1). The data syntax in barcode in the GS1 standards uses GS1 Application Identifiers (AIs) to denote the nature of the data. These are followed by the data itself. This is technically known as a name/value pair with each AI (name) having its data (value) next to it in the representation.

Most AIs are shown explicitly, but the AI (01) may be implied by the barcode type.

In some types of GS1 barcodes multiple data elements can be concatenated (linked together in a chain) because they:

- either have a pre-defined length so that the start point, and therefore the AI of the next element, appears in a position that can be determined
- or if a non-predefined length² string is followed by another element string, it must be terminated by the specified separator character Function Code 1 (FNC1).

4.1.2 EPC URI syntax

Normative References:

- The [EPC Tag Data Standard](#)

Abstract:

The EPC Tag Data Standard defines an Internet Uniform Resource Identifier (URI) syntax for certain GS1 identification keys (or key extensions), namely those that identify a specific instance of an entity as opposed to a class. A Uniform Resource Identifier is an Internet-standard mechanism for identifying an abstract, physical, or digital resource, with general syntax defined by the Internet standard RFC 3986. The most familiar form of URI is a Web page address, which is a particular form or subset of URI called a Uniform Resource Locator (URL). The form of URI defined in the EPC Tag Data Standard for representing GS1 identification keys is not a URL, however, but rather is a Uniform Resource Name (URN). A URN is a persistent name given to an Internet resource: the URN of the resource remains the same even though its location and ownership may change. For this reason it is an appropriate type of URI for GS1 identification keys.

The URIs defined in the EPC Tag Data Standard to represent a GS1 identification key all share a common structure, as follows:

```
urn:epc:id:<scheme-name>:...
```

where the *scheme-name* part is different depending on the GS1 identification key, and the syntax of the remainder of the URI depends on which scheme is used.

The EPC URI syntax may be used in information systems that need the ability to refer to a specific abstract, physical, or digital entity, without necessarily knowing in advance which GS1 identification key will be used. The EPC URI also has a structure that is more amenable for routing network requests using the Object Name Service (ONS) standard than other syntaxes for GS1 identification keys. The EPC URI is commonly used in the EPCIS and ONS standards.

4.1.3 EPC Tag data syntax

Normative References:

- The [EPC Tag Data Standard](#)

Abstract:

The data syntax in GS1 RFID tags is indicated by the EPC binary encoding header which is an extensible eight-bit field. For GS1 data this field denotes the principal key being represented and the length of the data.

Additional keys and AI data may be carried in the tag's user memory. The EPC Tag Data Standard defines an efficient compaction scheme called "packed objects" that provides for the encoding of any combination of GS1 Application Identifiers (AIs), and also addresses data access requirements including random access, tag selection by data content, modifying and deleting data elements, and selective locking. The "packed objects" compaction scheme fits within the general structure for RFID tag memory encoding specified in ISO/IEC 15962, including the use of an 8-bit Data System Format

² Sometimes misleadingly referred to as 'variable length AIs'. However, the technically correct distinction is between pre-defined and non-predefined as some AIs starting with two digits not included in the predefined length table contain fixed length data fields (e.g., AI (402), GSIN has a fixed length data format of N17 but still requires the use of FNC1 if followed by another element string).

Identifier (DSFID) header. In addition to its publication with the EPC Tag Data Standard, the “packed objects” scheme is published as an “access method” within ISO/IEC 15962.

4.1.4 EANCOM

Normative References:

- [GS1 EANCOM](#)
- UN/EDIFACT syntax rules (ISO 9735)

Abstract:

EANCOM is a set of semantic rules based on the UN/EDIFACT syntax rules (ISO 9735); they are subsets of the United Nations Standard Messages (UNSM). Logically associated elements of data are associated into segments. In this case it is these groupings of data elements that are explicitly tagged and the individual values of data elements follow the segment tag in a known sequence with separator characters between. Adjacent separator characters show missing optional data and segments are explicitly terminated.

4.1.5 XML

Normative References:

- [W3C XML](#)

Abstract:

W3C XML syntax is used in GS1 Business Message Standards (BMS) and several EPC standards (Reader Management, ALE, EPCIS). XML documents are constructed from elements, each of which has a tag followed by a value, so that the name of the data element which refers to a GS1 data definition is given explicitly. Each value is explicitly terminated by an end tag. This is another manifestation of the name/value pair approach.

4.2 Representation of keys

Normative References:

- The [GS1 General Specifications](#)

Abstract:

The following discusses the GS1 identification keys only as primary identifiers. Where a GS1 identification key is used as an attribute to another key (e.g. a ship-to location), the representation is dependent on the data carrier and the context in which the attribute is used. Below is a summary of the different GS1 identification keys in the approved GS1 syntaxes.

Data Content	GS1 Application Identifier Syntax	EPC URI Syntax	GS1 XML Syntax	EANCOM Syntax
SSCC (Serial Shipping Container Code)	N2+N18	urn:epc:id:sscc:CompanyPrefix.ExtensionPlusSerialReference	<serialShippingContainerCode>SSCC expressed in 18-digit field with leading zero(s) if required</serialShippingContainerCode>	Dependent upon usage. The segment example below shows: Goods Identity Number, Serial Shipping Container Code, code value: BJ and the actual SSCC: GIN+BJ+35410738000001068'
Global Trade Item Number (GTIN)	N2+N14	urn:epc:id:sgtin:CompanyPrefix.IndicatorPlusItemReference.SerialReference urn:epc:class:lgтин:CompanyPrefix.IndicatorPlusItemReference.LotNumber urn:epc:idpat:sgtin:CompanyPrefix.IndicatorPlusItemReference.*	<gtin>GTIN expressed in 14-digit field with leading zero(s) if required</gtin>	Dependent upon usage. The segment example below shows: Line Item, the actual GTIN and GS1 as the agency controlling the party identifier: LIN+1++5712345001110:SRV
Global Document Type Identifier (GDTI)	N3+N13+AN..17	urn:epc:id:gdti:CompanyPrefix.DocumentType.SerialComponent urn:epc:idpat:gdti:CompanyPrefix.DocumentType	<gdti>GDTI expressed as a 1-30 character alphanumeric field with leading zero(s) if required</gdti>	Dependent upon usage. The segment example below shows: BGM+220+354123450014+9' Note: The use of GDTI is possible but cannot explicitly be qualified in EANCOM. A mutual agreement between trading partners is required.

Data Content	GS1 Application Identifier Syntax	EPC URI Syntax	GS1 XML Syntax	EANCOM Syntax
Global Identification Number for Consignment (GINC)	N3+X..30	There is no EPC URI for the GINC	<ginc>GINC expressed as a 1-30 character alphanumeric field with leading zero(s) if required</ginc>	Dependent upon usage. The segment example below shows: RFF+CU:7365566156191234567'
Global Shipment Identification Number (GSIN)	N3+N17	There is no EPC URI for the GSIN	<gsin>GINC expressed as a 17-digit field with leading zero(s) if required</gsin>	Dependent upon usage. The segment example below shows: RFF+SRN:73655661561900123'
Identification of a Physical Location - Global Location Number	N3+N13	urn:epc:id:sgln:CompanyPrefix.LocationReference.Extension	<gln>GLN expressed in 13-digit field with leading zero(s) if required</gln>	Dependent upon usage. The segment example below shows: Name and Address, Party: Buyer, the actual GLN and GS1 as the agency controlling the party identifier: NAD+BY+5412345000013::9'
Global Returnable Asset Identifier (GRAI)	N4+N14+X..16	urn:epc:id:grai:CompanyPrefix.AssetType.SerialNumber urn:epc:idpat:grai:CompanyPrefix.AssetType.*	<grai>GRAI expressed as a 1-29 character alphanumeric field with leading zero(s) if required</grai>	Dependent upon usage. The segment example below shows: GIN+RAG+354123450014'
Global Individual Asset Identifier (GIAI)	N4+X..30	urn:epc:id:giai:CompanyPrefix.IndividualAssetReference	<giai>GINC expressed as a 1-30 character alphanumeric field with leading zero(s) if required</giai>	Dependent upon usage. The segment example below shows: GIN+CU+354123450000000014'
Global Service Relation Number (GSRN)	N4+N18	urn:epc:id:gsrc:CompanyPrefix.ServiceReference	Currently not used in GS1 XML.	Dependent upon usage. The segment example below shows: RFF+SNR:35412345001454857'
Global Coupon Number (GCN)	N3+N13+N..12	urn:epc:id:sgcn:CompanyPrefix.CouponCode.Serial	Currently not used in GS1 XML	Currently not used in EANCOM
Component / Part Identifier (CPID)	N4+X..30	urn:epc:id:cpi:CompanyPrefix.ComponentPartReference.Serial	Currently not used in GS1 XML	Currently not used in EANCOM

Data Content	GS1 Application Identifier Syntax	EPC URI Syntax	GS1 XML Syntax	EANCOM Syntax
Global Model Number (GMN)	N4 +X..30	Currently not used in EPC URI	Currently not used in GS1 XML	Currently not used in EANCOM

See also:

The GS1 identification keys are further explained in section [2.1](#) in this document.

4.3 Key extensions

4.3.1 Serialised GTIN

See section [2.2.1](#) – SGTIN (Serialised GTIN).

4.3.2 Extended GLN

See section [2.2.2](#) – Extended GLN.

4.3.3 Serialised CPID

See section [2.2.3](#) – SCPID (Serialised CPID)

5 Physical data carriers

A physical data carrier is a representation of data in a format that is designed to be machine-readable. There are two types of physical data carrier in the GS1 system: barcode and RFID tags and the GS1 standards for both are intended for carrying GS1 identification keys and GS1 supplementary data. They are usually attached to the object or location that the key they carry identifies. Examples include a barcode on a box, an RFID tag on a pallet and a barcode at a delivery point location.

The purpose of physical data carriers in the GS1 system is to provide a reliable way to automatically capture a GS1 identification key and link to the data held on computer systems (e.g., price look up) globally. In a GS1 compliant application of physical data carriers, a GS1 identification key must always be present. Many of the barcodes and RFID tags can also encode supplementary data which can be captured by the same scanner or reading system (e.g., batch number, weight, height, country of origin).

In line with the [GS1 Architecture Principles](#) the data standards are defined independently of physical data carrier. This means that the barcode or RFID tag never alters the meaning of the data.

5.1 Barcode

A barcode is an optically readable symbol that encodes data into a machine readable pattern using dark and light areas. They come in two main types:

- Linear symbols
- Two-dimensional symbols

5.1.1 Symbologies

Normative References:

- ISO/IEC 15424: Information technology; automatic identification and data capture techniques; data carrier/symbology identifiers

Abstract:

In order to identify the symbology of a barcode, a symbology identifier is generated by the decoder after decoding and is transmitted as a preamble to the data message. The symbology identifiers used in the GS1 system are:

Symbology Identifier	Symbology Format	Content
] E 0	EAN-13, UPC-A, or UPC-E	13 digits
] E 1	Two-digit Add-On Symbol	2 digits

Symbology Identifier	Symbology Format	Content
] E 2	Five-digit Add-On Symbol	5 digits
] E 3	EAN-13, UPC-A, or UPC-E with Add-On Symbol	15 or 18 digits
] E 4	EAN-8	8 digits
] I 1	ITF-14	14 digits
] C 1	GS1-128	Standard AI Element Strings
] e 0	GS1 DataBar	Standard AI Element Strings
] e 1	GS1 Composite	Data packet containing the data following an encoded symbol separator character
] e 2	GS1 Composite	Data packet containing the data following an encoded symbol separator character
] d 2	GS1 DataMatrix	Standard AI Element Strings
] Q 3	GS1 QR Code	Use for Extended Packaging Direct Mode

Notes:

- Symbology identifiers are case sensitive.
- Barcodes with Add-On Symbols may be considered either as two separate symbols, each of which is transmitted separately with its own symbology identifier, or as a single data packet. The system designer shall select one of these methods, but the method using symbology identifier]E3 is preferable for data security.
- For all the GS1 endorsed symbologies with the sole exception of ITF-14, the ISO Symbology Specifications have an explicit mechanism to indicate that GS1 data content is encoded.

Dependencies:

- The [GS1 General Specifications](#)

5.1.1.1 EAN/UPC

Normative References:

- ISO/IEC 15420: Information technology; automatic identification and data capture techniques; bar code symbology specifications; EAN/UPC

Abstract:

The EAN/UPC is a linear symbology that only encodes numbers. Its use is restricted to GS1 Applications. It has four main symbol types: EAN-13, UPC-A, EAN-8 and UPC-E.

EAN/UPC also has 2-digit and 5-digit add-on symbols whose use is restricted to a small number of specific areas.

Dependencies:

- The [GS1 General Specifications](#)

- Global Trade Item Number (GTIN)
- Restricted Circulation Numbers: a certain numbering capacity is set aside for closed-loop applications (e.g., Money off coupons)

5.1.1.2 ITF-14

Normative References:

- ISO/IEC 16390: Information technology; automatic identification and data capture techniques; bar code symbology specifications; ITF

Abstract:

The ITF-14 is a linear symbology that only encodes numbers. Within the GS1 system it is restricted to encoding the GTIN. Whatever type of GTIN is encoded, it must always be encoded as 14-digits in an ITF-14 symbol with leading zeros if required.

Dependencies:

- The [GS1 General Specifications](#)
- Global Trade Item Number (GTIN)

5.1.1.3 GS1-128

Normative References:

- ISO/IEC 15417: Information technology; automatic identification and data capture techniques; bar code symbology specifications; Code-128 Symbology specifications

Abstract:

Code-128 is a linear symbology that encodes all the numbers and letters and a number of special characters.

GS1-128 is a subset of the more general Code-128. As per the ISO/IEC standard 15417 the use of the Function 1 Symbol Character (FNC1) in Code 128 Symbols in the first symbol character position following the Start Character has been reserved exclusively for encoding GS1 Application Identifiers.

GS1-128 always uses GS1 Application Identifiers to encode information. It can encode all the GS1 identification keys and any GS1 Application Identifier.

Dependencies:

- The [GS1 General Specifications](#)
- All GS1 identification keys
- All GS1 Application Identifiers

5.1.1.4 GS1 DataBar

Normative References:

- ISO/IEC 24724: Information technology; automatic identification and data capture techniques; GS1 DataBar barcode symbology specification

Abstract:

GS1 DataBar is a family of linear symbologies used exclusively within the GS1 system. There are three groups of GS1 DataBar symbols, two of which have a number of versions optimised for different application requirements:

- The first group comprises GS1 DataBar Omnidirectional, GS1 DataBar Truncated, GS1 DataBar Stacked and GS1 DataBar Stacked Omnidirectional and only encodes GTINs. The second group is GS1 DataBar Limited which encodes GTINs in a linear symbol with certain numbering restrictions.

- The third group comprises GS1 DataBar Expanded and GS1 DataBar Expanded Stacked. They always use GS1 Application Identifiers to encode information and can encode all the GS1 identification keys and any GS1 Application Identifier.

Dependencies:

- The [GS1 General Specifications](#)
- All GS1 identification keys
- All GS1 Application Identifiers

5.1.1.5 GS1 DataMatrix

Normative References:

- ISO/IEC 16022: Information technology; automatic identification and data capture techniques; Data Matrix bar code symbology specification

Abstract:

Data Matrix ISO version ECC 200 is a standalone, two-dimensional matrix symbology that is made up of square modules arranged within a perimeter finder pattern. It can encode all the numbers and letters and a number of special characters and uses Reed-Solomon error correction.

GS1 DataMatrix requires a leading FNC1 character at the start. This indicates that GS1 Application Identifier (AI) data is encoded. GS1 DataMatrix therefore always uses GS1 Application Identifiers to encode information and can encode all the GS1 identification keys and any GS1 Application Identifier.

Dependencies:

- The [GS1 General Specifications](#)
- All GS1 identification keys
- All GS1 Application Identifiers

5.1.1.6 GS1 Composite

Normative References:

- ISO/IEC 24723: Information technology; automatic identification and data capture techniques; EAN.UCC Composite bar code symbology specification

Abstract:

The GS1 Composite Symbology integrates both a GS1 system linear symbol and a 2 Dimensional Composite Component as a single symbology. There are three types of Composite Symbols A, B and C, each with different encoding rules. Properly defined encoders automatically select the appropriate type and optimise.

The linear component always encodes the object's GS1 identification key and therefore the primary identification is readable by most scanning technologies. The adjacent 2D Composite Component encodes supplementary data.

The Composite Symbol only encodes information using GS1 Application Identifiers. It can encode all the supplementary GS1 Application Identifier.

Dependencies:

- The composite component requires a GS1 system linear symbol encoding a GS1 identification key
- The [GS1 General Specifications](#)
- GS1 Application Identifiers for supplementary information

5.1.1.7 GS1 QR Code

Normative References:

- ISO/IEC 18004: Information technology; automatic identification and data capture techniques; QR Code 2005 bar code symbology specification

Abstract:

GS1 QR Code is a standalone, two-dimensional matrix symbology that is made up of square modules arranged in an overall square pattern, including a unique finder pattern located at three corners of the symbol. Unlike a Composite Component symbol, GS1 QR Code does not require a linear symbol.

GS1 QR Code requires a leading FNC1 character at the start. QR Code 2005 is the only member of the QR Code family that supports GS1 system data structures, including Function 1 Symbol Character. ISO/IEC QR Code 2005 also contains specifications for Micro QR Code, but this symbology is not supported for the GS1 system. The FNC1 character indicates that GS1 Application Identifier (AI) data is encoded. GS1 QR Code therefore always uses GS1 Application Identifiers to encode information.

Implementation of GS1 QR Code shall be done per approved GS1 system application standards. While the GS1 QR Code is technically capable of encoding any AI, currently the sole application standard for GS1 QR Code specifies the use of AI (01) and AI (8200) only.

Dependencies:

- The [GS1 General Specifications](#)
- Global Trade Item Number (GTIN)
- AI (8200) – Product URL

5.1.2 Symbol placement

Normative References:

- The [GS1 General Specifications](#)

Abstract:

Consistency of symbol placement is important to efficient scanning. With manual scanning, variation of symbol placement makes it difficult for the scanning operator to predict where the symbol is located, and this reduces efficiency. With automated scanning, the symbol must be positioned so that it will pass through the field of vision of a fixed scanner as it travels past.

General principles exist such as number of symbols, scanning environment, orientation, printing direction, curvature of surface and avoiding scanning obstacles (i.e. anything that will obscure or damage a symbol and show through). In addition to these general principles guidelines are provided for symbols in various scanning environments.

The general recommendations for symbol location are supplemented with additional recommendations for the following areas:

- General Placement Guidelines for Point-of-Sale
- Placement Guidelines for Specific Packaging Types
- Placement Guidelines for Clothing and Fashion Accessories
- Placement for Plastics Packaged Products
- GS1 Logistics Label Design
- Placement Labels used in General Distribution
- Placement guidelines for Regulated Healthcare Trade Items
- Placement guideline Priority if both POS & General Distribution

5.2 RFID

Radio Frequency Identification (RFID) is a method of Automatic Identification and Data Capture in which data is carried by an electronic device called an RFID Tag, which communicates via radio frequency (RF) signals with a reading device called an RFID Interrogator (also called an "RFID

Reader,” though most such devices are capable of “writing” as well as “reading”). RFID Tags operate differently from barcodes in a number of ways, including the following:

- RFID Tags can be read even when there is not a direct optical line of sight from the RFID Tag to the RFID Interrogator. On the other hand, the communication between Tag and Interrogator may be subject to RF interference and absorption of RF signals by electrically conductive materials.
- Certain types of RFID Tags may be read at very long distances.
- A single Interrogator may read many Tags simultaneously, without having to “aim” the Interrogator at each Tag one at a time.
- The data on RFID Tags may be added to or changed at any time.
- Certain types of RFID Tags may provide additional functionality besides data storage and retrieval; for example: encryption, authentication, access control, electronic disabling, sensors, actuators, etc.

These different operating characteristics make RFID Tags a viable data carrier in applications where the use of barcodes might be unsuitable or impractical. In some applications, RFID Tags and barcodes are used simultaneously to obtain the benefits of both. These different operating characteristics also lead to the need for RFID Software Standards that have no counterpart for barcodes.

GS1 standards for RFID include the following:

- *Air Interface Standards* are standards that define the capabilities of RFID Tags and how RFID Tags communicate with RFID Interrogators. (The term “air interface” refers to the fact that the interface between Tag and Interrogator occurs via radio signals, informally “over the air.”)
- *Tag Data Standards* define how data is encoded in the digital memory of RFID Tags, and also provide definitions of data that is specific to RFID Tags and the process of capturing information from RFID Tags.
- *RFID Software Standards* are standards governing network and software interfaces between system components that interact with RFID Interrogators and capture data from RFID Tags.

5.2.1 Air interfaces

An Air Interface standard defines the capabilities of a particular class of RFID Tag and specifies how RFID Tags belonging to that class communicate with RFID Interrogators. GS1 Air Interface standards can be classified along two dimensions:

- The frequency band in which the radio communication between Tag and Interrogator takes place.
- The functions supported by the Tag.

5.2.1.1 UHF Gen 2

Normative References:

- [EPC™ Radio-Frequency Identity Protocols Generation-2 UHF RFID Protocol for Communications at 860 MHz – 960 MHz](#)
- ISO/IEC 18000-63:2015 – “Information technology -- Radio frequency identification for item management -- Part 6: Parameters for air interface communications at 860 MHz to 960 MHz”
- ISO/IEC 18000-6:2004/Amd 1:2006 – “Extension with Type C and update of Types A and B”

Abstract:

The UHF Gen 2 Air Interface (often referred to simply as “Gen 2”) specifies the air interface for passive RFID Tags operating in the 860 MHz – 960 MHz radio frequency band. This standard is maintained in synchrony with ISO/IEC 18000-6C.

5.2.1.2 HF Class 1

Normative References:

- EPC™ Radio-Frequency Identity Protocols EPC Class-1 HF RFID Air Interface Protocol for Communications at 13.56 MHz Version 2.0.3
- ISO/IEC 18000-3:2010 – “Information technology -- Radio frequency identification for item management -- Part 3: Parameters for air interface communications at 13,56 MHz”

Abstract:

The HF Class 1 Air Interface specifies the air interface for passive RFID Tags operating in the 13.56MHz radio frequency band, with functionality comparable to UHF Class 1 Gen 2 tags.

5.2.2 Tag Data Standards

Tag Data Standards define how data is encoded in the digital memory of RFID Tags, and also provide definitions of data that is specific to RFID Tags and the process of capturing information from RFID Tags. (In contrast, the definition of business data in the GS1 system is independent of data carrier; the Tag Data Standards only specify the encoding of such data for RFID Tags and not their semantics.)

5.2.2.1 EPC Tag Data Standard

Normative references:

- [EPC Tag Data Standard](#)
- ISO/IEC 15962, 2nd Edition. Appendixes I, J, K, and L of the EPCglobal Tag Data Standard, which specify the encoding of the user memory bank of a Gen 2 RFID Tag, are reproduced in this ISO/IEC specification.

Abstract:

- Defines the overall structure of the Electronic Product Code, including the mechanism for federating different coding schemes.
- Defines specific EPCglobal coding schemes.
- For each EPCglobal coding scheme, defines binary representations for use on RFID tags, text URI representations (EPC Pure Identity URI described in section [4.1.2](#) and EPC Tag URI described in section [5.2.2.4](#)) for use within information systems (in particular, at the ALE level and higher in the EPCglobal Architecture Framework, including EPCIS and Discovery Services), and rules for converting between one representation and another.
- For EPC codes that are in correspondence with GS1 codes, defines rules for traversing this correspondence in both directions.
- Defines additional control information that is specific to RFID and the capture of data from RFID Tags, including
 - Filter bits, which assist RFID Interrogators in isolating specific tag populations, in order to improve performance
 - Attribute bits, which provide information regarding special handling of the object to which the RFID Tag is affixed
- Defines the encoding of TID memory for Gen2 Tags, which encodes information about the Tag itself as opposed to the object to which the Tag is affixed. This information may include the capabilities of the Tag (such as how much memory it contains, whether it implements optional features, etc.). It also may include a globally unique serial number assigned at Tag manufacture time.
- Defines the encoding of User Memory for Gen2 Tags, which may be used to store additional data elements beyond the EPC.

Dependencies:

- UHF Class 1 Gen 2 Air Interface
- The [GS1 General Specifications](#)
- ISO/IEC 15961

5.2.2.2 Attributes values

Attribute values provide information regarding special handling of objects to which RFID Tags are affixed. They are defined in the EPC Tag Data Standard (see section [5.2.2.1](#)).

5.2.2.3 Filter values

Filter values assist RFID Interrogators in isolating specific tag populations, in order to improve performance. They are defined in the EPC Tag Data Standard (see section [5.2.2.1](#)).

5.2.2.4 EPC Tag URI

The EPC Tag URI is a Uniform Resource Identifier syntax for describing the complete contents of the EPC Memory Bank of a Gen 2 RFID Tag. It is defined in the EPC Tag Data Standard (see section [5.2.2.1](#)).

See also:

- Section [4.1.2](#) for information on EPC URI syntax.

5.2.2.5 EPC binary encoding

The EPC Binary Encoding is an efficient encoding of an EPC, together with Attribute Values, Filter Values, and other control information, into a string of bits suitable for storage in the EPC Memory Bank of a Gen 2 RFID Tag. It is defined in the EPC Tag Data Standard (see section [5.2.2.1](#)).

5.2.2.6 Tag Data Translation

Normative references:

- [EPC Tag Data Translation](#)

Abstract:

- Provides in machine-readable form all of the rules that define how to translate between EPC encodings defined by the EPC Tag Data Standard.

Dependencies:

- EPC Tag Data Standard

5.2.2.7 TID/XTID

The Tag Identification (TID) and Extended Tag Identification (XTID) encodes information about an RFID Tag itself, as opposed to the object to which the Tag is affixed. It is defined in the EPC Tag Data Standard (see section [5.2.2.1](#)).

5.2.2.8 User Memory Encoding (Packed Objects)

The User Memory Bank in a Gen 2 RFID Tag may be used to store additional data elements beyond the EPC. The procedures for encoding user memory, including the "Packed Objects" encoding method, are defined in the EPC Tag Data Standard (see section [5.2.2.1](#)).

5.2.3 RFID Software Interface Standards

GS1 RFID Software Interface Standards govern the network and software interfaces between system components that interact with RFID Interrogators and capture data from RFID Tags.

5.2.3.1 Low-level Reader Protocol (LLRP)

Normative references:

- [EPC Low Level Reader Protocol \(LLRP\)](#)

Abstract:

- Provides means to command an RFID Interrogator to inventory tags (that is, to read the EPC codes carried on tags), read tags (that is, to read other data on the tags apart from the EPC code), write tags, manipulate tag user and tag identification data, and access other features such as kill, lock, etc.
- May provide means to access RFID Interrogator management functions including discovery, firmware/software configuration and updates, health monitoring, connectivity monitoring, statistics gathering, antenna connectivity, transmit power level, and managing reader power consumption.
- May provide means to control RF aspects of RFID Interrogator operation including control of RF spectrum utilisation, interference detection and measurement, modulation format, data rates, etc.
- May provide means to control aspects of RFID Tag Air Interface operation, including protocol parameters and singulation parameters.
- May provide access to processing features such as filtering of EPCs, aggregation of reads, and so forth. For features that require converting between different representations of EPCs, may use the Tag Data Translation Interface to obtain machine-readable rules for doing so.

Dependencies:

- UHF Class 1 Gen 2 Air Interface Standard

5.2.3.2 Application Level Events (ALE)

Normative references:

- [EPC Application Level Events](#)

Abstract (data functions):

- Provides means for one or more client applications to request EPC data from one or more Tag sources.
- Provides means for one or more client applications to request that a set of operations be carried out on Tags accessible to one or more Tag sources. Such operations including writing, locking, and killing.
- Insulates client applications from knowing how many readers/antennas, and what makes and models of readers are deployed to constitute a single, logical Tag source.
- Provides declarative means for client applications to specify what processing to perform on EPC data, including filtering, aggregation, grouping, counting, and differential analysis.
- Provides a means for client applications to request data or operations on demand (synchronous response) or as a standing request (asynchronous response).
- Provides means for multiple client applications to share data from the same reader or readers, or to share readers' access to Tags for carrying out other operations, without prior coordination between the applications.
- Provides a standardised representation for client requests for EPC data and operations, and a standardised representation for reporting filtered, collected EPC data and the results of completed operations.

Abstract (control functions):

- Provides a means for client applications to query and configure the mapping between logical reader names as used in read/write requests and underlying physical resources such as RFID Readers.
- Provides a means for client applications to configure symbolic names for Tag data fields.
- Provides a means for management applications to secure client access to the ALE interface.

Dependencies:

- UHF Class 1 Gen 2 Air Interface Standard

- EPC Tag Data Standard

5.2.3.3 Reader Management (RM)

Normative references:

- [EPC Reader Management](#)

Abstract:

- Provides means to query the configuration of an RFID Interrogator, such as its identity, number of antennas, and so forth.
- Provides means to monitor the operational status of an RFID Interrogator, such as the number of tags read, status of communication channels, health monitoring, antenna connectivity, transmit power levels, and so forth.
- Provides means for an RFID Interrogator to notify management stations of potential operational problems.
- Provides means to control configuration of an RFID Interrogator, such as enabling/disabling specific antennas or features, and so forth.
- May provide means to access RFID Interrogator management functions including device discovery, identification and authentication, network connectivity management, firmware/software initialisation, configuration and updates, and managing reader power consumption.

Dependencies:

- UHF Class 1 Gen 2 Air Interface Standard

5.2.3.4 Discovery, configuration and initialisation (DCI)

Normative references:

- [EPC Discovery, Configuration, and Initialization \(DCI\) for Reader Operations](#)

Abstract:

- Provide a means for an RFID Interrogator to discover one or more Access Controllers.
- Provide a means for the Access Controller to discover one or more RFID Interrogator.
- Provide a means for an RFID Interrogator to discover one or more Clients.
- Provide a means for an RFID Interrogator and an Access Controller to exchange identity information and authenticate that identity information.
- Provide a means for a Client and Access Controller to authenticate their communications and operations.
- Provide a means for an Access Controller to configure an RFID Interrogator, including a means to update the software and/or firmware on the Interrogator.
- Provide a means for the Access Controller to initialise an RFID Interrogator, providing parameters necessary for the Interrogator to begin operation.
- Provide a means for an RFID Interrogator and Access Controller to exchange vendor-specific information.

Dependencies:

- "Control and Provisioning of Wireless Access Points (CAPWAP)," IETF RFC 5415, March 2009, <http://www.ietf.org/rfc/rfc5415.txt>.

5.3 Barcode / RFID interoperability guideline

Reference:

- [RFID Bar Code Interoperability, GS1 Guideline](#)

Abstract:

This GS1 guideline provides information to end users and solution providers that use GS1 data carriers including barcodes and radio frequency identification (RFID) tags, specifically, data carriers that include serialised data. The guideline provides recommendations for best practices designed to lead to the highest degree of interoperability when using these data carriers, especially in any of the following situations:

- When both barcodes and RFID tags are used together to label physical objects
- When it is necessary to transfer information from a barcode to an RFID tag or vice versa
- When deploying information systems that may read and write barcodes and RFID tags

6 Business data

6.1 Master data

Master data provides the description and structure to define a Trade Item, a Catalogue Item, or a Party. The use, definition, and relevance of these attributes are the same for all users of GS1 standards. The definition of these attributes must be the same for all industries.

Master data defines the attributes of trade items that are used to establish a catalogue. It can establish the details about buyers and sellers as the 'parties' transacting business within the supply chain. It also sets up the details of locations within the supply chain that are necessary for invoicing, billing and logistics.

6.1.1 Trade Item (Key = GTIN)

Any item (product or service) upon which there is a need to retrieve pre-defined information and that may be priced, ordered, or invoiced at any point in any supply chain.

See Also:

- [2.1.1](#) GTIN

Definition

The Trade Item (identified by a GTIN) definition is provided on the GS1 website:

www.gs1.org/glossary

References

- GS1 EANCOM Product Information Messages (PRICAT)
- Business Message Standard (BMS) Align/Trade Item (Data Definition)

6.1.2 Catalogue Item (Key = GTIN + GLN of Information Provider + Target Market)

This is Trade Item information as it is usually stored in a catalogue or Data Pool, typically as implemented for use in the Global Data Synchronisation Network (GDSN). This combination of keys and attributes defines the uniqueness of a catalogue item in the GDSN. This allows for the ability to possibly vary the values of some of the attributes of a Trade Item, represented by a GTIN based on either the Party (GLN of Information Provider) as well as by the target market (the geographic location(s) in which the Trade Item is intended to be sold).

Definition

The Catalogue Item definition is contained within the GS1 Catalogue Item Synchronisation Business Message Standard, provided on the GS1 website:

<http://www.gs1.org/gdsn>

References

- GS1 EANCOM Product Information Messages (PRICAT)

- GS1 EANCOM Product Data Messages (PRODAT)
- Business Message Standard (BMS) Catalogue Item Synchronisation

6.1.3 Party (GLN)

Abstract

The attributes of the Party ideally should be established as part of master data management using the GLN as the key to the information. The Party can be used to identify physical locations and legal entities where there is a need to retrieve pre-defined information to improve the efficiency of communication with the supply-chain. Parties are a prerequisite for GS1 EDI messages or for accessing information from the Global Data Synchronisation Network.

The use of Global Location Numbers (GLNs) in these areas is driven by the exact party role within a given business process requirement. These GLNs identify parties to different business processes and transactions.

See also:

- [2.1.2](#) GLN

Definition

The Party (identified by a GLN) definition is provided on the GS1 website:

<http://www.gs1.org/glossary>

References

- GS1 EANCOM Party Information Message (PARTIN)
- Business Message Standard (BMS) Basic Party Synchronisation
- Business Message Standard (BMS) Full Party Synchronisation

6.1.4 Price Synchronisation

Price Synchronisation is the capability for electronically communicating accurate pricing information between trading partners using global standards that accommodates the different pricing business practices and facilitates an invoice amount equal to the expected payment amount equal to the actual payment. GS1 price synchronisation allows for pricing business practices ranging from simple pricing and transactional pricing to component based pricing. Component-based pricing includes components such as promotions, allowances, charges, and brackets.

See also:

[2.1.1](#) GTIN

Definition

The Price Synchronisation definition is provided on the GS1 website:

<http://www.gs1.org/qdsn>

References

- GS1 EANCOM Business Transaction Messages (PRICAT)
- Business Message Standard (BMS) Price Synchronisation

6.1.5 Trusted Source of Data (TSD, also known as GS1 Source)

The GS1 Trusted Source of Data (TSD) framework supports the communication of authentic and accurate product data by brand owners to consumers/shoppers, retailers, internet applications, and government using internet and mobile devices. The standard defines the data and interfaces by which one or more Data Aggregators (as defined in the standard) may federate to provide seamless access to product data, for the benefit of Internet Applications across the globe.

Normative Reference

- [GS1 Trusted Source of Data \(TSD\)](#)

6.1.6 GS1 SmartSearch

GS1 SmartSearch specifies how machine-readable structured data about a product or product offering can be embedded within an existing web page. Like GS1 Source (Section [6.1.5](#)) and in contrast to GDSN (Sections [6.1.1](#) through [6.1.4](#)), GS1 SmartSearch focuses on structured data for use in B2C applications. Whereas GS1 Source provides an Application Programming Interface (API) for exchange of product data between data aggregators that serve data directly to Internet application providers on behalf of brand owners, GS1 SmartSearch provides a means for brand owners and others to embed product data directly into web pages that they publish, allowing for enhanced processing by search engines and other applications that consume public web pages.

GS1 SmartSearch is built around technologies developed for the so-called “semantic web,” including

- Resource Description Format (RDF) as the language for expressing structured data
- Schema.org and GS1 vocabularies to populate the structured data
- JavaScript Object Notation for Linked Data (JSON-LD) as the machine-readable syntax for encoding the structured data into a format that can be easily embedded into a web page.

These technologies allow structured product data to be inserted directly into public-facing web pages, where it is available to any application that consumes those pages. This allows web page publishers to distribute product data directly to applications that can process that data.

The data aggregator-based approach of GS1 Source and the web page approach of GS1 SmartSearch are complementary. GS1 Source is designed to address the needs of applications that need reliable, authoritative access to product data about a large range of products. Mobile applications that scan a barcode or search for a product are good examples of these. The web page approach of GS1 SmartSearch is designed to address the needs of applications that need deeper insight into the content of a particular web page that the application happens to be consuming. Search engines such as Google, Bing, and others are very important examples of such applications; social media sites, shopping engines, and other emerging applications are others.

<http://www.gs1.org/gs1-smartsearch>

Normative Reference

- GS1 Web Vocabulary Standard 1.5

6.2 Business transactions

Normative References:

- [EANCOM Message Implementation Guide](#)
- [GS1 Business Message Standard \(BMS\)](#)
- [GS1 UN/CEFACT XML profiles](#)

Abstract:

Standards for electronic supply chain transactions are provisioned by GS1 in EANCOM, GS1 UN/CEFACT XML profiles, and GS1 XML formats. The use of electronic business in the supply chain simplifies the processes involved and reduces costs. They support business processes such as order to cash and logistics.

The technical formats used to exchange this information are found in section [Z](#).

6.2.1 Plan

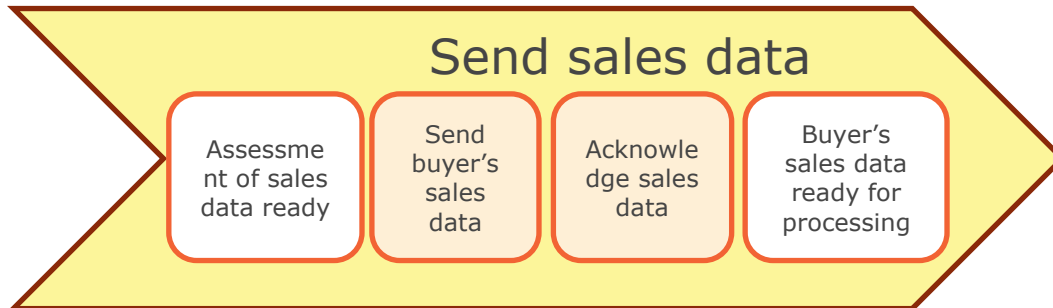
The replenishment process in broad sense addresses the business practice to exchange data between a buying party (e.g. buyer) and a supplying party (e.g. seller/supplier) related to the future demand of finished or semi-finished products, ingredients, packaging and raw materials.

Between retailer and manufacturer (the downstream supply chain) the data is based on future demand based on finished products and time series but it can also be restricted to actual sales data

for a certain period of time. Feed-back from the manufacturer on his availability to deliver is required, where available inventories (of both sides) are taken in account.

Between manufacturer and material supplier (the upstream supply chain) the data is basically based on material requirements for production and the timing for it, and also the feedback from the material supplier on his availability to deliver and the schedule for delivery. Inventories (on both sides) are taken into account for the actual delivery schedule.

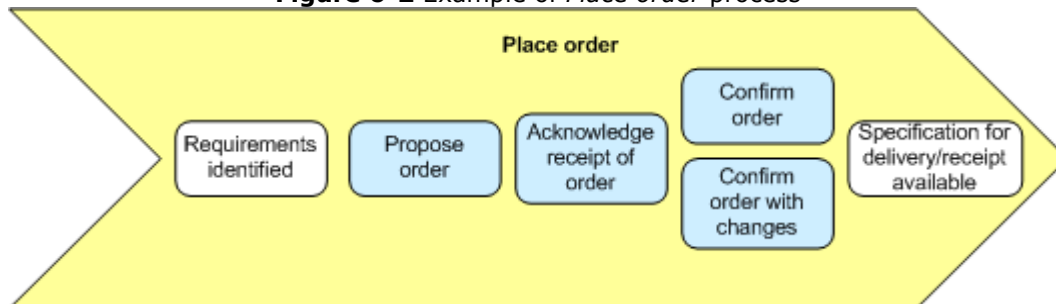
Figure 6-1 Example of *Send sales data* process. The buyer's sales data is exchanged in the document exchanges, shown blue in the diagram.



6.2.2 Order

This process is used to order goods and services. The purpose is to transfer between the buyer and supplier all information necessary to allow delivery to be made. This information is exchanged in the document exchanges shown in blue in the following diagram.

Figure 6-2 Example of *Place order* process



The state *Requirements identified* starts the process and *Specification for delivery/receipt available* is the final state of the process.

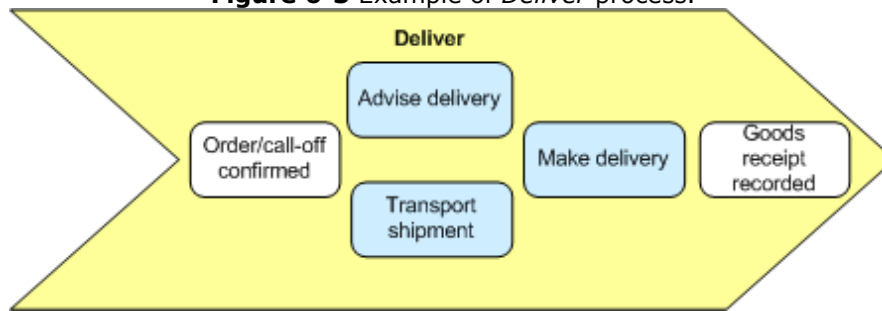
6.2.3 Deliver

This is the process of delivering goods that the buyer has ordered. It covers activities from the preparation of the shipment and its transport through to its receipt and the registration of information needed for traceability and invoice reconciliation.

In addition to the physical transfer of goods from the supplier to the buyer, information about the shipment is transferred using a despatch advice message. Since this document should arrive before the goods, the recipient can plan for their arrival.

Information is also exchanged with transporters and logistics service providers to manage the goods during transfer and intermediate storage.

The transfer of the goods and related information is achieved with the document exchanges shown in blue in the following diagram.

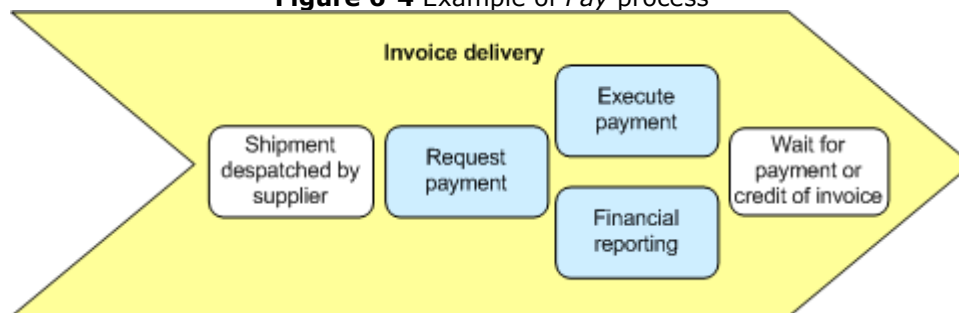
Figure 6-3 Example of *Deliver* process.


6.2.4 Pay

The Pay messages cover all financial information in the supply chain processes, such as invoice and remittance advice.

This process is used when a supplier issues an invoice demanding payment for goods or services delivered. The purpose is to ensure that the buyer has sufficient information to enable him to pay the debt and update his accounting system. Once the payment is carried out reporting messages may be exchanged, such as remittance advice and financial statement. Information is sent in the business document *Request payment*, shown in blue below.

The payment related information is achieved with the document exchanges shown in blue in the following diagram.

Figure 6-4 Example of *Pay* process


6.2.5 Other

Other messages cover general processes supporting the above processes, such as error reporting and status updates.

6.3 Visibility event data

Normative References:

- [Electronic Product Code Information Services \(EPCIS\) Standard \(also published as ISO/IEC 19987\)](#)
- [Core Business Vocabulary \(CBV\) Standard \(also published as ISO/IEC 19988\)](#)

The EPC Information Services (EPCIS) standard defines an abstract data model and concrete XML syntax for visibility event data, which is designed to provide information as to the whereabouts and condition of physical and digital objects. Visibility event data is complementary to master data and business transaction data defined earlier. Whereas the focus of master data standards is on the description of business entities, and the focus of business transaction data standards is to encode the information to support the creation or fulfilment of a contractual or monetary obligation between parties, the focus of visibility event data is on the location, status, and condition of assets.

Visibility event data as defined in EPCIS consists of a collection of events, where each event is a record of something that happened to one or more physical or digital objects. Each EPCIS event has four information dimensions, conveniently remembered by the mnemonic *what, where, when, and why*:

- *What* The physical or digital objects that are the subject of the event (indicated by their respective identifiers)
- *When* The date and time at which the event took place
- *Where* Location identifiers that indicate where the event took place, as well as where the objects are expected to be following the event
- *Why* Information that provides the business context for the event, including (a) an indication of what step of a business process was taking place at the time of the event; (b) the business state or condition of the objects subsequent to the event; and (c) links to business transaction data or other business data that was part of the business context in which the event took place.

There are four different event structures defined in the EPCIS standard, as detailed in the following sections. Each of these has the same four-dimensional information content as defined above, but the details of the *what* dimension differ for each event type.

6.3.1 Object event

The EPCIS Object Event is used to record an event that happened to one or more physical or digital objects, where no particular relationship between the objects is implied apart from their having participated in the same event together. The *what* dimension for an Object Event simply enumerates each of the objects involved in the event.

6.3.2 Aggregation event

The EPCIS Aggregation Event is used to record an event that happened to one or more objects, where there is a state of physical aggregation involved. Physical aggregation means that one or more “child” objects are physically associated to a “parent” object, such that the parent and all children must necessarily always exist at the same place at the same time. Examples of physical aggregation include: items packed into a carton; cartons stacked and shrink-wrapped onto a pallet skid; pallets packed into a shipping container, assembly of components into a computer; etc.

The EPCIS Aggregation Event may be used to indicate the *creation* of or *addition* to an aggregation, the *removal* from or *dismantling* of an aggregation (i.e., “disaggregation”), or the observation of objects in a state of aggregation that is neither added to nor deleted from during the event.

6.3.3 Transformation event

The EPCIS Transformation Event is used to record an event in which one or more objects are fully or partially consumed as inputs and one or more objects are produced as outputs. An example would be an event in which raw materials are mixed together to create a finished product.

6.3.4 Transaction event

The Transaction Event may be used to record the act of associating or disassociating a business transaction document to or from one or more physical or digital objects. For example, a transaction event may record the decision to fill a specific purchase order with specific serial numbers of the product being ordered. Because the other three event types may also include links to business transactions, the Transaction Event is often not needed as a separate event.

7 Information distribution and discovery

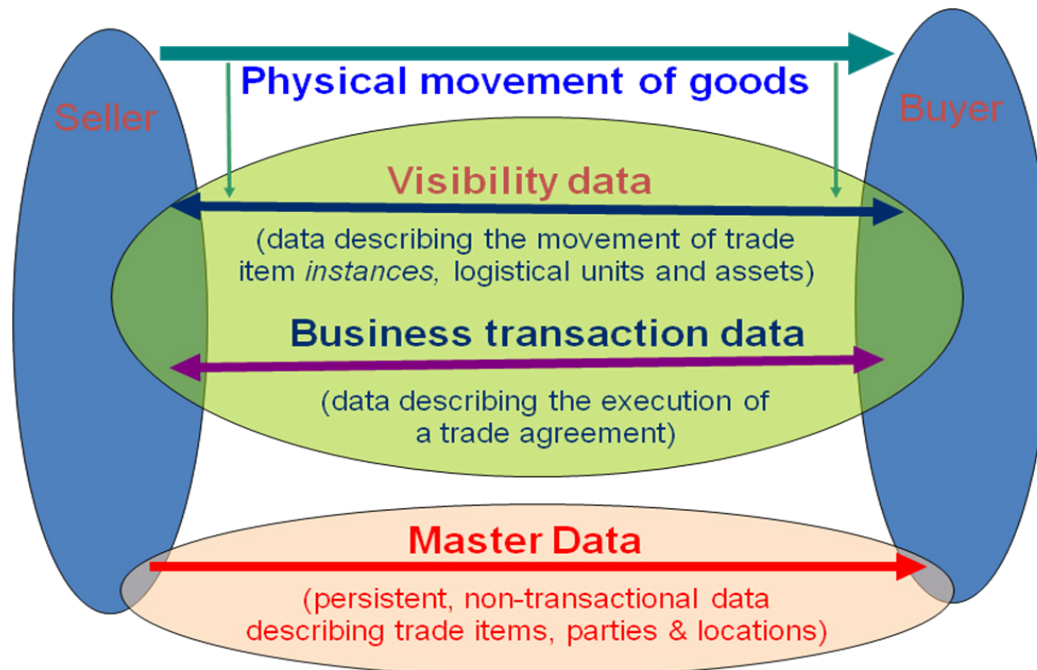
7.1 Data exchange categories

Looking across the GS1 standards, the data that is conveyed can be categorised into three types:

- **Master data** that describes the trade items, parties and locations, all of which are identified by GS1 identification keys.
- **Transaction data** that consist of trade transactions from order to final settlement, also making use of keys.

Visibility event data provide details about activity in the supply chain of products and other physical or digital assets, identified by keys, detailing where these objects are in time, and why; not just within one company's four walls, but throughout the supply chain.

Figure 7-1 Main streams of goods and data exchange between Buyers and Sellers



7.2 Data exchange methods

The communication methods may be broadly classified in two groups:

- **"Push"** methods, where one party unilaterally transfers data to another in the absence of a prior request. Push methods may be further classified as:
 - Bilateral party-to-party push, where one party transfers data directly to another party. GS1 implementation: GS1 EDI (EANCOM and GS1 XML).
 - Publish/subscribe, where one party transfers data to a data pool, which in turn pushes the data to other parties who have previously expressed interest in that data by registering a subscription ("selective push"). GS1 implementation: GDSN.
- **"Pull"** or "query" methods, where one party makes a request for specific data to another party, who in turn responds with the desired data. GS1 implementation: EPCIS, GS1 Source.

7.3 Messaging standards

Normative References:

- [EANCOM Message Implementation Guide](#)
- [GS1 Business Message Standard \(BMS\)](#)
- [GS1 UN/CEFACT XML profiles](#)

Abstract:

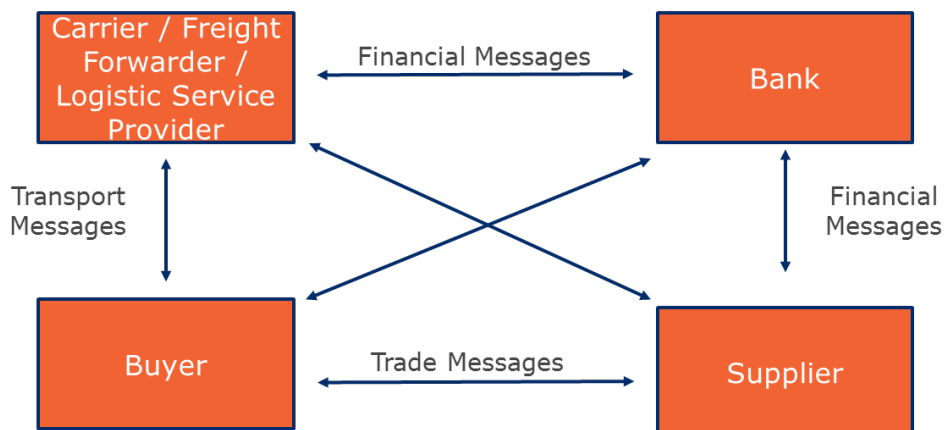
Standards for electronic supply chain transactions are provisioned by GS1 in EANCOM, GS1 UN/CEFACT XML profiles, and GS1 XML formats. Use of electronic business in the supply chain will enable simplification of the processes involved and reduce costs. They support business processes such as order to cash and logistics.

EANCOM is a subset of the UN/EDIFACT standard and has a large installed user base globally. For new developments and new sectors GS1 XML is being used since it is better adapted for the Internet and allows for stronger validation of the business contents.

7.3.1 EANCOM® MESSAGES

7.3.1.1 EANCOM introduction

The messages available in the EANCOM standard cover the functions required to carry out a complete trade transaction: messages which enable the **trade** transaction to take place, (e.g., price catalogue, purchase order, invoice, etc.); messages used to instruct **transport** services to move the goods; and messages used in settlement of the trade transactions through the **banking** system. The flows and trading partners catered for in EANCOM can be represented as follows:



7.3.1.2 Categorisation

The EANCOM messages can be categorised as follows:

Master data alignment, messages used to exchange master data related to relevant parties and products between trading partners. The master data is stored in computer systems for reference in subsequent transactions or interchanges. Examples of messages: Price/Sales Catalogue (PRICAT), Party Information (PARTIN).

Note: Some EANCOM messages, notably PRICAT, are used for data exchange between companies and data pools connected to GDSN.

Transactions, messages used to order goods or services, arrange for transport of the goods, and realise payment for the goods or services supplied. Examples of messages: Purchase Order (ORDERS), Despatch Advice (DESADV), Invoice (INVOIC), Transport Instruction (IFTMIN).

Reporting and planning, messages used to supply the trading partner with relevant information or future requirements. The acknowledgement of receipt of an interchange and experienced errors is also provided for. Examples of messages: Application Error and Acknowledgement (APERAK), Delivery Schedule (DELFOR), Sales Data Report (SLSRPT).

Miscellaneous, messages used for various purposes. They allow the exchange of general application support information and the administration of the exchange of an external object. Examples of messages: General Message (GENRAL), Drawing Administration (CONDRA).

The full list of EANCOM messages can be found in Appendix [B](#).

7.3.2 GS1 UN/CEFACT XML PROFILE MESSAGES

7.3.2.1 GS1 UN/CEFACT XML profiles introduction

XML is an acronym for "eXtensible Markup Language". XML is designed for information exchange over the Internet. Within GS1 set of standards, the GS1 UN/CEFACT XML profiles are used for Electronic Data Interchange - GS1 EDI.

The GS1 UN/CEFACT XML profile standards are based on and fully compliant with the World Wide Web Consortium's XML and XML Schema specifications as well as with the UN/CEFACT XML standards.

7.3.2.2 Categorisation

The GS1 UN/CEFACT XML profile messages can be categorised as follows. These are detailed further in section [6](#).

Order, messages used to order goods or services. Currently available: Order and Order Response.

Deliver, messages used for transport of the goods. Currently available: Despatch Advice.

Pay, messages used to realise payment for the goods or services supplied. Currently available: Invoice.

The full list of GS1 UN/CEFACT XML profile messages can be found in Appendix [D.C](#).

7.3.3 GS1 XML MESSAGES

7.3.3.1 GS1 XML Introduction

XML is an acronym for "eXtensible Markup Language". XML is designed for information exchange over the Internet. Within GS1 set of standards, GS1 XML is used for Electronic Data Interchange - GS1 EDI and within the GDSN.

The [GS1 XML standards](#) are based on and fully compliant with the World Wide Web Consortium's XML and XML Schema specifications. It also uses the Core Components and XML standards from UN/CEFACT wherever applicable.

7.3.3.2 Categorisation

The GS1 XML messages can be categorised as follows. These are detailed further in section [6](#).

GDSN, messages used to exchange master data related to relevant parties and products between trading partners. The master data is stored in computer systems for reference in subsequent transactions or interchanges. Examples of messages: GDSN Catalogue Item Notification, Item Authorisation, GDSN Trade Item Extension: Food & Beverage.

Plan, messages used for collaborative planning and replenishment. This set of messages supports the Collaborative Planning, Forecasting, and Replenishment (CPFR®) business process. Examples of messages: Forecast, Product Activity, Replenishment Plan.

Order, messages used to order goods or services. Examples of messages: Order, Configure to Order.

Deliver, messages used for transport of the goods. Examples of messages: Despatch Advice, Transport Instruction, CrossDock Despatch Advice Extension.

Pay, messages used to realise payment for the goods or services supplied. Examples of messages: Invoice, Financial Institution Control Totals, EU Invoice Extension.

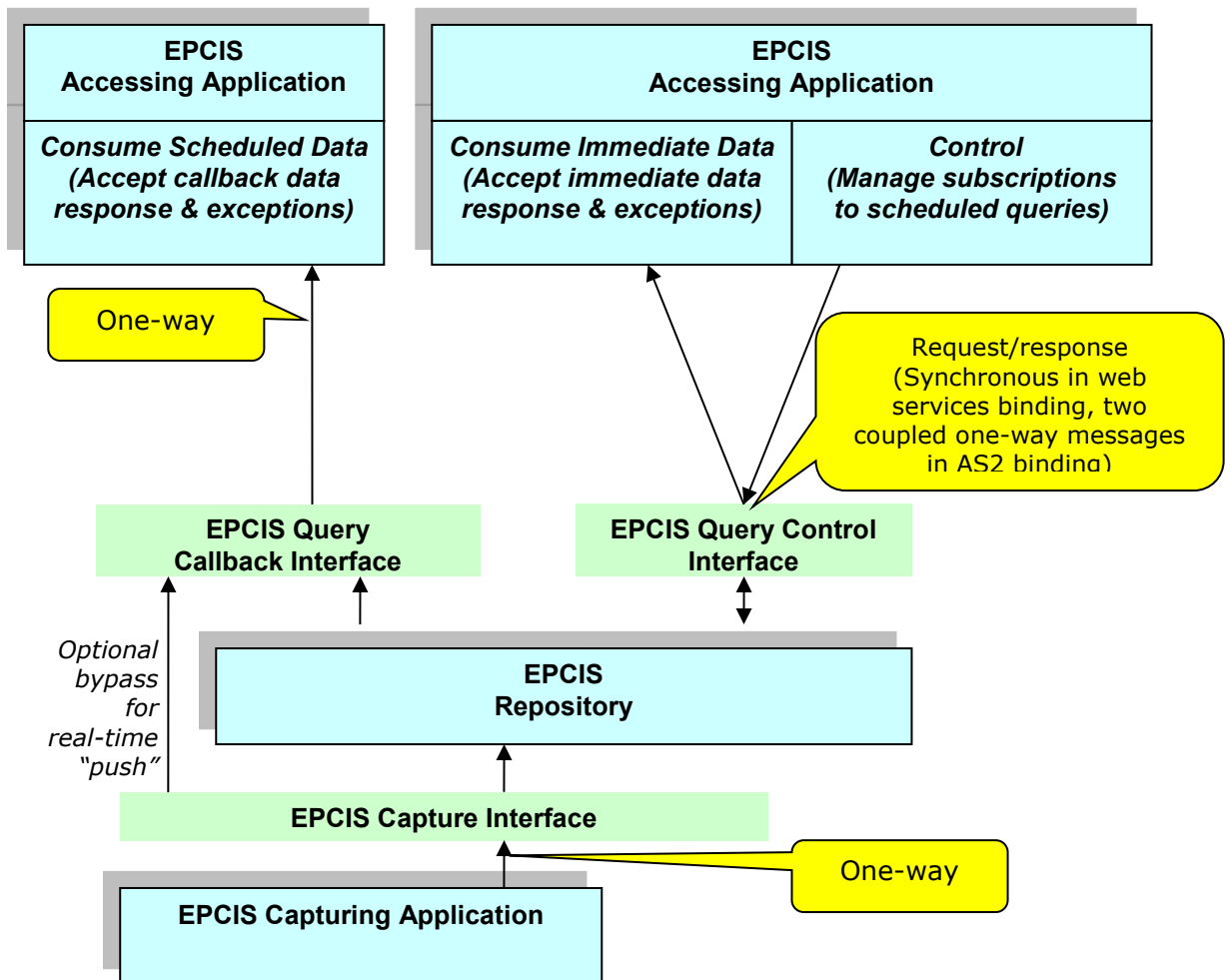
Other, messages used for various purposes. They allow the exchange of general application support information and the administration of the exchange of an external object. Examples of messages: Standard Business Document Header (SBDH), Application Receipt Acknowledgement

The full list of GS1 XML messages can be found in Appendix [C](#).

7.4 Visibility event capture/query

The Electronic Product Code Information Services (EPCIS) standard specifies a data model and XML representation for visibility event data, and interfaces for capture and query of events conforming to this data model and XML schema. The data model is described in section 6.3. This section describes the capture and query interfaces.

The EPCIS standard specifies three interfaces: the EPCIS Capture Interface, the EPCIS Query Control Interface, and the EPCIS Query Callback Interface. (The latter two interfaces are referred to collectively as the EPCIS Query Interfaces.) The diagram below illustrates the relationship between these interfaces:



In this diagram, the green boxes denote the EPCIS interfaces as defined in the standard. The blue boxes are intended to illustrate typical system components that use or implement the standard interfaces. It must be stressed, however, that the EPCIS standard only defines the interfaces and not the system components. For example, there is no requirement that an end user system must include an "EPCIS Repository" component. In some end user systems, there is indeed a component whose role is to store and retrieve EPCIS events, and such a component is often referred to as an "EPCIS Repository." On the other hand, an end user system might have some other system component that performs this function as well as many other functions, and so would not be identified as an "EPCIS Repository" at all. Still another end user system may lack this function altogether. By defining only interfaces, the EPCIS standard provides for the great variety of business information systems architectures that end users actually deploy.

The following subsections discuss the EPCIS Capture Interface and the EPCIS Query Interfaces in more detail.

7.4.1 EPCIS capture interface

The EPCIS Capture Interface specified in the EPCIS standard provides a standardised way for one system component to deliver an EPCIS event to another system component within an overall end user information system. Typically, the EPCIS Capture Interface is used to deliver EPCIS events from “edge” infrastructure responsible for operations in a factory, warehouse, or other facility where products and other objects are physically (or digitally) handled, to an information system that stores or performs business-level processing on the captured EPCIS events.

The EPCIS Capture Interface simply specifies that EPCIS events are delivered using a standard XML schema defined in the EPCIS standard, and provides several different methods of transport for such an XML document. The two methods of transport specified in the EPCIS standard are:

- Message queue
- HTTP

7.4.2 EPCIS query interfaces

The EPCIS Query Interfaces specified in the EPCIS standard provides a way for one system component (the “query client”) to query another (the “query server”) for EPCIS events that match specified criteria, either between two components within the same end user environment or between two end users. There are two modes of operation provided:

- On-demand (“pull”) The query client sends a query to the query server, which responds immediately with the events matching the specified criteria.
- Standing query (“push”) The query client sends a standing query to the query server via the Query Control Interface, where the standing query includes the query criteria plus an execution schedule (e.g., “daily at 3:00am”). Periodically according to the schedule, the query server looks for events matching the query criteria that are new since the last time the query was executed, and delivers those to the query client via the Query Callback Interface. Once the standing query is set up, the query client does not make any further requests; the data is “pushed” by the server to the client asynchronously.

In the standing query mode, the party establishing the standing query need not be the party that receives the results; e.g., it is common that Party A establishes its own schedule by which Party A pushes EPCIS events to Party B.

The query language allows for matching EPCIS events using a variety of criteria, including all of the data fields defined in EPCIS events as well as extension fields.

An EPCIS query server may wish to provide access to only a subset of information, depending on the identity of the requesting query client. This situation commonly arises in cross-enterprise scenarios where the requesting client belongs to a different organisation than the operator of an EPCIS query server, but may also arise in intra-enterprise scenarios. The EPCIS standard specifies a number of ways in which access to information may be restricted for security purposes.

Several methods of transport are provided for each interface:

- For the EPCIS Query Control Interface:
 - SOAP over HTTP (as described by a WSDL schema)
 - XML over AS2 (a separate request and response message, correlated using the Standard Business Document Header)
- For the EPCIS Query Callback Interface:
 - XML over HTTP or HTTP+TLS (HTTPS)
 - XML over AS2

7.5 Discovery

“Discovery” refers to the process by which one party in a supply chain can locate relevant data or services made available by other members of the supply chain.

7.5.1 Object Name Service

Normative References:

- [EPCglobal Object Name Service](#)

Abstract:

The Object Name Service is a special case of a Discovery Service. It is a DNS-based lookup service designed to locate services (e.g. EPCIS designated by the organisation that issued the EPC) for a class of objects. ONS does not address the issues of discovering the set of EPCIS data sources that may contain information about a particular EPC or set of EPCs nor does it address security or the interaction model with the target service.

ONS 2.0 provides for a federated ONS model, one that supports multiple peer roots rather than a single root. ONS 2.0 also provides support for barcode identifiers and a framework for defining services

8 Communication

GS1 standards specify communication at three levels. At each level, different syntax is used for communication.

At the level of peer-to-peer exchange of business data between trading partners, GS1 standards use two different syntaxes:

- EDIFACT
- XML

At the level of inter-communications between data capture components, GS1 standards mostly use XML syntax, but in certain instances use a custom binary syntax (as in LLRP) or something else (as in the SNMP binding for Reader Management).

At the level of exchange between data carrier and reading device, GS1 standards use a syntax that is highly specific to the communication medium, via light waves for barcodes and radio waves for RFID.

8.1 Syntax

8.1.1 UN/EDIFACT

Abstract

United Nations/Electronic Data Interchange For Administration, Commerce and Transport (UN/EDIFACT) is the international EDI standard developed under the United Nations. The work of maintenance and further development of this standard is done through the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT). The UN/EDIFACT syntax has been adopted by the International Organisation for Standardisation (ISO) as the ISO standard ISO 9735.

The UN/EDIFACT standard provides

- A set of syntax rules to structure data,
- An interactive exchange protocol (I-EDI),
- Standard messages which allow multi-country and multi-industry exchange.

EANCOM is a GS1 EDI standard, fully based on UN/EDIFACT, which comprises a set of internationally agreed standards, directories and guidelines for the electronic interchange of data.

As a subset of UN/EDIFACT, EANCOM provides the collection of only those message elements which are needed by the business applications and required by the syntax (mandatory elements). Optional elements covering very specific business requirements not relevant for GS1 users are omitted from EANCOM.

EANCOM incorporates the GS1 standards of physical identification of trade items, logistics units and the Global Location Numbers identifying the trading partners into the electronic messages. It allows integration of the physical flow of goods with related information sent by electronic means.

References

- EANCOM 2002, based on D01B, syntax versions 3 and 4, EANCOM implementation guidelines for D01B messages.
 - <http://www.gs1.org/eancom>
- UN/CEFACT Directory 01B, UN/CEFACT EDIFACT Directory D01B
 - <http://www.unece.org/trade/untdid/download/d01b.zip>
- ISO9735 (1-10): Electronic data interchange for administration, commerce and transport (EDIFACT). Application level syntax rules.
 - http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_tc_browse.htm?commid=53186

8.1.1.1 Syntax3

Abstract

The EDIFACT syntax rules set the standards for structuring data into segments, segments into messages, and messages into an interchange.

EANCOM 2002,, Syntax 3 is based on UN/EDIFACT directory D.01B, syntax version 3 which was released by UN/CEFACT in 2001.

8.1.1.2 Syntax4

Abstract

The EDIFACT syntax rules set the standards for structuring data into segments, segments into messages, and messages into an interchange.

EDIFACT syntax version 4 is as an enhancement of the EDIFACT syntax version 3. Syntax version 4 supports requirements such as digital signature, additional character sets, and more.

EANCOM 2002, Syntax 4 is based on UN/EDIFACT directory D.01B, syntax version 4 which was released by UN/CEFACT in 2001.

8.1.2 XML

8.1.2.1 GS1 XML for EDI and GDSN

Abstract

It is based on the W3C standard: XML – eXtensible Markup Language.

GS1 XML refers to a design methodology for the use of XML in GS1 EDI and GDSN business message standards. This methodology provides a standardised and predictable structure for electronic business messages, enabling business partners to communicate business data rapidly, efficiently and accurately, irrespective of their internal hardware or software types.

References

- GS1 XML Business Message Standards (BMS)
 - <http://www.gs1.org/gs1-xml>
- GS1 UN/CEFACT XML profiles
 - <http://www.gs1.org/gs1-un-cefact-xml/2012>
- Technical guidelines
 - Technical specification to facilitate the implementation of GS1 XML messages.

- <http://www.gs1.org/gs1-xml/guideline/gs1-xml-technical-user-guide/3>
- W3C XML Standards
 - XML Technologies including XML, XML Namespaces, XML Schema, XSLT, Efficient XML Interchange (EXI), and other related standards.
 - <http://www.w3.org/standards/xml/>

8.1.2.2 XML in EPC standards

It is based on the W3C standard: XML – eXtensible Markup Language.

XML is used in the EPCIS, ALE, and Reader Management standards to define inter-communications between data capture components. XML used in these standards follows a design methodology similar to the GS1 XML methodology used in GS1 EDI and GDSN business message standards, but tailored to the requirements of inter-communications between data capture components.

References

- Technical guidelines
 - EPCglobal XML Naming & Design Rules Analysis
- W3C XML Standards
 - XML Technologies including XML, XML Namespaces, XML Schema, XSLT, Efficient XML Interchange (EXI), and other related standards.
 - <http://www.w3.org/standards/xml/>

8.1.2.3 Standard Business Document Header (SBDH)

Abstract

The Standard Business Document Header (SBDH) is a component of GS1 XML business message standards and is also used within the EPCIS standard in certain circumstances.

The Standard Business Document Header (SBDH) provides information about the routing and processing of the XML instance document. The SBDH is designed to be independent of the specific transport protocol used. The information contained in the SBDH can be used by communication applications to determine routing whether the transport protocol used is ebMS, AS2, or any other protocol.

The SBDH can also optionally provide business scope and business service information.

References

- UN/CEFACT STANDARD BUSINESS DOCUMENT HEADER – Version 1.3
 - This specification defines the ‘Standard Business Document Header’ (SBDH) which enables integration of documents between internal applications, enterprise applications, and business-to-business infrastructure by providing a consistent interface between applications. The standard header information enables any application to determine the logical routing requirements and/or the logical processing requirements of a document based on information contained in the standard header.
 - <http://www.gs1.org/standard-business-document-header-sbdh>
- Standard Business Document Header (SBDH). Implementation guidelines. - Version 1.3
 - The Standard Business Document Header Technical Implementation Guide is a supplement so that the implementer understands not only the technical details but also practical ways to use the SBDH and guidelines on its appropriate use.
 - <http://www.gs1.org/standard-business-document-header-sbdh>

8.1.3 Other data capture components syntax

Many GS1 inter-communications standards use XML syntax as noted above in section [8.1.2.2](#). Certain low-level data capture component standards use a different syntax that is tailored to specific requirements. This includes the following:

- The Low-Level Reader Protocol (LLRP) standard uses an *ad hoc* binary format, in order to minimise message size and message processing time. This is necessary because LLRP typically operates in a real-time or near-real-time environment.
- The Reader Management (RM) standard uses a syntax defined by the Simple Network Management Protocol (SNMP) Internet standard, which is a commonly accepted industry standard for management of network devices. (The RM standard also offers an XML alternative to SNMP.)
- The Object Name Service (ONS) standard uses a syntax defined by the Domain Name System (DNS) Internet standard, upon which ONS is built.
- The RFID Reader Discovery, Configuration, and Initialization (DCI) standard uses a syntax defined by the Control and Provisioning of Wireless Access Points (CAPWAP) Internet standard, upon which DCI is built.

References

- RFC5415 Control and Provisioning of Wireless Access Points (CAPWAP), <http://www.ietf.org/rfc/rfc5415.txt>
- RFC1157 A Simple Network Management Protocol (SNMP), <http://www.ietf.org/rfc/rfc1157.txt>

8.2 Protocols

Information is exchanged and shared using the appropriate communication protocols. Protocols defined or recommended by GS1 are the following:

- EDIINT AS1, AS2 and AS4
- ebMS
- Web services
- Others: LLRP, AIP, ...

References

- See each chapter for the specific references.

8.2.1 EDIINT

Abstract

The EDIINT project was initiated by IETF to define a protocol to enable Electronic Data Interchange (EDI) over the Internet whilst maintaining a service level equivalent to that found in the existing EDI exchanges over Value Added Networks (VAN).

The EDIINT protocols define an envelope for information to be transmitted over the Internet (or TCP-IP based networks) using HTTP, which is the foundation for the World Wide Web (WWW), SMTP, which is the common Internet mail protocol or FTP, File Transfer Protocol.

Rather than creating new solutions, EDIINT uses existing standards to ensure reliable and secure exchanges.

Security, authentication, message integrity, and privacy are assured by the use of encryption and digital signatures.

Another important feature, non-repudiation, makes it difficult under normal circumstances for the intended recipient of a message to deny having received it.

EDIINT is designed to handle any type of document but in practice it is primarily adopted for the type of transactions normally linked to EDI and XML exchanges.

EDIINT has developed AS1 and AS2 standards which are implementations over the SMTP and HTTP protocols respectively.

References

- "EDIINT AS1 and AS2 Transport Communication Guidelines - Issue 1, Feb-2006" by John Duker and Jin Chun
 - This document defines the EDIINT AS1 and AS2 Transport Communication Guidelines used by companies participating in e-Commerce using the GS1 published XML, EANCOM, I/C, UCS, and VICS data format standards.
 - http://www.gs1.org/sites/default/files/docs/xml/EDIINT_AS1_AS2_Transport_Comm_Guide_i1.pdf
- "EDIINT AS1 and AS2 User Guide – Version 1.1, 2006-08-01" by the GS1 Europe EDIINT Forum, a network of Western European Member Organisations of GS1
 - This document aims to provide both a functional overview and a technical framework for the implementation of the EDIINT protocols.
 - <http://www.gs1.eu/?page=&tudasbazis=60&lister=8>
- "GS1 Newcomers to AS2 Implementation Guide" by the GS1 GSMP EDI Technology Group
 - This guide is designed to be an informative source to GS1 community members and their trading partners who are new to AS2 based communications.
 - http://www.gs1.org/docs/xml/Newcomers_to_AS2_Implementation_Guide_i1.pdf

8.2.1.1 AS1

Abstract

Applicability Statement 1 – An Internet Request For Comment (RFC) defining how applications can securely transport EDI and XML over the Internet using SMTP. It specifies how to transport data files.

The AS1 standard provides S/MIME (Secure Multi-Purpose Internet Mail Extensions) and uses Simple Mail Transfer Protocol (SMTP) to transmit data using e-mail.

It was the first AS protocol developed and uses signing, encryption and MDN (Message Disposition Notification) conventions. The specification has been largely superseded by Applicability Statement 2 (AS2)

An Internet connection capable of sending and receiving e-mail, an EDI transfer engine, and Digital Certificates are required for data exchange using AS1.

Normative References

- AS1 - "MIME-based Secure Peer-to-Peer Business Data Interchange Over the Internet"
 - <http://www.ietf.org/rfc/rfc3335.txt>

8.2.1.2 AS2

Abstract

Applicability Statement 2 – An Internet RFC defining how applications can securely transport EDI and XML over the Internet using HTTP. It specifies how to transport data files.

The AS2 protocol is based on HTTP/S and SMIME. It was the second AS protocol developed and uses the same signing, encryption and MDN conventions used in the original AS1 protocol.

AS2 provides a direct point-to-point message exchange between trading partners, compared with using an intermediate value added network (VAN) or service provider.

The AS2 standard allows businesses to use a common, single communications solution. This eliminates the complications and costs involved when different businesses in a network use different transfer protocols. A Web server, an EDI transfer engine, and Digital Certificates are required for data exchange using AS2. Almost any type of data can be transmitted.

AS2 is the preferred message transport protocol of choice for B2B messaging using GS1 XML standards. An AS2 message transport binding is also available for the EPCglobal EPCIS standard.

Normative References

- "MIME-Based Secure Peer-to-Peer Business Data Interchange Using HTTP, Applicability Statement 2 (AS2)", RFC 4130
 - <http://www.ietf.org/rfc/rfc4130.txt>

8.2.1.3 AS4

Abstract

Applicability Statement 4 – An OASIS draft standard which maps AS2 functional requirements onto the Web Services stack using the ebMS version 3.0 specification.

Allows small enterprises (without a 24x7 Internet connected server) to "pull" documents securely from an AS4 "hub" partner.

Supports multiple document pull channels (priority, document type, etc.)

Supports reliable messaging, payload compression, message-level security, and digitally signed receipts.

8.2.2 ebMS

Abstract

ebXML Messaging Services (ebMS) is a standard under the E-Business XML umbrella which provides a secure and reliable SOAP / Web Services based transport protocol to the ebXML Architecture.

The ebXML Message Service (ebMS) is defined as a set of layered extensions on the SOAP 1.1 and SOAP Messages with Attachments (SWA) specifications. The ebXML Message Service provides the necessary extensions for security and reliability that are not addressed directly by the SOAP 1.1 specification

The ebXML Message Service specification defines a message structure and protocol that is independent of the underlying transport protocol, such as SMTP, File Transfer Protocol (FTP), HTTP or any other protocol capable of exchanging MIME data.

Thus, businesses are free to choose the most suitable method for the actual transfer of messages with their partners, suppliers and customers while maintaining a standard message structure. This feature enables the messaging service to be integrated once with the enterprise applications rather than once for each transport protocol. Transport protocol adapters can be treated as "plug-ins" for the ebXML Message Service implementation.

The ebXML Message Service is payload neutral, meaning that any kind of information can be reliably routed. This information can include XML documents, binary data, or EDI messages. This permits businesses to use the latest technology while also allowing them to leverage their existing infrastructure.

The ebXML Messaging Service provides many options for reliable messaging, security, encryption, compression and non-repudiation of receipt.

Currently, the ebXML Messaging Services committee is finalising a new version, ebMS 3. This is the specification of the Messaging Service and its associated processing rules using Web Services standards.

Normative References

- "ebXML Message Service Specification 2.0, 1 April 2002" by OASIS ebXML Messaging Services Technical Committee
 - http://www.oasis-open.org/committees/ebxml-msg/documents/ebMS_v2_0.pdf
- "OASIS ebXML Messaging Services Version 3.0: Part 1, Core Features, 12 July 2007" by OASIS ebXML Messaging Technical Committee
 - http://www.oasis-open.org/committees/download.php/24618/ebms_core-3.0-spec-cs-02.pdf

8.2.3 Web services

Abstract

A web service is defined by the W3C as "a software system designed to support interoperable machine-to-machine interaction over a network. The term Web services describes a standardised way of integrating Web-based applications using the XML, SOAP, WSDL and UDDI open standards over an Internet Protocol backbone.

XML is used as the syntax for the data, SOAP provides an envelope and header structure, WSDL is used for describing the service interfaces and UDDI is used for listing what services are available.

Used primarily as a means for businesses to communicate with each other and with clients, Web services allow organisations to communicate data without intimate knowledge of each other's IT systems behind the firewall.

Web services are frequently just Internet Application Programming Interfaces (API) that can be accessed over a network, such as the Internet, and executed on a remote system hosting the requested services. Web services share business logic, data and processes expressed using the web service's API and accessed across a network.

In common usage the term refers to clients and servers that communicate over the public Internet or enterprise networks using the HTTP protocol and XML syntax.

Web services allow different applications from different sources to communicate with each other without time-consuming custom coding, and because all communication is in XML, Web services are not tied to any one operating system or programming language.

The ALE and EPCIS standards, are examples where web service interfaces are provided.

References:

- The World Wide Web Consortium (W3C) is the main international standards organisation for the World Wide Web (abbreviated WWW or W3). The W3C Web Services Activity is designing the infrastructure, defining the standards, architecture and creating the core technologies for Web services.
 - <http://www.w3.org/2002/ws/>
- The Web Services Interoperability Organisation (WS-I) is an open industry organisation chartered to establish Best Practices for Web services interoperability, for selected groups of Web services standards, across platforms, operating systems and programming languages.
 - <http://www.ws-i.org/>

8.3 Security

All GS1 standards use security appropriate to their implementation. See the individual standards for details. An overview of security within the EPCglobal standards is provided in the EPCglobal Architecture Framework.

References

- [EPCglobal Architecture Framework](#)

8.3.1 EANCOM digital signature

Abstract

Digital signatures are used in EANCOM to preserve the integrity of EDIFACT messages between the sender's and the receiver's EDI gateways.

References

- Digital Signatures for EANCOM messages.
 - http://www.gs1.org/docs/EDI/eancom/eancom_Digital_Signature.pdf
- Joint ISO/TC 154 – UN/CEFACT Syntax Working Group (JSWG), ISO 9735-5:2002
 - http://www.iso.org/iso/catalogue_detail.htm?csnumber=35036
 - http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=35037
- Joint ISO/TC 154 – UN/CEFACT Syntax Working Group (JSWG), ISO 9735-8:2002

- http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=35039

8.3.2 XML security

Abstract

GS1 has endorsed XMLDSIG for the implementation of XML Signatures within GS1 XML BMS.

GS1 has provided a document 'Security for XML Messages' (XMLSEC) which provides detailed implementation guidelines for XML Signatures.

References

- XML Signature Syntax and Processing (Second Edition) - W3C Recommendation 10 June 2008
 - <http://www.w3.org/TR/xmlsig-core/>
- Security for XML messages, Implementation guidelines
 - <http://www.gs1.org/edi>

8.3.3 Digital Certificate Profile

Abstract

Digital Certificates bind an identity to a pair of electronic keys that can be used to encrypt and sign digital information. A Digital Certificate makes it possible to verify the identity of a party to a transaction (authentication), protect a document from unauthorised access (encryption), protect a document from alteration (integrity), and assert the provenance of a document (non-repudiation).

Digital Certificates are the electronic counterparts to driver licenses, passports and membership cards. You can present a Digital Certificate electronically to prove your identity or your right to access information or services online.

A Digital Certificate typically contains the:

- Owner's public key
- Owner's name
- Expiration date of the public key
- Name of the issuer (the CA that issued the Digital Certificate)
- Serial number of the Digital Certificate
- Digital signature of the issuer

A Digital Certificate is issued by a Certification Authority (CA) and signed with the CA's private key.

The most widely accepted format for Digital Certificates is defined by the CCITT X.509 international standard; thus certificates can be read or written by any application complying with X.509.

8.3.3.1 AS2

Abstract

EDINT AS1 and AS2 guidelines developed by GS1 make recommendations on a set of parameters linked to X.509 Digital Certificates.

References

- "EDIINT AS1 and AS2 Transport Communication Guidelines - Issue 1, Feb-2006" by John Duker and Jin Chun
 - This document defines the EDIINT AS1 and AS2 Transport Communication Guidelines used by companies participating in e-Commerce using the GS1 published XML, EANCOM, I/C, UCS, and VICS data format standards.

http://www.gs1.org/sites/default/files/docs/xml/EDIINT_AS1_AS2_Transport_Comm_Guide_i1.pdf

A Supplementary Data GS1 Application Identifiers

AI	Name	Attribute to which Key
02	GTIN of trade items contained in a logistic unit	SSCC: AI 00
10	Batch or lot number	GTIN: AI 01, 02, or 8006
11	Production date (YYMMDD)	GTIN: AI 01, 02, or 8006
12	Due date (YYMMDD)	GLN: AI 415 and 8020
13	Packaging date (YYMMDD)	GTIN: AI 01, 02, or 8006
15	Best before date (YYMMDD)	GTIN: AI 01, 02, or 8006
16	Sell by date (YYMMDD)	GTIN: AI 01, 02, or 8006
17	Expiration date (YYMMDD)	GTIN: AI 01, 02, or 8006
20	Internal product variant	GTIN: AI 01, 02, or 8006
21	Serial number	GTIN: AI 01
22	Consumer Product Variant	GTIN: AI 01
240	Additional product identification assigned by the manufacturer	GTIN: AI 01, 02, or 8006
241	Customer part number	GTIN: AI 01, 02, or 8006
242	Made-to-Order variation number	GTIN: AI 01 (9), 02 (9) or 8006 (9)
243	Packaging component number	GTIN: AI 01
250	Secondary serial number	GTIN: AI 01 or 8006 and 21
251	Reference to source entity	GTIN: AI 01, 02, or 8006
254	GLN Extension component	GLN: AI 414
30	Variable count	GTIN: AI 01 (9) or 02 (9)
310*	Net weight, kilograms (variable measure trade item)	GTIN: AI 01 (9) or 02 (9)
311*	Length of first dimension, metres (variable measure trade item)	GTIN: AI 01 (9) or 02 (9)
312*	Width, diameter, or second dimension, metres (variable measure trade item)	GTIN: AI 01 (9)
313*	Depth, thickness, height, or third dimension, metres (variable measure trade item)	GTIN: AI 01 (9)

AI	Name	Attribute to which Key
314*	Area, square metres (variable measure trade item)	GTIN: AI 01 (9) or 02 (9)
315*	Net volume, litres (variable measure trade item)	GTIN: AI 01 (9) or 02 (9)
316*	Net volume, cubic metres (variable measure trade item)	GTIN: AI 01 (9) or 02 (9)
320*	Net weight, pounds (variable measure trade item)	GTIN: AI 01 (9) or 02 (9)
321*	Length or first dimension, inches (variable measure trade item)	GTIN: AI 01 (9) or 02 (9)
322*	Length or first dimension, feet (variable measure trade item)	GTIN: AI 01 (9) or 02 (9)
323*	Length or first dimension, yards (variable measure trade item)	GTIN: AI 01 (9) or 02 (9)
324*	Width, diameter, or second dimension, inches (variable measure trade item)	GTIN: AI 01 (9)
325*	Width, diameter, or second dimension, (variable measure trade item)	GTIN: AI 01 (9)
326*	Width, diameter, or second dimension, yards (variable measure trade item)	GTIN: AI 01 (9)
327*	Depth, thickness, height, or third dimension, inches (variable measure trade item)	GTIN: AI 01 (9)
328*	Depth, thickness, height, or third dimension, feet (variable measure trade item)	GTIN: AI 01 (9)
329*	Depth, thickness, height, or third dimension, yards (variable measure trade item)	GTIN: AI 01 (9)
330*	Logistic weight, kilograms	GTIN: AI 01 (9) or SSCC: AI 00
331*	Length or first dimension, metres	GTIN: AI 01 (9) or SSCC: AI 00
332*	Width, diameter, or second dimension, metres	GTIN: AI 01 (9) or SSCC: AI 00
333*	Depth, thickness, height, or third dimension, metres	GTIN: AI 01 (9) or SSCC: AI 00
334*	Area, square metres	GTIN: AI 01 (9) or SSCC: AI 00
335*	Logistic volume, litres	GTIN: AI 01 (9) or SSCC: AI 00
336*	Logistic volume, cubic metres	GTIN: AI 01 (9) or SSCC: AI 00
337*	Kilograms per square metre	GTIN: AI 01

AI	Name	Attribute to which Key
340*	Logistic weight, pounds	GTIN: AI 01 (9) or SSCC: AI 00
341*	Length or first dimension, inches	GTIN: AI 01 (9) or SSCC: AI 00
342*	Length or first dimension, feet	GTIN: AI 01 (9) or SSCC: AI 00
343*	Length or first dimension, yards	GTIN: AI 01 (9) or SSCC: AI 00
344*	Width, diameter, or second dimension	GTIN: AI 01 (9) or SSCC: AI 00
345*	Width, diameter, or second dimension	GTIN: AI 01 (9) or SSCC: AI 00
346*	Width, diameter, or second dimension	GTIN: AI 01 (9) or SSCC: AI 00
347*	Depth, thickness, height, or third dimension	GTIN: AI 01 (9) or SSCC: AI 00
348*	Depth, thickness, height, or third dimension	GTIN: AI 01 (9) or SSCC: AI 00
349*	Depth, thickness, height, or third dimension	GTIN: AI 01 (9) or SSCC: AI 00
350*	Area, square inches (variable measure trade item)	GTIN: AI 01 (9) or 02 (9)
351*	Area, square feet (variable measure trade item)	GTIN: AI 01 (9) or 02 (9)
352*	Area, square yards (variable measure trade item)	GTIN: AI 01 (9) or 02 (9)
353*	Area, square inches	GTIN: AI 01 (9) or SSCC: AI 00
354*	Area, square feet	GTIN: AI 01 (9) or SSCC: AI 00
355*	Area, square yards	GTIN: AI 01 (9) or SSCC: AI 00
356*	Net weight, troy ounces (variable measure trade item)	GTIN: AI 01 (9) or 02 (9)
357*	Net weight (or volume), ounces (variable measure trade item)	GTIN: AI 01 (9) or 02 (9)
360*	Net volume, quarts (variable measure trade item)	GTIN: AI 01 (9) or 02 (9)
361*	Net volume, gallons U.S. (variable measure trade item)	GTIN: AI 01 (9) or 02 (9)
362*	Logistic volume, quarts	GTIN: AI 01 (9) or SSCC: AI 00
363*	Logistic volume, gallons	GTIN: AI 01 (9) or SSCC: AI 00
364*	Net volume, cubic inches	GTIN: AI 01 (9) or 02 (9)

AI	Name	Attribute to which Key
365*	Net volume, cubic feet (variable measure trade item)	GTIN: AI 01 (9) or 02 (9)
366*	Net volume, cubic yards (variable measure trade item)	GTIN: AI 01 (9) or 02 (9)
367*	Logistic volume, cubic inches	GTIN: AI 01 (9) or SSCC: AI 00
368*	Logistic volume, cubic feet	GTIN: AI 01 (9) or SSCC: AI 00
369*	Logistic volume, cubic yards	GTIN: AI 01 (9) or SSCC: AI 00
37	Count of trade items contained in a logistic unit	GTIN: AI 02
390*	Amount payable – single monetary area	GLN: AI 415 and 8020
391*	Amount payable – with ISO currency code	GLN: AI 415 and 8020
392*	Amount payable for a variable measure trade item – single monetary unit	GTIN: AI 01 (9)
393*	Amount payable for a variable measure trade item – with ISO currency code	GTIN: AI 01 (9)
394*	Percentage discount of a coupon	GCN: AI 255
400	Customer's purchase order number	
403	Routing code	SSCC: AI 00
410	Ship to - deliver to Global Location Number	
411	Bill to - invoice to Global Location Number	
412	Purchased from Global Location Number	
413	Ship for - deliver for - forward to Global Location Number	
415	Global Location Number of the Invoicing Party	
420	Ship to - deliver to postal code within a single postal authority	
421	Ship to - deliver to postal code with ISO country code	
422	Country of origin of a trade item	GTIN: AI 01, 02, or 8006
423	Country of initial processing	GTIN: AI 01 or AI 02
424	Country of processing	GTIN: AI 01 or AI 02
425	Country of disassembly	GTIN: AI 01 or AI 02

AI	Name	Attribute to which Key
426	Country covering full process chain	GTIN: AI 01 or AI 02
427	Country subdivision of origin	GTIN: AI 01
7001	NATO stock number	GTIN: AI 01, 02, or 8006
7002	UN/ECE meat carcasses and cuts classification	GTIN: AI 01 or AI 02
7003	Expiration date and time	GTIN: AI 01 or AI 02
7004	Active potency	GTIN: AI 01 & AI 10
7005	Catch area	GTIN: AI 01 or AI 02
7006	First freeze date	GTIN: AI 01 or AI 02
7007	Harvest date	GTIN: AI 01 or AI 02
7008	Species for fishery purposes	GTIN: AI 01 or AI 02
7009	Fishing gear type	GTIN: AI 01 or AI 02
7010	Production method	GTIN: AI 01 or AI 02
703s	Number of Processor with ISO Country Code	GTIN: AI 01 or AI 02
710	National Healthcare Reimbursement Number – Germany PZN	GTIN: AI 01
711	National Healthcare Reimbursement Number – France CIP	GTIN: AI 01
712	National Healthcare Reimbursement Number – Spain CN	GTIN: AI 01
713	National Healthcare Reimbursement Number – Brasil DRN	GTIN: AI 01
714	National Healthcare Reimbursement Number (NHRN) – Portugal AIM	GTIN: AI 01
7020	Refurbishment lot ID	GTIN: AI 01 or 8006 and 416
7021	Functional status	GTIN: AI 01 or 8006
7022	Revision status	GTIN: AI 01 or 8006 and 7021
8001	Roll products - width, length, core diameter, direction, and splices	GTIN: AI 01 (9)
8002	Electronic serial identifier for cellular mobile telephones	
8005	Price per unit of measure	GTIN: AI 01 (9) or AI 02 (9)
8006	Identification of the component of a trade item	

AI	Name	Attribute to which Key
8007	International Bank Account Number	GLN: AI 415 & AI 8020
8008	Date and time of production	GTIN: AI 01 or AI 02
8011	Component / Part Identifier Serial Number	CPID: AI 8010
8012	Software version	GTIN: AI 01 or 8006
8019	Service Relation Instance Number (SRIN)	GSRN: AI 8018
8020	Payment Slip Reference Number	GLN: AI 415
8110	Coupon code identification for use in North America	
8111	Loyalty points of a coupon	GCN: AI 255
8112	Coupon code identification for use in North America	
8200	Extended Packaging URL	GTIN: AI 01
90	Information mutually agreed between trading partners (including FACT DIs)	
91-99	Company internal information	

* Indicates the fourth digit of the GS1 Application Identifier

B EANCOM® MESSAGES

B.1 Master Data Alignment

B.2 Party Information (PARTIN)

The Party Information message is used to provide location information and the related operational, administrative, commercial and financial data to the trading partner, (e.g., name and address, contact persons, financial accounts, etc.).

B.2.1 Product Inquiry (PROINQ)

The Product Inquiry message enables a buyer to inquire on a product or group of products from a master product catalogue according to criteria defined in the message.

B.2.2 Product Data (PRODAT)

The Product Data message is used to provide technical and functional data related to products, (e.g., the technical specifications of an electrical product, the ingredients of a cake, etc.), and does not include any commercial terms and conditions.

B.2.3 Price/Sales Catalogue (PRICAT)

The Price/Sales Catalogue message is used as a catalogue or list of all of the supplier's products or as an advanced warning to particular changes in the product line. The catalogue would include descriptive, logistical, and financial information about each product. However, the catalogue may also be used to provide technical and functional data related to products, (e.g., the technical specifications of an electrical product, the ingredients of a cake, etc.) as done in the Product Data message.

B.3 Transactions

B.3.1 Request for Quotation (REQOTE)

The Request for Quotation message is transmitted by the customer to his supplier to request a quotation for the supply of goods or services.

B.3.2 Quotation (QUOTES)

The Quotation message is transmitted by the supplier to his customer in response to a previously received request for quotation for the supply of goods or services. The quotation should provide details on all aspects previously requested by his customer.

B.3.3 Contractual Conditions (CNTCND)

The message provides the contractual conditions of a previously negotiated contract in order to enable the automatic validation of orders and the verification of invoices prior to payment.

B.3.4 Purchase Order (ORDERS)

The Purchase Order message is transmitted by the customer to his supplier to order goods or services and to specify the relevant quantities, dates and locations of delivery.

B.3.5 Purchase Order Response (ORDRSP)

The Purchase Order Response is sent by the supplier to his customer in relation to one or more goods items or services to acknowledge the receipt of the Purchase Order, to confirm its acceptance, to propose any amendments, or to notify non-acceptance of all or part of the Purchase Order.

B.3.6 Purchase Order Change Request (ORDCHG)

The Purchase Order Change Request is sent by the customer to the supplier to specify the details concerning modifications to a previously sent Purchase Order.

B.3.7 Cargo/Goods Handling and Movement (HANMOV)

The Cargo/Goods Handling and Movement message is sent by a party (e.g., buyer or supplier) to a logistics service provider identifying handling services on products held but not owned by the message recipient.

B.3.8 Instruction to Despatch (INSDDES)

The Instruction to Despatch is a message from a party (e.g., buyer or supplier) to a Logistics Service Provider who has control over ordered goods, providing instructions to despatch or collect a consignment according to conditions specified in the message.

B.3.9 Firm Booking (IFTMBF)

The Firm Booking is a message from a party booking forwarding and/or transport services for a consignment to the party providing those services, containing conditions under which the sender of the messages requires the services to take place.

B.3.10 Booking Confirmation (IFTMBC)

The Booking Confirmation message is sent from a carrier or forwarder to the consignor booking services, providing confirmation of a booking for a specified consignment.

B.3.11 Transport Instruction (IFTMIN)

The Transport Instruction is sent by a customer to his supplier of transport services requesting the transportation of a single consignment of goods to a specified delivery point or points.

B.3.12 Forwarding and Consolidation Summary (IFCSUM)

The Forwarding and Consolidation Summary message is a message from the party issuing either an instruction or a booking regarding transport services for multiple consignments under conditions agreed, to the party arranging the transport services.

B.3.13 Transport Status (IFTSTA)

The Transport Status message allows for the exchange of information regarding the status of the physical movement of consignments or goods at any point (in time or place) within the full transport chain.

B.3.14 Arrival Notice (IFTMAN)

The Arrival Notice message is sent from the party providing transport services to the party indicated in the contract (e.g., the consignor), giving notice and details of the arrival of a consignment. The message may also be used to provide proof of delivery information.

B.3.15 Despatch Advice (DESADV)

The Despatch Advice is a message specifying details for the goods despatched, advising the consignee of the detailed contents of a consignment. The message relates to a single despatch point and a single or multiple destination points.

B.3.16 Receiving Advice (RECADV)

The Receiving Advice is a message specifying details for the goods received, advising the consignor of the received contents of a consignment. The message relates to a single receiving point and a single despatch point.

B.3.17 Invoice (INVOIC)

The Invoice message is sent by the supplier to the customer claiming payment for goods or services supplied under conditions agreed by the seller and the buyer. This same message with correct data qualification also covers the functions of proforma invoice, debit and credit note. The seller may invoice for one or more transactions referring to goods and services related to one or more order, delivery instruction, call off, etc.

B.3.18 Tax Control (TAXCON)

The Tax Control message may be sent by the supplier to the customer summarising the tax related information for an invoice or batch of invoices. The message may also be sent by either party to third parties, auditors, and tax authorities in summary form to detail the tax information over a period of time.

B.3.19 Remittance Advice (REMADV)

The Remittance Advice is a communication between buyer and seller which provides detailed accounting information relative to a payment, or other form of financial settlement, on a specified date for the provision of goods and/or services as detailed in the advice. The message may be initiated by either the buyer or seller.

B.3.20 Multiple Payment Order (PAYMUL)

A Multiple Payment Order is sent by the Ordering Customer to its bank, to instruct the bank to debit one or more accounts it services for the Ordering Customer, and to arrange for the payment of specified amounts to several Beneficiaries.

B.3.21 Commercial Account Summary (COACSU)

The Commercial Account Summary message enables the transmission of data concerning payments made and outstanding items on an account over a period of time. The message may be exchanged by trading partners or may be sent by parties to their authorised agents (e.g., accountants).

B.3.22 Commercial Dispute (COMDIS)

The Commercial Dispute message is a notice of commercial dispute against one or more INVOIC messages (e.g., incorrect price, incorrect product identification, no proof of delivery, etc.).

B.3.23 Order Status Enquiry (OSTENQ)

The Order Status Enquiry message may be sent from a buyer to a supplier to request information on the current status of a previously sent order(s).

B.3.24 Order Status Report (OSTRPT)

The Order Status Report message may be used by a supplier to report the status of an order. This message may be sent as a reply to an Order Status Enquiry sent by a buyer or buyer's agent or a report sent at regular intervals as agreed by the parties.

B.3.25 Announcement for Returns (RETANN)

The Announcement for Returns message is used by a party to announce to another party details of goods for return due to specified reasons (e.g. returns for repair, returns because of damage, etc.). The message may be used by the message sender to request credit for goods, or the replacement of goods.

B.3.26 Instructions for Returns (RETINS)

The Instructions for Returns message is the means by which a party informs another party whether and how goods shall be returned. The sender of the message will normally be informed by the recipient of the intention to return goods by means of the Announcement for Returns message.

B.4 Report and Planning Messages

B.4.1 Delivery Schedule (DELFOR)

The Delivery Schedule is a message from a customer to his supplier providing product requirements for short term delivery instructions and/or long term product/service forecasts for planning purposes. The message can be used to authorise the commitment of labour and material resources. The message may also be sent by a supplier to a buyer in response to a previously transmitted delivery schedule.

B.4.2 Sales Data Report (SLSRPT)

The Sales Data Report message, sent from a seller to his supplier, headquarters, distribution centre or third party such as a marketing institute, transmitting sales data by location in terms of product(s) identification, quantity sold, price, and promotions applicable.

B.4.3 Sales Forecast Report (SLSFCT)

The Sales Forecast Report message, sent from a seller to his supplier, headquarters, distribution centre or third party, transmitting sales forecast data by location in terms of product identification, forecasted quantities and promotions applicable.

B.4.4 Inventory Report (INVRPT)

The Inventory Report is a message between interested parties, specifying information related to planned or targeted inventories. All goods, services and locations detailed in the inventory report will have been previously identified in the Party Information and Price/Sales Catalogue Messages.

B.4.5 Syntax and Service Report Message (CONTRL)

The Syntax and Service Report Message is used by the receiver of an EANCOM® message to acknowledge receipt of and/or detail any errors contained in an interchange. This message is used to report on the syntax level of a message and is not used to report on the business data contained.

B.4.6 Application Error and Acknowledgement (APERAK)

This message is sent from the party who received an original message, to the party who issued it, to acknowledge the receipt of the message by the recipient's application and to report errors made during the processing within the application.

B.4.7 Multiple Debit Advice (DEBMUL)

The Multiple Debit Advice message is sent by a Bank to its customer to report amounts which have been (or will be) debited from the customer's account in settlement of a referenced business transaction(s). A Multiple Debit Advice message may cover the financial settlement of one or more commercial trade transactions, such as invoices, credit notes, debit notes, etc.

B.4.8 Multiple Credit Advice (CREMUL)

The Multiple Credit Advice message is sent by a Bank to its customer to report amounts which have been (or will be) credited to the customer's account in settlement of a referenced business transaction(s). A Multiple Credit Advice message may cover the financial settlement of one or more commercial trade transactions, such as invoices, credit notes, debit notes etc.

B.4.9 Banking Status (BANSTA)

The Banking Status message is sent by a bank to its customer, providing status information regarding a previously sent financial message. The Banking Status message may cover the response given to any previously sent message, such as a commercial or payment instruction, a request for information, etc. This message provides a means to report on errors and inconsistencies found in the original message at application level.

B.4.10 Financial Cancellation (FINCAN)

A Financial Cancellation message is sent by the Ordering Customer to the Ordered Bank to request cancellation of a previously sent financial message(s). A Financial Cancellation message must always be responded to by a Banking Status message.

B.4.11 Financial Statement (FINSTA)

The Financial Statement message is sent by a financial institution to provide for a customer a statement of booked items confirming entries on the customer's account.

B.4.12 Direct Debit (DIRDEB)

A Direct Debit is sent by the Creditor to the Creditor's Bank instructing the latter to claim specified amount(s) from the Debtor(s) and to credit the amount(s) to an account.

B.4.13 Metered Services Consumption Report (MSCONS)

A Metered Services Consumption Report is a communication between trading parties, or their agents, providing consumption and where required associated technical information at a location(s) for a product(s) or service(s) where the supply is recorded using a meter(s).

B.4.14 Quality Test Report (QUALITY)

A message to enable the transmission of the results of tests performed to satisfy a specified product requirement. The content includes, but is not limited to, test data and measurements, statistical information, and the testing methods employed.

B.5 Miscellaneous

B.5.1 Drawing Administration (CONDRA)

This message will be used for the administration of exchange of an external object. For example, an external object may be a photograph, a video, a film, a CAD file. The message will give additional information about the object and it will refer to the message, and if necessary to the line number to which it is related.

B.5.2 Secure Authentication and Acknowledgement Message (AUTACK)

The service message AUTACK (Secure Authentication and Acknowledgement Message) enables the transmission of integrity and authenticity data for referenced data. The message is used to transport the digital signature and the related information needed by the recipient to verify the digital signature. This message can only be used with version 4 of the UN/EDIFACT Syntax (ISO 9735).

B.5.3 Security Key and Certificate Management Message (KEYMAN)

KEYMAN is a message providing for security key and certificate management. The message can be used to transmit a public key or a reference to a certificate used with asymmetric algorithms. This message can only be used with version 4 of the UN/EDIFACT Syntax (ISO 9735).

B.5.4 Payroll Deduction Advice (PAYDUC)

The Payroll Deductions Advice is sent by a party (usually an employer or its representative) to a service providing organisation (social security agency, pension fund, etc.), to detail payments by payroll deductions, on behalf of employees, made to the service providing organisation. This message can only be used with version 4 of the UN/EDIFACT Syntax (ISO 9735).

B.5.5 General Message (GENRAL)

The General Message may be used to send required data for which there is no specific standard message. It was designed primarily to facilitate early transmission testing between new EDI partners or to transmit text (preferably structured or coded) to supplement or further clarify previously transmitted EDI standard messages.

C GS1 XML MESSAGES

C.1 GDSN

C.1.1 Align Catalogue Item Synchronisation

A standard outlining the choreography and messages for the synchronisation of master data from Source Data Pools to Recipient Data Pools within the GDSN supported by the GDSN Global Registry. Examples of documents within this standard are

- **Catalogue Item Notification** – A business message used to transmit trade item information from a data source or a data pool to a data recipient with the Global Data Synchronisation Network
- **Catalogue Item Confirmation** - This refers to electronic communication from the Data Recipient to the Data Source indicating what action has been taken on the item
- **Catalogue Item Subscription** - A business message used to establish a request for the update of trade item information from an end recipient on a continuous basis.
- **EANUCC Response** - A response message used to acknowledge that a business message has been successfully received and validated.
- **GDSN Exception** - An error message sent by the recipient of a business message containing errors.

C.1.2 Align Basic Party Synchronisation

A set of messages used to populate the GS1 Global Registry with basic information about parties participating in the GDSN and report party information to data pools and their registered trading partners.

C.1.3 Item Authorisation

A set of messages used to authorise trading partners to sell or deliver an item at a specific location or group of locations. This standard is intended for Direct Store Delivery (DSD) business scenarios.

C.1.4 GDSN Common Library

A standard specifying common components that are used in multiple GDSN standards. This typically consists of classes of data elements and attributes.

C.1.5 GDSN Price Synchronisation

A standard outlining the choreography and messages needed for the process of synchronising price information between trading partners.

C.1.6 GDSN Trade Item

A standard containing the core data model for the identification and description of all trade items. This information is exchanged between trading partners using the messaging and choreography of GDSN Catalogue Item Synchronisation.

C.1.7 GDSN Trade Item Extensions

The GDSN Trade Item standard contains trade item information that can be applied to any type of trade item in any industry and any process. To support requirements related to specific types of trade items, industries or processes without adding too many attributes and elements to the core trade item model, the concept of extensions has been developed. The use of extensions is optional. The extensions are:

C.1.8 Apparel & Home Fashion Extension

Contains information specifically for clothing and home fashion.

C.1.8.1 Attribute Value Pair (AVP) Extension

A generic extension designed to carry trade item information for which there is no suitable standard attribute. This is intended for "fast track" attributes (attributes that are approved for inclusion in a future version of core trade item or an extension) and "extended attributes" (non-standard attributes) that may be agreed between trading partners and data pools.

C.1.8.2 Audio Visual Photography Extension

An extension containing attributes specifically relevant for Audio/Visual/Photography products.

C.1.8.3 Books and Publications Extension

An extension enabling the passing of information currently communicated by book publishers within an ONIX message to be communicated utilising a data structured extension within the Global Data Synchronisation Network (GDSN).

C.1.8.4 Chemical Ingredients Extension

An extension to the trade item which enable the synchronisation of chemical ingredients information in relation to chemical ingredients information, safe storage and display, employee safety, environmental protection, sustainability information and transportation of products.

C.1.8.5 Electronic Games Extension

The specific purpose of this extension is to pass attributes describing within the product classes Computer/Video Game Gaming Software and Computer Software (Non Games).

C.1.8.6 Food & Beverage

An extension containing detailed information about foodstuffs, such as ingredient and nutrition information, allergen information, claims and preparation information end more.

C.1.8.7 Healthcare

The objective of this extension is to provide an initial set of attributes needed to communicate information relating to trade items within the healthcare sector.

C.1.8.8 Movie Publications

An extension containing information about movie publications.

C.1.8.9 Music Recordings

An extension containing information about music recordings.

C.1.8.10 Non-GTIN Logistic Units

An extension that supports the exchange of information about standard logistics units to which no GTIN has been assigned. The information is associated to the highest item level that has a GTIN assigned to it.

C.1.8.11 Promotional Trade Item

An extension that details necessary information about promotional trade items. The extension provides information on these promotional trade items and to be able to link them to the standard trade items they replace or complement.

C.1.8.12 Specific Technical Characteristics

An extension that allows communications about technical properties of trade items.

C.2 Align (EDI)

C.2.1 Item Data Notification

Item master data is a set of data, which describes the specifications and structures of each item involved in Supply Chain Processes. Each set of data can uniquely be identified by a Global Trade Item Number (GTIN).

C.3 Plan

C.3.1 Purchase Conditions

Purchase Conditions expresses the official commitment between buyer and seller that certain quantities are to be delivered over a given period and at the stated price. In doing so it sets the contractual conditions for the ordering and delivering of the goods and so details specific terms and conditions that apply for a given period.

C.3.2 Goods Requirements

A message allowing the buyer to communicate Goods Requirements to the seller, which is needed in several business scenarios. Sometimes it is needed in traditional order driven scenarios and is definitely needed in supplier managed scenarios. The Goods Requirements communicated by the buyer can be gross or net (=gross requirements +/- inventory).

C.3.3 Goods Requirements Response

The Goods Requirements Response message enables the responding party to communicate acceptance of the Goods Requirements transaction.

C.3.4 Replenishment Proposal

The replenishment process in broad sense addresses the business practice to exchange data between a buying party (e.g. buyer) and a supplying party (e.g. seller/supplier) related to the future demand of finished or semi-finished products, ingredients, packaging and raw materials. This message responds to the replenishment request by issuing a replenishment proposal.

C.3.5 Replenishment Request

The replenishment process in broader sense addresses the business practice to exchange data between a buying party (e.g. buyer) and a supplying party (e.g. seller/supplier) related to the future demand of finished or semi-finished products, ingredients, packaging and raw materials. This message allows the buyer to request the supplier to plan for future replenishment.

C.3.6 Performance Measurement

The Performance Measurement message allows trading partners to identify goals for the measures that they wish to share, as well as exchange the values for those measures. The scope of the

message includes key measures of Sales, Operations, Supply Chain, and Data Accuracy performance.

C.4 Order

C.4.1 Order

The Order provides the ability for a buyer to order variable quantities of trade items/services shipped to multiple locations using one transmission.

C.4.2 Order Response

The Order Response provides the ability for a supplier to respond to an order previously sent by the buyer. The Order Response allows the seller to inform about either the acceptance of the entire order as transmitted, or the acceptance of the order with modifications on items (substitutes), quantities, prices and/or dates, or the rejection of the entire order.

C.4.3 Configure to Order

The Configure to Order provides support for configurable items on a purchase order. A configurable item is one that starts with a single structure, but to which a large variety of options may be added in a variety of combinations.

C.5 Deliver

C.5.1 Consumption Report

Allows the Buyer in consignment business scenarios to communicate the consumed materials or sold goods to the seller.

C.5.2 Despatch Advice

The Despatch Advice enables one Shipper to provide information about the content of a shipment to one Receiver. Specifically, the Despatch Advice serves as a link to a prior agreement between Shipper and Receiver and is applicable to one or many Receiver destination points from one Shipper launch point. Furthermore, the Despatch Advice may be used to indicate the despatch of goods being returned by the Receiver.

C.5.3 Receiving Advice

The Receiving Advice provides the Receiver of the shipment the capability to inform the Shipper of actual goods received, compared to what was advised as being sent. It enables the link to the information that makes up a Despatch Advice or Shipping Document, providing detailed information about the content of a shipment of goods from the Shipper to the Receiver.

C.5.4 Despatch Advice - Meat Product Extension

The objective of this extension is to describe the exchange of production history data of unprepared beef in order to support traceability and quality management.

C.5.5 Inventory Report

A message used to communicate inventory levels from the place where goods are stored to the owner of goods.

C.5.6 Despatch Advice Line Item Extension Fish Traceability

Fish Traceability Extension is an extension to the Despatch Advice Document used to enable tracking & tracing (traceability) of wild-caught fish and farmed aquaculture products from the point of capture to retail sale.

C.6 Transport

C.6.1 Transport Capacity Requirements

In the Transport Capacity Requirements message the Logistic Services Buyer will define their transportation capacity requirements by developing a forecast based on aggregated demand covering extended periods of time. (i.e. product/order forecasts are rolled up and extended to shipment forecasts).

C.6.2 Transport Capacity Plan

The Logistic Services Seller is responsible for developing the Transport Capacity Plan. He does this based on the Transport Capacity Requirements communicated to him by the Logistic Services Buyer. The Logistic Services Seller may combine the cargo (for multiple requirement lines) if they are for the same trade lane (i.e. origin/destination), forecast bucket, and service requirement level (e.g. refrigerated vs. general cargo).

C.6.3 Transport Capacity Booking & Response

Transport Capacity Booking is the process to reserve space for estimated consignments or shipments. Typically the booking process covers a period of less than a week prior to actual shipments covered by capacity booking moving through the Logistics Network. The Logistic Services Buyer will send transport capacity booking requests to the Logistic Services Seller. The Transport Capacity Booking Response is sent by the Logistic Services Seller to the Logistic Services Buyer, accepting or rejecting the Transport Capacity Booking.

C.6.4 Transport Instruction & Response

The main objectives are to communicate/ share the arrangement of the transport of goods between all parties involved in the movement of the consignment(s) as well as providing the information necessary to perform that transport and delivery of the goods.

C.6.5 Transport Status Request & Notification

This business message standard enables the transmission of status information by a freight forwarder or carrier, to a party requesting information concerning a consignment of goods for which a Transport Instruction was previously sent.

C.6.6 Transport Pick-up / Drop-off Request & Confirmation

This business message standard enables the request and confirmation for an appointment to collect goods at a pick-up location or to deliver goods at a drop-off location.

C.7 Warehousing

C.7.1 Warehousing Inbound Instruction

Message that supports the warehouse inbound process, and enables a Logistic Services Client (LSC) to inform his Logistic Services Provider (LSP) that goods will be arriving.

C.7.2 Warehousing Inbound Notification

Message that supports the warehouse inbound process, and enables a Logistic Services Provider (LSP) to inform his Logistic Services Client (LSC) on the status of goods received on behalf of the client.

C.7.3 Warehousing Outbound Instruction

Message that supports the warehouse outbound process, and enables a Logistic Services Client (LSC) to inform his Logistic Services Provider (LSP) that goods need to be shipped.

C.7.4 Warehousing Outbound Notification

Message that supports the warehouse outbound process, and enables a Logistic Services Provider (LSP) to inform his Logistic Services Client (LSC) on the status of goods shipped on behalf of the client.

C.7.5 Warehousing Operations Instruction

Message that supports the inventory management process, and enables a Logistic Services Client (LSC) to inform his Logistic Services Provider (LSP) that the inventory status of goods needs to be changed.

C.7.6 Warehousing Operations Notification

Message that supports the inventory management process, and enables a Logistic Services Provider (LSP) to inform his Logistic Services Client (LSC) that the inventory status of goods has been changed.

C.7.7 Logistics Inventory Request

Message that supports the inventory management process and enables a party to request an inventory report from another party, using specific selection criteria.

C.7.8 Logistics Inventory Report

Message that supports the inventory management process and enables a party to report on inventory status and events as registered in his system.

C.8 Pay

C.8.1 Advanced Remittance Notification

The purpose of this message is to provide prior notification of payment in support the Collaborative Receipt Settlement (CRS), which is the process of rendering payment for goods received based upon quantity received and synchronised pricing records without having to exchange an invoice from a seller to a buyer.

C.8.2 Buyer Reconciliation of Request(s) for Payment

A message enabling a buyer to respond to Requests For Payment received from a seller. The document reports to the seller whether or not the buyer was able to schedule the requested payment through the accounts payable system.

C.8.3 Claims Notification

The purpose of this message is to provide notification of claims in support the Collaborative Receipt Settlement (CRS), which is the process of rendering payment for goods received based upon

quantity received and synchronised pricing records without having to exchange an invoice from a seller to a buyer.

C.8.4 Debit Credit Advice

Provides advice to a trading partner that a monetary adjustment - debit or credit amount value - is being applied to the purchase of goods or services.

C.8.5 Invoice

The message requesting payment for goods or services under conditions agreed upon between the seller and the buyer. It contains the necessary information needed for payment consisting of parties, items, prices, amounts and quantities.

C.8.6 Request for Payment

The Core Request for Payment Message is defined as requesting payment for goods or services under conditions agreed upon between the seller and the buyer. It contains only the necessary information needed for payment consisting of parties, items, and quantities. Extensions are available to add functionality and are categorised by business process. For example, the Core Request for Payment could be used with the Simple Invoice Extension for data relative to pricing and reference numbers.

C.8.7 Settlement

The Settlement message provides the ability is to send payment and remittance without adjustment, send remittance with adjustments and/or discounts, send payment and remittance with adjustment and/or discounts, send payment, send remittance without adjustments and/or discounts.

C.9 Other

C.9.1 Product Recall

The Product Recall messages support the process of removing specific products (traceable items) which may pose a health and safety risk to consumers from the supply chain.

C.9.2 Artwork Content & Response

A business message standard that enables the communication of artwork content between manufacturers / suppliers and their artwork studios.

C.9.3 Cash processing machines

A set of messages that supports cash processing between banking institutions.

C.9.4 Application Receipt Acknowledgement

The Application Receipt Acknowledgement And Or Error Application Receipt Acknowledgement message sent as a response to any business message received. The Responder upon receiving the XML Instance Document acknowledges receipt (and optionally detects errors/warnings) at the SBDH, Transaction, Command and/or Document hierarchical levels and responds to the message Initiator.

C.9.5 Shared Common Library

This standard contains the components that are determined to be foundational to all domains where GS1 XML is applied and helps to enforce consistency across messages. The Shared Common Library components include:

- GS1 Keys (e.g. Party Identification)
- Document Components (Document, Response)
- Components based on “global” concepts (e.g. Contact, Currency Exchange, Address, Person).

C.9.6 EDI Common Library

This standard contains the components that are determined to be foundational to the EDI domain and helps to enforce consistency across messages. The EDI Common Library components include:

- Transactional trade item details
- Transactional party details
- Logistic unit details
- Transport related information such as transport equipment, transport means
- Financial information such as payment terms, financial accounts

D GS1 UN/CEFACT XML profile MESSAGES

D.1 Cross Industry Despatch Advice

The Despatch Advice enables one Shipper to provide information about the content of a shipment to one Receiver.

D.2 Cross Industry Invoice

The Invoice Message is defined as requesting payment for goods or services under conditions agreed upon between the seller and the buyer. It contains the necessary information needed for payment consisting of parties, items, prices, amounts and quantities.

D.3 Cross Industry Order

The Order provides the ability to order different quantities of trade items/services originating from multiple locations of the seller, shipped to multiple locations of the buyer, using one business message.

D.4 Cross Industry Order Response

The Seller sends a response to the Buyer confirming acceptance of the Order or of a changed Order, rejection of the Order or of a change to an existing Order, proposing a change to the Order or withdrawal of a previously agreed.