Implementation Guideline for encoding transport process information

Rules for encoding transport data to enable transport processes (Scan4Transport)

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1 Introduction

The GS1 Logistics Label has been established successfully for many years to support the flow and management of transport units along the supply chain. However, users, especially logistics service providers, need to have transport data encoded directly on the label to best support their processes. As a response to this requirement, this Implementation Guideline explains how to add relevant transport data in a 2D Code on the transport label while supporting existing applications.

The Guideline specifically details how existing and recently approved GS1 Application Identifiers can be used to encode transport process information. Additionally, an informative section provides an explanation on how Digital Link URI Syntax could be used for encoding transport process information.

Contributors have expressed their support of the approaches described in this standard to ensure interoperability among stakeholders in the transportation of goods from source (Seller) to final destination (Buyer).

This Implementation Guideline consists of three main parts:

- **PART I**
  The principles, covered in sections 4 to 5, explain the main business needs and challenges and the way these will be addressed. The principles are not rules but help to explain the logic behind the rules.
- **PART II**
  The rules, covered in sections 6 to 9, specify how the identification keys, data elements and data capture standards (2D barcodes, transport unit labels) must be applied.
- **PART III**
  This section provides examples of how the standard can be implemented using GS1 or non-GS1 barcodes

Part I and Part II describe normative rules, meaning they are based on and compliant with the GS1 *General Specifications*.

Part III covers implementations aspects that the *GS1 General Specifications* may not cover yet and thus may be subject to changes resulting from the Public Review and Prototyping exercises.

All parts of this Implementation Guideline build upon the *General Specifications* and the *GS1 Logistic Label Guideline*.

GS1 will update this Implementation Guideline periodically, reflecting the learnings of initial implementations done during the Prototyping period.
Please see the GS1 Transport-and-Logistics website for more information about GS1's projects and developments related to the use of GS1 standards in the T&L environment.

1.1 Target audience

All parties involved in creating transport units or handling transport units at any stage of their journey from original source to final destination, may use this Implementation Guideline.
These include:

- Senders of Goods (e.g. manufacturers, sellers, marketplaces, retailers),
- Receivers of Goods (e.g. consumers, buyers, businesses of all sizes, authorities like municipalities, hospitals),
- Logistic Service Providers <LSP> (e.g. carriers, couriers, express and parcel operators, postal operators), and
- Regulators.

1.2 Scope of the standard

Today's Transport & Logistics(T&L) industry and supply chain are becoming ever more open and competitive, with increasing numbers of service providers (especially in Last Mile) and also new entrants coming in from outside the traditional T&L environment.

As a result, Transport & Logistics processes have become far more international and complex. This drives the need for greater interoperability among stakeholders in the T&L environment and among their systems and supply chains.

To meet these challenges, the Transport & Logistics industry must improve its operational processes and in particular develop capabilities to manage and track all their activities at the level of the individual transport unit.

A key enabler is the SSCC with the ability to identify transport units unambiguously across the systems and processes between all stakeholders.

This Implementation Guideline defines the rules, roles and responsibilities regarding the creation of transport unit labels when using 2D barcodes to include more transport process data on GS1 transport labels. The SSCC is the mandatory identifier required on all transport labels and this standard defines how it should be used in concert with optional attributes to support transport and logistic processes.

Note: This Implementation Guideline does not replace the existing *GS1 Logistics Label Guideline* but describes the possibility how to use the transport label in combination with the GS1 Digital Link.

1.3 Conventions applied in this document

1.3.1 References

References to documents, websites etc. are indicated as follows [REFERENCE, paragraph number (optional)]. The list of references with full details is included in section 2.

1.3.2 Rules and recommendations

Rules and recommendations are numbered per section. For example, clause [4-3] is the third clause in section 4.

Within this specification, the terms SHALL, SHALL NOT, SHOULD, SHOULD NOT, MAY, NEED NOT, CAN, and CANNOT are to be interpreted as specified in section 7 of the ISO/IEC Directives, Part 2, edition 7.0 [ISODir2]. When used in this way, these terms will always be shown in ALL CAPS; when these words appear in ordinary typeface they are intended to have their ordinary English meaning.

1.3.3 Format of element strings

The following conventions apply to indicate the format of GS1 Application Identifiers and data fields.

To indicate the allowed characters:

- N numeric digit
- X any character, see [GENSPECS, figure 7.11 – 1] for the allowed characters.

To indicate the length:

- Nn exact number of digits
- N..n maximum number of digits
- Xn exact number of characters
- X..n maximum number of characters

Examples:

- X3 exactly 3 characters
- N..18 up to 18 numeric digits

To indicate digit / character position:

- X_n
- N_n

Examples:

- N_3 numeric digit on position 3
- X_{16} any character on position 16

2 References

Table 2-1 Normative references

REF ID	Document	Author / Year
GENSPECS	*GS1 General Specifications*	GS1, latest
DIGLNK	GS1 Digital Link Standard	GS1, latest
ISODIR2	ISO/IEC Directives, Part 2: Rules for the structure and drafting of International Standards – 7th edition, 2016	ISO
LogLabGuide	*GS1 Logistic Label Guideline*	GS1, latest
LIM	Logistics Interoperability Model	GS1, latest
RFC 6570	URI Template	*https://tools.ietf.org/html/rfc6570*
RFC 2606	Reserved Top Level Domain Names	*https://tools.ietf.org/html/rfc2606*
RFC 6761	Special-Use Domain Names	*https://tools.ietf.org/html/rfc6761*
RFC 3986	Uniform Resource Identifier: Generic Syntax	*https://tools.ietf.org/html/rfc3986*

Table 2-2 Relevant regulations for Transport & Logistic stakeholders

Regulation	Description
Not Applicable	

Table 2-3 Informative references/resources

Regulation	Description
GS1 S4T Digital Link toolkit *(source code at https://github.com/gs1/S4T)*	Online resources providing the ability to generate a GS1 Digital Link URI and encode it in a QR Code.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

The term Logistic Label stands for the label on a transport unit that is identified by an SSCC. As this Implementation Guideline very much focuses on transport issues and the term transport label is the more accepted term in the transport area this document also uses transport label.

3.1 General concepts

Location

A geographic position of an entity, in either the form of geospatial coordinates (latitude, longitude, altitude) or a civic address

Note: A civic address can extend to internal landmarks within a site, e.g., building number, floor number, room number.

(ISO/IEC TR 16167:2011(en), 3.2.4)

Transport Unit

A transport package containing a single product/product package or collection of product/product packages (same or different) designed to enable these to be handled as a single transport entity. (ISO 17364:2013 4.7)

Transport Unit Label

A piece of paper or other material displaying information and affixed to the transport unit. (Adapted from ISO 20167-1:2016)

Shipment

A grouping of logistics and transport units assembled and identified by the seller (sender) of the goods travelling under one despatch advice and/or Bill of Lading to one customer (recipient).[GENSPECS]

Consignment

A grouping of logistic or transport units assembled by a freight forwarder or carrier to be transported under one transport document (e.g., waybill) [GENSPECS]

Party

An individual, a group or an organisation.

Note: A party may take on a wide variety of roles within the context of this Implementation Guideline.

3.2 Identification

Unique identification

Depending on the scope / context, the term unique identification may be used to refer to a globally unique identification key for a Transport Unit, Shipment, Consignment, Location or Party.

- When referring to the transport unit, the term transport unit ID is used.
- When referring to the Shipment, the term Shipment ID is used.
- When referring to the Consignment, the term Consignment ID is used.
- When referring to the Location, the term Location ID is used.
- When referring to the Party, the term Party ID is used.

3.3 Transport unit label elements

Human readable interpretation (HRI)

Characters, such as letters and numbers, which can be read by persons and are encoded in GS1 AIDC data carriers confined to a GS1 standard structure and format. The human readable interpretation is a one-to-one illustration of the encoded data. However, start, stop, shift and function characters, as well as the symbol check character, are not shown in the human readable interpretation. [GENSPECS]

Non-HRI text

Characters such as letters and numbers that can be read by persons and may or may not be encoded in GS1 AIDC data carriers and are not confined to a structure and format based on GS1 standards (e.g., a date code expressed in a national format that could be used to encode a date field in a GS1 AIDC data carrier, brand owner name, consumer declarations). [GENSPECS]

Data titles

Data titles are the abbreviated descriptions of element strings, which are used to support manual interpretation of barcodes. [GENSPECS]

Barcode

A symbol that encodes data into a machine readable pattern of adjacent, varying width, parallel, rectangular dark bars and pale spaces. [GENSPECS]

3.4 Typographical conventions used in this document

This document includes examples of GS1 Digital Link URIs such as:

```
https://example.com/sscc/{sscc} and
https://example.org/00/{sscc}
```

The use of the monospace font indicates that the text has meaning for computers. Further, these examples follow the convention used in [RFC 6570]. The places where the values of variables should be inserted are written in braces, so, for example, {sscc} means "insert the SSCC value here". All other text in the URI is a literal string to be used as written. As explained in [RFC 2606] and [RFC 6761], the domains example.com, example.org and example.net are second-level domain names reserved by the Internet Assigned Numbers Authority (IANA) for use in documentation. These should be understood as a placeholder for any registered second-level domain name.

PART I - GENERAL PRINCIPLES

4 Managing last mile delivery and first mile collection

4.1 Introduction

Transport is the backbone of all economies in the world. All value chains that (partly) rely on the transportation of physical objects need reliable, effective and efficient transport & logistics (T&L) networks. Here are just a few examples of such value chain: Healthcare (pharmaceuticals, medical devices, consumables and general supplies), Technical industries (e.g. mining, construction), Energy (Oil & Gas), Retail and Finance (cash handling).

According to the European Union, transport is a cornerstone of European integration and is vital for fulfilling the free movement of individuals, services and goods.

Transport is also a major contributor to the economy, representing more than 9% of EU gross value added (the contribution to the economy). Transport services alone accounted for around €664 billion in gross value added in 2016 and they employ around 11 million people in the EU alone.

4.2 Logistics network context

Transport & Logistics networks have always been complex generally involving numerous stakeholders with different roles, who at times are not known to each other. The complexity of T&L networks is increasing, and the complexity is showing an accelerated pace.

The explosive growth of e-commerce mostly drives this increase. Consumers and business customers order more frequently and they order in smaller quantities. At the same time, the total demand for product is increasing. The net result is a massive increase of the number of deliveries (and returns) that transport and logistics providers must manage.

Furthermore, customers have more complex and restrictive demands related to those deliveries and returns —demands that can only be fulfilled with more transport providers. Transport operators from around the world rely on the transport data encoded on a logistics label to support their daily operations. Currently, this data is captured in various proprietary formats. As the number of transport providers grows, so do these proprietary solutions.

Currently, many of these suppliers encode this information in two-dimensional (2D) barcodes. Retailers and shippers often use multiple transport providers to fulfil their various transport needs and have to support just as many different formats to encode the same information on a transport label

Due to the opportunities offered by the massive increase in number of orders, an increasing number of parties are getting involved in the T&L networks, using an increasing number of different systems. Unfortunately, these parties and their systems do not work well together.

For shippers, there is excessive waste associated with the development costs and time required to setup different transport providers in their transport systems and processes.

A major issue revolves around the lack of a common, global standard in sharing transport data. This is driving inefficiencies, unnecessary costs and decreasing productivity industry-wide. The cost of maintaining multiple label formats and data capture processes is a burden on all stakeholders in the industry.

Most importantly, the lack of interoperability inhibits stakeholders from efficiently handling the transport process information generated by other stakeholders. By using a common standard that describes a standard mechanism for encoding the information, stakeholders can read transport data generated by other stakeholders. This translates to faster handling with near-perfect accuracy, especially in the “last mile” where the number of packages is rapidly increasing and more stakeholders are involved.

One paramount requirement however above all others necessitates a fundamental change to the way that T&L Delivery and Returns processes will be handled in future:

Both Sellers and Buyers expect highly reliable transport & logistics services.
They also demand to have visibility of where their Goods are at any point in time.

In several sectors (e.g. healthcare, tobacco) and geographies of the world (e.g. Australia, Europe, Brazil), there are legal frameworks in place that impose that stakeholders must also trace products exactly over their entire journey from original seller to final buyer.

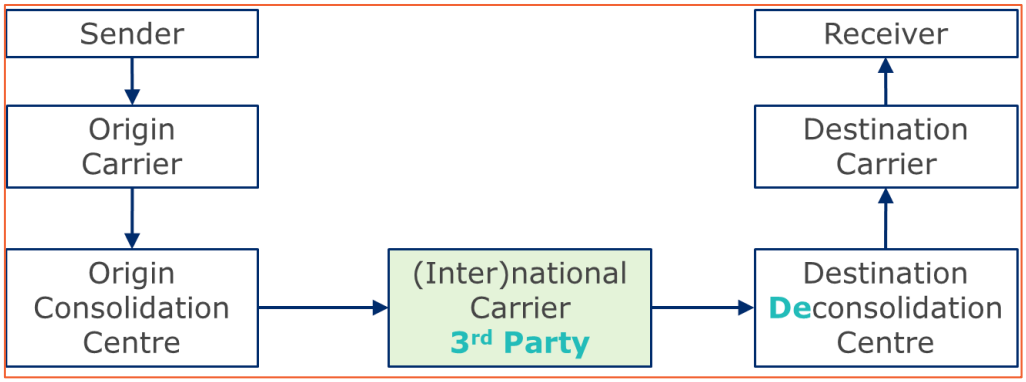
Current processes in Transport & Logistics are, largely, not able to meet those requirements.

4.3 Business processes

In the delivery journey for a transport unit, there are three main stages:

1. Pre-carriage/First mile;
   collecting the transport units from source and moving it to a (first) depot where it may be consolidated with other transport units to achieve efficiencies in the logistics network.
2. Main carriage;
   transporting consolidated transport units usually over longer distances to a deconsolidation centre near the final delivery location.
3. Onward carriage/Last mile;
   delivering the individual transport units to their final destination.

Figure Typical logistics network.



There are a few things to take note of in this diagram.

- The three stages model applies equally to domestic and international networks.
- *For each of the three stages, a different carrier may be used*.
  In fact, even when the transport unit is managed end-to-end by an integrated courier, express or parcel service provider they each manage their networks exactly as described in the diagram above. Even integrated carriers make use of subcontracted third party carriers within parts of their networks.
- There are several points in the network where the transport units are handed over from one party to another.

Note: The carrier boxes in the above figure may itself represent a complex network of hubs and depots used to increase efficiency in the transportation.

A key feature in current logistics networks is that transport units are sorted at every hub, depot and (de)consolidation centre they pass through. This is a labour intensive process and today often error-prone. The vast majority of all logistic service providers heavily rely on manual sorting processes. Some service providers have highly sophisticated automated sorting solutions but these are not available everywhere in their networks. Furthermore, those automated sorting solutions generally rely on proprietary ID keys and labels. So handovers among with those carriers is often cumbersome (and may involve relabelling, which introduces significant risks of errors.)

Increasing efficiency and accuracy in these sorting processes is a pre-condition for T&L to meet the (reliability) requirements outlined in the context paragraph above.

4.4 The vision for transport and logistics

In transport and logistics, a transport label with an SSCC for the transport unit is required.

The Seller assigns an SSCC, a globally unique ID Key, to each Transport Unit.
(Serial Shipping Container Code; compliant with ISO 15459-1 Licence Plate)

The Seller attaches a standardised Transport Unit Label to each Transport Unit that all Parties may use.

The Seller makes the relevant information regarding the Transport Unit (e.g. its final destination, and required service levels (e.g. delivery not before/not after) and the contents (e.g. Product ID Keys, type of goods, transaction values) available to the various stakeholders in the transport & logistics network.
The semi-circle in the bottom half of the figure below shows a number of common stakeholders involved in the T&L network.

The Seller hands over the Transport Units to the first carrier

Carrier/s and other T&L service providers execute their part of the activities necessary to move the goods smoothly to final recipient (Buyer shown on the right-hand side of the Figure). These parties should use the standardised GS1 Transport/Logistics label and the Transport Unit ID Key (SSCC) assigned by the Seller for the execution of their activities.

All T&L service providers could make information on progress available using the Transport Unit ID Key assigned by the seller.

Figure 4-1 GS1 Vision - Common ID and Label end-to-end

Note: For clarity, the vision is described from seller to buyer.
However, the process would be the same for transportation from any source to any destination.

This vision clearly addresses the issues we have identified for the current logistic networks operations:

1. All stakeholders work with a common ID Key (SSCC) and common label.
   This means stakeholders may easily hand over transport units without increasing risk of errors or incurring non-value add activities such as relabelling.
2. The logistic service providers (especially those working for many customers) can more easily handle transport units coming from different sources.
   They may even be able to justify investing in more automated sorting solutions because the automated solution can process many more transport units if they all use common standard ID Key and carry labels with the same layout.
   This would improve both efficiency, accuracy and speed (reduction in lead times) within the hubs, depots and networks as a whole.
3. Using the same ID Key (SSCC) for the transport unit allows all parties to gain access to the relevant information for the unit (as and when they need it). Access options include EDI and online/Web services.
4. The commonly used ID Key and labelling combined with information exchanges based on the commonly used ID Key enable achieving the paramount requirement of persistent location awareness.
5. In addition, having access to transport process information assists the logistic service providers to plan in advance
6. It also enables improvements in the administrative procedures among the stakeholders engaged in logistic services transactions.
7. In cases where the transport units cross borders, the relevant border authorities may use the access to electronic (advance) data to more quickly process the declarations related to these transport units (and even clear them before they reach the border, ensuring no delays at the border crossing).

4.5 The challenges

The vision outlined above clearly requires at least one of two main conditions to be met:

- Parties have somehow exchanged relevant data for the Transport Unit in advance;
- Party handling the Transport Unit has access to the relevant data in an Information System at the moment they handle the transport unit.

Unfortunately, transport & logistics networks are not likely to meet these requirements consistently due to the physical and organisational characteristics of transport & logistics.

The first challenge is caused by the very high levels of fragmentation in the transport & logistics industry.

A recent analysis of the German transport service provider market found that less than one percent of companies employ over 250 people, while 72 percent have fewer than ten employees. In France 96% of the companies employ less than 50 people and 88% less than 10 people. Furthermore, an article on *Freightwaves* in 2019 stated that 91 percent of fleets in the U.S. have eight or less trucks.

Additionally, the transport & logistics environment is a low margin business. In France the average margin is 1% Therefore, these smaller companies have limited funds to invest in Information Technology (IT). Especially when they are working for several customers, the revenue/margin they make for an individual customer is so low, that they cannot justify investing in electronic data exchanges with individual, especially small customers.

In fact, another recent study identified that transport services buyers also rely on manual processes with *"Twenty-four percent of buyers still using manual methods (e.g. pen and paper) to handle transportation management needs".* In France 33% of the companies are using EDI to exchange data most of them employing more than 100 people.

In short meeting the requirement of electronic data exchanges in advance among all stakeholders given current approaches in the transport & logistics networks is not consistently possible.

Now consider the second requirement of access to relevant data on an IT system at the moment the service provider handles Transport Unit.

When scanning an ID Key/SSCC, the device used by the operator must be able to connect to the IT system to retrieve the data in that system.

However, there are large geographies around the in the world where reliable access to networks in a cost-effective manner is not guaranteed.

These types of issues exist in geographies like Latin America, Africa and more remote areas of China, Russia, Australia, USA, and Canada.

There are ongoing initiatives that hold the promise of access to a mobile network anywhere in the world. For the moment, it is unclear whether any of these initiatives will deliver that ubiquitous coverage.

Additionally, even if persistent connectivity were available, due to the service nature of transportation, this business sector will likely require a contingency to ensure expedient and reliable transport.

Therefore, the operator must have immediate access to relevant data from the Transport Unit itself in order to be able to execute the handling of the transport unit in an efficient and effective manner.

To enable the operators of the logistic service providers to access information needed we describe in this Implementation Guideline a method to include standardised data in a 2D barcode. That 2D barcode should be generated at source and then be used by any and all stakeholders handling the transport unit.

To enable this, we describe the content and structure of the 2D barcode unambiguously and we will provide guidance rules to enable all stakeholders to implement the creation and use of the 2D barcode consistently across all stakeholders.

That way we can ensure true interoperability among all stakeholders and achieve many of the objectives, we identified for the Vision for Transport & Logistics networks.

4.6 How would 2D barcodes help?

Note that the preferred way to handle the transport unit is to use the SSCC of the transport unit to access the latest available information for that transport unit and then decide what to do with the transport unit. Traditionally, the transport unit handler retrieves this information from his own IT system, which received the information via Electronic Data Interchange (EDI).

More and more, it is becoming necessary to change the handling (e.g. routing) of the transport units dynamically in order to meet the requirements of todays and future value chains.

A 2D barcode generated at source contains the information that was relevant and accurate at the time the 2D barcode was created. Information sent initially via EDI is often not updated either. therefore, the information may no longer be accurate at the time the operator handles the transport unit later in the transport & logistics network.

Relying only on the data included in the 2D barcode could be misleading in those scenarios.

Therefore, the 2D barcode ***must*** include the ID key for the transport unit to enable the operator to access the latest available information (assuming connectivity to an up-to-date IT system is available).

When an operator must rely on the content of the 2D barcode on the transport unit only, one must scan the barcode with a device and read the relevant data into a pertinent IT application on that device.

The application on the operator's device will process the relevant data and instruct the operator how to handle the transport unit.

Note: The 2D barcode will deliver operational benefits only in those cases where the operator uses a device with basic IT capability installed.
In a purely manual process (not using any kind of IT), the 2D barcode cannot help improve operational effectiveness or efficiency.

- First and Last Mile activities:
  First and Last Mile drivers are often sub-contractors for multiple transport companies. Like a

postal worker, these companies have a regular route and can pick-up freight without any electronic transaction between the shipper and the Logistics Service Provider. The barcode is used to capture the address and other essential information to book the transport task in the Logistic Service Provider's System. Similarly, the last mile drivers drive for multiple companies and will pick up freight from various depots. They use the barcode to capture the complete ship-to address into their application to enable route optimization and record handling instructions.

- Sortation activities:
  While a postal code can be used in some geographies to sort freight, there are countries around the world where the postal code can range between 0.56sq km to 634,000 sq. km and therefore not granular enough to sort freight. While a GLN could be used to sort freight, implementation of the GLN is not widespread enough (e.g. B2C deliveries) for Logistic Service Providers to rely upon when sorting freight. Subsequently, the full address, from country right down to street number needs to be captured in a barcode to enable sortation process.
  Furthermore, access to the data linked to the GLN may not be available (or too slow) at the time of sorting.
- Administration activities:
  Logistic Service Providers (i.e. sub-contractors) can be paid based on the number of transport units, the weight of the transport unit and distance the transport unit travels. Subsequently, they need to be able to capture the information from a barcode (in case there is no advance electronic record containing the information) to simplify the administration process and enable them to be paid (more quickly).
- Redundancy:
  With the millions of freight units moving through a single depot daily, Logistic Service Providers rely on being able to capture the complete address information through a barcode in the event they have not received the transport instruction via EDI or have lost access to/do not have access to business systems allowing them to look-up the information.

5 Content principles

5.1 Data necessary for correct handling

A critical principle to ensure many stakeholders will implement the standardised 2D barcode is to keep the content of the barcode simple, meaning limiting the number of data elements included in it.

At the same time, the information in the barcode must be sufficient for an operator to handle the transport unit accurately based on that information. The full content of the 2D barcode is intended to be used only in cases when there is no access to information from an IT system or business process demands immediate action based on local information.

To achieve the above goals the standard utilises existing GS1 data elements (Application Identifiers) in combination with the GS1 Digital Link standard.

5.1.1 Expressing data using GS1 Application Identifiers

GS1 Application Identifiers enable a set of attribute :value pairs of data to be encoded in a data carrier. Each attribute within a pair is a GS1 Application Identifier (AI) expressed as a numeric string, e.g. '00' is the AI corresponding to the SSCC, '420' is the AI for the ship-to / deliver-to postal code. The value is the corresponding value for each GS1 Application Identifier. For example, '106141412345678908' is an example value for the SSCC where the attribute / AI is '00'.

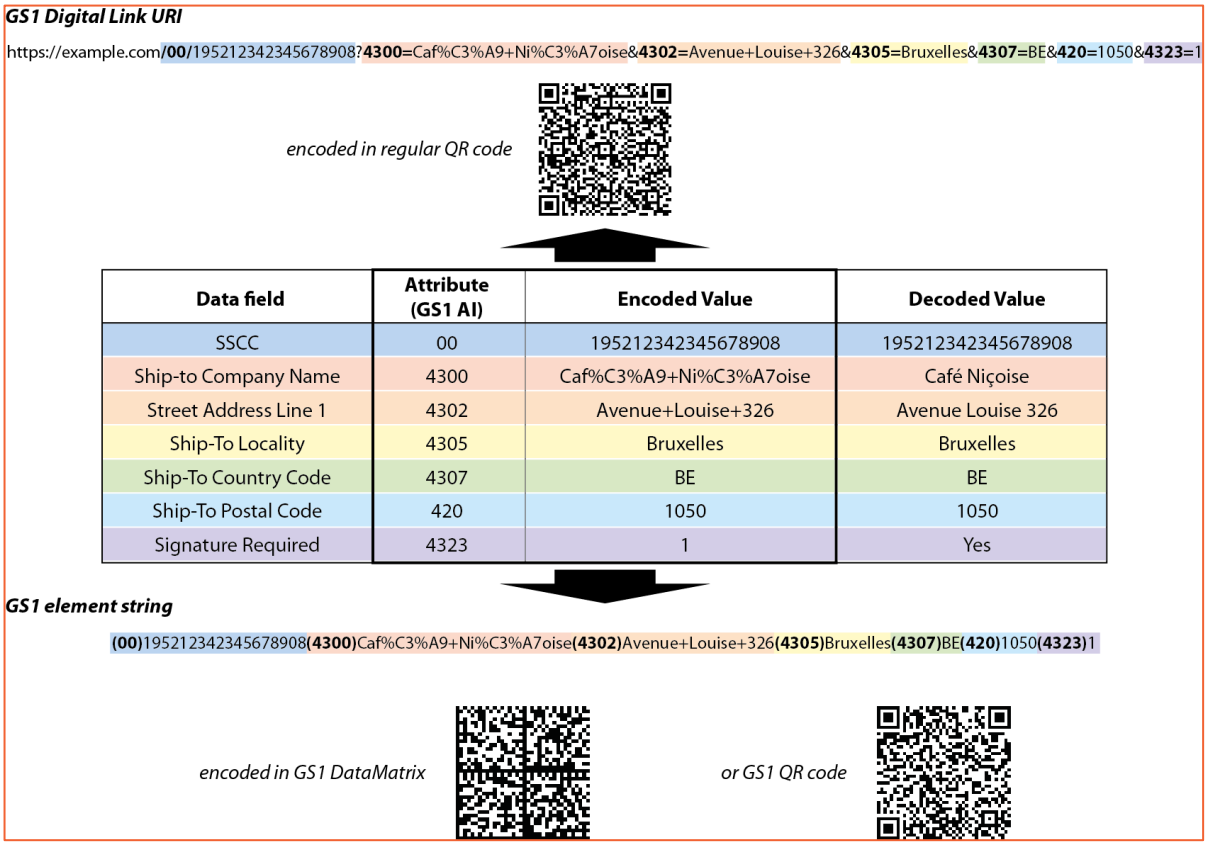
In GS1 barcodes such as GS1 DataMatrix and GS1 QR Code, such attribute:value pairs are expressed as element strings that are concatenated according to rules defined in sections 7.8 and 7.8.5 of the *GS1 General Specifications*.

GS1 Digital Link URI provides an alternative syntax for expressing such attribute :value pairs as a Web URI that can directly link to information and services on the Web. GS1 Digital Link URI can be encoded in data carriers that support the encoding of URLs or Web URIs. These include QR Codes, NFC tags or DataMatrix symbols. Note that NFC tags, along with QR Code and DataMatrix symbols encoded with a GS1 Digital Link URI based on an SSCC are not yet formally approved as a GS1 data carrier.

GS1 Digital Link is a method by which a range of specific business objectives may be achieved. For the purposes of transport, GS1 Digital Link provides a means to encode standardized transport process information within a 2D barcode traveling with a transport unit. This information can be used to support transport business processes in the absence of a connection to a remote database. Conversely, Digital Link can be used to support other applications when an Internet connection is available.

When GS1 Digital Link URI syntax is used within Scan4Transport applications, the SSCC and its value are always encoded within the URI path information, while all other GS1 Application Identifiers are expressed via the URI query string.

The following diagram illustrates the equivalence between the element string notation used in GS1 data carriers such as GS1 DataMatrix and GS1 QR Code and the corresponding GS1 Digital Link URI syntax that could be used within a QR Code or DataMatrix symbol.



DataMatrix ECC 200 and QR Code are 2D symbologies that are not reserved exclusively for GS1 use. They are used by the wider community beyond GS1 and can support native encoding of a URL or Web UR, including a GS1 Digital Link URI. Symbology identifier]d1 indicates DataMatrix ECC 200. Symbology identifier]Q1 indicates QR Code. Throughout this document, these are referred to as 'regular' DataMatrix and 'regular' QR Code, to distinguish them from GS1 DataMatrix and GS1 QR Code described below, which are exclusively used for encoding element string syntax, NOT GS1 Digital Link URI syntax.

Additionally, GS1 approves a specific encoding within DataMatrix and QR Code symbologies, which it uses exclusively for encoding element string syntax. GS1 refers to this practice as GS1 DataMatrix and GS1 QR Code. Symbology identifier]d2 indicates GS1 DataMatrix, while symbology identifier]Q3 indicates GS1 QR Code.

Symbology	Symbology Identifier	Use
'regular' DataMatrix ECC 200	]d1	Encode Web URIs or URLs, including GS1 Digital Link URIs Not reserved for exclusive use by GS1.
'regular' QR Code	]Q1	
GS1 DataMatrix	]d2	Encode GS1 element string syntax. Reserved for exclusive use by GS1
GS1 QR Code	]Q3	

5.1.2 Application identifiers for transport processes

The tables below list the most commonly used Application Identifiers available to support this Implementation Guideline. For a full list of AIs, see https://www.gs1.org/standards/barcodes/application-identifiers

Table 5-5- General Application Identifiers recommended for logistic and transport process information

Application Identifier	Data Content	Format
00	Serial Shipping Container Code (SSCC)	N2+N18
330n	Logistic weight, kilograms	N4+N6
331n	Length of first dimension, metres	N4+N6
332n	Width, diameter, or second dimension, metres	N4+N6
333n	Depth, thickness height, or third dimension, metres	N4+N6
336n	Logistic volume, cubic metres	N4+N6
401	Global Identification Number for Consignment (GINC)	N3+X..30
402	Global Shipment Identification Number (GSIN)	N3+N17
403	Routing Code	N3+X..30
410	Ship-to / Deliver-to Global Location Number	N3+N13
413	Ship for - Deliver for - Forward to Global Location Number	N3+N13
420	Ship-to / Deliver-to postal code within a single postal authority	N3+X..20

Note: Rows of the table below that are shaded in gray indicate Application Identifiers that may require non-Latin characters. To encode non-Latin characters within the alphanumeric value, use percent-encoding as defined in RFC 3986. A space character SHOULD be encoded as a single plus symbol, +.

Table 5-1 New GS1 Application Identifiers created for encoding transport process information

Type	Application Identifier	Data Content	Description	Example
Address Information	**4300**	Ship-to / Deliver-to Company Name	Name of the company receiving the freight unit	Company XYZ
	4301	Ship-to / Deliver-to Contact	Name of the person receiving the freight unit	Jane Doe
	4302	Ship-to / Deliver-to Address line 1	Receiving company / residential street address (Line 1)	Nexus Business Park
	4303	Ship-to / Deliver-to Address line 2	Receiving company / residential street address (Line 2)	8 Nexus Court
	4304	Ship-to / Deliver-to Suburb	Receiving company / residential Suburb	Mulgrave
	4305	Ship-to / Deliver-to Locality	Receiving company / residential Locality (town, city)	Melbourne

	4306	Ship-to / Deliver-to Region	Receiving company Region (state)	Victoria
	4307	Ship-to / Deliver-to Country Code	Receiving company / residential Country	AU
	4308	Ship-to / Deliver-to telephone number	Contact phone number for the receiver of the freight unit. Used to populate the system when no EDI has been received	316091234567
	4310	Return-to Company Name	Company name for the return to address	
	4311	Return-to Contact	Name of the contact freight unit is to be returned to	
	4312	Return-to Address line 1	Return to company / residential street address (Line 1)	
	4313	Return-to Address line 2	Return to company / residential street address (Line 2)	
	4314	Return-to Suburb	Return to company / residential Suburb/Town/City	
	4315	Return-to Locality	Return to company / residential Locality (town, city)	Mulgrave
	4316	Return-to Region	Return to company / residential Region (state)	Victoria
	4317	Return-to Country Code	Return to company / residential Country	AU
	4318	Return-to Postal Code	Return to company / residential Postcode	
	4319	Return-to telephone number	Contact phone number for the Return to company for the freight unit.	
Transport Task	**4320**	Service code description	Freight service code specifies if it is a standard, express, overnight, same day service, etc. This will be unique text from the shipper.	Express
Freight Unit	**4321**	Dangerous Goods Flag	A flag to indicate if the freight unit contains Dangerous Goods	0 (=NO) or 1 (=YES)

Boolean Indicator	**4322**	Authority to leave	This indicates to the operator that he/she may leave the transport unit at the destination location. Implies the operator does not need to hand the transport unit over to a person. Also implies no signature from recipient is required.	0 (=NO) or 1 (=YES)
	4323	Signature Required Flag	This indicates to the operator that the operator must get a signature from the recipient for having delivered the transport unit to the intended destination. This implies that delivery must be made to a person.	0 (=NO) or 1 (=YES)
Delivery Instruction	**4324**	Not before Delivery Date Time	In transportation, it is a common business requirement to not deliver before a set date.	YYMMDDHHMM
	4325	Not after Delivery Date Time	In transportation, it is a common business requirement to deliver before a set date.	YYMMDDHHMM
	4326	Release date	Sometimes transport service providers are required to "hold" transport units for a while before these transport units are allowed to be sent out to recipients.	YYMMDD

5.2 Using transport data elements

To support an application and ensure data is available where and when it is needed, one must consider the different transport activities related to the first and last mile of a delivery, sortation, and administration related to transportation and logistics.

5.2.1 Transport Unit information

A transport unit will have sets of information related to the unit:

- Identification Keys for the Transport Unit;
  We distinguish two types of Transport Unit ID Keys:
  - The GS1 SSCC (Serial Shipping Container Code) as a globally unique unambiguous ID Key.
    Any stakeholder creating transport units may assign an SSCC.
    The SSCC is guaranteed to be unique regardless of who assigned the SSCC.
  - Carrier specific ID keys;
    Carriers currently often uses proprietary ID Keys that are unique within their own network. That enables them to handle the transport units throughout their own network using their own (sophisticated) IT systems.
    For example, the global postal networks use the so-called "S10" ID Key to identify postal transport units uniquely (the Universal Postal Union calls them postal items) across all postal operators participating in the UPU network.
- Physical characteristics of the Transport Unit.
  Information regarding dimensions (width, height and length), volume and weight.

- Service indicator.
  Transport service providers organise and sell their services along a number of different options (e.g. Air vs land transport, expedited vs deferred service, groupage versus parcel, tracked vs non-tracked).
  Operators handling the transport units may use the service indicator to determine the appropriate way to process the transport unit (both physically and in terms of information they need to capture for the unit).
- Carrier specific handling information.
  Many carriers require a so-called "routing code" to be included on the transport label.
  They may use this routing code as (additional) information to enable them to handle transport units in their own network efficiently and effectively.

Using this information an operator may confirm they are handling a transport unit they are supposed to handle as well as determine how/when to handle it (e.g. heavy or bulky transport units may need to be handled with certain equipment and/or first/last).

Note: When the operator uses a device to scan the 2D barcode, which is then processed by an application installed on the device, this application may provide relevant instruction to the operator based on business rules configured in the application.

5.2.2 Address information

Information regarding addresses related to the Transport & Logistics services that are applicable for the transport unit are also needed.

Two different addresses are relevant and may be included in the barcode:

1. The ship-to / deliver-to address;
   Identifies the location of the destination for the transport unit as precisely as possible.
2. The return-to address;
   In case a transport unit cannot be delivered (or is refused), the transport unit may be returned to a location determined by the sender of the transport unit.

An address (be it ship-to or return-to) consist of a number of logical components. The representation of an address (based on these components) varies widely across different countries in the world.

The *Universal Postal Union* has done a lot of good work on analysis of and design for addresses, which they incorporated in global postal standards. This Implementation Guideline leverages the UPU standards.

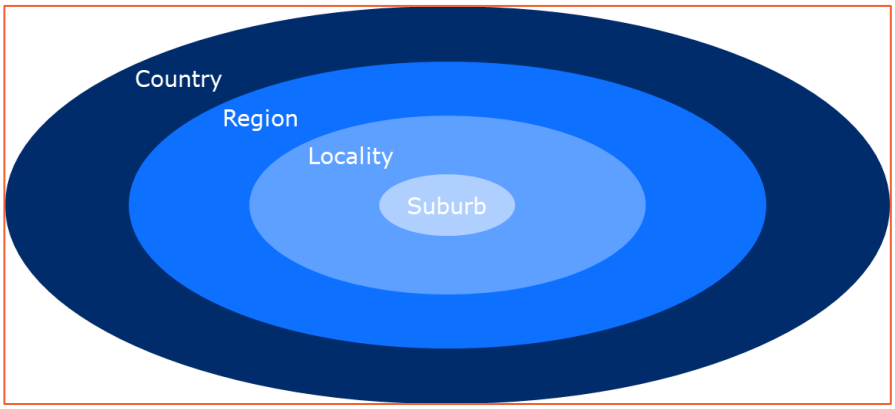
Here are the components (data elements) that may make up an address for transportation purposes.

- Party name (Party may be a company or a consumer)
  E.g. Chris Foster
- Address lines.
  In Scan4Transport, we allow for up to two address line fields.
  E.g., 22 Quebec Street
  Always use address line 1 first, and then address line 2 (if needed).
- Postal Code (e.g. V5T 1G7)
- Country Code according to ISO 3166 Alpha-2 standard (e.g. CA "Canada").
  Always include this data element.
- Region – e.g. British Columbia, Bavaria
- Locality – e.g. Vancouver, Munich
- Suburb – e.g. Mount Pleasant
- Contact information.
  This consists of the following data elements:

- Contact name;
  Information on whom to contact for further enquiries.
  E.g. "Chris Foster";
- Contact Phone:
  E.g. "+1 123 456 7890".

Note-1: There is a logical hierarchy across four of the above data elements for geographical areas that all stakeholders must consider to ensure all stakeholders will interpret these data elements consistently.
That is a pre-requisite to all operators handling the transport unit being able to handle it correctly.
Data element "Country Code" covers the largest geographical area.
The data element "Region" describes an area within the country specified in data element "Country Code".
The "Locality" represents a smaller area within the "Region".
The Suburb represent a smaller area within the Locality.
Therefore, in order of decreasing geographical size we have "Country Code", "Region", "Locality" and "Suburb".
Figure below illustrates this hierarchy.

Figure: *Geographical hierarchy*



Note-2: Address formats vary widely from country, so do the minimum data-elements that need to be available to accurately deliver. Data elements available in many countries do not exist in others (e.g. postal codes). Many other data elements are ambiguous if used on their own. E.g., same street address may appear in a different locality, same locality may exist in different regions.

You will generally need combinations of data elements to ensure uniqueness.
Examples:

1) In many geographies, users should represent the address by the following:
Country Code + Post Code + Street address line 1.
2) In the absence of Postal Codes, you probably need
Country Code + Region + Locality + Street address line 1 (maybe even also street address line 2).

5.2.3 Goods related information

The nature of the Goods that are inside the transport unit may significantly affect how to handle the transport unit properly.

The following data elements are valuable to assist operators in determining if they should handle the transport unit at all and if so, how:

Dangerous Goods indicator.
Transporting Dangerous Goods is subject to legal requirements that can be highly detailed and prescriptive. In many cases, transport operators need specific licenses to handle specific types of dangerous goods. Most logistic service providers are **not** allowed by law to handle dangerous goods (for lack of proper licenses).
The indicator in a 2D barcode would enable the operator to determine quickly whether he/she runs the risk of handling transport units that they are not allowed to handle.

Service code description.

5.2.4 Delivery Instructions

A group of data elements that relate to the activities (business requirements) that the operator needs to take into account when dropping off the transport unit at the final destination.

We distinguish the following data elements for delivery instructions:

- *Signature Required.*
  This indicates to the operator that the operator must get a signature from the recipient for having delivered the transport unit to the intended destination.
  This implies that delivery must be made to a person.
- *Authority to leave.*
  This indicates to the operator that he/she may leave the transport unit at the destination location. Implies the operator does not need to hand the transport unit over to a person.
  Also implies no signature from recipient is required.
  However, this and the above instruction are independent business requirements.
  For a specific transport unit we may specify "Signature Required" is no and we may also specify "Authority to leave" is no.
  In that case, the operator must still hand over the transport unit to a person at the destination location (even though the person does not have to sign for receipt).
- *Not after Delivery Date Time.*
  In transportation, it is a common business requirement to deliver before a set date. Additionally a latest time for the delivery may be specified.
- *Not before Delivery Date Time.*
  In transportation, it is a common business requirement to **not** deliver before a set date. Additionally an earliest time for the delivery may be specified.
- *Release date.*
  Sometimes transport service providers are required to "hold" transport units for a while before these transport units are allowed to be sent out to recipients.
  E.g., when a new product is released and Customers have pre-ordered, the Seller may have promised Customers that orders will be shipped from a specific date onwards.
  The Seller may in fact already have pre-positioned those Customer Orders (Shipments) in several "holding" location in the Delivery networks to ensure speedy delivery to those Customers that have pre-ordered.
  They will then specify to the LSP responsible for those locations that those Orders/Shipments may not be despatched from those holding locations until the date they communicated to the market.
  In this Implementation Guideline, we refer to such a date as the release date.

5.2.5 Transaction Information

Transportation is always executed as a result of one or several transactions among stakeholders.

To be able to link the transport execution back to the relevant transactions, we need to be able to include Identification Keys for those transactions.

We distinguish the following data elements related to transactions:

- *Shipment Identification*.
  Shipment refers to the Trade Transaction between Buyer and Seller of the Goods.
  The Shipment ID remains the same regardless of the number of transport movements that the shipment may travel on during the end-to-end journey from original source of the Goods to the final Destination for the Goods.
  The GS1 Global Shipment Identification Number (GSIN) may be used as ID Key for the Shipment.

- *Consignment Identification.*
  Consignment refers to the Logistics Services transaction that occurs between a Buyer of those services (the Logistics Services Client or LSC) and the Seller of those services (the Logistics Service Provider or LSP).
  As indicated above, a Shipment may travel over several transport movements. Each of those transport movements may be executed under a different logistic services transaction. Whenever the transport movement is executed under a separate logistic services transaction, it will be considered a separate Consignment in this Implementation Guideline.
  GS1 provides the Global Identification Number for Consignments (GINC) as ID Key for Consignments.

Note: These transaction ID Keys are included on the assumption that they are processed by the operator (in the application on his/her device and/or later on when he/she connects with the transport service providers main IT systems).
In that scenario, these references may be used to access relevant additional information related to those transactions.
They may also be used as part of the provision of information on transport execution progress to the relevant stakeholders in those transactions.
This is especially important when it comes to the various administrative processes related to the transactions.

5.2.6 Overview of main delivery scenarios

In various places in this Implementation Guideline, we have indicated that the transport & logistics (T&L) network used for the end-to-end journey of Shipments from Seller to Buyer may take quite different forms.

The configuration of the T&L network affects the way the transport unit labels (and 2D barcodes on them) may be used at the different stages in these T&L networks.

So let us look at the most common T&L network configurations and their main characteristics:

1. *An integrated network under the total control of a single Logistic Service Provider* and little or no outsourcing to subcontracted logistic service providers.
   Some Courier, Express and Parcel carriers claim to operate networks of this kind.
   In fact, they do run parts of their networks like that in a number of geographies (but they do not in every geography they operate in).
   All administrative processes (including financial settlement) for the Shipments are handled between the single LSP and the Logistic Services Client (LSC).
2. *A network operated under the direction of a lead Logistic Service Provider*.
   This kind of network is virtually integrated. The lead Logistics Service Provider (LLP) subcontracts significant parts of the network to other logistic services providers.
   The LLP takes responsibility towards his Logistics Services Client (LSC) to manage the transportation end-to-end and provide information on progress of transport execution across the entire virtual network for the Shipments of the LSC.
   All administrative processes (including financial settlement) for the Shipments are handled between the LLP and the LSC.
   The LLP takes care of all administrative processes related to the subcontracted logistic services (Consignments) with the subcontracted LSPs.
   A good example is the global Postal network.
   The LSC hands the transport unit over to the Postal operator in the origin country. This origin postal operator arranges transportation to the destination country. This operator also "books" the delivery transport movement with the Postal Operator in the destination country.
   The LSC interacts with the postal operator at origin only: booking, paying, tracking end-to-end is all between the two of them
3. *A network operated under the direction of the Seller (Sender of the Goods)*
   In this type of network, the Seller takes care of all interactions with the Logistic Service Providers (LSP) handling the transport units over the lifecycle of the transport units.
   The Sender selects which LSP to use for each transport movement required to transport the Goods efficiently and effectively from Seller to Buyer.
   The Seller books the transport movements (Consignments) with the selected LSP.
   The LSP will execute the transportation. The Seller needs to receive the relevant information on progress of the transport execution.
   The Seller will also take care of all the administrative processes (including financial settlement) with the LSP for services rendered,

It will be clear that the business requirements for the transport unit labels (and thus for the 2D barcodes on those labels) will be quite different in each of those types of networks.

5.2.7 Mapping to GS1 identification keys

It is important that we properly understand the main concepts that we use ID Keys for such as Shipment, Consignment and Transport Unit.

The figure below illustrates the concepts of Shipment and Consignment (as defined by UN/CEFACT, UBL, GS1 and others) and how each of these are identified using the GS1 standards.

Figure 5-1 Consolidated fulfilment – Shipment vs Consignment

The figure shows two trade transactions (Shipments; dotted grey arrows) covering the Sale/Purchase of Goods:
one between Seller A and Buyer A, the other between Seller B and Buyer B.
This Sale typically identifies Product Codes (GTIN), quantities ordered, prices, and delivery terms among other things.

Those two trade transactions (Shipments) result in a number of transport movements (solid grey arrows) to deliver the goods Sold/Purchased. The parties involved in the trade transactions (as Logistic Services Clients or LSC) will arrange these transport movements with their Logistic Service Providers (LSP) resulting in a number of logistic services transactions.

The figure shows five transport movements. We assume here each of these transport movements is executed under a separate logistic services transaction / contract (Consignment).

The trade transaction sent under each Shipment must be identified unambiguously for several reasons[1]. In the figure, we identify each of the two Shipments unambiguously by its own unique Global Shipment Identification Number (GSIN).

Similarly, each of the Consignments should be identified unambiguously for several (other) reasons[2]. In the figure, we identify each of them unambiguously with its own unique Global Identification Number for Consignment (GINC).

The figure also shows various kinds of packaging used to transport the goods in the five consignments. E.g. pallets and different sizes of boxes.

Within the context of this Implementation Guideline, we will use the term "Transport Unit"[3] to refer to an item of any composition established for transport, which needs to be managed through the supply chain. Transport units take many forms, a single box/parcel containing a limited number of

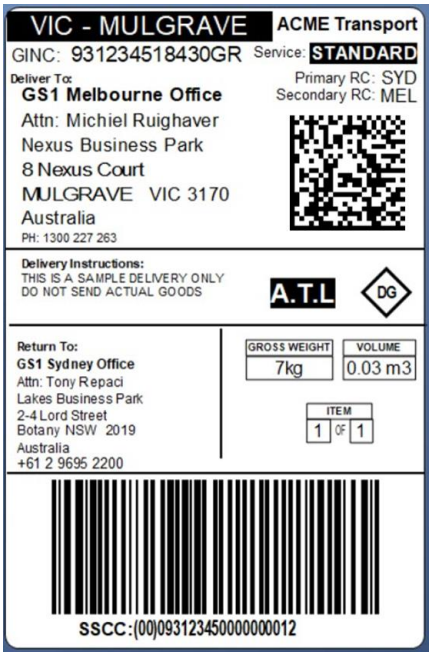
[1] EU VAT Ecommerce package regulations coming into effect 1st July 2021 rely on unambiguous identification of the Sales/Trade transaction. Furthermore, Seller and Buyer of the Goods may base financial settlement between them on this unambiguous identification (GSIN).
[2] For instance, financial settlement for the logistic services between the LSC and LSP may be based on this unambiguous identification (GINC).
[3] In line with ISO/IEC 15459-1

products (in e-commerce often just one), a pallet of multiple products, or an intermodal container containing multiple pallets.

The GS1 ID Key for a transport unit is the Serial Shipping Container Code (SSCC).

Transport units must be labelled in order to enable handling them efficiently and effectively. As indicated in the Vision section above, once a transport unit has been labelled, all stakeholders handling the transport unit should use that label over the life of the transport unit.

The figure to the right shows a sample label with a linear GS1-128 barcode and a 2D barcode (compliant with this Implementation Guideline).



For this label, take note of several points:

- At the bottom of the label, there is the GS1-128 barcode (linear barcode) that contains the SSCC, which unambiguously identifies the unit over its entire lifetime.
- The middle of the label contains a GS1 2D barcode, which also contains the SSCC. This is valuable because scanning the 2D barcode can capture all relevant data elements in a single scan.
- Not all stakeholders may be able to scan and use 2D barcodes. Providing a linear barcode with the SSCC ensures the transport unit may be handled effectively and efficiently.

Note: The sample label shown here was taken from the GS1 Logistics Label Guideline (Release 1.3). Please always refer to the *current GS1 Logistic Label guideline* when designing and programming the creation of labels attached to transport units.

PART II - RULES

6 Identification rules

6.1 Identification keys

A key is an attribute (or group of attributes) of an entity that serves to uniquely identify that entity, within some specified domain of entities.

6.2 SSCC

The Serial Shipping Container Code (SSCC) provides functionality to support the management (tracking, tracing, storage, etc.) of logistic units through the supply chain. To ensure global uniqueness and traceability, the physical builder of the logistic unit or the brand owner of the logistic unit is responsible for the allocation of the SSCC.

6.3 GSIN

An individual Global Shipment Identification Number (GSIN) is a unique number, which remains the same for the life of the grouping of logistics or transport units to which it is assigned. When assigning a GSIN, the rule is that an individual GSIN number must not be reallocated within ten years of the shipment date from the seller or third party logistics provider (sender) of the GSIN to a trading partner buyer (recipient) to comply with the regulations of the World Customs Organisation (WCO). GSIN meets the requirements for UCR (Unique Consignment Reference) according to the WCO. For goods that circulate within one country (domestic transport), the period of reuse is based on either governmental, industry or the discretion of the seller (sender) of the goods. The GSIN SHALL be assigned by the Seller of the Goods

6.4 GINC

An individual Global Identification Number for Consignment is a unique number, which remains the same for the life of a grouping of logistics or transport units to which it is assigned. When assigning a GINC, the rule is that an individual GINC number must not be reallocated within one year of the shipment date from the freight forwarder assigning the GINC to a transport. However, prevailing regulatory or industry organisation specific requirements may extend this period.

The GINC SHALL be assigned by the LSC or by the LSP involved in the Logistic Services transaction.

6.5 GS1 Company Prefix (GCP)

The GS1 Company Prefix is included at the beginning of the GS1 identification keys and so establishes global uniqueness (see section 9 for more information).

- The GS1 Company Prefix SHALL only be used to issue keys by or on behalf of the company that is the licensee of the GS1 Company Prefix, in accordance with the key allocation rules specified in GENSPECS section 4 Application rules and management practices.
- When the ownership or legal structure of the company that assigned the key changes, for example due to a merger, acquisition, split or spin-off, the responsibility for the GS1 Company Prefixes SHALL be re-arranged according to the rules in GENSPECS section 1.6 Allocation.

7 Scan4Transport label rules

7.1 Creating the Scan4Transport label

Only the Seller (Sender) of the goods, who creates the transport units when packing the goods into those units for transport, knows the relevant set of information. For that reason, the sender should allocate the SSCC and generate the label for the transport unit.

7.2 Minimum data elements

When creating a Scan4Transport compliant transport label an SSCC (00) is the required identifier.

If the 2D barcode is intended to support ship-to address information, the following data elements are recommended as a minimum:

- SSCC (00)
- Ship-to / Deliver-to address line 1 (4302)
- Ship-to / Deliver-to postal code within a single postal authority (420)

Other data elements may also be included as a transport company deems necessary for a particular transport service, customer, or geographical destination. The Implementation Guideline defines these other data elements and allows for a user to include those data elements necessary to support their business.

Note: The nature of the Digital Link standard allows for other information to be accessible via a network connection. Additionally, adding many data elements to the 2D barcode may create a barcode that is larger than a transport label can accommodate.

7.3 Additional barcodes

A Scan4Transport label SHALL include a GS1-128 barcode encoding the SSCC along with the two-dimensional barcode containing Scan4Transport data elements.

PART III – IMPLEMENTATION

8 Two approaches to Scan4Transport

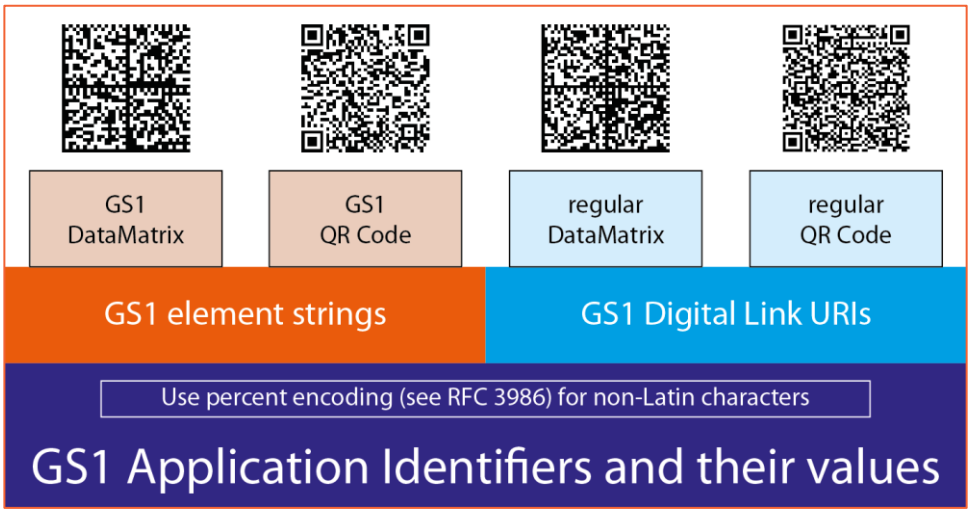
When implementing Scan4Transport, user organisation may choose one of two main approaches: Please refer to the Figure "Two approaches to Scan4Transport".

- Build on the current GS1 2D barcodes (GS1 DataMatrix and GS1 QR code).
  In this approach, user organisations will use GS1 2D barcodes on the Logistic Label.
  All data elements encoded have to comply with the current rules for the GS1 barcodes.
  One of those rules is that user organisations must use the GS1 element string rules and then encode the information in the GS1 2D barcode.
- Build on the GS1 Digital Link standard.
  In this approach, the user organisation will use non-GS1 (referred to as "regular") 2D barcodes (DataMatrix and QR code) on the Logistic Label.
  The content for the regular 2D barcodes will have to comply with the Digital Link rules.
  One of those rules is that the barcode content must be constructed as a Digital Link URI (Uniform Resource Identifier).

Both approaches use GS1 Application Identifier and value pairs to construct the content of the 2D barcode.

In both approaches, "special characters" may still be included in the barcode using the percent encoding approach described in RFC 3986. In this context, "special characters" are characters that are not included in the character set allowed for the specific type of barcode.

Figure - Two approaches to Scan4Transport



9 Mapping address data elements to Application Identifiers

Address formats vary widely from country to country. Local conventions for writing are different e.g. some countries will generally write the house number before the street name whereas in other countries people will always write the house number after the street name. Many more local variations related to other data elements that make up an address exist.

For correct interpretation by systems, we need to provide unambiguous standard ways to structure the components of an address in order for the Scan 4 Transport approach to work well across large numbers of stakeholders implementing the S4T approach.

In this chapter, we have included a number of sample addresses from various parts of the world and indicated which GS1 Application Identifiers should be used to identify each of the address data elements.

The guidance provide here is based on globally widely accepted and implemented approaches such as those followed by the UPU (Universal Postal Union) and schema.org.

Note: In below examples we consistently use AI 420 (Postal Code) and AI 4307 (Country Code) to include these two data elements separately rather than using AI 421 which combines country code and postal code. We recommend user organisations implementing Scan4Transport adopt this as common practice.
The main reason for this is that many (even most) transportation is within a single country. For domestic transport, we can then suffice with including AI 420 (and omit AI 4307), making the QR code smaller or allowing more other data elements to be included.

9.1 Sample addresses

GS1 Japan
Place Canada, 7-3-37 Akasaka, Minato-ku,
Tokyo JAPAN 107-0052,

Data Element	Representation	Description	Example	Context
Ship-to / Deliver-to Company	4300	Name of the company and/or per receiving the freight unit	GS1 Japan	Japan
Ship-to / Deliver-to Address line 1	4302	Receiving company/residential street address line 1	Place Canada, 7-3-37 Akasaka	Japan
Ship-to / Deliver-to Suburb	4304	Receiving company/residential Suburb	Minato-ku	Japan (City)
Ship-to / Deliver-to Locality	4305	Receiving company/residential Locality	Tokyo	Japan (Prefecture)
Ship-to / Deliver to postal code within a single postal authority	420	Ship to / Deliver to postal code	107-0052	Japan
Ship-to / Deliver-to Country Code	4307	ISO 3166 Alpha-2 code for the Country	JP	Japan

GS1 France
21, boulevard Haussmann,
75.009 PARIS FRANCE

Data Element	Representation	Description	Example	Context
Ship-to / Deliver-to Company	4300	Name of the company and/or person receiving the freight unit	GS1 France	France
Ship-to / Deliver-to Address line 1	4302	Receiving company/residential street address line 1	21, boulevard Haussmann	France
Ship-to / Deliver-to Suburb	4304	Receiving company/residential Suburb/Town/City	Paris	France (City)
Ship-to / Deliver to postal code	420	Ship to - Deliver to postal code	75009	France
Ship-to / Deliver-to Country Code	4307	ISO 3166 Alpha-2 code for the Country	FR	France

Transport LAMBOLLEY
Zone Industrielle des Feuilles zone A
21 Rue des Entrepôts
SEYSSUEL
(FR) 38200 France

Data	Representation	Description	Example	Context
Ship-to / Deliver-to Company	4300	Name of the company and/or per receiving the freight unit	Transport LAMBOLLEY	France
Ship-to / Deliver-to Address line 1	4302	Receiving company / residential street address line 1	Zone Industrielle des feuilles, Zone A	France
Ship-to / Deliver-to Address line 2	4303	Receiving company/residential street address line 2	21 Rue des entrepôts	France
Ship-to / Deliver-to Suburb	4304	Receiving company / residential Suburb	SEYSSUEL	France
Ship-to / Deliver to postal code	420	Ship-to / Deliver-to postal code	38200	France
Ship-to / Deliver-to Country Code	4307	ISO 3166 Alpha-2 code for the Country	FR	France

977 GS1 Ireland
978 2nd Floor, The Merrion Centre
979 Nutley Lane
980 Donnybrook, Dublin 4
981 County Dublin, D04KF62 Ireland

Data Element	Representation	Description	Example	Context
Ship-to / Deliver-to Company	4300	Name of the company and/or per receiving the freight unit	GS1 Ireland	Ireland
Ship-to / Deliver-to Address line 1	4302	Receiving company/residential street address (Line 1)	2nd Floor, The Merrion Centre	Ireland
Ship-to / Deliver-to Address line 2	4303	Receiving company/residential street address (Line 2)	Nutley Lane	Ireland
Ship-to / Deliver-to Suburb	4304	Receiving company/residential Suburb/Town/City	Donnybrook	Ireland (City)
Ship-to / Deliver to Locality	4305	Receiving company Region – Territories	Dublin 4	Ireland
Ship-to / Deliver-to Region	4306	Receiving company/residential State/Locality	County Dublin	Ireland
Ship-to / Deliver to postal code	420	Ship to - Deliver to postal code	D04KF62	Ireland
Ship-to / Deliver-to Country Code	4307	ISO 3166 Alpha-2 code for the Country	IE	Ireland

982

GS1
300 Charles Ewing Blvd
Ewing Township, NJ 08628 USA

Data Element	Representation	Description	Example	Context
Ship-to /Deliver-to Company Name	4300	Name of the company and/or per receiving the freight unit	GS1	USA
Ship-to /Deliver-to Address line 1	4302	Receiving company/residential street address line 1	300 Charles Ewing Blvd.	USA
Ship-to /Deliver-to Suburb	4304	Receiving company/residential Suburb	Ewing Township	USA (Town)
Ship-to / Deliver-to postal code	420	Ship-to / Deliver-to postal code	08628	USA
Ship-to / Deliver-to Country Code	4307	ISO 3166 Alpha-2 code for the Country	US	USA

GS1 Australia Melbourne Office
Nexus Business Park 8 Nexus Court,
Mulgrave Victoria 3170 Australia

Data	Representation	Description	Example	Context
Ship-to / Deliver-to Company	4300	Name of the company and/or per receiving the freight unit	GS1 Australia Melbourne Office	Australia
Ship-to / Deliver-to Address line 1	4302	Receiving company/residential street address (Line 1)	Nexus Business Park	Australia
Ship-to / Deliver-to Address line 2	4303	Receiving company/residential street address (Line 2)	8 Nexus Court	Australia
Ship-to / Deliver-to Suburb	4304	Receiving company/residential Suburb/Town/City	Mulgrave	Australia (City)
Ship-to / Deliver-to Locality	4305	Receiving company/residential State/Locality	Melbourne	Australia
Ship-to / Deliver-to postal code	420	Ship to - Deliver to postal code	3170	Australia
Ship-to / Deliver-to Region	4306	Ship to - Deliver to	Victoria	Australia
Ship-to / Deliver-to Country Code	4307	ISO 3166 Alpha-2 code for the Country	AU	Australia

10 Support for non-Latin characters

Many of the data elements that the S4T approach created new AI for, will contain characters that cannot be included in the Scan4Transport barcode as-is.

Common examples of such characters are "space" and so-called non-Latin characters such as ä, Ü, ñ, Ô, ç and entire languages (e.g. Korean, Thai, Chinese).

All of the address examples in the previous chapter included "space" characters.

One of the French address examples above included ô (21 Rue des Entrepôts

The characters that can normally be encoded within a barcode are those appearing in the invariant subset of ISO/IEC 646, as shown in Figure 7.11-1 of the GS1 General Specifications. This does not include any non-Latin characters.

Fortunately, the global Unicode standard UTF-8 is widely used in the World Wide Web to define how these so-called "special characters" may be expressed using hexadecimal characters (0-9 and A-F) to identify such characters within the Unicode character code tables. By using UTF-8 in combination with Percent-encoding defined within RFC 3986, it is possible to express any "special" character within a Web URI or within in the string of "allowed" characters that may be encoded in the barcode. This approach ensures that anybody who reads the barcode and decodes it will be able to recreate the correct content for each data element in the barcode even if those data elements contained "special characters". For this reason, the GS1 General Specifications will note that percent-encoded values may appear within the encoding of GS1 Application Identifiers 4300-4306, 4310-4316 and 4320 – and that if such percent-encoded sequences appear, they should be decoded to the corresponding special characters

10.1 Percent encoding (RFC 3986)

RFC 3986 defines how Percent Encoding can be used to represent non-Latin characters within URIs. Each non-Latin character is first converted to UTF-8 and then encoded using percent encoding, where each byte is expressed as a literal percent symbol followed by two hexadecimal characters. RFC 3629 defines UTF-8.

Example:
"Café Niçoise" would be encoded as
Caf%C3%A9+Ni%C3%A7oise

The "é" is encoded as "%C3%A9",
the "ç" is encoded as "%C3A7" and
the space character may be encoded as "%20" or "+" as a special alias for "%20" as per RFC 3986.

Note: Most programming and scripting languages provide built-in commands that support for URL / URI encoding / decoding. These commands take care of percent encoding, although there may be variations in how these work across programming languages.
Typically, these built-in functions don't express space as '+' but instead use %20 – although' '+' is more compact.

The following GS1 Application Identifiers may use percent encoding to express values containing non-Latin characters:

- 4300-4306,
- 4310-4316 and
- 4320.

Example Address:
Av. 9 de Julho, 3183
Apt 125
Jardim Paulista
São Paulo, SP
CEP 01407-000

Ship-to / deliver-to Address one: Av. 9 de Julho, 3183

Ship-to / Deliver-to address two: Apt 125

Ship-to / Deliver-to Suburb: Jardim Paulista

Ship-to / Deliver-to Locality: São Paulo (ã encoded as %C3%A3)

Ship to / Deliver-to Region: SP

Ship-to / Deliver-to postal code within a single postal authority: CEP 01407-000

10.2 Handling of percent encoding in programming.

Many programming languages provide built-in functions for percent-encoding and percent-decoding, as indicated in the table below:

Programming language	Function for percent-encoding	Function for percent-decoding
JavaScript	encodeURIComponent(str)	decodeURIComponent(str)
Java	java.net.URLEncoder.encode(str, StandardCharsets.UTF_8)	java.net.URLDecoder.decode(str, StandardCharsets.UTF_8)
Python	urllib.parse.quote(str)	urllib.parse.unquote(str)
.Net	Uri.EscapeDataString(str) OR HttpUtility.UrlEncode(str)	Uri.UnescapeDataString(str) OR HttpUtility.UrlDecode(str)

Note: The table contains some of the most popular programming environments, but is not intended to be comprehensive.
Consult the manuals / help-functions of your programming environment to determine the appropriate functions to us within your environment.

11 Using GS1 barcode based approach

In this approach, user organisations will use GS1 2D barcodes on the Logistic Label, typically GS1DataMatrix or GS1 QR Code.
All data elements encoded have to comply with the current rules for the GS1 barcodes.
One of those rules is that user organisations must use the GS1 element string rules and then encode the information in the GS1 2D barcode.
As explained in section 10, Application Identifiers 4300-4306, 4310-4316 and 4320 support non-Latin characters within their values provided that these are encoded using percent-encoding.

11.1 Permissible data carriers

Permissible data carriers are detailed in section 2.6.14 *Encoding transport process information* of the *GS1 General Specifications*.

11.2 Example S4T logistic label (using GS1 barcodes)

The image on the right shows a Logistic Label using GS1 (2D) barcodes approach to implement Scan4Transport.

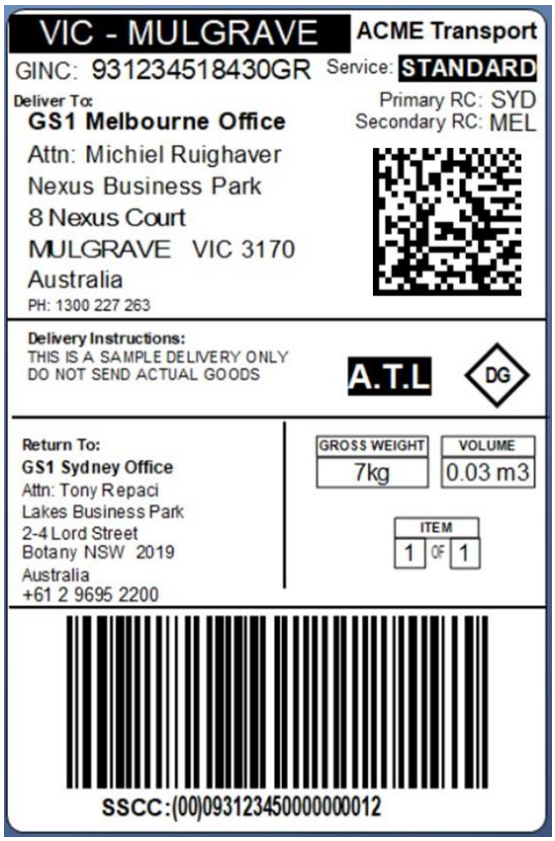
The label still shows the SSCC in the GS1-128 linear barcode format as mandated by GS1 General Specifications and the Logistic Label Guideline. This means more traditional stakeholders in the supply chain may still use the linear barcode to access information regarding the transport unit.

The label also includes a GS1 DataMatrix encoding the following information:

1. AI 00 – SSCC 931234500000000012
2. AI 4307 – Ship-to/Deliver-to Country Code AU
3. AI 420 – Ship-to/Deliver-to Postal Code 3170
4. AI 401 – GINC 93123458430GR
5. AI 403 – Routing Code MEL

Stakeholders able to process the S4T barcode may suffice with scanning the 2D barcode only. They would be able to access additional information regarding the transport unit based on the SSCC. Alternatively, they may use the other data elements in the S4T barcode for handling the transport unit correctly (e.g. during sorting using automated systems).

Figure A-1 S4T label using GS1 barcodes



11.3 Using the GS1 Digital Link Resolver

Even though it is not possible to include a URL in a GS1 barcode, it is still possible implement an online/Web service that handlers of the transport unit may access for the latest up-to-date information regarding the transport unit.

The resolver infrastructure for GS1 Digital Link URIs offers user organisations (usually the seller) the facility to register redirection records within a GS1 Digital Link resolver, to automatically redirect from a GS1 Digital Link URI containing a specific SSCC to the corresponding data about that shipment. Version 1.2 of GS1 Digital Link is expected to introduce URI templates and a standardised ingestion interface for resolvers, so that this can be managed in a scalable generic way, rather than requiring a new referral record for each individual SSCC. For example, it should be possible to configure that SSCCs constructed from a specific GS1 Company Prefix will always redirect to a service operated by the corresponding shipper, with the actual SSCC passed to that service as a parameter, so that the corresponding data for the specific shipment can be returned.

Apps scanning the S4T barcode content may access the GS1 DL resolver using canonical GS1 Digital Link URIs that begin with *https://id.gs1.org/00/* appended with the relevant SSCC value.
e.g. *https://id.gs1.org/00/195212342345678908* when querying for SSCC 195212342345678908.

Note that the GS1 Digital Link resolver operated by GS1 plays two special roles:

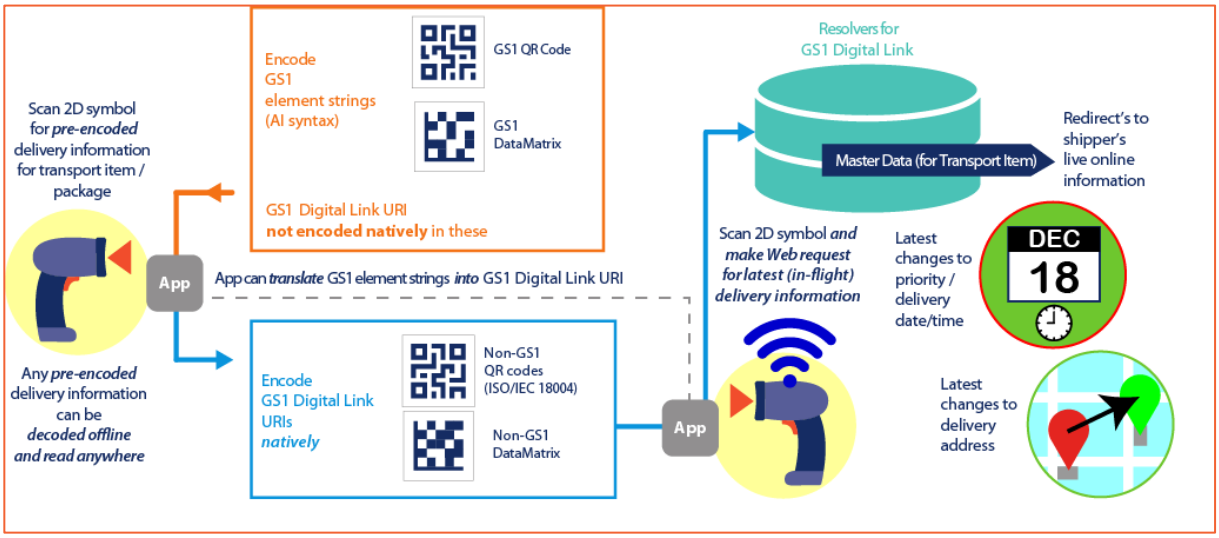
1. It supports canonical GS1 Digital Link URIs using the hostname id.gs1.org . This is useful when a GS1 barcode (e.g. GS1 DataMatrix or GS1 QR Code) does not indicate which domain name to use for the shipper.

2. The GS1 resolver for GS1 Digital Link has a policy of only supporting referral records specified by the respective licensee of an individual GS1 identification key (e.g. GTIN, SSCC) or for the respective licensee of the GS1 Company Prefix from which the GS1 ID key is derived (in situations where a GS1 Company Prefix is licenced to the shipper).

The GS1 DL Resolver would lookup the SSCC value in its registry. If found, the GS1 DL Resolver will automatically redirect the App to the appropriate Web service that the seller registered with GS1 DL Resolver. The App need not even know that the redirection happened.

Clearly, the App would need to be programmed to access the GS1 DL Resolver (composing the URL to access the GS1 DL Resolver based on the barcode content and constructing the GS1 Digital Link URI from the SSCC extracted from the barcode.

The following diagram shows conceptually how GS1 Digital Link supports flexible and automated redirection to various kinds of information resources, in this case for products. However, the same infrastructure also supports redirection to information about shipments, assets, etc.



12 Using Digital Link based approach

12.1 GS1 Digital Link data

GS1 Digital Link is a method by which a range of specific business objectives may be achieved. For the purposes of transport, GS1 Digital Link provides a means to encode standardized transport process information within a 2D barcode traveling with a transport unit. This information can be used to support transport business processes in the absence of a connection to a remote database. Conversely, GS1 Digital Link can be used to support other applications when an Internet connection is available. Note that the GS1 General Specifications currently only recognise GS1 Digital Link for use in consumer-facing applications for extended packaging for products. Prototyping for wider use of GS1 Digital Link in other applications/sectors is underway.

12.2 Permissible data carriers

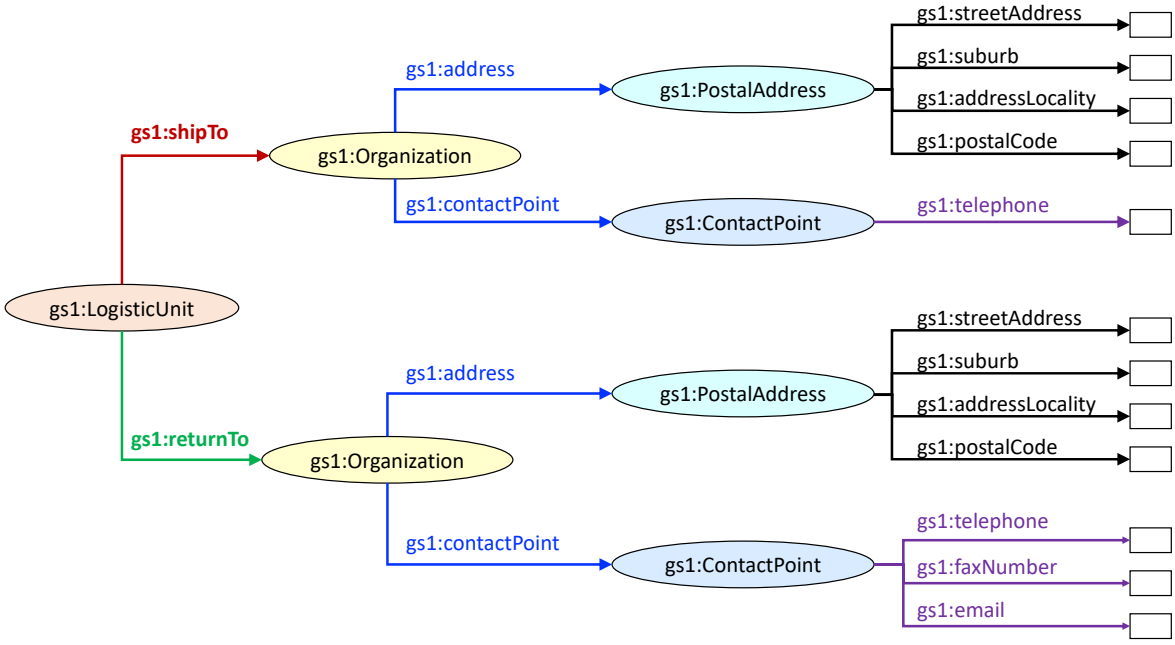
The Scan4Transport compliant transport label should encode relevant transport-process data elements using the GS1 Digital Link syntax (*https://www.gs1.org/standards/gs1-digital-link*) within a two-dimensional barcode, e.g. either a Data Matrix (*ISO/IEC 16022)* or a QR Code (*ISO/IEC 18004*).

12.3 Example GS1 Digital Link URI with S4T data in URI query string

https://TransportUnit.Seller.com/00/395211001001300012 1?4300=GS1+AISBL&4302=Avenue+Louise+326&4305=Bruxelles&4307=BE&420=1050&403=123%2B1021JK%2B0320%2B12%0B&s4t

This could be translated offline to XML or JSON or an HTML table, as shown in the examples of sections 12.4, 12.5 and 12.6. Note that GS1 Application Identifiers only support a flat list of attribute:value pairs in which the attribute is a GS1 Application Identifier such as (4302), whereas GS1 data models such as the *GS1 Web vocabulary* or GDSN data model would typically use a more hierarchical data structure

In these examples, instead of defining two separate XML elements <shipToStreetAddress1> and <returnToStreetAddress1> or properties such as "shipToStreetAddress1" and "returnToStreetAddress1", it is sufficient to define a single XML element <streetAddress> or JSON/JSON-LD property/attribute "streetAddress" and to re-use this within nested parent elements <shipTo><address> or <returnTo><address> in order to distinguish between the ship-to street address line 1 (4302) and the return-to street address line 1 (4312).
The following diagram illustrates this hierarchical data modelling in the GS1 Web vocabulary.



To align with schema.org, the GS1 Web vocabulary models its property / attribute for contact telephone number within a gs1:ContactPoint class, not within the gs1:PostalAddress class. New properties within the GS1 Web vocabulary (expected to be gs1:shipTo and gs1:returnTo) will link a gs1:LogisticUnit to a gs1:Organization. Existing property gs1:address links a gs1:Organization to a gs1:PostalAddress class, while existing property gs1:contactPoint links a gs1:Organization to a gs1:ContactPoint class that includes properties such as gs1:email, gs1:telephoneNumber and gs1:faxNumber. By aligning with this hierarchical approach, there is no need to define two properties for each address data field / attribute, one for the ship-to / deliver-to address, the other for the return-to address.

12.4 Example XML translation

Below is an illustrative example of how the data contained within the Scan4Transport identifiers could be expressed as an XML data structure.

```
<sscc>395211001001300012l</sscc>
<shipTo>
  <address>
    <companyName>GS1 AISBL</companyName>
    <streetAddress1>Avenue Louise 326</streetAddress1>
    <addressLocality>Bruxelles</addressLocality>
    <postCode>1050</postCode>
    <countryCode>BE</countryCode>
  <address>
</shipTo>
```

12.5 Example JSON translation

Below is an equivalent example of the same hierarchical data structure, expressed in JavaScript Object Notation (JSON). This is slightly more compact than XML and may be easier to use in modern programming/scripting languages. The *GS1 S4T Digital Link toolkit* will be capable of translating an element string or GS1 Digital Link URI to such a JSON data structure.

```
{
  "id": "https://TransportUnit.Seller.com/00/3952110010013000121" ,
  "isA": "LogisticUnit",
  "sscc": "395211001001300012 1",
  "shipTo": {
    "isA": "Organization",
    "address": {
      "isA": "PostalAddress",
      "organizationName": "GS1 AISBL",
      "streetAddress": "Avenue Louise 326",
      "addressLocality": "Bruxelles",
      "postalCode": "1050",
      "addressCountry": { "countryCode": "BE" }
    }
  }
}
```

12.6 Example JSON-LD translation and RDF Turtle

Below is an equivalent example of the same hierarchical data structure, expressed in JavaScript Object Notation for Linked Data format (JSON-LD). The *GS1 S4T Digital Link toolkit* will be capable of translating an element string or GS1 Digital Link URI to such a JSON-LD data structure.

```
{
  "@context": {
    "gs1": "https://gs1.org/voc/",
    "rdf": "http://www.w3.org/1999/02/22-rdf-syntax-ns#",
    "rdfs": "http://www.w3.org/2000/01/rdf-schema#",
    "xsd": "http://www.w3.org/2001/XMLSchema#",
    "@vocab": "https://gs1.org/voc/",
    "id": "@id",
    "isA": "@type"
  },
  "id": "https://TransportUnit.Seller.com/00/3952110010013000121" ,
  "isA": "LogisticUnit",
  "sscc": "395211001001300012 1",
  "shipTo": {
    "isA": "Organization",
    "address": {
      "isA": "PostalAddress",
      "organizationName": "GS1 AISBL",
      "streetAddress": "Avenue Louise 326",
      "addressLocality": "Bruxelles",
      "postalCode": "1050",
      "addressCountry": { "countryCode": "BE" }
    }
  }
}
```

RDF Turtle is another Linked Data format complementary to JSON-LD. The above example would probably look like this in RDF Turtle:

```
@prefix gs1: <https://gs1.org/voc/> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
<https://TransportUnit.Seller.com/00/3952110010013000121> rdf:type gs1:LogisticUnit .
<https://TransportUnit.Seller.com/00/3952110010013000121> gs1:shipTo _:b0 .
<https://TransportUnit.Seller.com/00/3952110010013000121> gs1:sscc "395211001001300012 1" .
```



```
_:b0 rdf:type gs1:Organization .
_:b0 gs1:address _:b1 .
_:b1 rdf:type gs1:PostalAddress .
_:b1 gs1:organizationName "GS1 AISBL" .
_:b1 gs1:streetAddress "Avenue Louise 326" .
_:b1 gs1:addressLocality "Bruxelles" .
_:b1 gs1:postalCode "1050" .
_:b1 gs1:addressCountry _:b2 .
_:b2 gs1:countryCode "BE" .
```

12.7 Example HTML Table

A Web page might display the decoded information as a table, as shown below – or even formatted to resemble the layout of a shipping label as shown in the diagram of section 12.8.

Element	Description	Example
00	SSCC	395211001001300012 1
4300	Ship-to Company Name	GS1 AISBL
4302	Ship-to Street Address 1	Avenue Louise 326
4304	Ship-to Suburb	Bruxelles
420	Ship-to Postal Code	1050
4307	Ship-to Country Code	BE (Belgium)

12.8 Example S4T Logistic Label (Digital Link approach)

The image on the right shows a Logistic Label using the GS1 Digital Link approach to implement Scan4Transport.

The label still shows the SSCC in the GS1-128 linear barcode format as mandated by GS1 General Specifications and the Logistic Label Guideline. This means more traditional stakeholders in the supply chain may still use the linear barcode to access information regarding the transport unit.

The label also includes a regular QR code encoding the following information (See next paragraph for more details on the structure of the barcode content):

1. A URI path to Web resource "https://example.com/00/395211001001300121"
2. AI 00 – SSCC 395211001001300121 appears as part of the URI path to the Web resource shown above
3. AI 4307 – Ship-to/Deliver-to Country Code NL
4. AI 420 – Ship-to/Deliver-to Postal Code "1500 KM" (encoded as 1500+KM)
5. AI 403 – Routing Code "123+1021JK+320+12" (encoded as 123%2B1021JK%2B320%2B12)

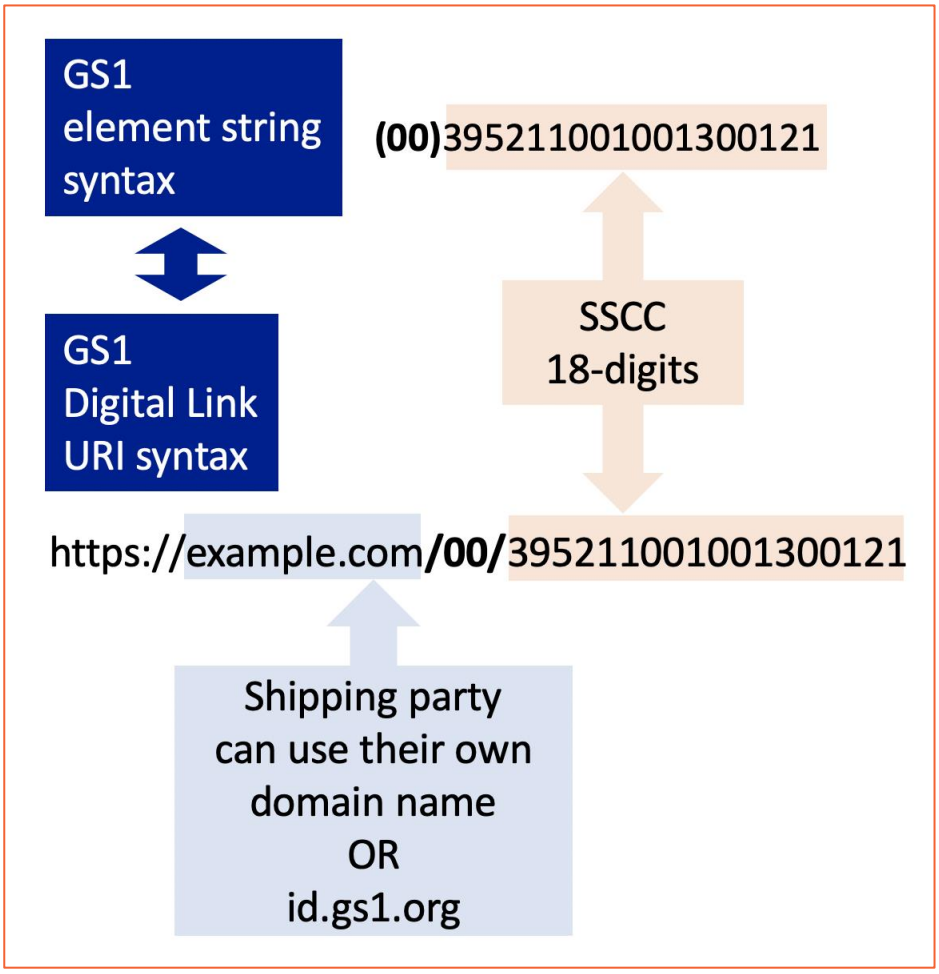
6. An indicator that the QR code contents have been constructed according to the rules for Scan4Transport. This indicator always appears at the end of the URI.
   "&s4T"

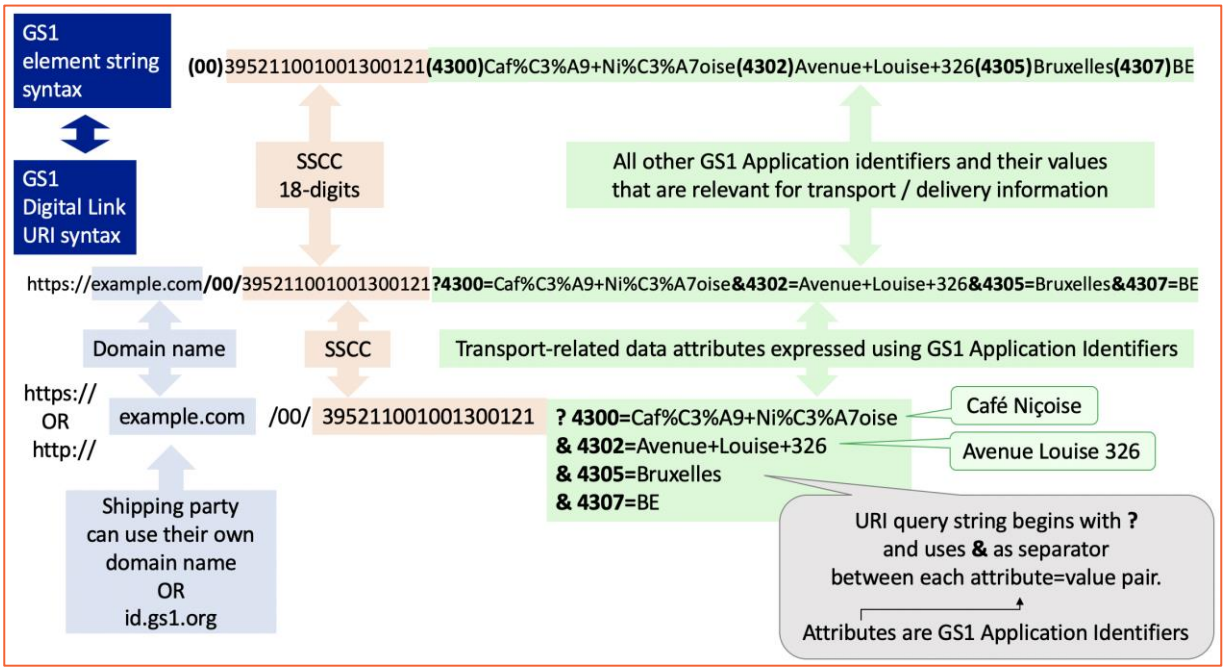
Stakeholders able to process the S4T barcode may suffice with scanning the 2D barcode only. They would be able to access additional information regarding the transport unit based on the SSCC and the URI path to the Web resource.
Alternatively, they may use the other data elements in the S4T barcode for handling the transport unit correctly (e.g. during sorting using automated systems).

12.9 Recommendations for constructing a Digital Link URI

The GS1 Digital Link standard requires that the content of the URI starts with http:// or https:// followed by the hostname and any URI path information. For a GS1 Digital Link URI based on an SSCC identifier, the URI path information consists of /00/ followed by the 18-digit SSCC value.

Within the context of GS1 Scan4Transport, any GS1 Application Identifiers other than SSCC (00) should be expressed in the URI query string, which follows after a "?" delimiter after the URI path information.





In the above examples, we used the URL https://TransportUnit.Seller.com/00/{sscc}

This is best explained processing the URL from right to left.

- {sscc} provides the unique and unambiguous Transport Unit ID.
  This ID Key may be used to find the records with the latest information for the Transport Unit;
- /00/ indicates that the value provided in the {sscc} should be interpreted as a GS1 Serial Shipping Container Code (SSCC)
- *TransportUnit.Seller.com* is the domain name used to access the online/Web service that the Seller of the Products transported within the Transport Unit offers (if any) to provide the latest information to handlers of the transport unit (as well as to other parties involved).

The Scan 4 Transport approach does not require that the URL points to an actual live/operational online/ Web service. The Scan 4 Transport approach delivers many benefits to transport operations based on the other components of the Digital Link URI.

However, as indicated in various places in this document, the information available on the Transport Unit Label may no longer be up to date by the time the handler of the Transport Unit processes the Unit.
In case that handler had access to an online/Web service (using the URL), the handler could avoid processing the transport unit "incorrectly". Imagine a customer who wants to change the Delivery location from his home address to his office address (maybe in the same city and the same handler could make the delivery).

The customer could inform the seller. The seller could simply post the latest information on the Web services that the Seller provides. The handler would immediately see on the mobile device that he/she must now deliver this transport unit to the office address rather than the home address (which is still included in the data on the transport unit label).

By implementing a Web service to provide handlers of the transport unit access to the latest information, the seller has the opportunity to improve the customer experience (avoiding deliveries that do not satisfy the customer).

The shipping company that issues SSCCs may construct GS1 Digital Link URIs using its own domain name or hostname and may operate its own resolver infrastructure or URL rewriting rules within its website to ensure that appropriate data is returned in response to a Web request for a GS1 Digital Link URI containing a specific SSCC.

GS1 makes an open source implementation of a GS1 Digital Link resolver freely available at https://github.com/gs1/GS1_DigitalLink_Resolver_CE

A Acronyms

Abbreviation	Full term
AI	GS1 Application Identifier
AIDC	Automatic Identification and Data Capture
EPC	Electronic Product Code
GCP	GS1 Company Prefix
GLN	Global Location Number
HRI	Human Readable Interpretation
LSC	Logistic Services Client
LSP	Logistic Services Provider
SSCC	Serial Shipping Container Code

B Glossary of Business Terms

Please refer to the *www.gs1.org/glossary* for the latest version

https://xchange.gs1.org/sites/glossary/en-gb

Automatic Identification and Data Capture (AIDC)

A technology used to automatically capture data. AIDC technologies include barcodes, smart cards, biometrics and RFID. [GENSPECS]

GS1 identification key (ID Key)

A unique identifier for a type of objects (e.g. logistic units) or an instance of an object (e.g. a location or a transport unit).

GS1 ID key issuance and allocation

Issuance is the generation of a GS1 Identification Key (ID Key), based on the format and syntax for that key and on the issuance policy of the managing entity.

Allocation is the association of the issued GS1 Identification Key with an object of the type supported by the GS1 Identification Key in accordance with the GS1 rules.

Different entities may be involved in each process. For example, a computer program could be used to do the issuance and a human could be used to do the allocation.
A classic example of this is one where the IT department prepares a spreadsheet of available SSCCs (Serial Shipping Container Codes) for use by the Logistics department. Each SSCC in the spreadsheet is issued, but until the Logistics department actually assign it to a specific logistic unit, it is not considered to be allocated.

GS1 Prefix

A unique string of two or more digits issued by GS1 Global Office and allocated to GS1 Member Organisations to issue GS1 Company Prefixes or allocated to other specific areas. [GENSPECS]

GS1 Company Prefix

A unique string of four to twelve digits used to issue GS1 identification keys. The first digits are a valid GS1 Prefix and the length must be at least one longer than the length of the GS1 Prefix. The GS1 Company Prefix is issued by a GS1 Member Organisation. As the GS1 Company Prefix varies in length, the issuance of a GS1 Company Prefix excludes all longer strings that start with the same digits from being issued as GS1 Company Prefixes. [GENSPECS]

GS1 Application Identifier

The field of two or more digits at the beginning of an element string that uniquely defines its format and meaning.[GENSPECS]

GS1 Digital Link

The expression of the GS1 System of Identifiers on the World Wide Web as defined in the GS1 Digital Link standard.[DIGLNK]

C Measuring Transport Unit dimensions

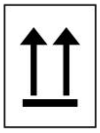
This Implementation Guideline includes separate data elements for dimensions of the transport unit. Data titles for these data elements are Length (AI 331n), Width (AI 332n) and Height (AI 333n).

To ensure an unambiguous understanding of these data elements please follow the guidelines in this Annex.

These guidelines do not (yet) cover all possible shapes and sizes of transport units but they provide some rules that should work for most transport units.

The starting point for determining width, length and height is agreeing on the orientation of the transport unit before starting to determine the values for the dimensions.

The generic rule to determine orientation in this Implementation Guideline is "First establish what the *UP-side* of the transport unit is".



Often the Transport Unit will have markings indicating the UP-side of it. (See example left).

In the absence of such marking, there may be other clear indications of what the UP-side is. E.g.,

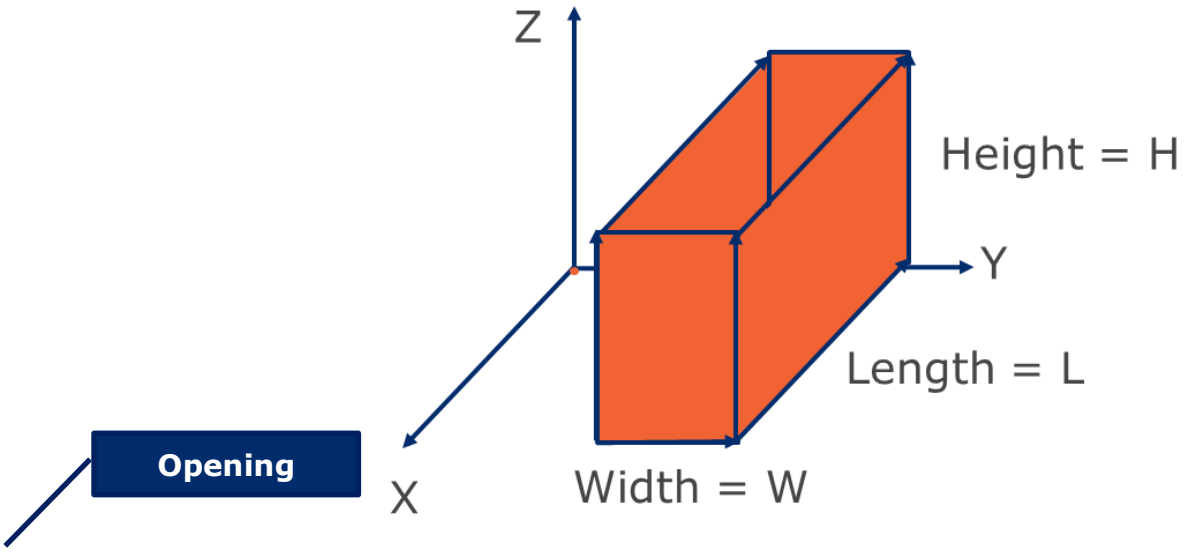
- A beer-keg will have its opening (for filling and connecting to the beer-pump) on its ***UP-side*** (or at least very near to that).
- Cardboard boxes are often closed by adhesive tape over the ***UP-side***.
- Text printed on the side (e.g. "Fragile") is readable only when the transport unit is on its down-side. Clearly, the ***UP-side*** is in the opposite direction.

Once the Transport Unit is in the upright position, we can measure the dimensions.
Below we will assume the Transport Unit is on a horizontal plane when doing the measurements.

As mentioned above there are many different shapes a Transport Unit may take.
Nevertheless, we can apply the below rules to all of those shapes:

1. Measure Height (H) from the horizontal plane up to the highest point of the Transport Unit;
2. Measure Width (W) and Length (L) parallel to the horizontal plane;
3. Width and Length are the greatest distance measured from one side of the transport unit to the opposite side (as projected on the horizontal plane);
4. The Width dimension contains the smaller of the two measurements for Width and Length;
5. The Length dimensions contains the larger of the two measurements for Width and Length

Below example for rectangular objects (e.g. cardboard box or standardised pallets) will assist in understanding how to apply the generic rules.



The X and Y-axes represent the horizontal plane. The Z-axis represents the vertical direction.

In the above illustration, we determined the orientation of the Transport Unit by positioning the "opening" of the box in the direction of the Z-axis. This will be the most common scenario when the Goods are packaged in transport units before despatch from Seller / Shipper.

The opening is the ***UP-side*** of the Transport Unit.

Now that we know the ***UP-side***, we can easily determine the three dimensions of this rectangular object

1. Measure the Height (H) along a vertical rib of the Transport Unit;
2. Measure the Width and Length along two perpendicular ribs in the horizontal plane;
3. Assign the lower of the values measured to the Width dimension and the higher to the Length dimension;

For cylindrical transport units (like kegs), you measure the Height in the same way as for the rectangular transport units. The Width and Length will be the same and equal to the diameter of the cylinder.

For oval-shaped transport units, the width dimension will be the shortest measurement across and the length will be the largest measurement across (both measured along the horizontal plane).

Clearly, there are many more shapes. We should also acknowledge the "ideal" shapes described above, may not always present themselves exactly like that in actual practice.
In those instances, you apply rule 3 mentioned on previous page.

D Contributors

Contributors

Name	Organisation
E-Wan AU	Australia Post Group
Gavin Baxter	Australia Post Group
James Best	Australia Post Group
Jeanne Duckett	Avery Dennison RFID
John Pearce	Axicon Auto ID Ltd
Jan Gustavsson	Bring Frigoscandia AB
Ed Jesus	Chep
Hermann Cluever	Coloplast A/S
Karl Brooks	DHL
Horst Kraus	DHL
Richard Fisher	DoD Logistics AIT Standards Office
Odarci Maia Junior	EMPRESA BRASILEIRA DE CORREIOS E TELEGRAFOS
Stefan Maagaard	Frode Laursen A/S
Michiel Ruighaver (co-chair)	GS1 Australia
Bonnie Ryan	GS1 Australia
Sue Schmid	GS1 Australia
Stephan Wijnker	GS1 Australia
Gerald Gruber	GS1 Austria
Eugen Sehorz (Architecture Group Liaison)	GS1 Austria
Jan Merckx	GS1 Belgium & Luxembourg
Luiz Costa	GS1 Brasil
Ricardo Verza Amaral Melo	GS1 Brasil
Nicole Golestani	GS1 Canada
Yi Ding	GS1 China
Marisa Lu	GS1 Chinese Taipei
Erik Soegaard	GS1 Denmark
Marie Holm	GS1 Denmark
Kimmo Keravuori	GS1 Finland
Tomi-Pekka Juha	GS1 Finland
Xavier Barras	GS1 France
Benjamin Couty	GS1 France
Thierry GRUMIAUX (Community Engagement)	GS1 France
Heide Buhl (Core Team)	GS1 Germany
Phil Archer (Digital Link Expert)	GS1 Global Office
Henri Barthel	GS1 Global Office
Mark Harrison (Digital Link Expert)	GS1 Global Office
Steven Keddie	GS1 Global Office

Dan Mullen (Lead Editor)	GS1 Global Office
Neil Piper	GS1 Global Office
John RYU (Facilitator)	GS1 Global Office
Jaco Voorspuij (Community Engagement)	GS1 Global Office
Stephen Lam	GS1 Hong Kong
Ildikó Lieber	GS1 Hungary
Ankit Arora	GS1 India
Stefan Gathmann	GS1 Ireland
Ilaria Archientini	GS1 Italy
Valeria Franchella	GS1 Italy
Koji Asano	GS1 Japan
Yoshihiko Iwasaki	GS1 Japan
Kazuna Kimura	GS1 Japan
Noriyuki Mama	GS1 Japan
Saúl Plancarte	GS1 Mexico
Raman Chhima	GS1 New Zealand
Owen Dance	GS1 New Zealand
Gary Hartley	GS1 New Zealand
Alexey Krotkov	GS1 Russia
Jonas Buskenfried	GS1 Sweden
Karolin Harsanji	GS1 Sweden
Jiraporn Chalermjirarat	GS1 Thailand
Vivian Underwood	GS1 US
Cornelia Winter	inet-logistics GbmH
Frank Niklaus	Kraftverkehr Nagel SE & Co. KG
Christophe PEREIRA	la poste
Alex Koumaras	Leopard Systems Pty Ltd
Nuno Bento	MixMoveMatch AS
Ricardo Cerceau	Saphety
John Butera	Sick Pty Ltd
Massimo Sacchi	Sick Pty Ltd
James Jamieson	Toll Holdings
Sean Lockhead	USAID GHSC-PSM
Marc Blanchet	Viagenie
Anthony Tanner	VicTas Freight Express

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