The Global Language of Business

Applying GS1 Standards for Supply Chain Visibility in Blockchain Applications

Prepared by the GS1 US Blockchain Cross Industry Discussion Group

Release 1.1 January 30, 2020

Table of Contents

About GS1

GS1® is a neutral, not-for-profit, global organization that develops and maintains the most widely-used supply chain standards system in the world. GS1 Standards improve the efficiency, safety, and visibility of supply chains across multiple sectors. With local Member Organizations in over 110 countries, GS1 engages with communities of trading partners, industry organizations, governments, and technology providers to understand and respond to their business needs through the adoption and implementation of global standards. GS1 is driven by over a million user companies, which execute more than six billion transactions daily in 150 countries using GS1 Standards.

About GS1 US

GS1 US®, a member of GS1 global, is a not-for-profit information standards organization that facilitates industry collaboration to improve supply chain visibility and efficiency through the use of GS1 Standards, the most widely-used supply chain standards system in the world. Nearly 300,000 businesses in 25 industries rely on GS1 US for trading-partner collaboration that optimizes their supply chains, drives cost performance and revenue growth while also enabling regulatory compliance. They achieve these benefits through solutions based on GS1 global unique numbering and identification systems, barcodes, Electronic Product Code-based RFID, data synchronization, and electronic information exchange. GS1 US also manages the United Nations Standard Products and Services Code® (UNSPSC®).

1 Preface

1.1 Introduction

As blockchain for enterprise continues to gain traction across all industries, there is a clear need for a common standard to communicate business processes and the movement of goods through the supply chain in order to realize maximum benefits of blockchain. With enhanced supply chain visibility being a common use case, industries have rallied around the use of GS1 Standards to enable systems interoperability and to uniformly prepare data for external exchange.

GS1 Standards support blockchain the same way that they have enabled other enterprise systems to work together for more than 45 years. They give supply chain partners the ability to share data among different information systems—so they can essentially speak the same language. Standards also enable transactions between partners to be completed with fewer manual look-ups and conversions, or time-consuming follow-up with customers to check basic facts about invoices, credits, delivery receipts, stock numbers, quantities, units of measure, purchase orders and any other data sets being placed on a blockchain.

With GS1 Standards in place, a company testing blockchain is also more likely to commit to effective data quality management overall, with strict data governance and attention to detail before any data is shared externally. Without standards-based collaboration for data sharing systems, supply chain partners risk creating and sharing an inefficient ledger of potentially bad data.

GS1 Standards like the Global Trade Item Number™ (GTIN®), Global Location Number (GLN) and EPCIS (Electronic Product Code Information Services) remove barriers that can be caused by disparate entries and proprietary systems. With particular relevance for blockchain, EPCIS is a GS1 Standard that enables supply chain partners to capture transactional information about supply chain events (e.g., shipped; received; etc.), and to share that information with their trading partners. EPCIS is in use today across various industries and has been found through pilot programs to be well suited for blockchain solutions in order to enhance scalability and interoperability across trading partner networks.

This guide is meant as a brief overview of EPCIS as well as other GS1 Standards that have been used for supply chain visibility across several different types of industries. More than 80 organizations have participated in the publication of this guide including leading manufacturers, distributors, providers, operators, retailers, and associations across the foodservice, retail grocery, healthcare and apparel & general merchandise sectors.

This guidance document was prepared by GS1 US® and the GS1 US Cross-Industry Blockchain Discussion Group to assist industries in understanding the core master data and standards elements needed to support supply chain visibility and traceability in blockchain.

Important: As with all GS1 Standards and solutions, this guideline is voluntary, not mandatory. It should be noted that use of the words "must" and "require" throughout this document relate exclusively to technical recommendations for the proper application of the standards to support the integrity of your implementation.

Important: Each company is individually responsible for meeting all statutory and/or regulatory requirements for their company and their products. Consult with your company's legal counsel or compliance team (regulatory or quality) for more specific information about current statutory and regulatory requirements applicable to your company and products

PART 1: Foundational Concepts

2 Overview of Common GS1 Standards for Visibility

This section provides a brief definition of common GS1 Standards leveraged in EPCIS for visibility. (Refer to the *Appendices* of this document for more information about GS1 Standards that support lot-level management and item-level traceability.)

2.1 Global Location Number (GLN)

The Global Location Number (GLN) is the globally unique GS1 Identification Number for locations and supply chain partners. The GLN can be used to identify a *functional entity* (like a retail store or accounting department), a *physical entity* (like a warehouse or operator location or even a nursing station), or a *legal entity* (like a health system corporation). The attributes defined for each GLN [e.g., name, address, location type (e.g., ship to, bill to, deliver to, etc.)] help users to assure that each GLN is specific to one unique location within the world.

2.2 Global Trade Item Number (GTIN)

The Global Trade Item Number™ (GTIN®) is the globally unique GS1 Identification Number used to identify "trade items" (i.e., products and services that may be priced, ordered or invoiced at any point in the supply chain). GTINs are assigned by the brand owner of the product and are used to identify products as they move through the global supply chain to ultimate end user. The GTIN is used to uniquely identify a product at each packaging level (e.g., a bottle of water; a case of 25 bottles of water, etc.).

2.3 Serialized Global Trade Item Number (SGTIN)

A common term for the combination of a GTIN and serial number

2.4 Global Trade Item Number + Lot/Batch number (LGTIN)

The combination of a GTIN plus batch/lot number

2.5 Serial Shipping Container Code (SSCC)

The Serial Shipping Container Code (SSCC) is the globally unique GS1 Identification Number used to identify individual logistic units (i.e., an item of any composition established for transport and/or storage which needs to be tracked individually and managed through the supply chain). The SSCC is assigned for the lifetime of the transport item and is a mandatory element on the GS1 Logistic Label. SSCCs serve as "license plates" from the carton level to the trailer load level to facilitate simple tracking of goods and reliable look up of complex load detail.

2.6 GS1 Data Carriers

GS1 Data Carriers provide *machine-readable representations* of GS1 Identification Numbers that facilitate automatic identification and data capture. In order to accommodate a variety of environments and applications, the GS1 System supports eight data carriers: six barcode symbologies (i.e., GS1 barcodes) and two RFID tags [i.e., GS1 Electronic Product Code (EPC®)-enabled radio frequency identification tags (EPC/RFID Tags)].

2.7 GS1 Application Identifiers

GS1 Application Identifiers (AIs) are a finite set of specialized identifiers encoded within barcodes to indicate the type of data represented in the various barcode segments. Each AI is a two, three, or four-digit numeric code. (When rendered in human-readable form, the AI is usually shown in parentheses. However, the parentheses are not part of the barcode's encoded data.) Each data element in a barcode is preceded by its AI.

For example, the AI for GTIN is 01. Thus, when "01" appears in the encoded content of a barcode, it means the next 14 digits comprise a GTIN.

There are approximately 100 AIs. There is an AI for each GS1 Identification Number. In addition, there are AIs for various types of secondary information to enable supply chain partners to communicate item-specific information wherever the barcode is scanned (e.g., expiration date; lot number; batch number). EPC Information Services (EPCIS)

The EPC Information Services (EPCIS) standard defines a data-sharing interface that enables supply chain partners to capture and communicate data about the movement and status of objects in the supply chain. The EPCIS specification provides technical standards, as well as a standardized set of service operations and associated data elements. In addition, the EPCIS standard incorporates data standards for how to populate EPCIS data elements. (See Core Business Vocabulary below.)

2.8 Core Business Vocabulary (CBV)

The Core Business Vocabulary (CBV) provides data standards for populating EPCIS data elements. The CBV provides lists of acceptable values for how to express what business process was operating on an object and the status of the object upon exiting the process. It includes syntaxes, vocabularies, and element values (with definitions).

2.9 Global Data Synchronization Network (GDSN)

The Global Data Synchronization Network™ (GDSN®) provides an efficient and effective approach to (1) storing GS1 Identifiers with their associated attributes, (2) checking to make sure that the identifiers and attributes are properly formatted, and (3) sharing that information with supply chain partners. The GDSN is a network of interoperable data pools connected by the GS1 Global Registry®. The GDSN-certified data pools store and manage supply chain information for their users, and the GS1 Global Registry connects those data pools together. The GDSN offers a continuous, automated approach to data management that promotes alignment of supply chain information among trading partners, increasing data accuracy, and driving costs out of the supply chain.

3 Identify

GS1 Identification Numbers globally and uniquely identify supply chain objects (e.g., products, assets, logistic units), as well as supply chain partners and physical locations.

3.1 Identifying Trade Units

3.1.1 GTIN

In the GS1 System of Standards, items are identified with the Global Trade Item Number (GTIN). GTIN is a globally unique, standards-based, identification number for trade items. When a brand owner assigns ("allocates") a GTIN, they define a prescribed set of data about the product to which that GTIN relates. These *product description attributes* define master data that is consistent across all instances of the product (e.g., size, color, brand information). GS1 Standards specify the list of attributes to be defined for each GTIN, as well as the permissible values. Once the GTIN is allocated and the attributes

are defined, the GTIN and its associated attributes are then saved in a database (like a GDSN-certified data pool) and shared among supply chain partners. (The *Master Data* section of this guideline explains how this information can be combined with EPCIS event information to obtain efficient supply chain visibility.)

Note: GS1 US provides an online tool, GS1 US Data Hub®, to support users in allocating GTINs and defining the associated attributes. *Visit http://www.gs1us.org/datahub for more information.*

3.1.2 LGTIN

This is the combination of a GTIN and batch/lot number

3.1.3 SGTIN

This is the combination of a GTIN and serial number

More information can be found on the *GS1 US Getting Started Guide*

3.2 Identifying Parties & Locations: GLN

In the GS1 System, parties and locations are identified with the Global Location Number (GLN). The GLN is a 13-digit, globally unique, standards-based, identification number for legal entities, functional entities, and physical locations. Each company is responsible for assigning (*allocating*) GLNs to its own parties and locations. When a user assigns a GLN, they define a prescribed set of data about the party/location to which that GLN relates (e.g., street address, floor). These GLN attributes define master data about the party/location (e.g., name, address, class of trade), which help to ensure that each GLN is specific to one, very precise location within the world. The GLN and its associated attributes are then saved in a database (like GS1 US DataHub | Location) and shared among supply chain partners.

3.2.1 Assigning GLNs

Each GLN is a numerical string comprising of three distinct segments. The three segments in a GLN are:

- **GS1 Company Prefix:** A globally unique number assigned to a company/organization by GS1 US to serve as the foundation for generating GS1 identifiers (e.g., GTINs, SSCCs). GS1 Company Prefixes are assigned in varying lengths depending on the company/organization's needs.
- **Location Reference:** A number assigned by the holder of the GS1 Company Prefix to uniquely identify a location within the company. The length of the *Location Reference* varies as a function of the GS1 Company Prefix length.
- **Check Digit:** A one-digit number calculated from the first 12 digits of the GLN used to ensure data integrity. GS1 US provides a check digit calculator to automatically calculate check digits for you.

Although the length of the GS1 Company Prefix and the length of the Location Reference vary, they will always be a combined total of 12 digits in a GLN. The addition of the *Check Digit* completes the 13 digits of the GLN. The figure below provides a color-coded example of a hypothetical GLN, and a key explaining how each digit is populated.

More information can be found on the *GS1 US Getting Started Guide*

4 Capture

GS1 Data Carriers provide *machine-readable representations* of GS1 Identification Numbers that facilitate automatic identification and data capture. In order to accommodate a variety of environments and applications, the GS1 System supports eight data carriers: six barcode symbologies (i.e., GS1 Barcodes) and two RFID tags (i.e., GS1 EPC/RFID Tags).

4.1.1 EPC/RFID Tags

EPC/RFID tags use a specialized binary encoding to hold data equivalent to barcode data. Software that reads and writes EPC/RFID tags translates between this binary encoded form and the barcode form (and/or the EPC URI form). See the *EPC Tag Data Standard* for details about how the translations are performed.

4.1.2 Barcodes

Barcodes are symbols that can be scanned electronically using laser or camera based systems. They are used to encode information such as product numbers, serial numbers and batch numbers. There are many types of barcodes, each with a specific use. The most prominent barcode will vary by industry (i.e. GS1-128 is the most common barcode for traceability in foodservice). It is important to understand which barcode is accepted by your trading partners and best for your particular use case. This *GS1 Barcode Chart* gives an overview of the most common barcodes used.

4.2 Translating Captured Data

EPCIS stores identifiers (e.g., GTIN + serial number, SSCC, GLN,) in EPC URI format, which differs from both the AI-based format used in GS1 barcodes and the binary encoding used in EPC/RFID tags. Therefore, identification information read from either barcodes or EPC/RFID tags first need to be translated into EPC URI format in order to be stored in EPCIS.

Most commercial products leveraging RFID and EPCIS standards already have the translation technology integrated into their software so that data read from either barcodes or EPC/RFID tags is automatically translated into EPC URI format when an EPCIS event is created. However, if a company is implementing their own software, they can either write their own translation module or license one of the commercially available software libraries on the market.

In order to translate barcode data into EPC URI format, it is necessary to know the length of the GS1 Company Prefix. To facilitate this, GS1 US has published a table of U.S. GS1 Company Prefixes that you can download and link to your translator/EPCIS to enable your system to access GS1 Company Prefix lengths automatically instead of prompting the user for the information. Alternatively, you can ask your trading partners for the length of their GS1 Company Prefixes and create your own table. (NOTE: EPC/RFID tags already include the length of the GS1 Company Prefix in the encoded binary form. Therefore, no additional lookup is needed to translate binary data from EPC/RFID tags into EPC URI format.)

5 Share

5.1 Master Data

When users assign a GS1 Identification Number, they define a set of standardized information (known as *attributes*) about the object to which that identifier relates. The GS1 System of Standards specifies the list of attributes to be defined for each GS1 Identifier and provides a precise definition as well as

acceptable values and data formats for each attribute. This set of attributes constitutes the "master data" about the object. For example:

- The GTIN is the globally unique GS1 Identification Number used to identify products. Standardized GTIN attributes about products include selling unit, item dimensions, and product classification. Once defined by the user, those attributes then can be stored in a GDSN-certified data pool and shared with supply chain partners using the Global Data Synchronization Network (GDSN).
- The GLN is the globally unique GS1 Identification Number for locations and supply chain partners. Standardized GLN data about locations include name, street address, location type, etc. Once defined by the user, those attributes then can be stored in a database and shared with supply chain partners using GS1 US Data Hub | Location. (Note GLN is a core component of physical event data sharing with EPCIS.)

From there, GS1 Identification Numbers can be encoded into GS1 Data Carriers for identification and automatic data capture and used in supply chain transactions. Because of this, master data, transaction data, and event data related to supply chain objects are all connected by their GS1 Identification Number.

GS1 Identification Numbers provide a link to information, and GS1 Standards for data sharing enable supply chain partners to share data and link it up in their systems to avoid re-entering it for every application that needs the data.

This is especially important for EPCIS applications like traceability where trading partners capture and share information about numerous supply chain events for each product. Use of GS1 Identifiers minimizes the data collected for each event and maximizes the data that can be linked to the event. This enables trading partners to avoid massive duplication of data in their systems by managing master data separately from traceability data. For example, a distributor records a traceability event. The *Object ID* (i.e., GTIN) provides the link to finding master data about the product:

Name: Product X, 50 Tabs

The *BizLocation* (i.e., GLN) provides the link to master data about the location using GS1 US Data Hub | Location:

LocationName: Smithfield Distribution Center
Address: 123 Main Street
City: Lawrenceville
State: NJ **Zip Code:** 08648

Best Practices:

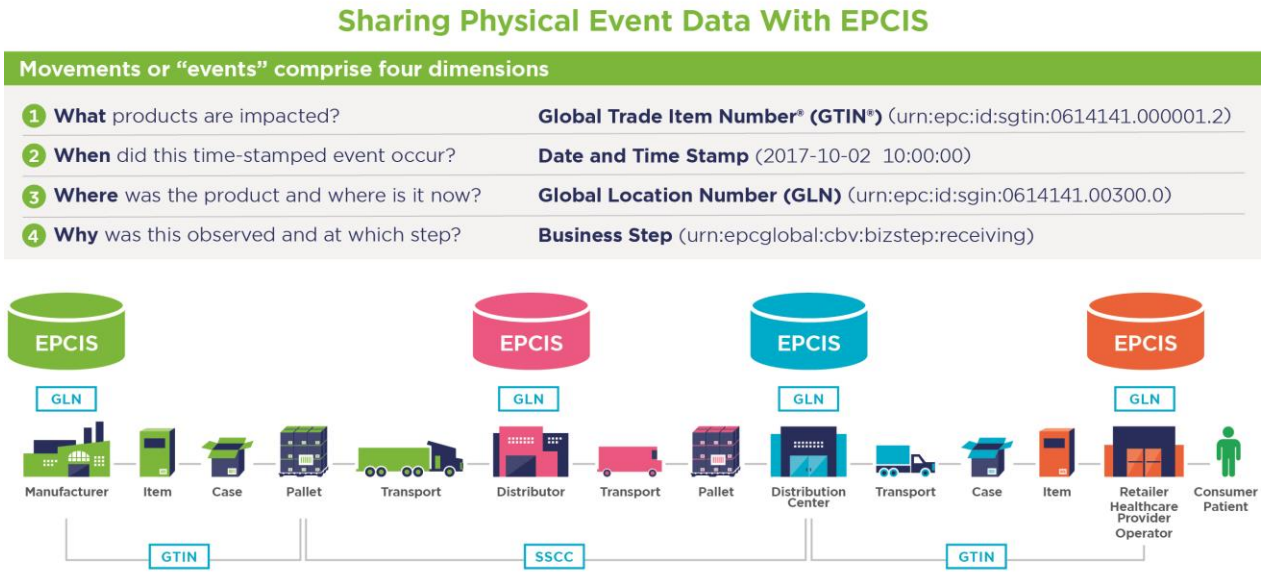
- *Because master data is managed separately from event/traceability data, it is essential to archive the original/previous version of master data whenever master data about products or locations is updated or changed. This will ensure that the historic master data is still available if ever needed after the update.*
- Validate and establish the source and governance of your master data.

5.2 Event Data

Electronic Product Code Information Services (EPCIS) is a GS1 Standard for capturing and communicating data about the movement and status of objects in the supply chain (e.g., products, logistics units, returnable assets). It enables supply chain partners to capture event information about objects as they move through the supply chain (e.g., shipped, received,), and to share that information

with their trading partners securely and in near real-time. EPCIS defines technical standards for a data-sharing interface between applications that capture EPC-related data and those that need access to it. EPCIS also provides data standards for how to express what business process was operating on the object and the status of the object upon exiting the process. For the data standards, EPCIS makes use of a second standard named the Core Business Vocabulary (CBV), which offers a pre-defined vocabulary for a large set of business events and scenarios.

The data elements captured and recorded for each EPCIS event are grouped into four dimensions: *what*, *when*, *where*, and *why*. The *GS1 General Specifications* and the GS1 EPC Tag Data Standard define identifiers for physical objects used in the "*what"* dimension, and identifiers for locations used in the "*where"* dimension. The GS1 EPC Core Business Vocabulary provides lists of acceptable values for *Business Step, Disposition*, and *Business Transaction Type* used in the *why* dimension, as well as the format for the business transaction identifiers used in the *why* dimension. Beyond the four dimensions of *what*, *where*, *when*, and *why* defined in the EPCIS standard, this guideline defines extension fields used to provide additional business data for lot-level management and serialized item-level traceability in certain EPCIS events.



PART TWO: Blockchain Concepts

6 Basics of Blockchain

Blockchain is one component of a broader traceability system. It is not typically considered a means of communication (like standards-based EDI or EPCIS). Nor is blockchain a standalone business application system. This is why the term "blockchain-based applications" is often used.

Blockchains provide a distributed ledger that catalogues transactions in an immutable, time-ordered manner. In their simplest form, they provide proof—or an audit—of a transaction that has happened. They also help to show that data has not been altered.

6.1 Understanding the blockchain layer

It is important to understand the specific requirements of the blockchain layer for a use case, industry or ecosystem.

What data gets stored on a blockchain? The data that gets written to a blockchain ledger can vary depending on the system and/or solution being implemented. The type of data written to a blockchain ledger can be:

1. Fully formed, cryptographically signed plain text event data. There is a concern about scalability and performance if full events are written to a ledger.

2. A cryptographic hash of the data that has little meaning by itself. This requires off-chain data exchange via a separate traceability application and a hash comparison to verify that data hasn't been altered since the hash was written to the ledger.

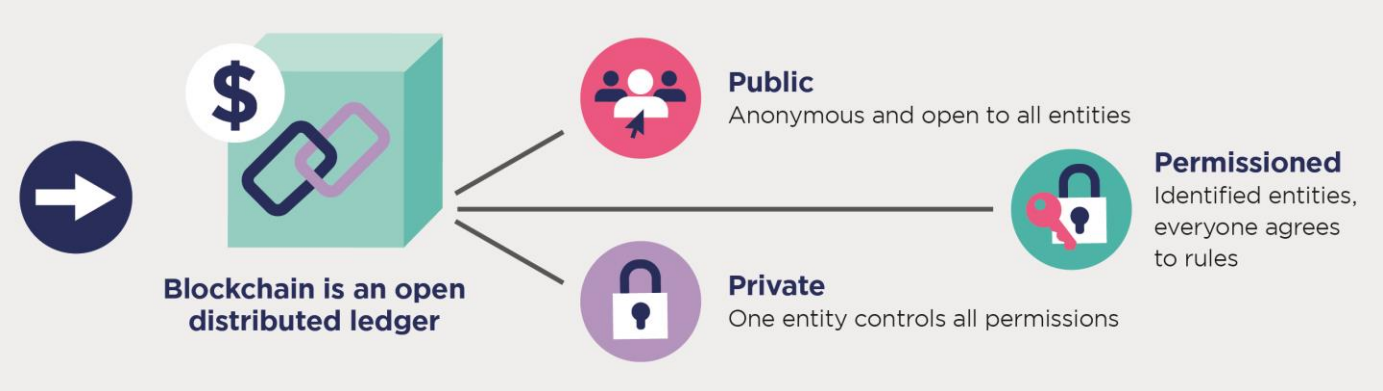
3. A cryptographic hash of the data and a pointer to off-chain data. This is the same as above with a pointer to the off-chain data source. Such an approach can enable the ledger to act as part of a discovery mechanism for parties who need to communicate and share data.

4. Some combination of the above.

5. Potentially many other methods.

Who gets to see the data stored on a blockchain?

The parties who are allowed to see the data that is stored on a blockchain ledger can vary depending on the underlying ledger technology. Options here include:
1. Public: Everyone sees all transactions.
2. Private: This includes a permission layer that makes transactions viewable to only approved parties.



6.2 Interoperability for traceability

How is interoperability for an end-to-end traceability system achieved?

Interoperability refers to the basic ability of different computerized systems to readily connect and communicate with one another, even if they were developed as part of different ecosystems. To ensure interoperability between different ecosystems, four things are needed:

1. Using GS1 standards for unique identification (e.g., batch/lot, Global Trade Item Number® (GTIN®), serialized GTIN, Serial Shipping Code Container, Global Location and more) can enable traceability business applications to exist and may interoperate today (whether or not a blockchain component is part of one or more of the interoperable ecosystems). Here the "what" and "who" of the ledger component must be standardized for an industry solution to be interoperable

2. Using EPCIS as the standardized event data and exchange format makes it possible for all parties that receive data to have a common understanding of the information that is being exchanged.

3. Defining requirements for ledger components is essential, when ledger components are required. Even more, it is important to understand whether or not an end-to-end traceability system for industry requires a blockchain ledger component. There are varying opinions on this across many industries.

4. Establishing inter-ecosystem and ecosystem-to-ecosystem governance is necessary for any data sharing network. This includes establishing policies around how the network participants will operate and share data together.

More information can be found within on the GS1 global website under *Traceability and Blockchain*

PART THREE: Visibility Concept

7 Supply Chain Visibility

7.1 Visibility data within an organization

When it comes to visibility data, an organization should first look at its internal business processes. The organization should identify which steps in those business processes are important from a traceability perspective. Subsequently, the organization will need to establish processes to define and capture all of the relevant data about these business process steps, which will enable the effective use of the data within and outside of the organization. Business processes will extend across a variety of departments of the organization, and therefore a common language is critical to implementations of data capture solutions. At the core of this are two concepts:

- Critical Tracking Events (CTEs)

  These are the actual events that occur to the traceable objects during their lifecycle, such as receiving, transforming, packing, shipping, transporting.

- Key Data Elements (KDEs)

  These are the pieces of data that describe the actual instances of the CTEs. The data will commonly cover the five dimensions (Who, What, Where, When, Why)

End-to-end supply chain visibility extends the responsibilities of the organization to include the exchange of data outside of the walls of any one enterprise.

Each member of the supply chain should, at a minimum, be able to trace back to the direct suppliers of traceable objects and to track forward to the direct recipients of traceable objects (in some cases even including end-consumers). This enables the possibility for all parties to gain access to relevant data further upstream and downstream through queries of direct trading partners (often referred to as a "one-up, one-down" approach.

7.2 Visibility data across supply chains

Supply chains involve multiple operators that are interdependent (in terms of traceability). Whether you are an upstream materials provider or a downstream retailer, all parties trading and/or handling traceable objects have a shared responsibility when it comes to achieving full-chain traceability. Although each party will have its own traceability system, these solutions will need to understand each other and be able to exchange data with each other. This is even true in cases of shared traceability systems (such as vertically integrated retail operations). The design of each individual system will be based on the traceability responsibilities of each party in the end-to-end supply chain and may be influenced by outside forces such as regulation. End-to-end traceability refers to the ability to track and trace an object through its entire life cycle and through all parties involved in its production, custody, trade, transformation, use, maintenance, recycling, or destruction. Traceability requirements may extend from all the way upstream (suppliers of raw materials, ingredients and components) to all the way downstream (customers of finished goods including end-consumers). This necessitates the use of a common language like EPCIS to ensure trading partners have a standardized format to send and receive visibility data. EPCIS visibility data content includes standardized messaging for the following:

-What: What physical objects were involved

-When: When the event took place

-Where: Where the event took place

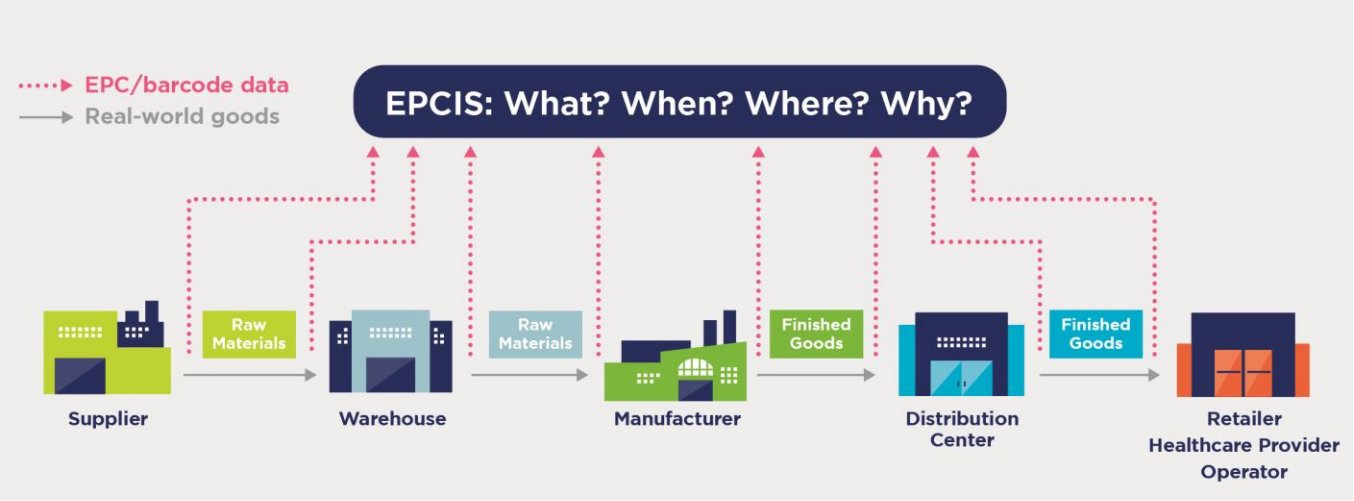
-Why: What business process step was being carried out

7.3 Data Sharing with Trading Partners

There are multiple ways to share EPCIS data with trading partners, below are some examples.

- Point-to-Point messaging (i.e. EDI)
    - Each party keeps its own data
    - Data shared pairwise on a need-to-know basis
    - Straightforward, especially for one-up/one-down sharing
    - Difficult for parties to find each other beyond one-up/one-down
- Centralized shared database (i.e. Cloud Services)
    - All data goes into a single shared database
    - With all data in one place – you always know where to find it
    - Central Party needs to be trusted and agreed upon
- Decentralized shared database
    - All data goes into a shared database
    - Multiple complete copies of everything
    - No need to agree to or trust a central authority
    - ***This is where blockchain resides***

More information on traceability and visibility can be found within the *GS1 Global Traceability Standard*



PART FOUR: Blockchain and Visibility

8 Blockchain and GS1 Standards for Visibility

Blockchain based applications for enterprise can provide a number of supply chain benefits, including:

- Greater visibility of product from origin to end state while in transit
- Business efficiency through automation (smart contracts)
- Increased trust for participants who cannot trade directly or lack an intermediary
- Improved detection and prevention of counterfeit and mislabeled products
- Risk and cyber-attack resilience for data storage (no central location that can be hacked or infiltrated)
- Supports an organization's larger goal of digital transformation and can enable other technological implementation, including the Internet of Things (IoT) and artificial intelligence (AI).

However, in order to maximize the utility of blockchain, a common, standardized language must be spoken between trading partners. The standards outlined in this guide are widely used in industry today and are suitable for blockchain. GS1 Standards enable systems interoperability, which is a critical foundational step to take before a company launches blockchain as it ensures an organization's internal systems are set up to exchange data with external systems. Standards also enable solution choice, as not all companies are going to choose the same technology partner to implement blockchain and not all platforms will run on the same ledger technology. Ultimately, for data-driven organizations leveraging blockchain to accomplish an identified goal, GS1 Standards can create more uniformity, consistency and reliability in underlying business applications, increasing the chances of more successful blockchain implementations.

9 Appendix - GS1 Standards

From an information management point of view, supply chain applications like lot-level management and item-level traceability require all parties to systematically associate the physical flow of products with the flow of information about them. This is best attained by deploying a common business language within the framework of a comprehensive standards system. The GS1 System is such a system, providing a comprehensive platform for companies to identify products and other business entities, capture supply chain data, and share data with trading partners.

The GS1 System of Standards encompasses identification standards, data standards, automatic identification data capture (AIDC) standards, and data communication standards. Table A-1 below summarizes some of the GS1 Standards that support lot-level management and item-level traceability.

Table 1 Overview of GS1 Standards to Support Traceability

GS1 Standards Supporting Lot-Level Management & Item-Level Traceability			
Identification Standards	**Trade Items**	Global Trade Item Number (GTIN)	
	Locations & Trading Partners	Global Location Number (GLN)	
	Logistics Units	Serial Shipping Container Code (SSCC)	
	Individual Assets	Global Individual Asset Identifier (GIAI)	
	Returnable Assets	Global Returnable Asset Identifier (GRAI)	
AIDC Standards	**GS1 Barcodes**	GS1-128 GS1 DataMatrix RSS EAN/UPC ITF-14 Composite Component	
	GS1 EPC/RFID		
Data Standards	**Master Data:** Global Data Dictionary Item Business Messaging Standard Party Business Messaging Standard	**Transactional Data:** eCom/EDI	**Event Data:** EPCIS Schema EPCIS Core Business Vocabulary
Sharing & Communication Standards	**Master Data:** GDSN Data Hub | Location EPCIS Master Data	**Transactional Data:** AS2	**Event Data:** EPCIS Capture EPCIS Query Discovery Services

10 Appendix - Acronyms

AI	Application Identifier
CBV	Core Business Vocabulary
EPC/RIFD	Electronic Product Code / Radio Frequency Identification
EPCIS	Electronic Product Code Information Services
XML	eXtensible Markup Language
GDSN	Global Data Synchronization Network
GLN	Global Location Number
GTIN	Global Trade Item Number
RFID	Radio Frequency Identification
SSCC	Serial Shipping Container Code
SGLN	Serialized Global Location Number (GLN)
SGTIN	Serialized Global Trade Item Number (GTIN)
U.P.C.	Universal Product Code (U.P.C.)
URI	Uniform Resource Identifier
URN	Uniform Resource Name

Proprietary Statement

This document contains proprietary information of GS1 US. Such proprietary information may not be changed for use with any other parties for any other purpose without the expressed written permission of GS1 US.

Improvements

Improvements and changes are periodically made to publications by GS1 US. All material is subject to change without notice. Please refer to GS1 US website for the most current publication available.

Disclaimer

Except as may be otherwise indicated in specific documents within this publication, you are authorized to view documents within this publication, subject to the following:

1. You agree to retain all copyright and other proprietary notices on every copy you make.
2. Some documents may contain other proprietary notices and copyright information relating to that document. You agree that GS1 US has not conferred by implication, estoppels, or otherwise any license or right under any patent, trademark, or copyright (except as expressly provided above) of GS1 US or of any third party.

This publication is provided "as is" without warranty of any kind, either express or implied, including, but not limited to, the implied warranties of merchantability, fitness for a particular purpose, or non-infringement. Any GS1 US publication may include technical inaccuracies or typographical errors. GS1 US assumes no responsibility for and disclaims all liability for any errors or omissions in this publication or in other documents which are referred to within or linked to this publication. Some jurisdictions do not allow the exclusion of implied warranties, so the above exclusion may not apply to you.

Several products and company names mentioned herein may be trademarks and/or registered trademarks of their respective companies. GS1 US does not, by promulgating this document on behalf of the parties involved in the creation of this document, represent that any methods, products, and/or systems discussed or recommended in the document do not violate the intellectual property rights of any third party. GS1 US has not performed a search to determine what intellectual property may be infringed by an implementation of any strategies or suggestions included in this document. GS1 US hereby disclaims any liability for any party's infringement of intellectual property rights that arise as a result of any implementation of strategies or suggestions included in this document.

This publication may be distributed internationally and may contain references to GS1 US products, programs, and services that have not been announced in your country. These references do not imply that GS1 US intends to announce such products, programs, or services in your country.

GS1 US shall not be liable for any consequential, special, indirect, incidental, liquidated, exemplary, or punitive damages of any kind or nature whatsoever, or any lost income or profits, under any theory of liability, arising out of the use of this publication or any content herein, even if advised of the possibility of such loss or damage or if such loss or damage could have been reasonably foreseen.

GS1 US HEREBY DISCLAIMS, AND YOU HEREBY EXPRESSLY RELEASE GS1 US FROM, ANY AND ALL LIABILITY RELATING TO YOUR COMPLIANCE WITH REGULATORY STANDARDS AND LAWS, INCLUDING ALL RULES AND REGULATIONS PROMULGATED THEREUNDER. GS1 US MAKES NO WARRANTIES OF ANY KIND RELATING TO THE SUITABILITY OF THE GS1 STANDARDS AND THE SPECIFIC DOCUMENTS WITHIN THIS PUBLICATION TO COMPLY WITH ANY REGULATORY STANDARDS, LAWS, RULES AND REGULATIONS. ALL INFORMATION AND SERVICES ARE PROVIDED "AS IS."

*GS1 US employees are not representatives or agents of the U.S. FDA, and the content of this publication has not been reviewed, approved, or authorized by the U.S. FDA. The following information contained herein is for informational purposes only as a convenience, and is not legal advice or a substitute for legal counsel. GS1 US Inc. assumes no liability for the use or interpretation of the information contained herein.

No Liability for Consequential Damage

In no event shall GS1 US or anyone else involved in the creation, production, or delivery of the accompanying documentation be liable for any damages whatsoever (including, without limitation, damages for loss of business profits, business interruption, loss of business information, or other loss) arising out of the use of or the results of use of or inability to use such documentation, even if GS1 US has been advised of the possibility of such damages.

IAPMO

In this publication, the letters "U.P.C." are used solely as an abbreviation for the "Universal Product Code" which is a product identification system. They do not refer to the UPC, which is a federally registered certification mark of the International Association of Plumbing and Mechanical Officials (IAPMO) to certify compliance with a Uniform Plumbing Code as authorized by IAPMO.

*If applicable

GS1 US Corporate Headquarters

Princeton South Corporate Center, 300 Charles Ewing Boulevard
Ewing, NJ 08628 USA
T +1 609.620.0200 | **E** info@gs1us.org

www.gs1us.org

Connect With Us