



The Global Language of Business

# Analysis and Recommendations – GPC and GDSN

GS1 Architecture Group Finding

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## Log of Changes

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1.0	April 2020	Benjamin Couty	Approved at GS1 Architecture Group meeting of 1 April 2020.

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# Table of Contents

<b>1</b>	<b>Introduction .....</b>	<b>7</b>
1.1	Audience.....	7
1.2	Assumptions.....	7
1.3	Scope of work.....	7
<b>2</b>	<b>Context .....</b>	<b>7</b>
2.1	Definition .....	7
2.1.1	Product Taxonomy: .....	7
2.1.2	Product Classification: .....	7
2.1.3	Characteristic (of a product): .....	8
2.1.4	Product Information: .....	8
2.2	Introduction to GDSN and GPC .....	8
2.2.1	GDSN .....	8
2.2.2	GPC .....	8
2.2.3	Existing process determination GPC vs. GDSN attributes.....	9
2.3	Current Implementation of GDSN and GPC .....	11
2.3.1	GDSN Implementation.....	11
2.3.2	GPC bricks and attributes implementation in GDSN Trade Item messages.....	11
2.3.3	Other implementation of GPC bricks and attributes .....	12
2.4	GPC and GDSN Standard Management Process .....	13
2.4.1	GPC SMG .....	13
2.4.2	GMD SMG .....	13
2.5	GPC and GDSN implementation by end-users .....	13
2.6	Other works and standards related to this topic .....	14
<b>3</b>	<b>Analysis (focused on GPC attributes in GDSN messages) .....</b>	<b>15</b>
3.1	Analysis according to GS1 architecture principles .....	15
3.2	Problem Statement .....	16
3.2.1	Business .....	16
3.2.2	Technical .....	16
3.2.3	Governance.....	16
3.2.4	Architecture .....	17
<b>4</b>	<b>Conclusions and first architecture and governance recommendations.....</b>	<b>17</b>
4.1	General conclusions.....	17
4.2	Recommendation 1: Remove GPC attributes from GDSN messages .....	17
4.3	Recommendation 2: Define a semantic ontology or data model and taxonomy (point 4 in the General conclusions).....	18
4.4	Governance recommendation: One SMG for GPC and GDSN .....	18
<b>5</b>	<b>Affected Documents.....</b>	<b>18</b>
<b>6</b>	<b>Annex: Other possible options that were evaluated for standard update....</b>	<b>19</b>
6.1	Keep GDSN and GPC attributes and exchange both through GDSN .....	19
6.2	Keep GDSN attributes for B2B information and GPC attributes for B2C information.....	19



6.3 A note regarding accessing product master data expressed using the GS1 Web vocabulary and the use of Semantic Web / Linked Data standards to unify the data models..... 19

**7 Parking lot: Observations we made during the analysis process..... 24**

7.1 About GPC characteristics and release management..... 24

7.2 About technical information management in GDSN..... 24

7.3 Technical comparison between GDSN & GPC..... 24

7.4 Misalignment between GDSN and EDI standards regarding the implementation of the BMS Shared Common Library..... 25

# 1 Introduction

## 1.1 Audience

This document is intended primarily as a reference for GMD and GPC Standard Management Groups, the teams responsible for the Global Standard Management Process and the GS1 Global Data Dictionary.

## 1.2 Assumptions

The reader is assumed to be generally familiar with GS1 Global Master Data and GPC standards. In particular, for the Global Master Data, standards such as GDSN and GS1 Web Vocabulary will be mentioned throughout this document.

## 1.3 Scope of work

The scope of work for this document is to answer the following questions:

The use of GPC attributes in GDSN is causing duplication of information. For instance:

There are 2 solutions to express colour of wine in GDSN:

- TradeItemDescriptionInformation/Colour (external codelist or text)
- GPC Attribute « 20000217 » (GS1 codelist)

There are 2 solution to express that a milk is organic in GDSN:

- OrganicInformation/OrganicClaim/organicTradeItemCode (100%, organic (95% by weight), Made with (70% by weight), ..., not organic, in conversion ...)
- GPC attribute « 20000142 » (yes/no)

There are 2 solutions to indicate the composition of a non-food product (for instance, for table cutlery)

- TradeItemMaterial/TradeItemMaterialComposition/materialCode (GS1 code list+ content or percentage ...if needed)
- GPC attribute « 20000794 » (GS1 code list)

Can the Architecture Group make some recommendations about how to solve this duplication issue between GPC and GDSN attributes when product information is shared using GDSN ?

# 2 Context

## 2.1 Definition

### 2.1.1 Product Taxonomy:

Taxonomy is the process of naming and hierarchically classifying products into groups within a larger system, according to their similarities and differences.

### 2.1.2 Product Classification:

Systematic distribution of product having common characteristics into classes or categories, in particular in order to facilitate their study, trade statistics for comparison, for customs procedures or to manage product assortment and find related products.

### 2.1.3 Characteristic (of a product):

A characteristic is a defined property of a product. A characteristic can be a technical and precise functionality, a physical evaluation (weight, height ...)... The characteristics allow comparison with similar products.

### 2.1.4 Product Information:

Product information is a collection of characteristics of a product which includes its benefits, form, presentation, price, purpose, ingredients or material composition, technical specifications, etc. Good product information should include a detailed description of the product, the utility of the product and its special features which differentiate it from the unique selling points of other products.

Product information may contain product classification and characteristics and be expressed using a product taxonomy.

## 2.2 Introduction to GDSN and GPC

### 2.2.1 GDSN

The Global Data Synchronisation Network (GDSN) is an internet-based, interconnected network of interoperable data pools and a global registry that enable companies around the globe to exchange standardised and synchronised supply chain data with their trading partners. It assures that data exchanged between trading partners is accurate and compliant with universally supported standards. GDSN is built around the GS1 Global Registry, GDSN-Certified Data Pools, the GS1 Data Quality Framework, and GS1 Global Product Classification, which when combined provide a powerful environment for secure and continuous synchronisation of accurate data messages using GS1 XML standards (called GDSN Trade Item messages). Trade items are identified using the GS1 identification key called Global Trade Item Number (GTIN). Partners and locations are identified by the GS1 identification key called Global Location Number (GLN). A combination of GTIN, GLN and Target Market (the geographical area where the catalogue item is intended to be sold) allows information to be shared in the Network through Trade Item messages containing attributes (called GDSN attributes or GDSN Trade Item attributes in the rest of the document). GDSN allows trading partners to share the latest information in their systems. Any changes made to one company's database can be automatically and immediately provided to all of the other companies who subscribe to the data through GDSN. When a supplier and a customer know they are looking at the same accurate and up-to-date data, it is smoother, quicker and less expensive for them to do business together. The GDSN provides a single point of truth for product information.

All GDSN messages are described in a Business Message Standard document (“GDSN Trade Item Module Library Business Message Standard” for the GDSN Trade Item Message)

All GDSN Trade Item attributes, as all GS1 XML messages attributes, are listed in the GS1 Global Data Dictionary (GDD).

### 2.2.2 GPC

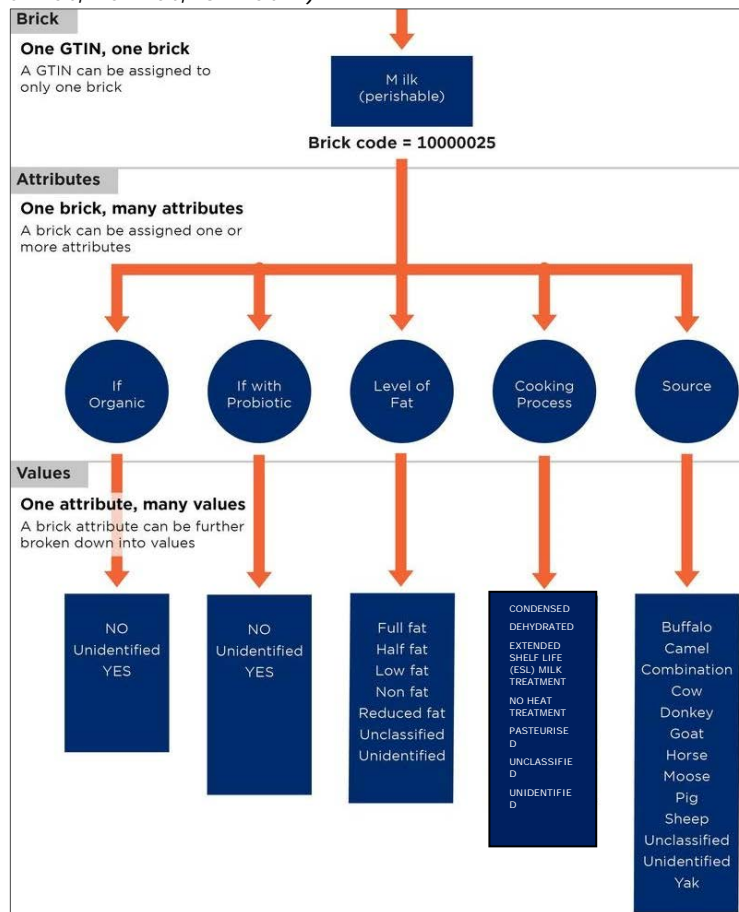
The GS1 Global Product Classification (GPC) standard, as a “pivotal” classification, helps global trading partners to group products in the same way, everywhere in the world. The resulting common business language is clear and instantly understandable.

The building block of GPC is a product code known as a brick. There are bricks for everything from a car to a bottle of milk. The highest level of the classification is a segment, which is defined as a particular industry. For example, a bottle of milk belongs to the food, beverages and tobacco segment.





The lowest level of the classification system is called a brick. Bricks can be extended using brick attributes which are defined as a particular product detail. For example, you can specify the level of fat claim for milk (Full fat, half fat, low fat ...).

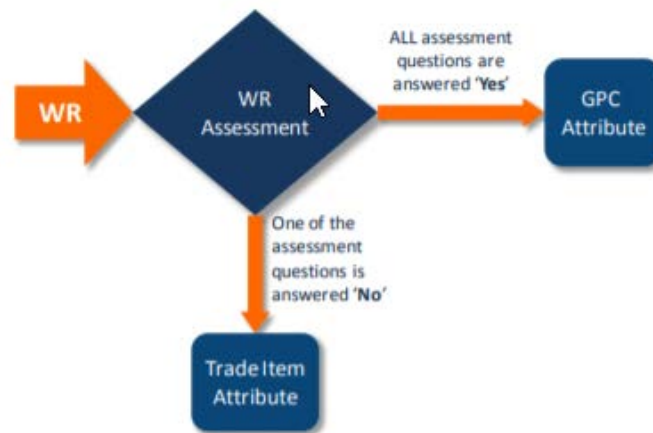


### 2.2.3 Existing process determination GPC vs. GDSN attributes

When a GS1 Work Request involving an attribute is received, it is evaluated as to whether the attribute is a part of the Trade Item or part of the GPC Brick. A specific set of rules determines this split. A series of questions is applied to each GPC WR with the following results:

- If 'Yes' is answered to ALL of the questions – the request is processed as a GPC Attribute which is contained in the GPC Schema and Online Browser. These WRs are routed to the GPC SMG.

- If 'No' is answered to any ONE of the questions – the request is processed as a GDSN Trade Item Attribute which is contained in the GS1 Global Data Dictionary (GDD). These WRs are sent to Central Operations where they are routed to the appropriate SMG.



Attribute Assessment Questions:

1. **Globally applicable?** Regional or local attributes need to be supported by the GDSN Trade Item Message.
2. **Relevant to users and industry?** Attributes must be recognized, understandable and relevant to the industry, in terms of product classification.
3. **Unique, objective and mutually exclusive?** The attributes must be unique in terms of intention and result, where there is no room for overlap and misinterpretation. Attributes also must be based on objective logic rather than based on subjectivity or emotion.
4. **Non-legislation specific?** The attributes within classification must not bear any relationship to that of legal requirements; if they do, they must be placed within the GDSN Trade Item Message.
5. **High-level attributes?** The intention and result of attributes within classification should be based on high level attributes and groupings that are a key criterion that a user would use to search, view and publish products.
6. **Can it be part of a single, comprehensive and exhaustive code list?** The attributes within classification must have a single, comprehensive and mutually exclusive code list / pick list of values that provide an answer to the question being asked. Duplicate values within the same attribute are prohibited; the same applies to abbreviated values. Each code list must contain either unclassified (value known but not defined in code list) or unidentified (value unknown) and, if applicable, both. The code list is to be managed and maintained by one source, the service provider.

In both groups, there is no specific process regarding duplication between GPC attributes and GDSN attributes. This is because each system is, most of the time, implemented as a stand-alone system even if GPC attributes could be exchanged in GDSN Trade Item Message.

## 2.3 Current Implementation of GDSN and GPC

### 2.3.1 GDSN Implementation

July 1, 2018		% Change in 2018 (July 1 - May 31, 2019)	May 31, 2019	
	TOTALS			TOTALS
Active Data Pools	39	0.0%	Active Data Pools	39
Trading Partner GLNs	49,502	11.1%	Trading Partner GLNs	54,982
Subscriptions Sent	2,425,397	13.6%	Subscriptions Sent	2,755,770
Subscriptions Matched	1,970,654	13.2%	Subscriptions Matched	2,231,576
Subscriptions Matched by Item	73,939,352	19.4%	Subscriptions Matched by Item	88,273,524
Recipient DP Subscription Matches	73,939,352	19.4%	Recipient DP Subscription Matches	88,273,524
Registered Items (GTINs)	27,499,979	11.9%	Registered Items (GTINs)	30,778,027
GTINs Coded with GPC	25,265,431 92%	11.4% -0.4%	GTINs Coded with GPC	28,151,556 91%

### 2.3.2 GPC bricks and attributes implementation in GDSN Trade Item messages

In GDSN, 92% of GTINs are coded with GPC bricks (other than 99999999, the “undefined” value for GPC brick)

When GPC brick value is different from “99999999”, adoption of GPC brick attributes in GDSN messages is extremely low: less than 1% of all GTINs actually use GPC brick attributes. This causes a lot of issues as we hear from retailers they will NOT use them as they are too difficult and cause an extra step in mapping both attribute and the value.

The other issue is that data pools do not always extend to the GPC attribute level, but rather stop at the GPC brick level.

#### 2.3.2.1 Geographical implementation

##### Implementation in France:

- GPC attributes are used in GDSN messages for alcoholic beverages (colour, grapes, region, ...)
- GPC attributes are used in GDSN messages for raw meat (with or without bone)
- GPC attributes are used in GDSN messages for tableware and cookware products

##### Implementation in Canada:

- All listed product (in data pool) should have a valid GPC Brick (other than 99999999)
- GPC attributes are used in GDSN messages for alcoholic beverages
- GPC attributes are used in GDSN messages for apparel products (to manage the gender: man, woman, child ...)

##### Implementation in US:

- All listed product (in data pool) should have a valid GPC Brick (other than 99999999)
- GPC attributes are used by only one recipient in GDSN messages.
- GPC attributes are not implemented in GDSN messages by trading partners. They rely on solution providers to provide technical solutions for mapping and entry in GDSN messages.

##### Implementation in Australia:

- 2.5% of active GTINs in data pool have 1 or more GPC attributes populated
- GPC attributes are populated and used in GDSN messages for alcoholic beverages (1.4%)

- GPC attributes are populated in GDSN messages across wide range of other GPC bricks as well, however not actively used by recipients (1.1%)

#### Implementation in Sweden:

- All products (in data pool) have a valid GPC code (other than 99999999)
- GPC attributes are used by one recipient in GDSN messages (alcoholic beverage monopoly retailer)
- GPC attributes are used only for alcoholic beverages in GDSN messages

#### Implementation in Germany:

- All listed products (in data pool) should have a GPC Brick (since 2012). Use of the special value 99999999 should be (and is) less than 2%
- GPC Bricks are key elements for data quality validation rules to set the right context (it is foreseen that GPC attributes are used in addition to the GPC Brick in this area) in GDSN messages
- GPC attributes are mainly used for FMCG products in GDSN messages
- GS1 Germany provides a recommendation for the usage of relevant GPC-Attributes to meet German FMCG market needs
- GPC attributes are used for all fresh fruit & vegetables
- GPC attributes are intended to be the main source for structured filter criteria for online shops within the eContent project

### 2.3.2.2 Use cases (GPC bricks and attributes in GDSN Trade Item messages)

Level	Use cases	Benefits
Brick and attribute (type + values)	Mapping between suppliers and retailers internal classifications	"Pivotal" classification system that facilitates the links between suppliers and retailers classification
Brick (or upper levels)	To apply some validation rules for specific product categories	Improve Data Quality
Brick	In the GDSN Global Registry as Subscription criteria	Allow data synchronisation between suppliers and retailers
Brick	In the GDSN Global Registry as a statistics element	Visibility about GDSN deployment regarding product categories
Brick and attribute (type + values)	As technical characteristics attribute	Language agnostic method to exchange information
Brick	In GDSN documentation tools, to identify relevant GDSN attributes for a product category (in B2C perspective)	Improve GDSN documentation for end-users

Today, it seems that GPC is not used for category management (doesn't fit the needs).

### 2.3.3 Other implementation of GPC bricks and attributes

Level	Use cases	Benefits
Brick	OECD - For non-food product to organise and classify product recall by product category and by hazard.	Improve product recall operation and allow relevant statistic information among all countries

Brick	U.S. International Trade Data System - Combined with GDSN attributes, to have better information about the products entering the US and to better target inspections.	Improve product visibility across borders, improve consumer security, and deliver significant cost savings to industry, government, national regulators, and customers alike
Brick and attribute (type + values)	To make a request for quotation (RFQ) on fresh fruits and vegetables (Metro & Edeka + NL Markets (Frugicom.nl)).	Accurate RFQ and reporting.
Brick and attribute (type + values)	To do auctions for fresh and cut flowers and plants (NL market).	Accurate auctions and reporting.
Brick	GS1 Activate tools (CodeOnline in France, Cadastro Nacional de Produtos for Brazil, ...) and other product registration tools to identify the relevant data model regarding the product category	Improve end users experience by forwarding him the relevant data model.
Brick	Included within the seven attributes required for Verified by GS1 as a statistics element	To monitor deployment of product categories in Verified by GS1

## 2.4 GPC and GDSN Standard Management Process

Today, two specific Working Groups are managing each of this standard: GPC SMG and GMD SMG (Global Master Data SMG).

### 2.4.1 GPC SMG

GPC SMG is in charge of the maintenance and the evolution of the GPC Standards

A new version is published twice a year (in June and in December). Implementation in GDSN is done based on GDM SMG request.

GPC is translated in 23 languages.

<https://www.gs1.org/standards/development-work-groups#GPC>

### 2.4.2 GMD SMG

GMD SMG (Global Master Data) is in charge of the maintenance and the evolution of the GDSN Standards (GDSN Trade Item messages and others messages)

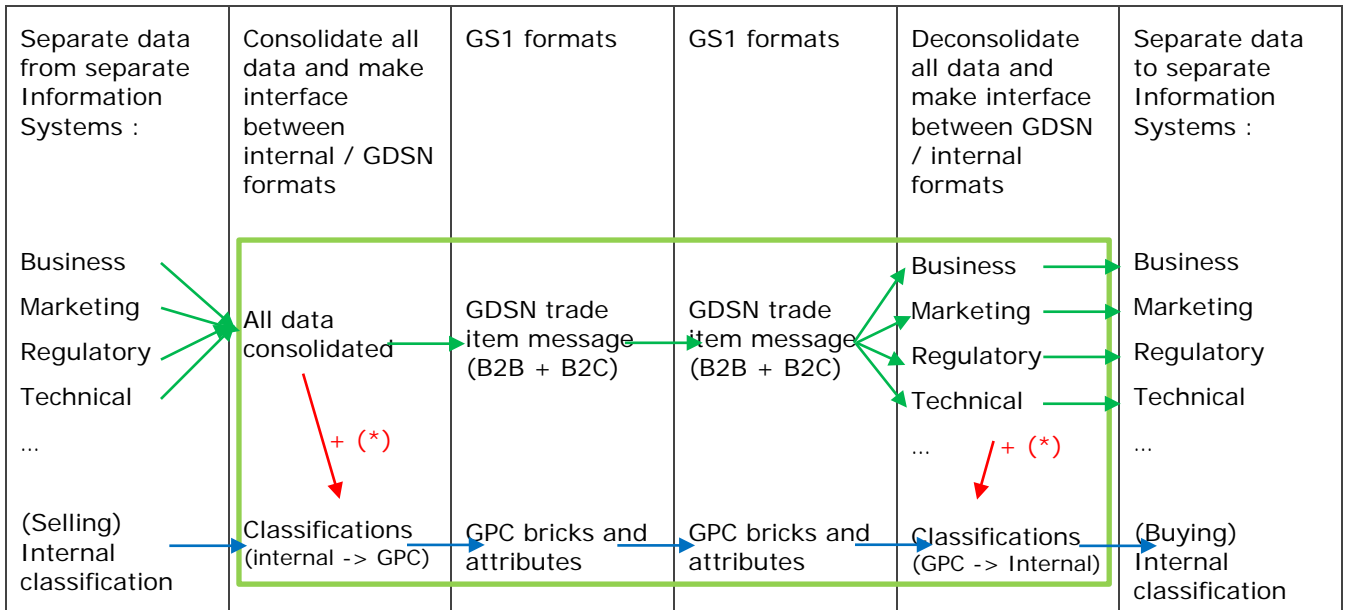
The regular release rhythm is 4 times a year (implementation dates in the GDSN: February, May, August and November). It was 3 times in 2019 due to an important release in May 2019.

<https://www.gs1.org/standards/development-work-groups#GMD>

## 2.5 GPC and GDSN implementation by end-users

Suppliers and retailers are using GDSN for product information exchange and GPC + other GDSN attributes for internal classification mapping.





It is challenging for users to make the link between GPC and internal classifications (usually business classifications). For most of the cases, the GPC Brick is not sufficient for this mapping. Users need to manage other information (GPC Attributes or some other GDSN Attributes such as brandName) to succeed in the mapping (see (\*) in the chart above).

However, GPC attributes are usually not specified by suppliers and sometimes not even managed by their tools.

## 2.6 Other works and standards related to this topic

**The GS1 Web vocabulary** (GS1 SmartSearch) is specifically intended to support on-demand access to consumer-relevant (B2C) master data, published via the Web via a block of structured data using W3C Linked Data standards (e.g. publishing in JSON-LD format).

It has blended together some GDSN attributes and GPC attributes in a unified way.

### Product Content Wizard approach

Product Content Wizard is a tool, used by Walmart and highlighted by the Consumer Goods Forum, to support the implementation of the Global Data Model. The idea is to use profiles by sector, product category and region in order to indicate which attributes are considered mandatory and to make it easier for brand owners and suppliers to provide the relevant data. In this respect, a Product Content Wizard supports data input as well as contextual data validation.

### Global Data Model

The Global Data Model is a globally and regionally agreed set of data attributes (from GDSN Trade Item message) to list and sell products. It was first created by GS1 and the Consumer Goods Forum members for Food and Near Food products in 2019. It will be extended in 2020 and beyond for other product families.

The Global Data Model is built around 3 layers of Trade Item attributes:

- Core layer attributes – attributes that are used in all analysed markets, regardless of the product category.
- Mature layer attributes – attributes that are used in most of the data models (depending on the product category) worldwide or at regional level
- Outer layer attributes – attributes are only optional and used in national market for legal or national business reason.

### Attribute Definition for Business

The GS1 Attribute Business Definitions standard provides clear business names, definition and usage example for the attributes identified by the Consumer Goods Forum to support the business processes:

- verify
- list/order
- move/store
- sell product digitally and physically

### 3 Analysis (focused on GPC attributes in GDSN messages)

#### 3.1 Analysis according to GS1 architecture principles

[https://www.gs1.org/docs/architecture/GS1\\_Architecture\\_Principles.pdf](https://www.gs1.org/docs/architecture/GS1_Architecture_Principles.pdf)

Principle	Y/N or NA	Commentary/explanation (in case of non-compatibility with the principle, if there is any doubt or if the principle does not apply)
Conformance. Are conformance criteria included?	NA	
Consistency. Fully consistent with the GS1 System architecture?	Y	Each are individually consistent but there are partial overlaps when both are used in conjunction due to a lack of coordination about the way both are management in the GSMP process.
Demonstrable Business Value and tied to trading partner needs?	NA	
Deprecation. Deprecates parts of the GS1 System that would otherwise duplicate the new standard?	N	Proposed as an option in the document.
Elimination of Non-conformance. Is there a plan to bring legacy users into conformance?	NA	
Extensibility. Is it extensible?	NA	
Forward Looking. Supports flexible solutions, is backwardly compatible and/or provides a cost-effective migration path?	N	2 solutions for same business needs increase complexity and costs for users.
Global Multi-Sector Standards. Applies to the maximum number of business contexts?	NA	
GS1 Identification Keys. Enables implementations that make mandatory use of class 1 or class 2 keys?	NA	
Interoperability. Supports different systems' ability to communicate through compatibility?	Y	Individually but when used together, can have duplication that is a barrier to interoperability
Non-duplication. Provides the only way in the GS1 System to perform the relevant function?	N	2 solutions for same business needs
Non-significance. Avoids GS1 keys carrying information about the entity identified?	NA	
Open Supply Chains. Defined outside the context of any particular kind of trading relationship?	NA	
Overall Value/Overall Cost. Achieves the best overall value for the <i>total</i> supply chain?	N	2 solutions for same business needs increase complexity and costs for users
Re-use of components. Re-uses standard data elements <i>consistently</i> ?	N	2 different solutions that use different components



Principle	Y/N or NA	Commentary/explanation (in case of non-compatibility with the principle, if there is any doubt or if the principle does not apply)
Royalty free. Developed under GSMP subject to the GS1 IP Policy?	NA	
Scalability. Enables continued growth in number of users and volume of use?	NA	
Security. Enables <i>appropriate</i> security to be built into users' implementations?	NA	
Simplicity. Adopts the simplest approach that achieves the desired result?	N	2 solutions for same business needs increase complexity and costs for users
Technology Independence. Data standards defined independently of data carrier and data sharing technology?	NA	
Third Party Standards. Uses 3 <sup>rd</sup> party standards as appropriate?	NA	
Vision and Mission. Aligned with the GS1 vision and mission statements?	NA	

In conclusion, 6 architecture principles are challenged by the current situation.

## 3.2 Problem Statement

### 3.2.1 Business

Today data sources using GDSN Trade Item messages have the ability to populate much of the same product attributes available in both the GDSN and GPC standard. This creates duplication and unintended complexities, especially when data sources are dealing with multiple industry sectors and target markets. The underlying reason for this is that different data recipients prefer different ways of processing the data they receive.

Such complexity reduces also standardization process agility. It creates also duplication of work that increase the time to deliver the standard to the market.

Such issues had highlighted by The Consumer Goods Forum during the Leapfrog project.

### 3.2.2 Technical

There are 2 ways of expressing certain product attributes in GDSN Trade Item messages (GPC and GDSN way) and the community is confused about which way to use in which scenario, in some cases resulting in the duplication of data entry and inconsistency.

The issue is determining the cut-off point between product classification and product specific attributes. Whilst there is a process in place in the GPC SMG to determine this cut-off point for GPC attribute requests (refer section 2.2.3 of this document), there is no such process in place in the GMD SMG for GDSN attribute requests. In the context of implementation, the same situation occurs, there is no rule to help the user to decide to use one or the other solution to provide the information.

### 3.2.3 Governance

Since GPC is an independent GS1 standard from GDSN (today, the two standards are maintained by two separate SMGs in GSMP (GPC SMG and GMD SMG), each with a separate set of participants), there is no process to determine whether there is duplication of a GPC attribute in GDSN Trade Item messages. In this context, it is important to note that there are use cases only using GPC (without using GDSN).

The issue GDSN has is the fact that GPC bricks and attributes do not cover all product attribution needs. This is where the GPC attributes & values fail mainly. GPC bricks, however, are needed in GDSN Trade Item messages, as products do need to be classified.



There is an opportunity to eliminate redundancy and develop a clearer process of GDSN attributes creation vs. GPC attributes creation.

### 3.2.4 Architecture

The main issue is that there is duplication for the same information between GDSN attributes and GPC attributes. This situation stems from the fact that the information that is shared at attribute level (in GDSN or in GPC) is always a characteristic of a product (for example, the colour of a wine). This characteristic of a product could be used for multiple reasons: to provide information to consumer, to manage buying decision, for logistic operations, etc. Sometimes such characteristics could also be used to group product in a classification (for example grouping wines of the same colour). The fact is that characteristics used to group products are not necessarily the same for all end users. It will depend on the perception of the market by each company. A wine retailer may use finer granularity than a food retailer to describe its product catalogue. The US market doesn't have the same way to classify wine as the French market (for France, grape is not so critical, the main characteristic is the area of production).

There is a need to provide a single way to describe a characteristic of a product in the GS1 standards, regardless of whether this characteristic is used to provide information to the consumer, to group products, or both.

A value of classification is that the same characteristics apply to all products in a grouping. In other words, when you know the (GPC Brick level) classification of a product, you also know which characteristics are relevant to describe the product. The value of GPC could be to provide such a list of characteristics that are relevant for each (GPC Brick level) classification of a product.

## 4 Conclusions and first architecture and governance recommendations

### 4.1 General conclusions

1/ The Architecture Group has effectively identified duplication problems between GPC attributes and GDSN attributes in the GDSN process: 2 different attributes (GDSN and GPC) can be used for the same information.

2/ Using GPC attributes in GDSN Trade Item messages is a problem and it must be solved in the GDSN Trade Item Module Library Business Message Standard (remove the possibility of duplication in the BMS) by the relevant GSMP group

3/ Since the GDSN Trade Item Module Library Business Message Standard and GPC standard are used separately, both must be kept in the GS1 system.

4/ The Architecture Group suggests to use a semantic approach to ensure consistency between the different standards

5/ The Architecture Group reminds the market that GDSN and GPC are M2M standards that are not intended to be directly visible to end-users.

6/ This RFF highlighted other issues, in particular on the structuring of the GPC, which should be addressed in the context of another analysis by an adhoc group.

7/ The introduction of GDSN contexts (based on GPC Bricks) could be a good solution to support the selection of attributes that are relevant for certain product category. Such approach could be done in broader context of semantic (independently of specific syntaxes).

8/ The architecture Group underlines the responsibility of a non-efficient creation process (2 different SMG without enough communication between them) in this situation

### 4.2 Recommendation 1: Remove GPC attributes from GDSN messages

-> **GDSN messages are the only standard for B2B and B2C product information exchange**

Eliminate the use of GPC attributes in GDSN, but they would still exist in GPC.

With this solution, it will be possible to use GPC Bricks to create the context and to identify the relevant GDSN attributes (product characteristics) for the concerned product. This solution was studied by the Global Data Model team who considered that this approach would facilitate product description attributes implementation.

**This solution solves the Technical Duplication issue**

**2 points of attention about the implementation of this recommendation:**

- The implementation of this recommended solution could have a significant impact on the market and should be accompanied by a migration plan.
- It will be necessary to ensure, prior to the implementation of this recommendation, that all GPC attributes are covered by GDSN attributes or code values.

### 4.3 Recommendation 2: Define a semantic ontology or data model and taxonomy (point 4 in the General conclusions)

In the current context, it's necessary to describe three times the same product in GPC attributes, in GDSN attributes, in GS1 Web Vocabulary. From a semantic point of view, the information is the same (e.g. Colour of the wine). One option could be to describe the data model for each class of product:

	Colour	Vintage	Grapes	Size
Wine	X	X	X	
Apparel	X			X

Such description will be independent of the way information is shared. Due to technical legacy issue, it will be possible to share automatically the information twice without any issue like inconsistency.

The GS1 Web vocabulary takes a unified approach to qualitative attributes that expect a value from a code list. It includes some qualitative attributes that were sourced from GPC brick attributes and other attributes that were sourced from GDSN attributes.

**This solution solves the Technical Duplication issue**

### 4.4 Governance recommendation: One SMG for GPC and GDSN

The charge in term of workload and the technical duplication are due to the duplication of the governance. One solution may be to define one instance (SMG) to manage a semantic model shared by both GPC and GDSN. It will be a SMG focused on a semantic approach for master data.

Such approach could be broader to other GS1 Standards include Product Characteristics like AI for barcode or Despatch Advice (i.e. Fish characteristics)

One of the benefits of this proposal would be to collect all available expertise on grouping attribute by product category.

**This solution solves the Creation process issue**

## 5 Affected Documents

This section identifies documents that may be affected by this document. A preliminary review of all listed documents has been done and some immediate suggestions are provided where that review found obvious need for changes.

These are recommendations only; when applying these findings to any specific document the group managing that document, as the subject matter experts, are expected to make modifications as they see fit.

- Global Product Classification (GPC) Development & Implementation Guide : [https://www.gs1.org/docs/gpc/GPC\\_Development\\_Implementation.pdf](https://www.gs1.org/docs/gpc/GPC_Development_Implementation.pdf)

- Global Data Dictionary (GDD) : <http://apps.gs1.org/gdd/SitePages/Home.aspx>
- GDSN Trade Item Module Library Business Message Standard : [https://www.gs1.org/docs/gdsn/3.1/BMS\\_GDSN\\_Trade\\_Item\\_Modules\\_r3p1p10\\_i1p3\\_Sept\\_2019.pdf](https://www.gs1.org/docs/gdsn/3.1/BMS_GDSN_Trade_Item_Modules_r3p1p10_i1p3_Sept_2019.pdf)

## 6 Annex: Other possible options that were evaluated for standard update

During the analysis work, the Architecture Group identified the other following options (this list is not exhaustive).

### 6.1 Keep GDSN and GPC attributes and exchange both through GDSN

-> **GDSN messages are the standard for B2B product information and B2C information is exchanged through GDSN technical characteristics attributes and GPC attributes.**

GS1 has to ensure that GDSN technical characteristics attributes and GPC attributes are aligned on the same B2C information using the following method:

GPC brick create the context and then identify the B2C information in GPC attribute and duplicate it into GDSN technical characteristics attributes.

The above change would allow a more flexible solution for both data sources and data recipients. Meaning a data source could implement either GPC attributes or the Product Characteristics attributes while the recipient could implement either solution also.

In addition this would allow usage of over 1800 attributes in GDSN if some customers only need a couple attributes instead of building out a solution for all GPC Brick attributes

The Codes have already been created.

Also it would allow data pools to use the productCharacteristicCode as an attribute as extended to interface with recipients as value add to recipients who can only handle attributes.

For the process point of view : As new work requests come in for new GPC Bricks attributes the process would be, once approved in GPC and an example of attribute & values in proper format for product characteristic created by GPC Governance, to submit a work request in GMD. The GMD maintenance group can either accept the work, expand the work or consider it duplication.

But this situation will create a double workload.

### 6.2 Keep GDSN attributes for B2B information and GPC attributes for B2C information

-> **GDSN is the source for B2B product information and B2C information is exchanged through GPC attributes.**

### 6.3 A note regarding accessing product master data expressed using the GS1 Web vocabulary and the use of Semantic Web / Linked Data standards to unify the data models

It should be noted that for any of Options 1, 2 or 3 above, the GS1 Web vocabulary provides an additional way of exchanging product master data via the Web in an on-demand mechanism via a simple Web request.

The GS1 Web vocabulary currently uses W3C Linked Data standards to express a subset of properties or attributes from a blend of the GDSN and GPC data models and is primarily targeted at detailed description of item-level products purchased by end consumers.

As examples of such a blend of the GPC and GDSN data models, the GS1 Web vocabulary defines properties such as `gs1:sharpnessOfCheese` (corresponding to GPC attribute 20002867) and seven

permitted values such as `gs1:SharpnessOfCheeseCode-EXTRA_SHARP` (corresponding to GPC attribute value 30015672) while also defining other properties such as `gs1:netWeight`, `gs1:grossWeight`, which expect precise quantitative values (numeric value and unit of measure code), something which can be expressed via the GDSN data model but not via GPC.

The table below shows type code lists within the GS1 Web vocabulary that map to GPC attributes:

Web URI in GS1 Web vocabulary	GPC attribute (exact match)
<a href="#">gs1:AnatomicalFormCode</a>	20002688
<a href="#">gs1:CheeseFirmnessCode</a>	20000192
<a href="#">gs1:ConsumerLifestageCode</a>	20000045
<a href="#">gs1:FoodBeverageRefrigerationClaimCode</a>	20000153
<a href="#">gs1:FoodBeverageTargetUseCode</a>	20001709
<a href="#">gs1:FootwearFasteningTypeCode</a>	20000968
<a href="#">gs1:FreshOrSeawaterFarmedCode</a>	20000073
<a href="#">gs1:SharpnessOfCheeseCode</a>	20002867
<a href="#">gs1:SportingActivityTypeCode</a>	20001966
<a href="#">gs1:TargetConsumerGenderCode</a>	20000366
<a href="#">gs1:UpperTypeCode</a>	20000985

Currently, for properties that expect a codified value from a defined enumerated list, the GS1 Web vocabulary defines 46 subclasses of type code ( <https://www.gs1.org/voc/TypeCode> ) of which just under 25% can be mapped exactly to GPC attributes and their values and the remainder are extracted from the GDSN data model. There may be some which appear in both the GPC attribute-value data model and also in the GDSN data model.

The GS1 Web vocabulary achieves a unified approach to blending the GPC and GDSN data models by consistently using the same W3C Linked Data framework to express the properties or attributes and their expected / permitted value types, irrespective of whether the property was originally sourced from GDSN or GPC. GPC attributes become properties that expect a value from a defined list of type codes. However, the GS1 Web vocabulary also defines other properties that expect values that are strings, dates, quantitative values etc. Because GPC attribute values cannot support such free-form values or continuously variable quantitative values, all of these kinds of properties within the GS1 Web vocabulary must have been sourced from the GDSN data model. It is also worth noting that in the GS1 Web vocabulary and unlike GPC, there is not a technical limitation that prevents a property from having more than one value from an enumerated code list. For example, in GPC, the attribute 20001709 (Target Use / Application) permits values such as 30015686 for a food that is suitable for breakfast or 30002251 that is suitable for a snack - but if it suitable for either breakfast or a snack, GPC has no way of expressing this, whereas in the GS1 Web vocabulary and GDSN data models, it is technically possible for a property such as `gs1:foodBeverageTargetUse` to have a list of multiple values such as [ `gs1:FoodBeverageTargetUseCode-SNACK` , `gs1:FoodBeverageTargetUseCode-BREAKFAST` ].

Each term (whether a class, property or type code value) is given a distinct Web URI starting at <https://www.gs1.org/voc/> . This links to an online definition for each term, together with hyperlinked semantic information about how each term relates to other terms (e.g. which classes express a particular property, what is the expected value type for each property (whether quantitative or from an enumerated list, whose defined values also have corresponding Web URIs). This means that unlike a numeric GPC code value or a numeric BMS ID within the Global Data Model, because it's a Web URI that works like a URL or Web address, if you're unsure of the meaning/definition or how to use it, it is sufficient to click on it to make a Web request for further information.

In addition to the online human-readable browsable documentation, a machine-interpretable ontology is also available for download in JSON-LD format at [https://www.gs1.org/docs/gs1-smartsearch/gs1Voc\\_v1\\_1.jsonld](https://www.gs1.org/docs/gs1-smartsearch/gs1Voc_v1_1.jsonld) , as well as being embedded inside the online documentation at <https://www.gs1.org/voc/> and actually being used to support that tool (via client-side JavaScript and server-side PHP which uses the JSON-LD vocabulary file rather than a conventional database as its store of information).

Web URIs are fundamental to the GS1 Web vocabulary and other Linked Data ontologies such as the widely used schema.org vocabulary. Not only does a Web URI provide a link to an online definition. The URI is used within the Linked Data representation instead of just a URN or a string name for a property or class or type code value. Just as a numeric GPC code links to multi-lingual definitions, any Web URI can have multi-lingual names and multi-lingual descriptions, since W3C Linked Data standards have been designed to provide a framework for multi-lingual support from the outset.

The use of W3C Linked Data standards such as RDF, RDFS, OWL, SKOS and the use of the Linked Data format JSON-LD to publish the GS1 Web vocabulary and machine-interpretable structured data about products etc. means that the GS1 Web vocabulary and markup using it can be easily processed and understood by software, including major Web search engines, smartphone apps etc.

The Linked Data principles and framework that were used to develop and implement the GS1 Web vocabulary were also used to develop GDSN Product Characteristics and to provide supporting online browsable documentation (previously at <https://id.gs1.org/gdsnchar/>), very similar to what is provided for the GS1 Web vocabulary at <https://www.gs1.org/voc/>.

Approved updates to the GS1 Web vocabulary can be made easily at any time without needing to wait for the 6-monthly publication cycle of GDSN. For each approved additional term (whether a property, class or type code value), a name and definition is needed, together with the information about usage and semantic relationships to existing terms within the GS1 Web vocabulary (and other vocabularies or ontologies such as schema.org). This is written in an RDF format such as Turtle or JSON-LD, appended to the existing GS1 Web vocabulary file and the resulting extended vocabulary file is uploaded to the GS1 website and also used to overwrite the file within the online documentation tool at <https://www.gs1.org/voc/>.

In contrast with GDSN, this Web-based data access approach typically lacks the convenience of accessing data from multiple brand owners and about multiple products through a unified channel or data pool, since each brand owner (and potentially also retailers) may publish such data using a separate Web URI (or URL) for each product, typically either embedding the machine-interpretable structured data within an existing product Web page or using HTTP Content Negotiation to enable direct access to the machine-interpretable structured data about one product.

The result is that for Web-based data retrieval, the product master data is often highly distributed across multiple Web addresses rather than being available via a logically centralised pool. However, there is no technical reason why also the GDSN data model might not also consider embracing such Semantic Web / Linked Data technology at some point in the future if the expected benefits justify the efforts of doing so and adapting to that approach; Linked Data can also be used in master data sharing approaches that are more logically centralised and less distributed - they don't require that the data must be fragmented across the Web and across multiple data sources of individual brand websites.

Although such an on-demand approach of retrieving data via a simple Web request (e.g. using a GS1 Digital Link for a product) does not include a 'push' subscription mechanism for retrieving updates about changes to the associated master data, it is possible to use the If-Modified-Since header of an HTTP request to periodically check for updates, with the effect that data is only returned if there has been a modification since the date and time specified in the If-Modified-Since header.

About GPC attribute numeric type as a language agnostic method to exchange information. This benefit is not limited to only numeric code values. In Linked Data technology, it is best practice to identify things using Web URIs and still possible to associate each thing (resource) identified Web URI with multi-lingual names, descriptions etc. using language-tagged string values. More info on this at: [https://www.w3.org/TR/rdf-schema/#ch\\_langstring](https://www.w3.org/TR/rdf-schema/#ch_langstring)

The following discussion provides a couple of detailed examples to show how the GS1 Web vocabulary uses the same Linked Data / Semantic Web technology to unify its handling of qualitative attributes, irrespective of whether they were sourced from GPC or the GDSN data model.

The GS1 Web vocabulary includes some properties sourced exclusively from GPC, such as:

[\*gs1:sharpnessOfCheeseCode\*](#) (which corresponds to GPC attribute 20002867)

which expects values from the code list:

[gs1:SharpnessOfCheeseCode](#)

which includes permitted attribute values such as

[gs1:SharpnessOfCheeseCode-EXTRA\\_SHARP](#) (corresponding to GPC attribute value 30015672)

[gs1:SharpnessOfCheeseCode-MILD](#) (corresponding to GPC attribute value 30015674)

As a further example, the GS1 Web vocabulary includes some properties sourced exclusively from the GDSN data model, such as:

[gs1:allergenType](#) (an attribute within the Allergen\_Information\_Module)

which expects values from the code list

[gs1:AllergenTypeCode](#)

which includes permitted attribute values such as

[gs1:AllergenTypeCode-GLUTEN](#)

At a technical level, qualitative attributes and values from both of these sources are handled in exactly the same way, using W3C Semantic Web / Linked Data standards, as described in further detail below.

Each set of permitted qualitative values is defined as a code list, formally as a subclass of an abstract class, <https://www.gs1.org/voc/TypeCode> . For example,

[gs1:AllergenTypeCode](#) **rdfs:subClassOf** [gs1:TypeCode](#) .

[gs1:SharpnessOfCheeseCode](#) **rdfs:subClassOf** [gs1:TypeCode](#) .

Each permitted value is defined as an individual whose **rdf:type** is that of the code list to which it belongs. For example,

[gs1:SharpnessOfCheeseCode-EXTRA\\_SHARP](#) **rdf:type** [gs1:SharpnessOfCheeseCode](#) .

[gs1:AllergenTypeCode-GLUTEN](#) **rdf:type** [gs1:AllergenTypeCode](#) .

The attribute or property that expects a value from that code list has a semantic annotation (**rdfs:range**) that equals the code list. For example,

[gs1:allergenType](#) **rdfs:range** [gs1:AllergenTypeCode](#) .

[gs1:sharpnessOfCheeseCode](#) **rdfs:range** [gs1:SharpnessOfCheeseCode](#) .

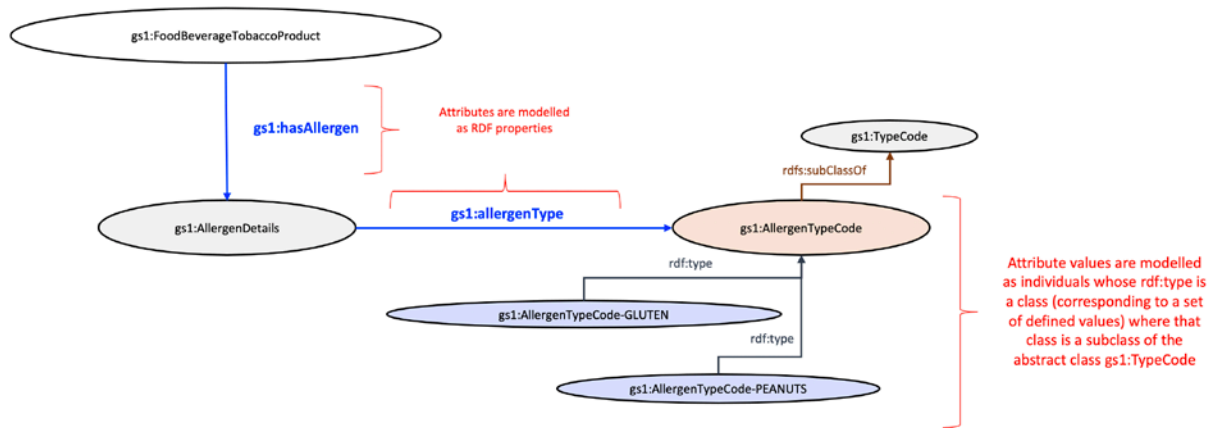
Using **rdfs:domain** it is possible to indicate which categories of product use these attributes or properties, e.g.

[gs1:allergenType](#) **rdfs:domain** [gs1:AllergenDetails](#) .

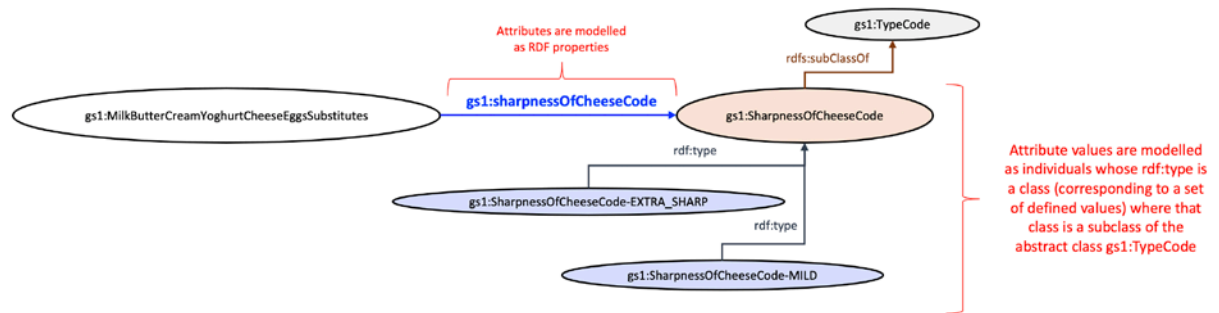
[gs1:hasAllergen](#) **rdfs:range** [gs1:AllergenDetails](#) .

[gs1:hasAllergen](#) **rdfs:domain** [gs1:FoodBeverageTobaccoProduct](#)





[`gs1:sharpnessOfCheeseCode`](#) `rdfs:domain` [`gs1:MilkButterCreamYoghurtCheeseEggsSubstitutes`](#)



Each of these (attribute or property, code list, individual value options within a code list) is assigned a unique Web URI within the namespace of the GS1 Web vocabulary (<https://gs1.org/voc/>, which is indicated by the Compact URI Expression (CURIE) prefix 'gs1:' in the examples above.) and may have additional annotations such as a name (expressed using `rdfs:label`) and description or definition (expressed using `rdfs:comment`), including the ability to natively support multi-lingual language-tagged values (e.g. "Extra Sharp"@en) for these.

This means that within the GS1 Web vocabulary, it is a unique Web URI that serves as the global language-independent identifier for each attribute, code list or individual attribute value, in the same way that an 8-digit numeric code identifies attributes and attribute values in GPC or a URN identifies resources within the GDSN data model and GDD.

The primary advantage of using Web URIs rather than URNs or 8-digit numeric strings is that they can also function as hyperlinks that link directly to online definitions, descriptions and examples of usage.

By aligning with W3C Semantic Web / Linked Data standards such as RDF [<https://www.w3.org/RDF/>], RDFS [<https://www.w3.org/2001/sw/wiki/RDFS>], OWL [<https://www.w3.org/OWL/>], SKOS [<https://www.w3.org/2004/02/skos/>] and JSON-LD [<https://www.w3.org/TR/json-ld/>], it is possible to easily unify GS1 data models from GPC, GDSN and other sources using precise semantic technology so that those data models can be automatically understood and used by software throughout the GS1 community and beyond. This potentially opens up the opportunity for new users and sectors to discover that GS1 has developed relevant data models, if we can use semantic technology to make them discoverable through tools such as Linked Open Vocabularies (<http://lov.okfn.org/>).

By using Linked Data / Semantic Web technology to exchange semantic data graphs (e.g. formatted in JSON-LD) rather than structured documents (e.g. formatted in XML), there is also the possibility to select more than one attribute from a code list, where appropriate; a list of multiple value URIs may appear as the value of a property unless a specific validation rule forbids it for that property and

instead only permits a single URI value. Such validation rules may be expressed using the W3C Shape Constraint Language (SHACL) standard [ <https://www.w3.org/TR/shacl/> ] or using JSON Schema [ <https://json-schema.org/> ] .

## 7 Parking lot: Observations we made during the analysis process

These questions/observations are out of the scope of this current RFF and some of them could be treated in some other RFF.

### 7.1 About GPC characteristics and release management

#### Business users are saying that GPC Brick attributes too difficult to use when used in GDSN.

- Difficulty to implement and maintain GPC Brick attributes and values in GDSN: Using non-intelligent codes are not business user friendly.
- Non-intelligent codes require all trading partners' data pools to maintain mappings from code to attribute and code to the attribute business value.
- In the last year, the amount of GPC attribute deletions for the year were 380, and deletion of the GPC attribute values 3305. This requires both suppliers and recipients to re-map their systems to get the equivalent data. Types of changes GPC attribute promoted to brick, attribute value promoted to brick, etc. This is non-backwards compatible and high cost to re-mapping systems.
- Requires suppliers if decision to use GPC attributes to look in multiple places for data for B2C. Since GPC Brick attributes cannot support measurements, quantitative values, multiple values for the same GPC brick attribute, values of "Combination" provide no business value. GDSN has provided these capabilities.
- Part of the complexity of GPC attributes and values is that the permitted set of values for each GPC attribute can depend on which GPC brick is using that attribute.

#### Business users are saying that GPC Brick are far too granular in some product categories.

- So business users would like to use the class or family codes instead of brick in GDSN.
- When the bricks are very granular, this becomes complex to implement and maintain Validation Rules based on GPC bricks

### 7.2 About technical information management in GDSN

- This information is very rich and specific to product. The difficulty is, among thousands of GDSN technical attributes, to retrieve the attributes relevant for a product category.

### 7.3 Technical comparison between GDSN & GPC

Technical need	GDSN solution	GPC solution	Comments	Example
Multiple values for the same attribute	Yes	No (or use combination value)		A skin care cosmetic effect may be Moisturizing and Anti-Aging A wine could be produced with several grapes



Same attribute type for several type of product	Yes	No		Brick attributes are limited like isTinted in GPC it is only available for Lip Balm.... A large piece of work would have to happen to apply the same attribute to many more cosmetics, car windows, eye glasses, contact lenses, computer privacy screen filters, camera lens, etc.
Consistency of the definition level (Classification isn't attribution).	?	No	The inconsistency of what level is defined for bricks has caused issues in addition to duplication. Many legacy bricks are at higher classification levels.  Hence it becomes a GDSN attribute.	A brick classification of cotton wool products includes cotton pads, cotton balls, cotton swabs/buds, and many others as a brick attribute and value.  Like swabs users may want to know if the stem is wood, plastic, or paper fibre. It does not apply to cotton products like cotton balls and cotton pads, only one brick attribute value, cotton swabs/buds.
Language agnostic method to exchange information	No	Yes	GPC has benefits using a numeric code value.	GS1 Canada decides to use GPC attributes as technical characteristics attributes for this reason.

#### 7.4 Misalignment between GDSN and EDI standards regarding the implementation of the BMS Shared Common Library

The BMS for Shared Common Library lists all the shared attributes between GDSN and EDI. This BMS has been created to ensure an alignment of technical solutions for the management of common information in EDI and GDSN such as address, contact, date, dimension, entity identification...

But in the reality, each Standard Management Group (GMD SMG for GDSN standards and EDI SMG for EDI standards) has a different release policy and therefore relied on a different version of the BMS for Shared Common Library. As a result, today, the technical solutions implemented for the same information can be different between the EDI standard and the GDSN standard, which causes an important architecture problem.