



Request for Finding Attributes Association with GS1 Keys

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1. Introduction

A Request for Finding (RFF) was submitted to the GS1 Architecture Group (AG) on 30 October 2013:

“Two work requests submitted to the ID SMG have indicated a potential need to associate attribute data currently requiring mandatory association with a GTIN to other GS1 identifiers, namely Global Coupon Number and Global Individual Asset Identifiers. The question raised was can a system that has been programmed to associate attribute data with a particular key, also identify the same attribute data with a different GS1 key. If so what impacts does this have on systems currently programmed with current mandatory associations as defined in section 4.13 of the GS1 General Specifications, (AG principle backward compatibility). If not, does the requirement to have attribute data defined for other GS1 identifiers create an architectural principle impact of duplication if the apparent attribute information is the same “type” for example expiry date of an asset, and what system implications does this create.”

The AG accepted the request on 6 November 2013 and agreed that a formal statement should be issued by the AG regarding the association of attributes with different GS1 keys.

2. Use cases

One of the use cases that triggered this RFF was a work request seeking to associate attributes currently specified for exclusive use in association with the GTIN to the Global Individual Asset identifier (GIAI), e.g. dates, batch / lot number. This work request was subsequently withdrawn.

Another work request asks to associate the expiry date, currently specified for exclusive use in association with the GTIN to the Global Coupon Number (GCN).

In addition, another request is asking for using the Application Identifier (AI) assigned to “amount payable” (AI 390n) designed to be used in association with both the payment slip reference number (AI 8020) and the GLN of the invoicing party (AI 415) to be used in association with a GCN.

3. Problem statement

The problem raised by this RFF relates to AIDC applications and the association of data elements prefixed by application identifiers. The issue is at the Capture layer of the GS1 System Architecture, not at the Identification or Share layers.

The rules stating the mandatory association of attributes with specific keys originates from the need to create an unambiguous message in space constrained linear bar codes. When scanning two or more linear bar codes it is critical for the software application validating the captured data to know what GS1 key attributes relate to. For example, capturing a data element prefixed by an AI conveying the meaning of batch / lot number is meaningless if this piece of data is not associated to a GTIN.

The rules of mandatory association of AIs were thus designed to remove any possible ambiguity in bar code scanning applications.

In eCom standard messages it is common to re-use the same data elements for association with different GS1 keys as and when necessary. eCom messages have significantly less space or data volume constraints. They use a rich syntax that enables a comprehensive identification of the data elements themselves and of their associations with other data elements, including GS1 keys.

There is no logical reason why an attribute could not be associated to several keys.

The GS1 General Specifications combine the data content with the representation of the data in automatic identification technologies. However, this legacy has led the GS1 General

Specifications mandating that data elements identified by an AI can be associated to only one GS1 Key.

4. GS1 Architecture principles

The following two GS1 Architecture Principles are worth considering in the context of this RFF.

Re-use of Components

Standard data elements should be re-used consistently across different GS1 standards. GS1 should store, reuse and share precise core component and business definitions and their equivalent representations in the GS1 System. The GS1 Global Data Dictionary (GDD) is the storage for this data.

The GDD is accessible and can be used to allow all trading partners and solution providers to have knowledge of and share a common definition of any GS1 System component. Additionally, the GDD provides information on the context(s) in which that component can be used.

This GS1 Architecture principle clearly confirms that attributes should be re-used in different standards whenever possible.

Technology Independence

The GS1 System Architecture should promote technology independence and a layered approach.

The GS1 Identification Keys are the foundation of the GS1 System. They, and other GS1 data standards, are defined independently of data carrier and information sharing technology in which they are used. Neither the data carrier nor information sharing technology alters the meaning of any GS1 Identification Key or other structured GS1 data.

The GS1 System Architecture is designed on the basis of three layers (identify, capture and share) which assists in establishing a modular approach where individual components of the GS1 System can be defined and documented independently of one another.

Where dependencies arise between individual components of the GS1 System, particularly during development efforts, these should be systematically recorded so that the consequences of a change in a component are known when the change is considered.

This principle makes the point that data standard are defined independently of the data carrier and information sharing technology in which they are used. This re-enforces the point that established attributes should be re-used unless some constraints dictate otherwise.

5. GS1 Keys and Attributes

Chapter 4 of the GS1 System Architecture addresses “Identify – GS1 Identification Keys and Supplementary Data”.

We have certain data elements that are "keys" in the data modeling sense of the word. These are non-significant (just meaningless numbers, though they may be allocated in a structured fashion), and meet the three criteria outlined in Section 4.1.3 of the architecture document: uniqueness, completeness, and persistence. Each key value stands for ("identifies") a physical, virtual, or conceptual object in the real world.

We have other data elements that are not keys, but merely "attributes" in the data modeling sense. These typically *are* significant (e.g., the weight attribute of a trade item has a physical meaning that can be manipulated mathematically; the name attribute of a trade item has marketing significance, etc.), and otherwise are not necessarily unique, complete, or persistent.

Some attributes refer to various non-significant data elements whose only use is as part of a compound key. This includes serial (AI 21), lot/batch (AI 10), etc. Most other attributes are truly attributes: weight, height, name, address, etc.

The definition of keys, including both what we call “GS1 Keys” plus the compound key components, belongs in the Identify layer. This is where we define GTIN, serial, batch/lot, GLN, GLN Extension, etc. The definitions of all the other attributes belong in the Share layer, where they can be incorporated into a whole variety of business messages along with the keys.

In the Capture layer, we define AI syntax as way of including both keys and attributes in bar codes and RFID tags. In this layer, we not only define specialized syntax (e.g., 6 digits for a date, which differs from the syntax used XML for example), but also additional semantics that defines *what it means to read the data carrier*.

Because of the data carriers space and data volume limitations, there is no means to create groups of data elements. The mandatory association rules are used to explain how multiple data elements should be interpreted as relating to each other. This is an extra consideration for the Capture layer that doesn't work the same way in the Share layer.

Attributes that are Compound Key Components are usually meaningless on their own. Therefore they should always be specified so that they go with one and only one key. For example, we should (and do) have different AIs for the GTIN serial number vs the GCN serial number.

For other attributes, the same data element could be used with different keys. These attributes aren't qualifying the key; they are providing further description of the thing the key identifies. So if a trade item has a weight, and a logistic unit has a weight, and the concept of weight is the same for both, they could in principle use the same data element identified by the same AI. However, the Capture layer constraint has to be considered. As it is possible for one bar code label to include both a GTIN and an SSCC, then different AIs are needed to indicate the weight of the trade item (GTIN) and the weight of the logistic unit (SSCC).

6. Framework

This section provides a framework that should be used by GSMP working groups when dealing with the question of possibly re-using a standard GS1 attribute in combination with another key than the one initially specified.

1. As a general principle, existing attributes should be re-used with different keys whenever possible provided that the definition of the data is identical. For example the expiry date of a trade item identified by a GTIN or expiry date of a coupon identified by a GCN is the same data element.
2. If the attribute is a component of a compound key (see section 4.1.3 of the GS1 System Architecture), it shall not be re-used.
3. Re-using the same data element does not necessarily imply using the same AI when representing the data in an automatic data capture technology. Assigning a new AI shall be considered in the following cases:
 - a. There is a possibility that two or more GS1 keys supplemented by the same attribute are used at the same time on the same entity.
 - b. There is a requirement for representing the data in a specific format due to data carrier space constraints for example.
4. When addressing work requests of this nature, consider impact on:
 - a. **Applications.** Implementation of the affected Application Identifiers should be considered when a decision is made. For example, the request to modify the Amount Payable AI and its association to Payment Slip Reference Number raises the question: what is the level of implementation of the Payment Slip Reference Number? It is difficult to completely understand global

implementation of a specific AI, but there can be estimates made and the relative impact be understood.

- b. **Software systems.** An analysis needs to be completed on the potential impact to software systems and practices if the mandatory associations for a data element (ex.: Expiry Date) is expanded from its existing association (ex.: GTIN) to an additional GS1 Key (ex.: GCN). For example, if an existing system scans an Expiry Date and is pre-programmed to 'wait' for a GTIN – what happens when the GCN is now included in the symbol and the GTIN is not? This may lead to an issue within the software system that needs to be identified.

Points 1, 2 and 3 above enable a logical conclusion to be reached when processing a request for re-using an AI as an attribute to an additional GS1 Key. The impact analysis results in qualitative information that should be taken into consideration in the decision to re-use an existing AI or not.
