The Global Language of Business

GS1 Verifiable Credentials – White Paper on Data Model and Validations

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1.0.0	14 October 2022	Kevin Dean	Initial release.
1.0.1	17 November 2022	Kevin Dean	Updated ns.gs1.org references to align with published JSON-LD files. Replaced ns.gs1.org identities with id.gs1.org. Tagged example data credentials for clarity.

Disclaimer

Table of Contents

1   Introduction

This is an early-stage white paper describing data models and validations proposed for implementation of Verifiable Credentials within the GS1 system. While this document contains a number of specific proposals and recommendations, it also reflects broad underlying principles applicable to Verifiable Credentials generally. GS1 reserves all rights to amend and expand upon the ideas herein, and to implement related data models, processes, standards and programs.

"Licensing" is the process of authorising a user company to identify products, locations, and other objects using GS1 identification keys. This is most commonly done by issuing a GS1 Company Prefix and allocating it to an organisation, but some GS1 Member Organisations will also issue single keys (referred to as single-issue or one-off keys) , typically to companies that need only a few of them.

"Declaration" is the process of declaring data associated with an object. This may be further broken down into three parts: identification, association, and authorisation.

- "Identification" is the process of generating a GS1 identification key from a valid licence, or an extended key (e.g., GTIN+serial) from an existing key.

- "Association" is the process of associating a key with data for the object that it represents (e.g., GTIN with trade item data, GLN with location data).

- "Authorisation" is the process of granting an outside party the authority to associate data with a key.

An exhaustive description of the GS1 system is beyond the scope of this document; the reader is assumed to be familiar with it and is directed to the GS1 General Specifications[1] and other standards[2] for details.

1.1   Tiers of Keys

Within the GS1 identification system, keys are broken down into four tiers. Full details may be found in the GS1 System Architecture[3], but some of the text is reproduced here.

- Tier 1: The structure, usage, and lifecycle rules of a GS1 tier 1 key are defined, administered, and managed entirely by GS1. A tier 1 key always incorporates a GS1 Prefix. A tier 1 key may incorporate a GS1 Company Prefix issued to a user company, who then issues the key, or it may be issued in its entirety as an individual key. Tier 1 keys are subject to allocation rules defined in GS1 standards, and their association with descriptive data elements is governed by validation rules also defined in GS1 standards.

- Tier 2: The structure of a GS1 tier 2 key is defined by GS1 as a GS1 tier 1 key, but its usage and lifecycle rules are defined, administered, and managed by an external organisation. A tier 2 key exists within the range of a GS1 Prefix or a GS1 Company Prefix, incorporates additional characters administered by an external organisation, and includes a check digit or a check character pair if required by its corresponding tier 1 key format. Tier 2 keys are unique with respect to tier 1 keys of the same type and can be used in most or all applications that support the corresponding tier 1 key type. Their allocation and lifecycle rules, however, are defined by an organisation external to GS1. The degree to which the usage and lifecycle rules are compatible with those of the corresponding tier 1 keys is specific to each tier 2 key.

- Tier 3: The structure, usage, and its lifecycle rules of a GS1 tier 3 key are defined, administered, and managed entirely by an organisation external to GS1. This organisation enters into an agreement with GS1 that enables its keys to be supported in selected GS1 standards (e.g., within an EPC header).

- Tier 4: The structure and, usage, and lifecycle rules of a GS1 tier 4 key are defined, administered, and managed entirely by an organisation or entity external to GS1. A tier 4 key has no explicit support within the GS1 system, but it may have some implicit support. For example, the EPCIS standard supports any URI as an object identifier and trading partners could, by mutual agreement, agree to use URIs for geographic locations as a ReadPointID for certain events.

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[1] _https://www.gs1.org/standards/barcodes-epcrfid-id-keys/gs1-general-specifications_
[2] _https://www.gs1.org/standards_
[3] _https://www.gs1.org/standards/gs1-system-architecture-document/current-standard_

For the purposes of this document, only tier 1 and tier 2 keys are considered.

The best-known examples of a tier 2 key are:

- The International Standard Book Number (ISBN), issued by the International ISBN Agency. GS1 Prefixes 978 and 979 are delegated to the Agency for ISBN management, and the ISBN can appear in some supply chain processes, functioning as a GTIN-13.
  - A subset of ISBNs starting with 9790 are reserved for the International Standard Music Number (ISMN).

- The International Standard Serial Number (ISSN), issued by the ISSN International Centre. GS1 Prefix 977 is delegated to the Centre for ISSN management, and the ISSN can appear in some supply chain processes, functioning as a GTIN-13.

1.2 Data Model

The credentials in this document are aligned as best as possible with the W3C Verifiable Credentials Data Model[4] (version 1.1 as of this writing), with the focus being on the claim portion as that is where the attributes required to assert a GS1 licence and to declare data associated with an object may be found. Credential metadata and proof are provided in the examples where necessary, but they are incomplete, especially as they can vary considerably from one ecosystem to the next. The proof especially is shown only as an object with an ellipsis "{ ... }", because the cryptographic proof adds no value to the examples.

Within the claim portion, the data model is based on the GS1 Web Vocabulary[5]. Examples won't necessarily show complete data; for example, in party identification, there is little value in an example that includes party address and other ancillary attributes.

Development and refinement of JSON-LD and other schemas to support these Verifiable Credentials is outside the scope of this document.

1.3 Identifiers

The W3C Verifiable Credentials Data Model requires that any identifier (credential ID, issuer ID, subject ID, etc.) be a URI. In most cases, these are Decentralized Identifiers (DIDs), but all URI formats are supported. The specific requirements for an identifier (in the *id* property of an object) are that:

- The *id* property **must** express an identifier that others are expected to use when expressing statements about a specific thing identified by that identifier.

- The *id* property **must not** have more than one value.

- The value of the *id* property **must** be a URI.

Furthermore, it is **recommended** that the URI in the *id* property be one which, if dereferenced, results in a document containing machine-readable information about the identifier.

1.3.1 Decentralized Identifiers

DIDs meet all the requirements and the recommendation, but they come at a cost: they are typically associated with cryptographic material, such as public keys, and service endpoints, for establishing secure communication channels. While this is necessary for a DID that identifies an individual or an organisation, it's not necessary for many use cases in GS1, such as serialised trade items, which could lead to an explosion of public/private key pairs and DID documents.

1.3.2 GS1 Digital Link URIs

In some circumstances, it may be better to use a GS1 Digital Link URI (DLURI) rather than a DID. For example, using DIDs as the credential subject ID to identify serialised trade items would require that a public/private key pair and DID document be generated for every trade item that is produced.

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[4] *https://www.w3.org/TR/vc-data-model/*
[5] *https://www.gs1.org/voc/*

The brand owner responsible would have to maintain and secure them, and most would never be used.

Using a DLURI as the credential subject ID instead allows for easy alignment with other parts of the GS1 system (e.g., by using a DLURI representing a GTIN and serial identifier to link to traceability data). In the rare case where a document containing machine-readable information about the subject is required, it may be discovered via an appropriate link type when dereferencing the DLURI, if such a document is made available by the DLURI issuer.

Similarly, a DLURI may be used as an identifier for the credential. For example, a DLURI incorporating a Global Document Type Identifier (GDTI) may be an appropriate way to identify a Verifiable Credential as a document in some supply chain processes. If a DLURI is used as a credential ID, it **may** have a default link, and, if it does, the default link **must** be a URI that returns a copy of the credential itself. This makes it easier for the URI to be referenced in other credentials without having to include a copy of the referenced credential in each presentation.

1.3.3 Other HTTPS URIs

Where the overhead of a DID isn't justified by and a DLURI format is not appropriate, other HTTPS URIs may be used. These will appear most commonly in the credential ID, and dereferencing an HTTPS URI used as a credential ID **may** return a copy of the credential itself. This makes it easier for the URI to be referenced in other credentials without having to include a copy of the referenced credential in each presentation.

1.4 Party Identification

A party that is an actor within any of these processes **must** have a DID appropriate to the ecosystem in which it is operating, and it **may** also have a DLURI representation of a party GLN.

For the sake of simplicity, where a DID refers to a party, the examples use a did:web URI, with the web address representing a domain under the control of the party. As with all URIs, the DIDs in this document are for illustration purposes only; in production, GS1 Global Office, GS1 Member Organisations, and user companies will be free to choose whatever DID methods best suit them. The only requirements are that the DID for GS1 Global Office be well known, as it is the anchor for all credentials, and that the DID documents for GS1 Global Office and the GS1 Member Organisations be publicly accessible.

1.4.1 Issuer – ID vs. Object

In the Verifiable Credentials data model, the issuer may be a URI, or it may be an object with an *id* property that is a URI. The examples use URIs only, but it may be desirable for the issuer to be an object and include a "gs1:Organization" property, at least for credentials issued by GS1 Global Office and GS1 Member Organisations.

1.5 Guiding Principles

Development of the W3C Verifiable Credentials Data Model and validations follows five guiding principles.

1.5.1 Alignment

The principal of alignment requires that the framework align with existing practices within GS1. If any new practices are to be created, they can only be in support of Verifiable Credentials as a capability of GS1.

1.5.2 Completeness

The principle of completeness requires that the framework support all use cases within the GS1 identification system. A framework that works for most, but not all, users is not one that GS1 can take to market.

1.5.3   Extensibility

Completeness doesn't mean that GS1 must provide a solution for all use cases, only that it must enable them.

The principle of extensibility requires that the framework to be extensible so that users can build their own applications around the GS1 identification system and be assured that the Verifiable Credentials they issue can work within it, as long as they follow the rules for the GS1 identification system.

1.5.4   Security

In any distributed system where most parties have no direct relationship, there are opportunities for error and, in rare circumstances, for fraud.

The principle of security requires that the validation rules be sufficient to detect erroneous or fraudulent Verifiable Credentials.

1.5.5   Consistency

The architecture of the GS1 identification system can lead to the temptation to take shortcuts with some of the Verifiable Credentials within the hierarchy. While this may simplify the model for some use cases, it makes generation and especially validation of the Verifiable Credentials more complex, which can lead to inconsistent and erroneous implementations.

The principle of consistency requires that generation and validation of a Verifiable Credential be done in a consistent manner, regardless of the path taken to get to that Verifiable Credential.

1.6   Nomenclature

The diagrams in the following sections are standard UML class and activity diagrams.

1.6.1   Class Diagram
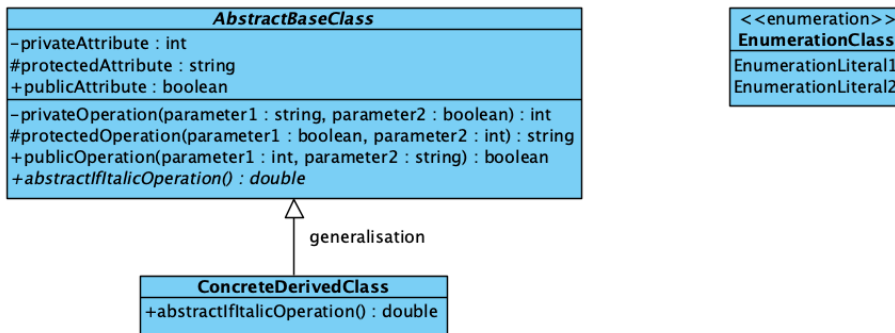
Classes that carry over from one class diagram to another (e.g., GS1ExtensibleCredential) are shown in full only in their initial appearance.

1.6.2 Activity Diagram
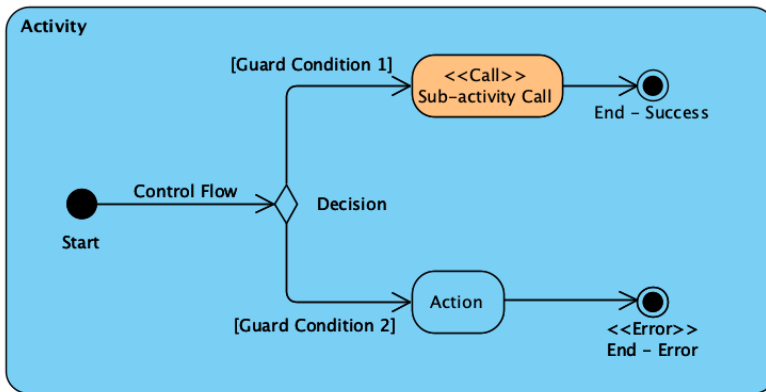
2   Base

Support for Verifiable Credentials within GS1 require some common functionality that isn't tied to any specific feature. This section defines the classes that provide that functionality.

2.1   Classes

<<enumeration>> GS1IdentificationKeyTypeCode
+valid(identificationKeyValue : xsd:string, includeSerialComponent : xsd:boolean) : xsd:boolean
GTIN GLN SSCC GRAI GIAI GSRN GDTI GINC GSIN GCN CPID GMN

GS1ExtensibleCredential
+extendsCredential : xsd:anyURI

2.1.1   GS1IdentificationKeyTypeCode

This is an enumeration of all available GS1 identification key types.

2.1.1.1   Literals

Enumeration	Description
GTIN	Global Trade Item Number.
GLN	Global Location Number.
SSCC	Serial Shipping Container Code.
GRAI	Global Returnable Asset Identifier.
GIAI	Global Individual Asset Identifier.
GSRN	Global Service Relation Number.
GDTI	Global Document Type Identifier.
GINC	Global Identification Number for Consignment.
GSIN	Global Shipment Identification Number.
GCN	Global Coupon Number.
CPID	Component/Part Identifier.
GMN	Global Model Number.

2.1.1.2   Operations

Operation	Return Type	Description
valid	xsd:boolean	This is a general method for validating a GS1 identification key. It validates the length, character set, check digit or check characters, and optionally the serial component. No implementation flow is provided for this method as doing so adds no value at this time. The implementation is presumed to be based on the rules in the GS1 General Specifications.

2.1.2   GS1ExtensibleCredential

This is the abstract superclass of any Verifiable Credential in the GS1 ecosystem that is extensible, i.e., that can be extended from another.

2.1.2.1   Attributes

Attribute	Type	*	Description
extendsCredential	xsd:anyURI	0..1	Reference to the credential that this one extends. Provides a complete chain to the GS1 Prefix or GS1-8 Prefix licence credential issued by GS1 Global Office.

3 Core Licensing

Core licensing is only about the tier 1 keys. This section covers most use cases for tier 1 keys and will be the easiest to take to market.

3.1 Licence Value and Alternative Licence Value

Every licence credential includes a licence value. The licence credential type is usually sufficient to define, together with the licence value, the "space" or "range" of the GS1 identification system granted to the licensee. The exception to this is any licence credential that has to do with a GS1 identification key, which requires an identification key type as an additional qualifier.

For licence credentials that have to do with prefixes, the licence value is in normalised GS1 (i.e., non-U.P.C.) form. Where the licence credential is within the U.P.C. range, the alternative licence value holds the U.P.C. form.

For licence credentials that have to do with GS1 identification keys, the licence value is the key, including the check digit or check characters if applicable, and excluding the serial component if applicable. When the licence is specifically for a GTIN, the licence value is the GTIN in its minimum format: GTIN-8, GTIN-12, GTIN-13 (which must not start with a zero), or GTIN-14 (which must start with indicator digit 9). Where the licence credential is for a GTIN-8, GTIN-12, or GTIN-13, the alternative licence value is the GTIN normalised to 13 digits (by padding with zeros on the left) and with the check digit removed (resulting in a 12-digit string); this value is used when verifying a GTIN with indicator digit 1-8 against a licence.

3.2 Classes
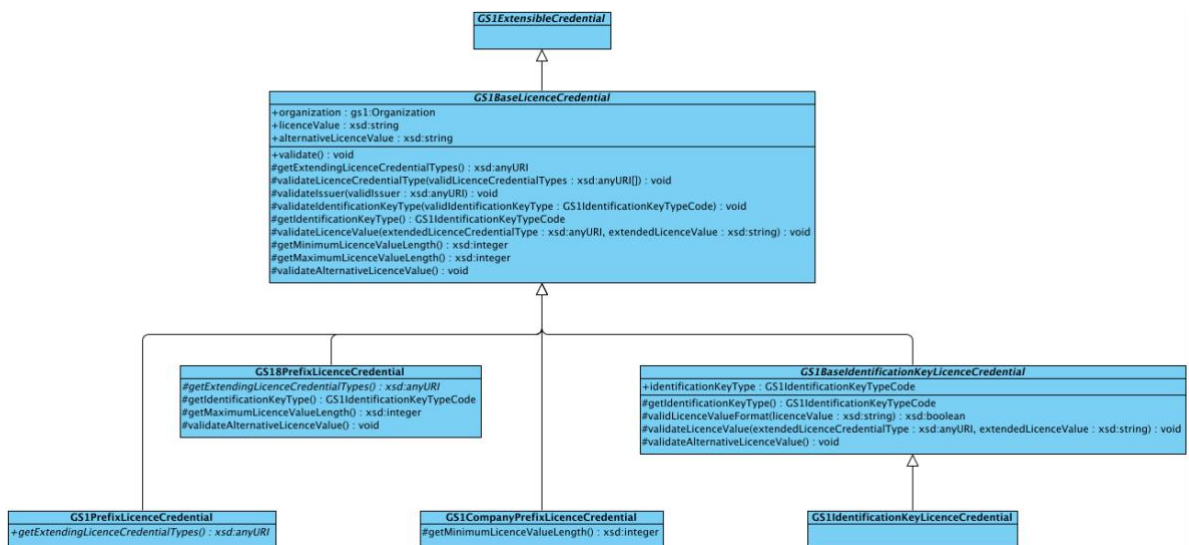
3.2.1 GS1BaseLicenceCredential

This is the abstract superclass of any Verifiable Credential that is shared with parties interested in the licence information associated with a GS1 identification key.

GS1 licence credentials form a chain all the way up to GS1 Global Office, which acts as the root of the GS1 identification system by issuing GS1 Prefixes and GS1-8 Prefixes. Even GS1 Global Office itself, which acts as a GS1 Member Organisation for countries that don't have one, must start with a GS1 Prefix licence or a GS1-8 Prefix licence issued to itself before issuing licences to user companies.

3.2.1.1   Attributes

Attribute	Type	*	Description
organization	gs1:Organization	1	Organization that is the credential subject. At minimum, the attributes partyGLN and organizationName must be populated.
licenceValue	xsd:string	1	Value of the licence.
alternativeLicenceValue	xsd:string	0..1	Alternative value of the licence. For most licences, the alternative value of the licence is the bridge between the U.P.C. system and the rest of the GS1 system: if the licence value starts with zero, then the alternative licence value is the same as the licence value but without the starting zero.

3.2.1.2   Operations

Operation	Return Type	Description
validate	void	Validate the licence credential by validating the extended credential (if any) and then the attributes of this licence credential.
getExtendingLicenceCredentialTypes	xsd:anyURI	Returns the licence credential types that can extend this licence credential. The default implementation returns an empty array, indicating that this is a terminating licence credential.
validateLicenceCredentialType	void	Validate the licence credential type against the list of licence credential types supported by the extended licence credential or the list of root licence credential types if there is no extended licence credential.
validateIssuer	void	Validate the issuer by comparing it to the credential subject of the extended credential or to the root DID if there is no extended credential.
validateIdentificationKeyType	void	Validate the identification key type against the identification key type of the extended licence credential. If both the identification key type and the valid identification key type are null, they must match.
getIdentificationKeyType	GS1IdentificationKeyTypeCode	Returns the singular identification key type supported by this licence or null if all identification key types are supported. The default implementation returns null if the extended credential is null or the identification key type supported by the extended credential if the extended credential is not null.
validateLicenceValue	void	Validate the licence value given the extended licence value.
getMinimumLicenceValueLength	xsd:integer	Returns the minimum licence value length. The default implementation returns the length of the licence value of the extended licence credential if any, or 2 if none.
getMaximumLicenceValueLength	xsd:integer	Returns the maximum licence value length. The default implementation returns 12.
validateAlternativeLicenceValue	void	Validate the alternative value of the licence. The default implementation treats the alternative value of the licence as the bridge between the U.P.C. system and the rest of the GS1 system: if the licence value starts with zero, then the alternative licence value is the same as the licence value but without the starting zero.

3.2.1.3 Implementation
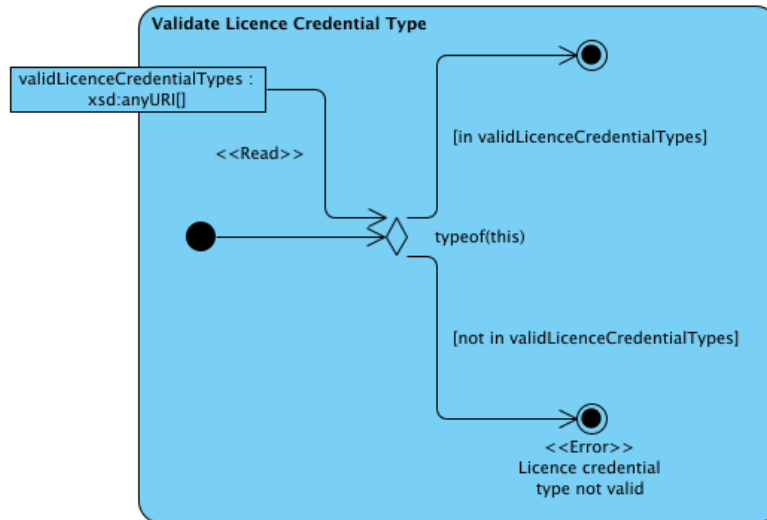
3.2.1.3.1 Validate Licence Credential
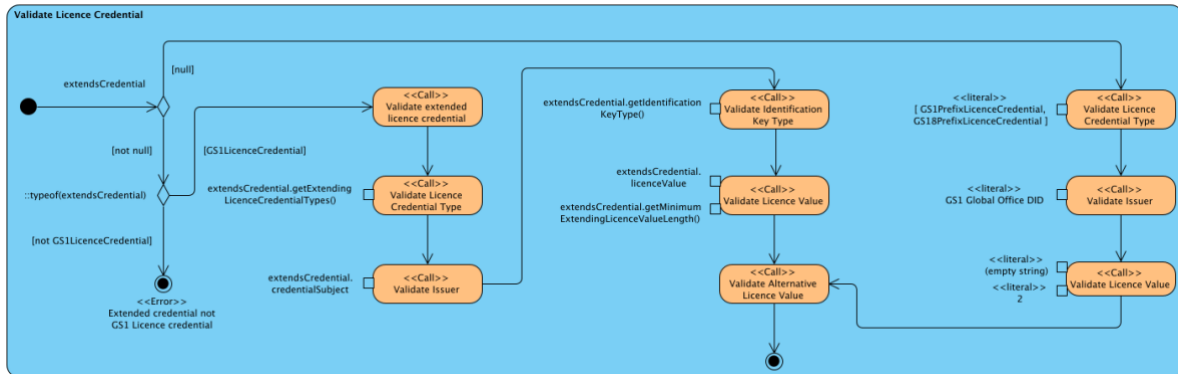
3.2.1.3.1.1 Flow

	Text	Description
	extendsCredential	Check for the existence of an extended credential.
	::typeof(extendsCredential)	Check the type of the extended credential.
	Validate extended licence credential	Recursive call to this activity to validate the extended licence credential. For a licence credential to be valid, all prior licence credentials must be valid as well.
	Validate Licence Credential Type	See implementation for "Validate Licence Credential Type".
	extendsCredential.getExtendingLicenceCredentialTypes()	Extended licence credential determines the valid licence credential types for the extending licence credential.
	Validate Issuer	See implementation for "Validate Issuer".
	extendsCredential.credentialSubject	The credential subject of the extended licence credential must be the issuer of the extending licence credential.
	Validate Identification Key Type	See implementation for "Validate Identification Key Type".
	extendsCredential.getIdentificationKeyType()	If the extended licence credential restricts the identification key type, the extending licence credential must have a null or the same identification key type restriction.
	Validate Licence Value	See implementation for "Validate Licence Value".
	extendsCredential.licenceValue	The licence value of the extended licence credential must be the start of the licence value of the extending licence credential.
	extendsCredential.getMinimumExtendingLicenceValueLength()	The length licence value of the extending licence credential must be at least the length specified by the extended licence credential.
	Validate Alternative Licence Value	See implementation for "Validate Alternative Licence Value".
	Validate Licence Credential Type	See implementation for "Validate Licence Credential Type".
	[GS1PrefixLicenceCredential, GS18PrefixLicenceCredential]	Only valid root licence credential types are for GS1 Prefix and GS1-8 Prefix.
	Validate Issuer	See implementation for "Validate Issuer".
	GS1 Global Office DID	GS1 Global Office is the root issuer.
	Validate Licence Value	See implementation for "Validate Licence Value".
	(empty string)	Empty string is the root licence value.
	2	The minimum length for a GS1 Prefix or GS1-8 Prefix is 2.

3.2.1.3.1.2   Errors

Error	Description
Extended credential not GS1 Licence credential	The extended credential must be a GS1 Licence credential.

3.2.1.3.2   Validate Licence Credential Type

3.2.1.3.2.1   Inputs

Input	Type	Description
validLicenceCredentialTypes	xsd:anyURI[]	The licence credential types against which to validate the type of this licence credential.

3.2.1.3.2.2   Flow

	Text	Description
⤴	typeof(this)	Check the type of this licence credential.

3.2.1.3.2.3   Errors

Error	Description
Licence credential type not valid	The type of this licence credential is not in the list of valid licence credential types.

3.2.1.3.3   Validate Issuer
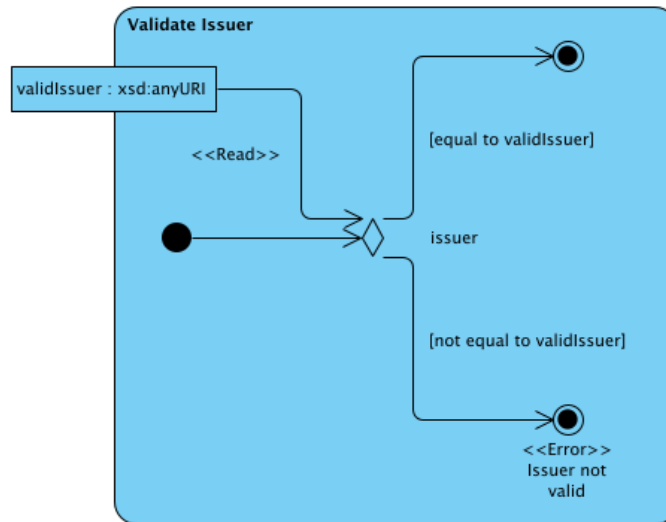
3.2.1.3.3.1   Inputs

Input	Type	Description
validIssuer	xsd:anyURI	The issuer against which to validate the issuer of this licence credential.

3.2.1.3.3.2   Flow

	Text	Description
↦	issuer	Check the issuer of this licence credential.

3.2.1.3.3.3   Errors

Error	Description
Issuer not valid	The issuer of this licence credential does not match the expected value.

3.2.1.3.4   Validate Identification Key Type
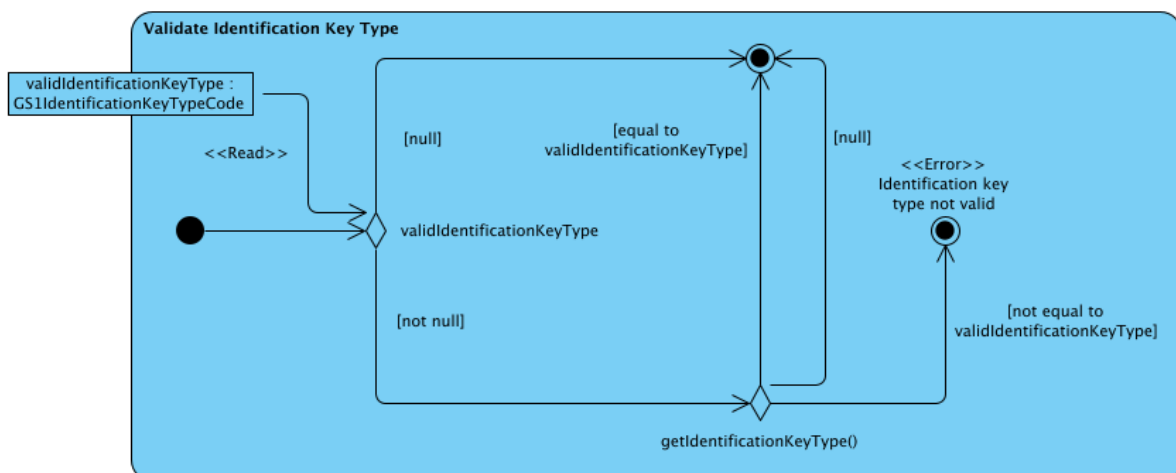
3.2.1.3.4.1 Inputs

Input	Type	Description
validIdentificationKeyType	GS1IdentificationKeyTypeCode	The identification key type against which to validate the identification key type supported by this licence credential.

3.2.1.3.4.2 Flow

	Text	Description
↦⚡	validIdentificationKeyType	Check the valid identification key type.
↦⚡	getIdentificationKeyType()	Check the identification key type of this licence credential.

3.2.1.3.4.3 Errors

Error	Description
Identification key type not valid	The identification key type of this licence credential does not match the expected value.

3.2.1.3.5 Validate Licence Value
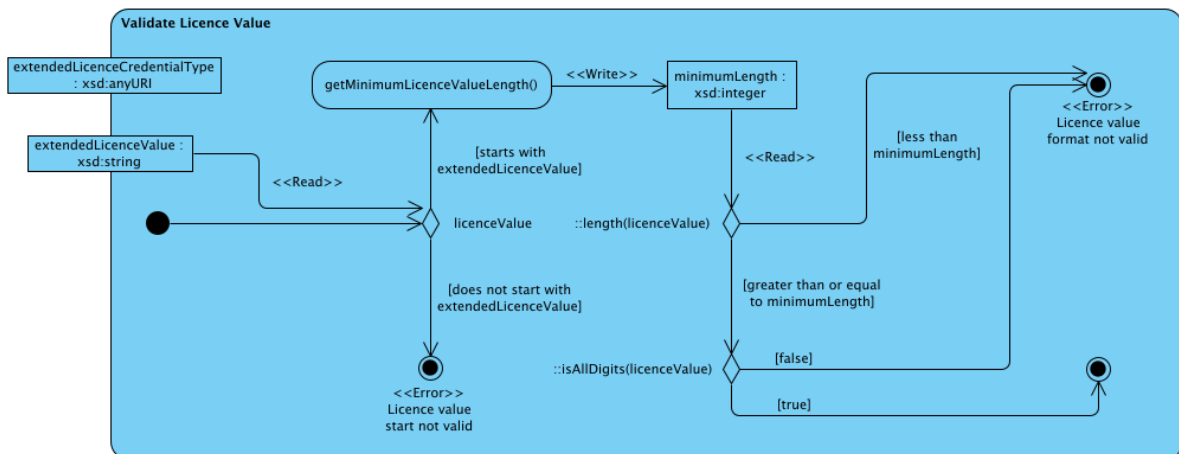
3.2.1.3.5.1 Inputs

Input	Type	Description
extendedLicenceCredentialType	xsd:anyURI	The type of the extended licence credential. This may affect the validation flow for some types of licence credential.
extendedLicenceValue	xsd:string	The licence value from the extended licence credential against which to validate the licence value of this licence credential.

3.2.1.3.5.2 Variables

Variable	Type	Description
minimumLength	xsd:integer	The minimum length of the licence value of this licence credential.

3.2.1.3.5.3   Flow

	Text	Description
↦	licenceValue	Check the licence value of this licence credential.
▭	getMinimumLicenceValueLength()	Get the minimum length of the licence value of this licence credential.
↦	::length(licenceValue)	Check the length of the licence value of this licence credential.
↦	::isAllDigits(licenceValue)	Check the format of the licence value.

3.2.1.3.5.4   Errors

Error	Description
Licence value start not valid	The licence value doesn't start with the expected value.
Licence value format not valid	The licence value format is not valid.

3.2.1.3.6   Get Minimum Licence Value Length
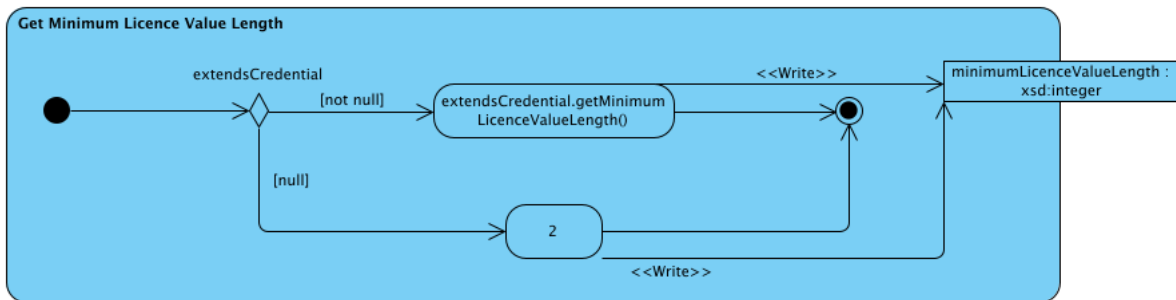
3.2.1.3.6.1   Outputs

Output	Type	Description
minimumLicenceValueLength	xsd:integer	Minimum licence value length

3.2.1.3.6.2   Flow

	Text	Description
↦	extendsCredential	Check the extended licence credential.
▭	extendsCredential.getMinimumLicenceValueLength()	Get the minimum licence value length from the extended licence credential.
▭	2	Minimum licence value length for any licence type that doesn't override this operation is 2.

3.2.1.3.7   Validate Alternative Licence Value
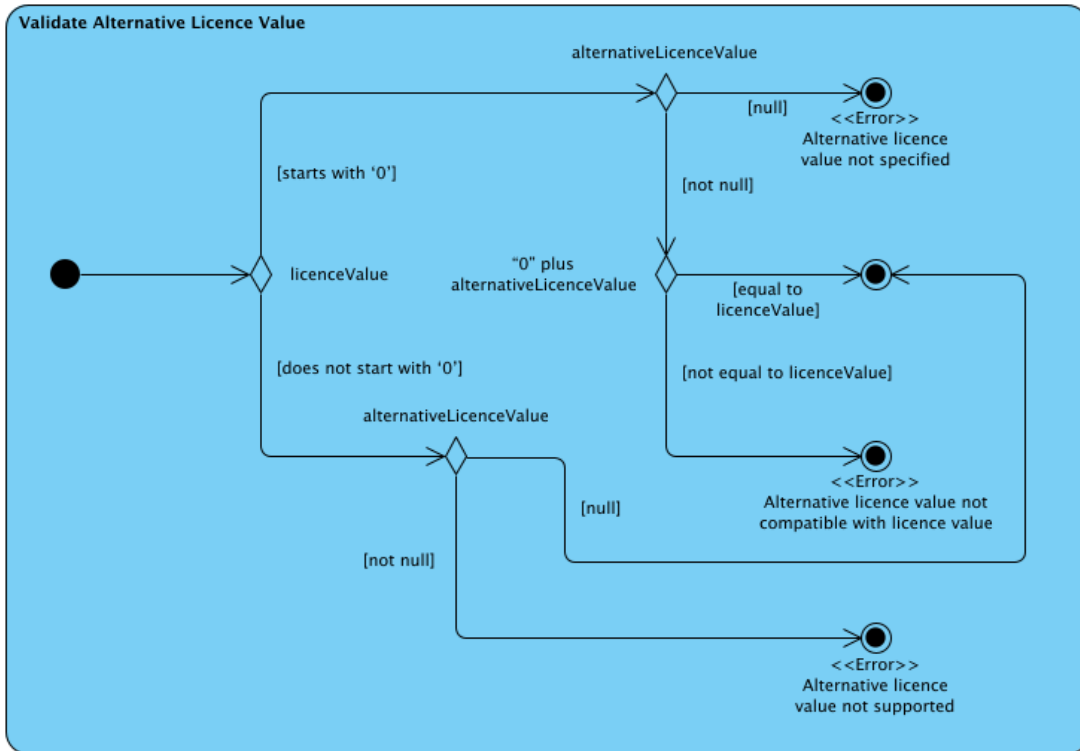
3.2.1.3.7.1   Flow

	Text	Description
→⚡	licenceValue	Check the licence value of this licence credential.
→⚡	alternativeLicenceValue	Check the alternative licence value of this licence credential.
→⚡	"0" plus alternativeLicenceValue	Check required alternative licence value.
→⚡	alternativeLicenceValue	Check the alternative licence value of this licence credential.

3.2.1.3.7.2   Errors

Error	Description
Alternative licence value not specified	The alternative licence value has not been specified.
Alternative licence value not compatible with licence value	The alternative licence value is not compatible with the licence value.
Alternative licence value not supported	An alternative licence value is not supported.

3.2.2   GS1PrefixLicenceCredential

A GS1 Prefix is issued by GS1 Global Office and allocated a GS1 Member Organisation or to itself for the purpose of issuing GS1 Company Prefix or GS1 identification key licences.

3.2.2.1   Operations

| Operation	Return Type	Description
getExtendingLicenceCredential Types	xsd:anyURI	Returns [GS1CompanyPrefixLicenceCredential, GS1IdentificationKeyLicenceCredential] as the licence credential types that can extend this licence credential.

3.2.3   GS18PrefixLicenceCredential

A GS1-8 Prefix is issued by GS1 Global Office and allocated a GS1 Member Organisation or to itself for the purpose of issuing GS1 identification key licences for GTIN-8s.

3.2.3.1   Operations

Operation	Return Type	Description
getExtendingLicenceCredential Types	xsd:anyURI	Returns [GS1IdentificationKeyLicenceCredential] as the licence credential types that can extend this licence credential.
getIdentificationKeyType	GS1IdentificationKeyTypeCode	Returns GTIN as the identification key type supported by this licence.
getMaximumLicenceValueLength	xsd:integer	Returns 7 as the maximum licence value length.
validateAlternativeLicenceValue	void	Validate the alternative value of the licence. The GS1-8 Prefix doesn't support the alternative licence value. Although in practice GS1 US doesn't issue GTIN-8s, it has still been licensed all GS1-8 Prefixes starting with zero and the default logic of checking for zero would be incorrect.

3.2.3.2   Implementation

3.2.3.2.1   Validate Alternative Licence Value (GS1-8 Prefix)
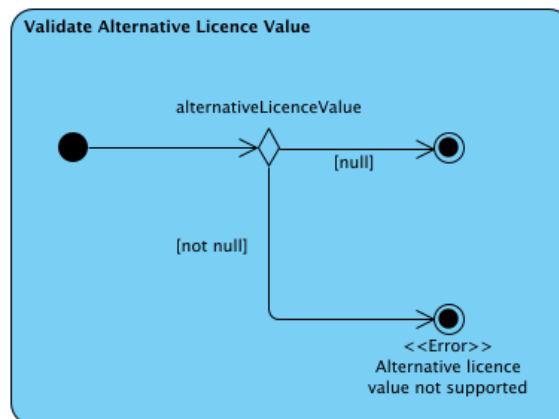
3.2.3.2.1.1   Flow

	Text	Description
↱	alternativeLicenceValue	Check the alternative licence value of this licence credential.

3.2.3.2.1.2 Errors

Error	Description
Alternative licence value not supported	An alternative licence value is not supported.

3.2.4 GS1CompanyPrefixLicenceCredential

A GS1 Company Prefix Licence is issued by a GS1 Member Organisation or GS1 Global Office and allocated to a user company or to itself for the purpose of generating tier 1 GS1 identification keys.

3.2.4.1 Operations

Operation	Return Type	Description
getMinimumLicenceValueLength	xsd:integer	Returns the maximum of 4 or the length of the underlying GS1 Prefix licence value plus 1 as the minimum licence value length.

3.2.4.2 Implementation

3.2.4.2.1 Get Minimum Licence Value Length (GS1 Company Prefix)
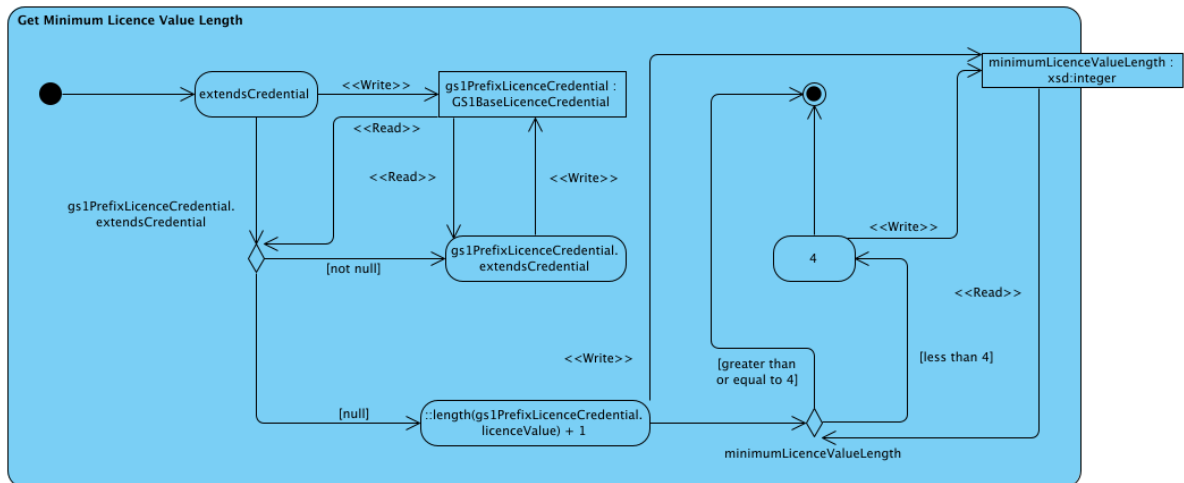
3.2.4.2.1.1 Outputs

Output	Type	Description
minimumLicenceValueLength	xsd:integer	Minimum licence value length

3.2.4.2.1.2 Variables

Variable	Type	Description
gs1PrefixLicenceCredential	GS1BaseLicenceCredential	Holder to determine GS1 Prefix licence credential. The GS1 Prefix is the root licence credential for a GS1 Company Prefix licence credential.

3.2.4.2.1.3 Flow

	Text	Description
⊟	extendsCredential	Get the first extended licence credential in the chain.
⇄	gs1PrefixLicenceCredential.extendsCredential	Check the extended licence credential of the holder for the GS1 Prefix licence credential. If null, GS1 Prefix licence credential has been found.
⊟	gs1PrefixLicenceCredential.extendsCredential	Get the next extended licence credential in the chain.
⊟	::length(gs1PrefixLicenceCredential.licenceValue) + 1	The length of the GS1 Company Prefix licence value must be at least one longer than the length of the GS1 Prefix licence value.
⇄	minimumLicenceValueLength	Check the minimum licence value length. Must be at least 4.
⊟	4	Minimum licence value length for GS1 Company Prefix is 4.

3.2.5 GS1BaseIdentificationKeyLicenceCredential

This is the abstract superclass that provides base functionality for licence credential types that support GS1 identification keys.

3.2.5.1 Attributes

Attribute	Type	*	Description
identificationKeyType	GS1IdentificationKeyTypeCode	1	Identification key type of the licence. This plus the licence value define the GS1 identification key.

3.2.5.2 Operations

Operation	Return Type	Description
getIdentificationKeyType	GS1IdentificationKeyTypeCode	Returns the identification key type of the licence.
validLicenceValueFormat	xsd:boolean	Determines if the licence value matches the format (character set, minimum and maximum lengths, etc.) required by the identification key type.
		For all identification key types except the GTIN, the licence value is the identification key in its entirety, including check digit or check characters if applicable.
		For the GTIN, the licence value is the GTIN in its minimum format (8, 12, 13, or 14 digits), including check digit. If the GTIN is 13 digits, it must not start with a zero. If the GTIN is 14 digits, it must start with indicator digit 9.
validateLicenceValue	void	Validate the licence value given the extended licence value.
validateAlternativeLicenceValue	void	Validate the alternative value of the licence. The default implementation treats the alternative value of the licence as the bridge between the U.P.C. system and the rest of the GS1 system: if the licence value starts with zero, then the alternative licence value is the same as the licence value but without the starting zero.

3.2.5.3 Implementation

3.2.5.3.1 Validate Licence Value (GS1 Identification Key)
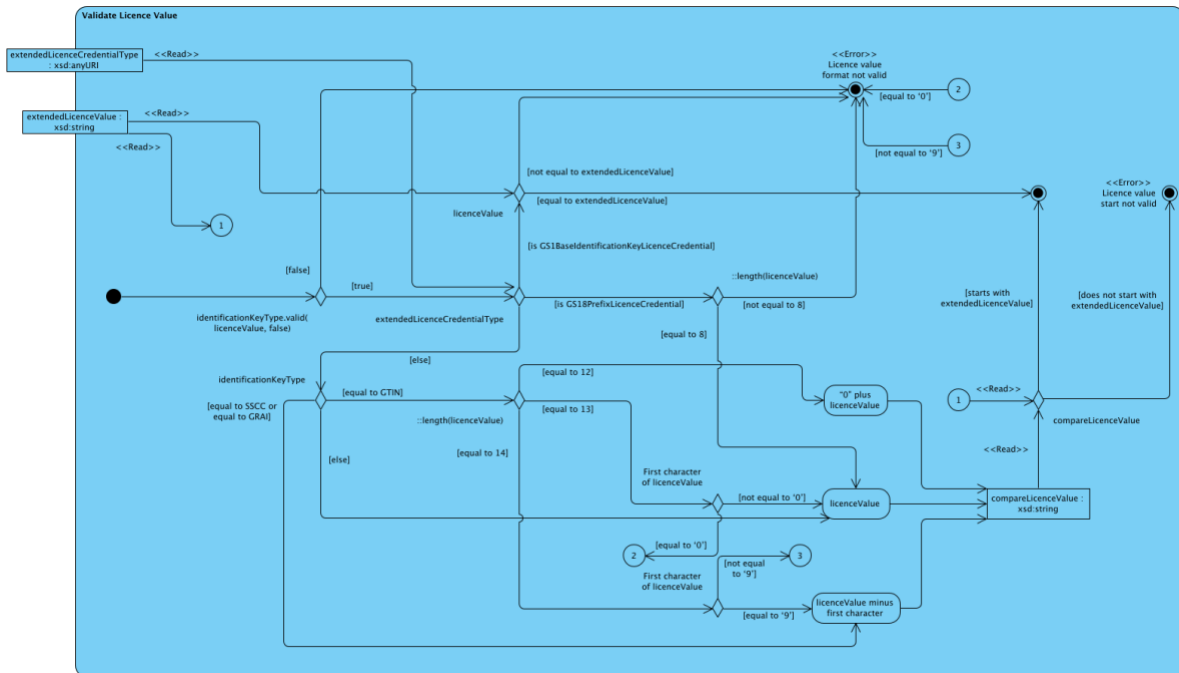
3.2.5.3.1.1 Inputs

Input	Type	Description
extendedLicenceCredentialType	xsd:anyURI	The type of the extended licence credential. This affects the validation flow.
extendedLicenceValue	xsd:string	The licence value from the extended licence credential against which to validate the licence value of this licence credential.

3.2.5.3.1.2 Variables

Variable	Type	Description
compareLicenceValue	xsd:string	The portion of the licence value to compare against the licence value of the extended licence credential.

3.2.5.3.1.3 Flow

	Text	Description
⇢	identificationKeyType.valid(licenceValue, false)	Check that the licence value is structurally valid for the given identification key type.
⇢	extendedLicenceCredentialType	Check the extended licence credential type.
		If the type is GS1BaseIdentificationKeyLicenceCredential, the validation simply requires that the licence value of this licence credential equal the licence value of the extended licence credential.
		If the type is GS18PrefixLicenceCredential, the normal validation rules apply but the length of the licence value must be exactly 8. The identification key type is known to be GTIN.
⇢	licenceValue	Check the licence value against the licence value of the extended licence credential.

	Text	Description
	::length(licenceValue)	Check the length of the licence value. Must be exactly 8.
	identificationKeyType	Check the identification key type.
		If the type is GTIN, extended validation rules apply.
		If the type is SSCC or GRAI, the first character of the licence value must be removed (extension digit for SSCC, zero padding for GRAI) before checking the licence value against the licence value of the extended licence credential.
		Otherwise, the licence value is checked as is.
	::length(licenceValue)	Check the length of the licence value.
		If the length is 12, the GTIN is based on a U.P.C. Company Prefix and the licence value requires a zero to be padded on the left before checking against the licence value of the extended licence credential.
		If the length is 13, the GTIN is not based on a U.P.C. Company Prefix and must not start with a zero.
		If the length is 14, the GTIN must start with indicator digit 9 (indicating a variable measure trade item scanned in general distribution), which must be removed before checking the licence value against the licence value of the extended licence credential.
	First character of licenceValue	Check the first character of the licence value. Must not be '0'.
	First character of licenceValue	Check the first character of the licence value. Must be '9'.
	"0" plus licenceValue	The licence value requires a zero prepended to it before being compared to the licence value of the extended licence credential.
	licenceValue	The licence value is compared as is to the licence value of the extended licence credential.
	licenceValue minus first character	The licence value has an extra character at the start (indicator digit for GTIN, extension digit for SSCC, zero for GRAI) that must be removed before being compared to the licence value of the extended licence credential.
	compareLicenceValue	Check the portion of the licence value to compare against the licence value of the extended licence credential.

3.2.5.3.1.4 Errors

Error	Description
Licence value format not valid	The licence value format is not valid.
Licence value start not valid	The licence value doesn't start with the expected value.

3.2.5.3.2 Validate Alternative Licence Value (GS1 Identification Key)
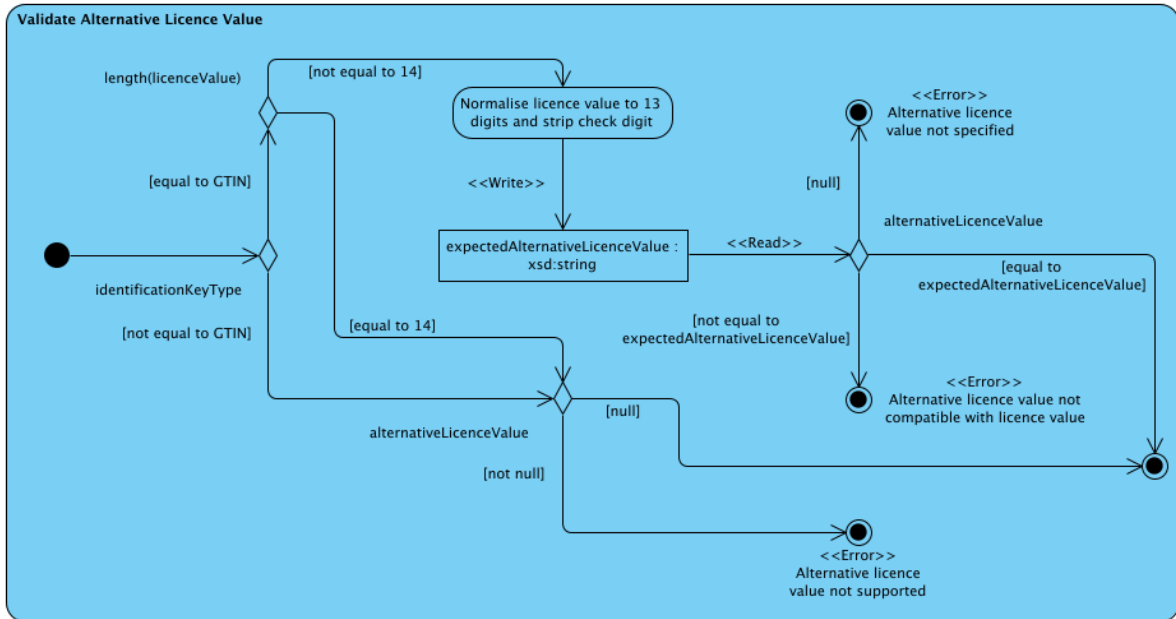
3.2.5.3.2.1 Variables

Variable	Type	Description
expectedAlternative LicenceValue	xsd:string	The expected alternative licence value, being a 12-digit string to be used to check against GTINs with indicator digits 1-8.

3.2.5.3.2.2 Flow

	Text	Description
➡️	identificationKeyType	Check the identification key type of this licence credential.
➡️	length(licenceValue)	Check the length of the licence value of this licence credential.
▱	Normalise licence value to 13 digits and strip check digit	The alternative licence value is used to check against GTINs with indicator digits 1-8. To do this efficiently, the alternative licence value is the licence value padded on the left with enough zeros to bring it up to 13 digits and then the check digit on the right is removed, yielding a 12-digit string.
➡️	alternativeLicenceValue	Check the alternative licence value of this licence credential.
➡️	alternativeLicenceValue	Check the alternative licence value of this licence credential.

3.2.5.3.2.3 Errors

Error	Description
Alternative licence value not specified	The alternative licence value has not been specified.
Alternative licence value not compatible with licence value	The alternative licence value is not compatible with the licence value.
Alternative licence value not supported	An alternative licence value is not supported.

3.2.6 GS1IdentificationKeyLicenceCredential

A GS1 identification key licence is issued by a GS1 Member Organisation or GS1 Global Office and entitles the user company to allocate that key to an object.

Within GS1 Member Organisations, there are generally two types of programmes for issuing GS1 identification key licences.

The first programme is to support the marking of very small trade items. If the GS1 Member Organisation determines that the trade item is too small for a GTIN-13, it will issue a GS1 identification key licence for a GTIN-8.

The second programme is to support small- to medium-sized enterprises (SMEs) that sell only a handful of products and often don't have the resources or the need to manage a GS1 Company Prefix. The GS1 Member Organisation usually sets aside a GS1 Company Prefix for the purpose of generating single-issue GS1 identification key licences.

4   Declaration

Declaration is about data. Fundamentally, it requires three components: a key to identify the object about which the declaration is being made, the data with which the key is associated, and enough information about the party making the declaration to know whether or not to trust it.

A GS1 identification key is said to be allocated to an object when it is associated with data about that object. For a GTIN, the data describes the product or other trade item, with a brand and description. For a GLN, the data describes a location, with a name and address. For an SSCC, the data describes the source, destination, and contents. Similar mappings exist for all identification keys, and not just for those within the GS1 system.

In most cases, the party that issues the key is expected to be the one to associate data with it, but this isn't always the case. Some product data, when provided by the brand owner, isn't necessarily trusted by the users of that data. For retailers, one of the critical data sets is that of the product dimensions and weight for planogram purposes, and a significant percentage of brand owners, even large multinationals, cannot provide consistent and reliable planogram data. For consumers, product certifications (organic, allergen-free, fair trade, kosher, praman, etc.) are more trusted, or only trusted, when they can be verified by outside agencies.

To support the ability for outside agencies to associate data with a key in a way that can be fully trusted, the party that issues the key must delegate the authority to do so to that outside agency.

There are, however, some circumstances where even delegation isn't trusted. For example, product reviews are expected to be independent, and the validity of the product review will depend on the identification of the product being reviewed and some authority to review the product (e.g., proof of purchase for a consumer-based review or the reputation of the reviewing party for a business-based review). There is no authorisation provided by the licensee for the review and the trust in the data comes through a different path.

➢ For the sake of simplicity, all the data elements in this section are assumed to be unilingual. In a production implementation, localisable attributes (e.g., product description) would support multiple languages. Similarly, some structured attributes are simplified, and some repeatable attributes are shown as singletons.

4.1   Issuer

It will take some time for Verifiable Credentials to achieve critical mass. To support the transition to a world in which all parties can make the appropriate declarations or delegations themselves, there is an automatic delegation to the licensor as the issuer of a credential. This allows GS1 Member Organisations to issue declarations on behalf of their user companies, such as for Verified by GS1.

4.2   Credential Subject ID

When declaring data, the credential subject ID should be a GS1 Digital Link URI (DLURI). While preference should be given to the canonical URI (based on id.gs1.org), this is not required.

Using the DLURI means that the data declaration can support any level of granularity required (e.g., GTIN, GTIN+CPV, GTIN+lot, GTIN+serial, GLN, GLN+extension, etc.). Furthermore, using a DLURI eliminates the need to generate and secure a public/private key pair for every object, which can be difficult to manage as the number of objects requiring Verifiable Credentials grows (e.g., GTIN+serial for manufacturing, GLN+extension for warehouse location identification, SSCC for logistics).

In some use cases where a DID or other URI is required as the credential subject ID (e.g., party identification between trading partners), the DLURI shall be included as well using a "sameAs" attribute in the credential subject. If the credential subject ID is already a DLURI, the "sameAs" attribute shall not be specified.

The presence of a DLURI makes for easy association between Verifiable Credentials of different types. For example, a retail operation may want to assign GLNs to all of its stores and to make basic declarations about them, such as the store name and address as well as its opening hours. As each store can act as a Verifiable Credential issuer or subject in some circumstances, the party data Verifiable Credential, containing the store name and address, would have the store's DID as the

credential subject ID and a "sameAs" attribute with the DLURI. However, the store's opening hours have nothing to do with its participation in Verifiable Credential processes, so the DLURI can be specified as the credential subject ID for the opening hours Verifiable Credential.

4.3   GS1 Key Credential

When discussing licensing, the terms "identification key" and "GS1 identification key" are used, but when discussing declarations, the terms "key" and "GS1 key" are used. "Identification key" and "GS1 identification key" refer to any of the foundational keys within the GS1 General Specifications: GTIN, GLN, SSCC, etc., and exclude serialised versions of keys that natively support serialisation (GRAI, GDTI, and GCN). "Key" and "GS1 key" refer to the identification keys alone as well as any combination of identification keys and other attributes that can identify something for which data can be declared.

Some examples:

- GTIN to identify a trade item;
- GTIN+lot to identify common manufacturing characteristics across multiple trade item instances;
- GTIN+serial to identify a specific instance of a trade item;
- GLN to identify a warehouse;
- GLN+extension to identify a sub-location within a warehouse;
- GDTI in serialised form to identify a specific document; and
- GSRN+SRIN to identify a sequence within an episode of care.

The lifecycle of a key is different from the lifecycle of the licence on which it is based and on the data associated with it. A trade item may be withdrawn from the market, but the data associated with it would be valid for a long time to come, especially if in the resale market if it's a non-perishable item. The underlying licence, whether for a GS1 Company Prefix or for a GS1 identification key (even if identical to the key), could also remain valid for some time. Revoking the Verifiable Credential for the GS1 key can make a statement about the validity of the key without affecting the validity of the data declared for it (but it will prevent new declarations from being made).

Furthermore, with the multitude of data sets that can be associated with a key, it's difficult to identify one that can apply across multiple key types, or even one that can apply across all instances of a single key type. For example, it can be argued that a trade item shall have a brand and description, so a basic trade item data declaration containing those attributes should be enough to make a statement about the GTIN without having to create a separate Verifiable Credential, but other questions arise:

- Which description do you use? The supply chain description, the regulatory description, or the consumer description?
- How do you handle changes to the basic trade item data that don't change the GTIN?
- What happens to other data declarations that refer to the basic trade item data declaration when the basic trade item data declaration is revoked and replaced with an updated description?
- How do you discover the current version of the basic trade item data declaration?

The best way to deal with these questions is to keep the GS1 key in its own Verifiable Credential.

4.4 Classes
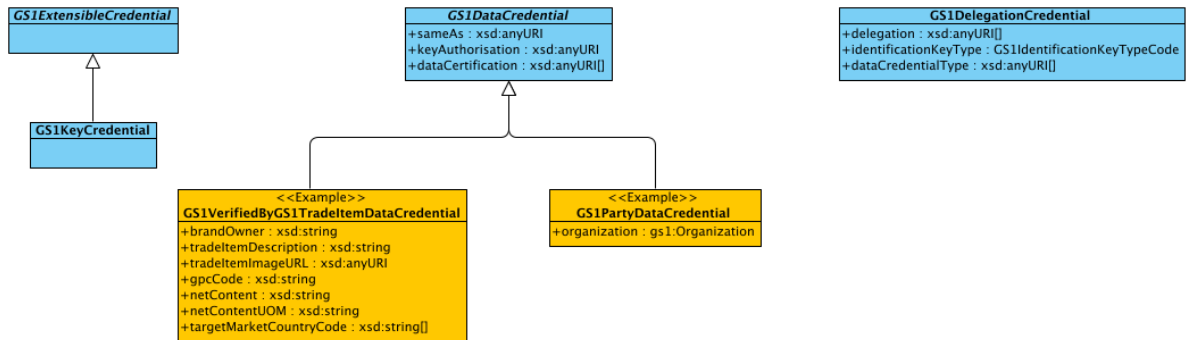
4.4.1 GS1KeyCredential

This is the Verifiable Credential that indicates that something has been identified. It contains no data about what has been identified as that is done via the association process. This credential is used only to indicate that the key that it contains exists and is valid. When the key is retired (e.g., a product is withdrawn from the market or an asset is destroyed), the credential is revoked.

The credential subject ID must be a GS1 Digital Link URI. While preference should be given to the canonical URI (based on id.gs1.org), this is not required. Using the GS1 Digital Link URI means that the credential can support any level of granularity required (e.g., GTIN, GTIN+CPV, GTIN+lot, GTIN+serial, GLN, GLN+extension, etc.).

4.4.2 GS1DataCredential

A data credential is data about something identified with a key credential. While anyone can make any declaration about an object, for that data to be trusted, it has to be authorised in some fashion. This can vary depending on the type of data and the business process in which it is used. For example, a brand owner can be trusted to declare the brand name, description, size and unit of measure, and much more about their own product. The brand owner may not be trusted, however, to declare certain product certifications (e.g., Halal and conformance to other religious practices) or to provide high-quality data for critical supply chain processes (e.g., dimensions and weights for planogram purposes). In such cases, the brand owner would have to authorise other parties that are trusted to provide that data.

On the other hand, an anonymous consumer can provide a review of the product without any authorisations provided by the brand owner but can increase trust in the review by referencing a proof of purchase credential for the product.

Ultimately, the rules governing which declarations may be made, by whom, and with what combination of data authorisation and data certification credentials depend on the data being provided.

The key authorisation and data certification credential URIs do not need to be resolvable, and the fact that this credential is presented does not require that the other credentials be presented as well. It is up to the holder to decide whether to present the other credentials alongside this one, and up to the verifier to decide whether or not to accept them (or accept their absence).

4.4.2.1 Attributes

Attribute	Type	*	Description
sameAs	xsd:anyURI	0..1	If the credential subject ID is not a GS1 Digital Link URI, this specifies the GS1 Digital Link URI.

Attribute	Type	*	Description
keyAuthorisation	xsd:anyURI	0..1	Reference to a credential that authorises the issuer to declare data for the credential subject (the key). Normally, this is the key credential itself, in which case the issuer of this and the key credential must be the same. For data that is declared by other parties on behalf of the issuer of the key credential, a delegation credential may be provided instead. In some circumstances, where the issuer of the data declaration is entirely independent, the key authorisation may be entirely outside of the GS1 system (e.g., a proof-of-purchase Verifiable Credential for a product review).
dataCertification	xsd:anyURI[]	0..*	List of references to credentials that certify that the issuer is competent to declare data of the given type. This would be used, for example, to declare that a solution provider is certified in accordance with the GS1 Package Measurement Rules Standard would assure the verifier of the credential that the planogram data contained in the credential is accurate. The combination of a data authorisation credential from the brand owner for planogram data along with the GS1 Package Measurement Rules Standard data certification credential would confirm to the verifier that the solution provider is both authorised and competent to provide the data. Multiple data certification credentials may be provided, which may address situations where multiple certifying parties exist and different users require different certifications. It's not always necessary to have a data certification credential to match a key delegation credential, as data certification may be implied by the issuer of the credential (e.g., a Halal or other religious practice certification authority) that is trusted by the community that is interested in the data.

4.4.3 GS1DelegationCredential

This is the Verifiable Credential that delegates to another party the right to issue data credentials on behalf of the issuer of this credential.

4.4.3.1 Attributes

Attribute	Type	*	Description
delegation	xsd:anyURI[]	1..*	References to the licence or key credentials that have been delegated to the credential subject. Within GS1, provides a complete chain to the GS1 Prefix licence credential issued by GS1 Global Office. If a URI is to a licence credential, all keys within the licence are delegated to the credential subject. If a key entry is incomplete (e.g., the delegation is for serial-level data but only the GTIN key credential is provided), all additional attributes below the path in the key are delegated to the credential subject. The delegation URIs do not need to be resolvable, and the fact that this credential is presented does not require that the delegation credentials be presented as well. It is up to the holder to decide whether to present the delegation credentials alongside this one.

Attribute	Type	*	Description
identificationKeyType	GS1IdentificationKeyTypeCode	0..1	The identification key type to which the delegation applies. This attribute is generally not necessary. If all of the delegations are for individual GS1 key credentials, or if the data type can apply to only one type of thing, the identification key type can be implied.
dataCredentialType	xsd:anyURI[]	0..*	A URI representing the data credential types that have been delegated. If the list is empty, the credential subject has the authority to declare any data of any type for the delegated URIs.

4.4.4   GS1VerifiedByGS1TradeItemDataCredential

The Verified by GS1 trade item data credential is the Verifiable Credential that is shared with parties interested in the basic information associated with a trade item identified by a GTIN.

4.4.4.1   Attributes

Attribute	Type	*	Description
brandOwner	xsd:string	1	The name of the brand owner.
tradeItemDescription	xsd:string	1	The description of the trade item.
tradeItemImageURL	xsd:anyURI	0..1	A URL pointing to an image of the trade item.
gpcCode	xsd:string	0..1	The Global Product Classification code.
netContent	xsd:string	0..1	The net content.
netContentUOM	xsd:string	0..1	The net content unit of measure.
targetMarketCountryCode	xsd:string[]	0..*	The target market country code(s).

4.4.5   GS1PartyDataCredential

The party data credential is the Verifiable Credential that is shared with parties interested in the basic information associated with a party identified by a GLN.

4.4.5.1   Attributes

Attribute	Type	*	Description
organization	gs1:Organization	1	Organization that is identified by the GLN.

5   Examples

Examples showing relationships between Verifiable Credentials are colour-coded according to the issuer as follows:

GS1 Global Office	GS1 Member Organisation	GS1 user company	Third party (e.g. solution provider)

5.1   GS1 Prefix Licence Credential

5.1.1   GS1 Prefix 754 Licensed to GS1 Canada

GS1 Prefix Licence 754

```
{
  "@context": [
    "https://www.w3.org/2018/credentials/v1",
    "https://ref.gs1.org/gs1/vc/licence-context/"
  ],
  "id": "https://id.gs1.org/vc/licence/gs1_prefix/754",
  "type": [
    "VerifiableCredential",
    "GS1PrefixLicenceCredential"
  ],
  "issuer": "did:web:id.gs1.org",
  "issuanceDate": "2005-01-01T00:00:00Z",
  "credentialSubject": {
    "id": "did:web:www.gs1ca.org",
    "partyGLN": "7541230000000",
    "organizationName": "GS1 Canada",
    ...
    "licenceValue": "754"
  },
  "credentialStatus": {
    "id": "https://id.gs1.org/vc/licence/status/gs1_prefix/754",
    "type": "CredentialStatusList2021"
  },
  "proof": { ... }
}
```

Attribute	Notes
id	A resolvable URI where this credential is stored. Note that the URI contains the GS1 Prefix.

Attribute	Notes
issuer	Resolvable DID for GS1 Global Office.
credentialSubject	
id	The DID for the GS1 Member Organisation, or GS1 Global Office itself, to whom the GS1 Prefix has been licensed.
licenceValue	The GS1 Prefix.

5.1.2 U.P.C. Prefix 6 Licensed to GS1 US

<div style="text-align:center">

U.P.C. Prefix Licence
6

</div>

```
{
  "@context": [
    "https://www.w3.org/2018/credentials/v1",
    "https://ref.gs1.org/gs1/vc/licence-context/"
  ],
  "id": "https://id.gs1.org/vc/licence/gs1_prefix/06",
  "type": [
    "VerifiableCredential",
    "GS1PrefixLicenceCredential"
  ],
  "issuer": "did:web:id.gs1.org",
  "issuanceDate": "2005-01-01T00:00:00Z",
  "credentialSubject": {
    "id": "did:web:www.gs1us.org",
    "partyGLN": "0614141000005",
    "organizationName": "GS1 US",
    ...
    "licenceValue": "06",
    "alternativeLicenceValue": "6"
  },
  "credentialStatus": {
    "id": "https://id.gs1.org/vc/licence/status/gs1_prefix/06",
    "type": "CredentialStatusList2021"
  },
  "proof": { ... }
}
```

Attribute	Notes
id	A resolvable URI where this credential is stored. Note that the URI contains the GS1 Prefix.
issuer	Resolvable DID for GS1 Global Office.
credentialSubject	
id	The DID for the GS1 Member Organisation, or GS1 Global Office itself, to whom the GS1 Prefix has been licensed.
licenceValue	The GS1 Prefix.
alternativeLicenceValue	The GS1 Prefix as U.P.C. Prefix.

5.1.3 GS1 Prefix 978 Licensed to GS1 Global Office (Self)

GS1 Prefix Licence 978

```
{
  "@context": [
    "https://www.w3.org/2018/credentials/v1",
    "https://ref.gs1.org/gs1/vc/licence-context/"
  ],
  "id": "https://id.gs1.org/vc/licence/gs1_prefix/978",
  "type": [
    "VerifiableCredential",
    "GS1PrefixLicenceCredential"
  ],
  "issuer": "did:web:id.gs1.org",
  "issuanceDate": "2005-01-01T00:00:00Z",
  "credentialSubject": {
    "id": "did:web:id.gs1.org",
    "partyGLN": "9506000038186",
    "organizationName": "GS1 AISBL",
    ...
    "licenceValue": "978"
  },
  "credentialStatus": {
    "id": "https://id.gs1.org/vc/licence/status/gs1_prefix/978",
    "type": "CredentialStatusList2021"
  },
  "proof": { ... }
}
```

Attribute	Notes
id	A resolvable URI where this credential is stored. Note that the URI contains the GS1 Prefix.
issuer	Resolvable DID for GS1 Global Office.
credentialSubject	
id	The DID for the GS1 Member Organisation, or GS1 Global Office itself, to whom the GS1 Prefix has been licensed.
licenceValue	The GS1 Prefix.

5.2   GS1-8 Prefix Licence Credential

5.2.1   GS1-8 Prefix 754 Licensed to GS1 Canada
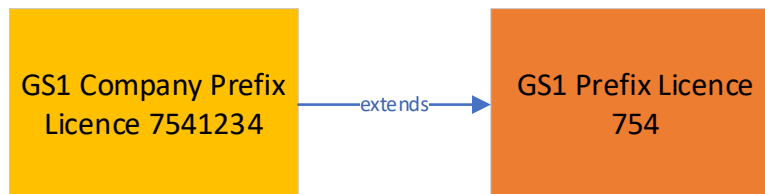

GS1-8 Prefix Licence
754

```
{
  "@context": [
    "https://www.w3.org/2018/credentials/v1",
    "https://ref.gs1.org/gs1/vc/licence-context/"
  ],
  "id": "https://id.gs1.org/vc/licence/gs1_8_prefix/754",
  "type": [
    "VerifiableCredential",
    "GS18PrefixLicenceCredential"
  ],
  "issuer": "did:web:id.gs1.org",
  "issuanceDate": "2005-01-01T00:00:00Z",
  "credentialSubject": {
    "id": "did:web:www.gs1ca.org",
    "partyGLN": "7541230000000",
    "organizationName": "GS1 Canada",
    ...
    "licenceValue": "754"
  },
  "credentialStatus": {
    "id": "https://id.gs1.org/vc/licence/status/gs1_8_prefix/754",
    "type": "CredentialStatusList2021"
  },
  "proof": { ... }
}
```

Attribute	Notes
id	A resolvable URI where this credential is stored. Note that the URI contains the GS1-8 Prefix.
issuer	Resolvable DID for GS1 Global Office.
credentialSubject	
id	The DID for the GS1 Member Organisation, or GS1 Global Office itself, to whom the GS1-8 Prefix has been licensed.
licenceValue	The GS1-8 Prefix.

5.3 GS1 Company Prefix Licence Credential

5.3.1.1 GS1 Company Prefix 7541234 Licensed to Example Company
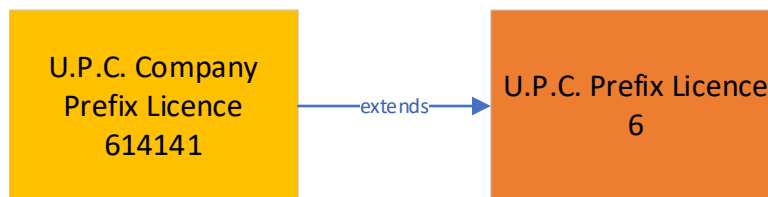


```
{
  "@context": [
    "https://www.w3.org/2018/credentials/v1",
    "https://ref.gs1.org/gs1/vc/licence-context/"
  ],
  "id": "did:example:b6d13abe-464d-4bb9-a568-b6d81efd57e3",
  "type": [
    "VerifiableCredential",
    "GS1CompanyPrefixLicenceCredential"
  ],
  "issuer": "did:web:www.gs1ca.org",
  "issuanceDate": "2020-11-19T14:56:37Z",
  "credentialSubject": {
    "id": "did:web:www.example.ca",
    "partyGLN": "7541234000006",
    "organizationName": "Example Company",
    ...
    "extendsCredential": "https://id.gs1.org/vc/licence/gs1_prefix/754",
    "licenceValue": "7541234"
  },
  "credentialStatus": {
    "id": "https://www.gs1ca.org/credentials/gs1_company_prefix/status/7541234",
    "type": "CredentialStatusList2021"
  },
  "proof": { ... }
```

```
}
```

Attribute	Notes
id	A DID for this credential. The ID isn't resolvable because the credential is sensitive information and only the user company can decide when it's presented.
issuer	Resolvable DID for GS1 Canada.
expirationDate	The date the licence expires. Optional, as the GS1 Member Organisation may not want to reveal this information or may simply rely on the credential status check.
credentialSubject	
id	The DID for the user company to whom the GS1 Company Prefix has been licensed.
extendsCredential	URI of the GS1 Prefix licence that this GS1 Company Prefix licence extends.
licenceValue	The GS1 Company Prefix.

5.3.1.2 U.P.C. Company Prefix 614141 Licensed to Example Company


```
{
  "@context": [
    "https://www.w3.org/2018/credentials/v1",
    "https://ref.gs1.org/gs1/vc/licence-context/"
  ],
  "id": "did:example:5df96271-b6ee-4fa0-8a99-32624906afd2",
  "type": [
    "VerifiableCredential",
    "GS1CompanyPrefixLicenceCredential"
  ],
  "issuer": "did:web:www.gs1us.org",
  "issuanceDate": "2020-11-19T14:56:37Z",
  "credentialSubject": {
    "id": "did:web:www.example.com",
    "partyGLN": "0614141000005",
    "organizationName": "Example Company",
    ...
    "extendsCredential": "https://id.gs1.org/vc/licence/gs1_prefix/06",
    "licenceValue": "0614141",
    "alternativeLicenceValue": "614141"
```

```
    },
    "credentialStatus": {
        "id": "https://www.gs1us.org/vcs/stat/prefix/0614141",
        "type": "CredentialStatusList2021"
    },
    "proof": { ... }
}
```

Attribute	Notes
id	A DID for this credential. The ID isn't resolvable because the credential is sensitive information and only the user company can decide when it's presented.
issuer	Resolvable DID for GS1 US.
expirationDate	The date the licence expires. Optional, as the GS1 Member Organisation may not want to reveal this information or may simply rely on the credential status check.
credentialSubject	
id	The DID for the user company to whom the GS1 Company Prefix has been licensed.
extendsCredential	URI of the GS1 Prefix licence that this GS1 Company Prefix licence extends.
licenceValue	The GS1 Company Prefix. This is the value used to generate all GS1 identification keys except GTINs.
alternativeLicence Value	The GS1 Company Prefix as U.P.C. Company Prefix. This is the value used to generate GTINs. The alternative licence value applies only to GS1 Company Prefixes starting with zero as, with the leading zero removed, they are the only ones that are may be used to generate 12-digit GTINs for the US and Canadian markets.

5.4   GS1 Identification Key Licence Credential

5.4.1   GTIN-13 7541234555551 Licensed to Example Company
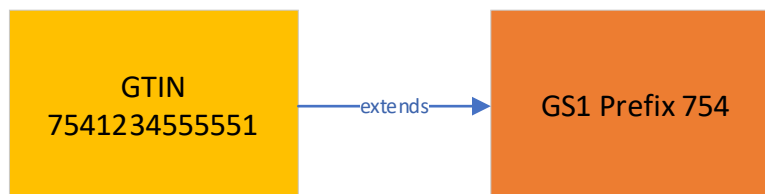

```
{
    "@context": [
        "https://www.w3.org/2018/credentials/v1",
        "https://ref.gs1.org/gs1/vc/licence-context/"
    ],
    "id": "did:example:3b306a01-eada-420e-bf5d-caa603042a61",
    "type": [
```
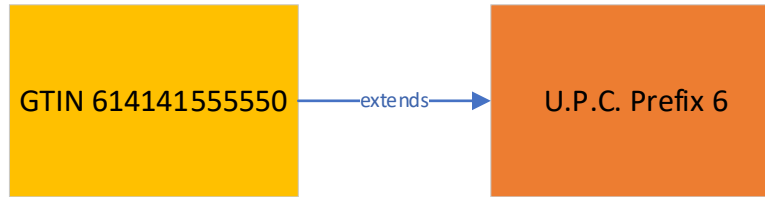
```
    "VerifiableCredential",
    "GS1IdentificationKeyLicenceCredential"
  ],
  "issuer": "did:web:www.gs1ca.org",
  "issuanceDate": "2020-11-19T14:56:37Z",
   "credentialSubject": {
    "id": "did:web:www.example.ca",
    "partyGLN": "7541234000006",
    "organizationName": "Example Company",
    ...
    "extendsCredential": "https://id.gs1.org/vc/licence/gs1_prefix/754",
    "licenceValue": "7541234555551",
    "alternativeLicenceValue": "754123455555",
    "identificationKeyType": "GTIN"
  },
  "credentialStatus": {
    "id": "https://www.gs1ca.org/credentials/gtin/status/7543210555551",
    "type": "CredentialStatusList2021"
  },
  "proof": { ... }
}
```

Attribute	Notes
id	A DID for this credential. The ID isn't resolvable because the credential is sensitive information and only the user company can decide when it's presented.
issuer	Resolvable DID for GS1 Canada.
expirationDate	The date the licence expires. Optional, as the GS1 Member Organisation may not want to reveal this information or may simply rely on the credential status check.
credentialSubject	
id	The DID for the user company to whom the GTIN has been licensed.
extendsCredential	URI of the GS1 Prefix licence that this GTIN licence extends.
licenceValue	The GTIN-13.
alternativeLicence Value	The GTIN-13 with the check digit removed.
identificationKeyType	GTIN.

5.4.2 GTIN-12 614141555550 Licensed to Example Company


```
{
  "@context": [
    "https://www.w3.org/2018/credentials/v1",
    "https://ref.gs1.org/gs1/vc/licence-context/"
  ],
  "id": "did:example:6845f958-7a4a-41a3-832b-ed2c2a332c89",
  "type": [
    "VerifiableCredential",
    "GS1IdentificationKeyLicenceCredential"
  ],
  "issuer": "did:web:www.gs1us.org",
  "issuanceDate": "2020-11-19T14:56:37Z",

  "credentialSubject": {
    "id": "did:web:www.example.com",
    "partyGLN": "0614141000005",
    "organizationName": "Example Company",
    ...
    "extendsCredential": "https://www.gs1us.org/vcs/prefix/0614141",
    "licenceValue": "614141555550",
    "alternativeLicenceValue": "061414155555",
    "identificationKeyType": "GTIN"
  },
  "credentialStatus": {
    "id": "https://www.gs1us.org/vcs/stat/gtin/0614141555550",
    "type": "CredentialStatusList2021"
  },
  "proof": { ... }
}
```

Attribute	Notes
id	A DID for this credential. The ID isn't resolvable because the credential is sensitive information and only the user company can decide when it's presented.
issuer	Resolvable DID for GS1 US.
expirationDate	The date the licence expires. Optional, as the GS1 Member Organisation may not want to reveal this information or may simply rely on the credential status check.

Attribute	Notes
credentialSubject	
id	The DID for the user company to whom the GTIN has been licensed.
extendsCredential	URI of the GS1 Company Prefix licence that this GTIN licence extends.
licenceValue	The GTIN-12.
alternativeLicence Value	The GTIN-12 in normalised GTIN-13 form with the check digit removed.
identificationKeyType	GTIN.

5.4.3 GTIN-8 75412340 Licensed to Example Company
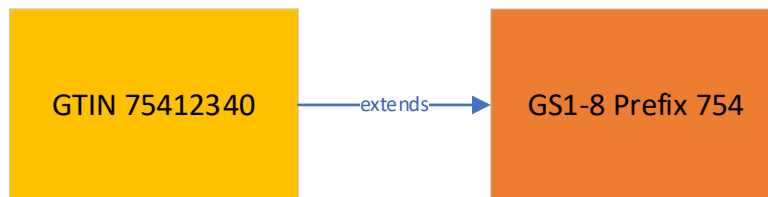

```
{
  "@context": [
    "https://www.w3.org/2018/credentials/v1",
    "https://ref.gs1.org/gs1/vc/licence-context/"
  ],
  "id": "did:example:0159a4a2-38a6-4ff7-8f54-e8af8897c40c",
  "type": [
    "VerifiableCredential",
    "GS1IdentificationKeyLicenceCredential"
  ],
  "issuer": "did:web:www.gs1ca.org",
  "issuanceDate": "2020-11-19T14:56:37Z",

  "credentialSubject": {
    "id": "did:web:www.example.ca",
    "partyGLN": "7541234000006",
    "organizationName": "Example Company",
    ...
    "extendsCredential": "https://id.gs1.org/vc/licence/gs1_8_prefix/754",
    "licenceValue": "75412340",
    "alternativeLicenceValue": "0000007541234",
    "identificationKeyType": "GTIN"
  },
  "credentialStatus": {
    "id": "https://www.gs1ca.org/credentials/gtin8/status/75412340",
    "type": "CredentialStatusList2021"
  },
```

```
"proof": { ... }
}
```

Attribute	Notes
id	A DID for this credential. The ID isn't resolvable because the credential is sensitive information and only the user company can decide when it's presented.
issuer	Resolvable DID for GS1 Canada.
expirationDate	The date the licence expires. Optional, as the GS1 Member Organisation may not want to reveal this information or may simply rely on the credential status check.
credentialSubject	
id	The DID for the user company to whom the GTIN has been licensed.
extendsCredential	URI of the GS1-8 Prefix licence that this GTIN licence extends.
licenceValue	The GTIN-8.
alternativeLicence Value	The GTIN-8 in normalised GTIN-13 form with the check digit removed.
identificationKeyType	GTIN.

5.5 GS1 Key Credential

5.5.1 GTIN 7541234555551, Issued by Licensee (Brand Owner)
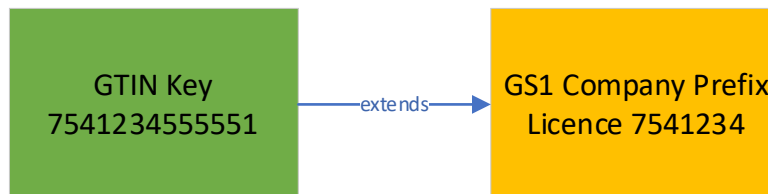

```
{
  "@context": [
    "https://www.w3.org/2018/credentials/v1",
    "https://ref.gs1.org/gs1/vc/declaration-context/"
  ],
  "id": "did:example:60cda318-a0a7-4e39-b600-ea38bf68a31f",
  "type": [
    "VerifiableCredential",
    "GS1KeyCredential"
  ],
  "issuer": "did:web:www.example.ca",
  "issuanceDate": "2020-12-02T09:48:11Z",
  "credentialSubject": {
    "id": "https://id.gs1.org/01/07541234555551",
    "extendsCredential": "did:example:b6d13abe-464d-4bb9-a568-b6d81efd57e3"
```
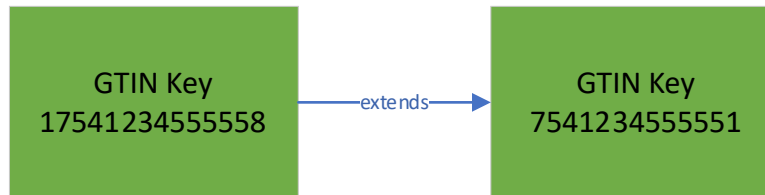
```
    },
    "credentialStatus": {
      "id": "https://www.example.com/mycreds/status/60cda318-a0a7-4e39-b600-ea38bf68a31f",
      "type": "CredentialStatusList2021"
    },
    "proof": { ... }
}
```

Attribute	Notes
id	A DID for this credential. The ID isn't resolvable because the credential is sensitive information and only the user company can decide when it's presented.
issuer	The DID for the user company. It is not necessary that the DID be resolvable as the user company may wish to keep it private.
credentialSubject	
id	The GS1 Digital Link URI for the GTIN.
extendsCredential	URI of the GS1 Company Prefix licence that this GTIN extends.

5.5.2 GTIN 17541234555558, Issued by Licensee (Brand Owner)


```
{
  "@context": [
    "https://www.w3.org/2018/credentials/v1",
    "https://ref.gs1.org/gs1/vc/declaration-context/"
  ],
  "id": "did:example:5bff56d2-4ec4-4d9d-ba8b-52031fa82fc7",
  "type": [
    "VerifiableCredential",
    "GS1KeyCredential"
  ],
  "issuer": "did:web:www.example.ca",
  "issuanceDate": "2020-12-02T09:48:11Z",
  "credentialSubject": {
    "id": "https://id.gs1.org/01/17541234555558",
    "extendsCredential": "did:example:60cda318-a0a7-4e39-b600-ea38bf68a31f"
  },
  "credentialStatus": {
    "id": "https://www.example.com/mycreds/status/5bff56d2-4ec4-4d9d-ba8b-52031fa82fc7",
    "type": "CredentialStatusList2021"
```

```
    },
    "proof": {}
}
```

Attribute	Notes
id	A DID for this credential. The ID isn't resolvable because the credential is sensitive information and only the user company can decide when it's presented.
issuer	The DID for the user company. It is not necessary that the DID be resolvable as the user company may wish to keep it private.
credentialSubject	
id	The GS1 Digital Link URI for the GTIN.
extendsCredential	URI of the GTIN credential that this credential extends (due to presence of indicator digit).

5.5.3 GTIN 7541234555551, Lot ABC123, Issued by Licensee (Brand Owner)
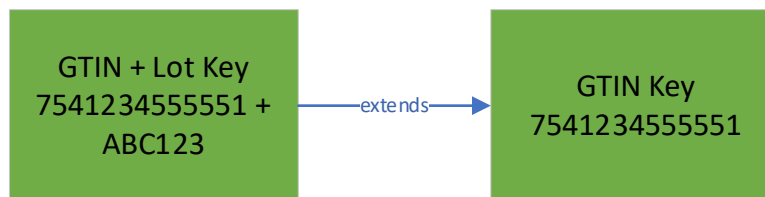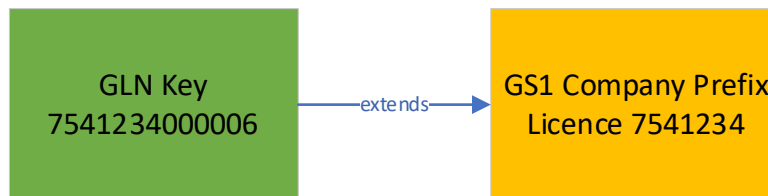


```
{
  "@context": [
    "https://www.w3.org/2018/credentials/v1",
    "https://ref.gs1.org/gs1/vc/declaration-context/"
  ],
  "id": "did:example:f29f3264-0c2b-4fb5-9b48-fb831d5d06ea",
  "type": [
    "VerifiableCredential",
    "GS1KeyCredential"
  ],
  "issuer": "did:web:www.example.ca",
  "issuanceDate": "2020-12-02T09:48:11Z",
  "credentialSubject": {
    "id": "https://id.gs1.org/01/07541234555551/10/ABC123",
    "extendsCredential": "did:example:60cda318-a0a7-4e39-b600-ea38bf68a31f"
  },
  "credentialStatus": {
    "id": "https://www.example.com/mycreds/status/f29f3264-0c2b-4fb5-9b48-fb831d5d06ea",
    "type": "CredentialStatusList2021"
  },
  "proof": { ... }
```

}

Attribute	Notes
id	A DID for this credential. The ID isn't resolvable because the credential is sensitive information and only the user company can decide when it's presented.
issuer	The DID for the user company. It is not necessary that the DID be resolvable as the user company may wish to keep it private.
credentialSubject	
id	The GS1 Digital Link URI for the GTIN plus lot.
extendsCredential	URI of the GTIN credential that this credential extends (due to presence of lot).

## 5.5.4   GLN 7541234000006, Issued by Licensee (Party)


```
{
  "@context": [
    "https://www.w3.org/2018/credentials/v1",
    "https://ref.gs1.org/gs1/vc/declaration-context/"
  ],
  "id": "did:example:60cda318-a0a7-4e39-b600-ea38bf68a31f",
  "type": [
    "VerifiableCredential",
    "GS1KeyCredential"
  ],
  "issuer": "did:web:www.example.ca",
  "issuanceDate": "2020-11-19T14:56:37Z",
  "credentialSubject": {
    "id": "https://id.gs1.org/417/7541234000006",
    "extendsCredential": "did:example:b6d13abe-464d-4bb9-a568-b6d81efd57e3"
  },
  "credentialStatus": {
    "id": "https://www.example.com/mycreds/status/60cda318-a0a7-4e39-b600-ea38bf68a31f",
    "type": "CredentialStatusList2021"
  },
  "proof": { ... }
}
```

Attribute	Notes
id	A DID for this credential. The ID isn't resolvable because the credential is sensitive information and only the user company can decide when it's presented.
issuer	The DID for the GS1 Member Organisation. GS1 Member Organisations are permitted to issue credentials on behalf of their licensees.
credentialSubject	
id	The GS1 Digital Link URI for the GLN.
extendsCredential	URI of the GS1 Company Prefix licence that this GTIN extends.

5.6   Data Credential

5.6.1   Verified by GS1 Data Credential for GTIN 7541234555551, Issued by Brand Owner
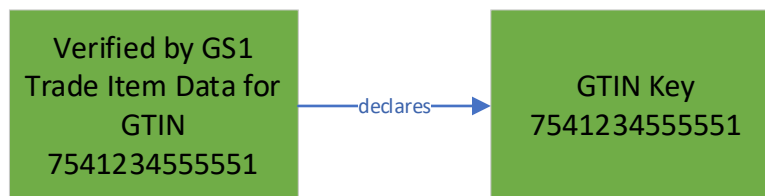

```
{
  "@context": [
    "https://www.w3.org/2018/credentials/v1",
    "https://ref.gs1.org/gs1/vc/trade-item-context/"
  ],
  "id": "did:example:4e24b35d-de87-49d4-a26b-70490c62ec25",
  "type": [
    "VerifiableCredential",
    "VerifiedByGS1DataCredential"
  ],
  "issuer": "did:web:www.example.ca",
  "issuanceDate": "2020-12-03T03:14:59Z",
  "credentialSubject": {
    "id": "https://id.gs1.org/01/07541234555551",
    "keyAuthorisation": "did:example:60cda318-a0a7-4e39-b600-ea38bf68a31f",
    "brandOwner": "The Best Example",
    "tradeItemDescription": "Never Give Up NRG Drink",
    "tradeItemImageURL": "https://www.example.com/assets/7541234555551.png",
    "gpcCode": "10000266",
    "netContent": "300",
    "netContentUOM": "ml",
    "targetMarketCountryCode": [
      "CA", "US"
    ]
```

```
  },
  "credentialStatus": {
    "id": "https://www.example.com/mycreds/status/4e24b35d-de87-49d4-a26b-70490c62ec25",
    "type": "CredentialStatusList2021"
  },
  "proof": { ... }
}
```

Attribute	Notes
id	The DID for this credential. The ID isn't resolvable because the credential is sensitive information and only the user company can decide when it's presented.
issuer	URI of the licensee.
credentialSubject	
id	GS1 Digital Link URI for the trade item.
keyAuthorisation	Reference to the GTIN key credential to which this data applies.

5.6.2 Party Data for GLN 7541234000006, Issued by Licensee (Party)
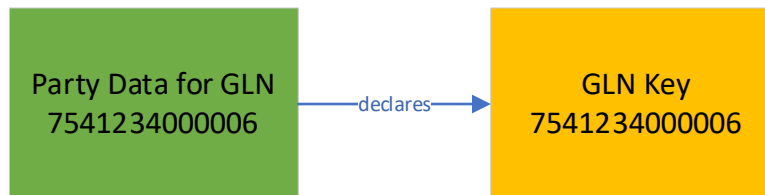

```
{
  "@context": [
    "https://www.w3.org/2018/credentials/v1",
    "https://ref.gs1.org/gs1/vc/party-context/"
  ],
  "id": "did:example:f16e1ed6-33ec-4e9a-a34d-afcb5ac9af65",
  "type": [
    "VerifiableCredential",
    "PartyDataCredential"
  ],
  "issuer": "did:web:www.example.ca",
  "issuanceDate": "2020-11-19T14:56:37Z",
  "credentialSubject": {
    "id": "did:web:www.example.ca",
    "sameAs": "https://id.gs1.org/417/7541234000006",
    "keyAuthorisation": "did:example:60cda318-a0a7-4e39-b600-ea38bf68a31f",
    "partyGLN": "7541234000006",
    "name": "Example Company",
    ...
```

```
    },
    "credentialStatus": {
        "id": "https://www.gs1ca.org/credentials/party/status/7541234000006",
        "type": "CredentialStatusList2021"
    },
    "proof": { ... }
}
```

Attribute	Notes
id	The DID for this credential. The ID isn't resolvable because the credential is sensitive information and only the user company can decide when it's presented.
issuer	URI of the licensor (GS1 Member Organisation).
credentialSubject	
id	DID for the party.
sameAs	GS1 Digital Link URI for the party. Required because the ID is not a GS1 Digital Link URI.
keyAuthorisation	Reference to the GLN key credential to which this data applies.

5.7 Delegation Credential

5.7.1 Delegation Credential for Planogram, Issued by Brand Owner
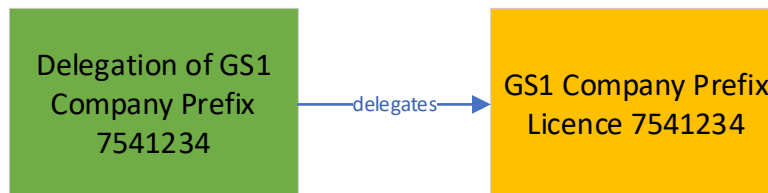

```
{
    "@context": [
        "https://www.w3.org/2018/credentials/v1",
        "https://ref.gs1.org/gs1/vc/declaration-context/"
    ],
    "id": "did:example:a60d21a8-485b-4f28-8510-c9b64325bab5",
    "type": [
        "VerifiableCredential",
        "DelegationCredential"
    ],
    "issuer": "did:web:www.example.ca",
    "issuanceDate": "2020-12-03T03:14:59Z",
    "credentialSubject": {
        "id": "did:web:www.egsolutionprovider.ca",
        "delegation": [
```

```
          "did:example:b6d13abe-464d-4bb9-a568-b6d81efd57e3"
      ],
    "dataCredentialType": [
        "GS1PlanogramDataCredential"
      ]
  },
  "credentialStatus": {
    "id": "https://www.example.ca/mycreds/status/a60d21a8-485b-4f28-8510-c9b64325bab5",
    "type": "CredentialStatusList2021"
  },
  "proof": { ... }
}
```

Attribute	Notes
id	The DID for this credential. The ID isn't resolvable because the credential is sensitive information and only the user company can decide when it's presented.
issuer	URI of the licensee.
credentialSubject	
id	URI of the party to which the authority to declare data is delegated.
delegation	Reference to the GS1 Company Prefix licence credential that is being delegated. The credential subject is authorized to make planogram declarations for all trade items (the only key type to which planogram data applies), so the identification key type is not necessary.
dataCredentialType	Data credential type for the planogram data set.

5.7.2 Planogram Data for GTIN 7541234555551, Issued by Solution Provider
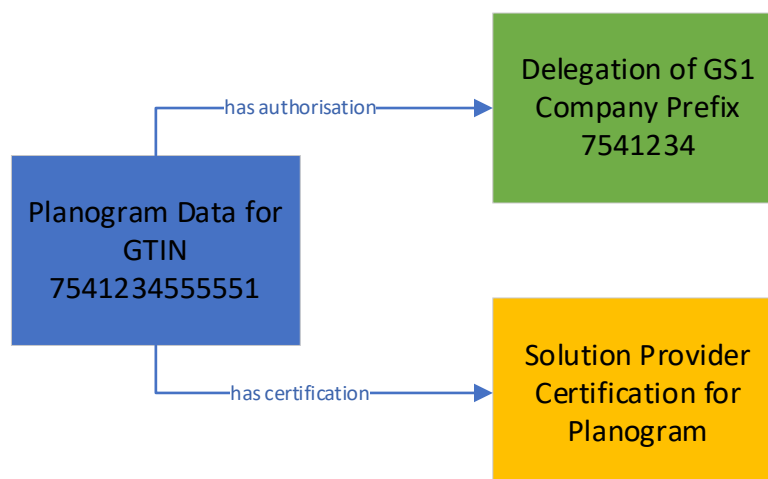

```
{
  "@context": [
    "https://www.w3.org/2018/credentials/v1",
    "https://ref.gs1.org/gs1/vc/planogram-context/"
```

```
    ],
    "id": "did:example:7b993cf5-379e-470e-9575-6f9fe75ab03b",
    "type": [
        "VerifiableCredential",
        "PlanogramDataCredential"
    ],
    "issuer": "did:web:www.egsolutionprovider.ca",
    "issuanceDate": "2020-12-03T03:14:59Z",
    "credentialSubject": {
        "id": "https://id.gs1.org/01/07541234555551",
        "keyAuthorisation": "did:example:a60d21a8-485b-4f28-8510-c9b64325bab5",
        "dataCertification": [
            "https://www.gs1ca.org/credentials/certification/534a928a-704c-41b6-9e47-aee0a756fb79"
        ],
        "length": "24",
        "lengthUOM": "cm",
        ...
    },
    "credentialStatus": {
        "id": "https://www.egsolutionprovider.ca/status/7b993cf5-379e-470e-9575-6f9fe75ab03b",
        "type": "CredentialStatusList2021"
    },
    "proof": { ... }
}
```

Attribute	Notes
id	The DID for this credential. The ID isn't resolvable because the credential is sensitive information and only the user company can decide when it's presented.
issuer	URI of the solution provider.
credentialSubject	
id	GS1 Digital Link URI for the trade item.
keyAuthorisation	Reference to the key authorisation required to make this declaration. This is the delegation of the GS1 Company Prefix by the brand owner for planogram data.
dataCertification	Reference to the certification issued by GS1 Canada that the solution provider is competent to provide standardised planogram data.