



The Global Language of Business

# GS1 Digital Link: Resolution

Resolving GS1 Digital Link URIs to one or more sources of related information enabling consistent representation of GS1 identification keys within web addresses to link to online information and services

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*To Be 1.2, Draft 0.6, 22 October 2020*

## Document Summary

Document Item	Current Value
Document Name	GS1 Digital Link: resolution
Document Date	22 October 2020
Document Version	To be 1.2
Document Issue	
Document Status	Draft
Document Description	enabling consistent representation of GS1 identification keys within web addresses to link to online information and services

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## Log of Changes

Release	Date of Change	Changed By	Summary of Change
0.1	2020-04-20	Phil Archer, Mark Harrison	Preparation for work on version 1.2 (by editing version 1.1). Known specific issues are highlighted where relevant in the text.
0.2	2020-05-14	Phil Archer, Ralph Tröger	Additional issues from RT: https for canonical URIs, identification of split in GRAIs; place holders for expected work on binary EPC/RFID
0.3	2020-08-07	Phil Archer	Split from original all in one standard. Signifiant changes to matching of link attributes to requests
0.4	2020-10-02	Dom Guinard, Phil Archer	Responding to Dom's comments and MSWG meeting 2020-10-01
0.5	2020-10-14	Phil Archer	Further responses to comments received from Dom and Frits van den Bos, tidying up of refs and glossary, introductory material added with links to other DL standards.
0.6	2020-10-22	Phil Archer	Removed schema.org as a namespace that SHOULD be supported

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# 1 Introduction

*This section and its subsections are informative*

GS1 defines a wide range of identifiers that underpin the supply chain and retail industry across the world. This document assumes the reader is familiar with these and the concept of GS1 Application Identifiers. If not, please see information on [GS1 identification Keys] and the [GENSPECS] for further background.

This work has been motivated by a number of trends. For example: the desire among retailers to move to 2D barcodes that can carry more information than just the GTIN; the problems of multiple barcodes causing scanning errors through conflicts which suggests a need for a single but multipurpose barcode; the growing expectation among consumers that more information is available online about the products they're considering buying; the brand owner concept of the pack as a media channel linking to multimedia experiences, and more.

As a result of GS1 Digital Link, it is possible to represent GS1 identification keys consistently within Web addresses as well as within barcodes containing Web addresses, such that a single identification approach can support both product identification for supply chain applications *and* a link to online material for consumer and business partner interactions. It's this dual functionality and enormous flexibility that is currently not possible when, for example, Brand Owners embed an unstructured Web page address in a QR Code<sup>®1</sup>.

The resolution functions defined in the current document are what brings that vision to life and allows easy communication between business partners and consumers in a manner that is scalable and that does not require all related assets to be aggregated in one place. The GS1 standard is based entirely on existing standards and techniques defined by the Internet Engineering Task Force (IETF) and the World Wide Web Consortium (W3C).

## 1.1 How the GS1 Digital Link standard documents fit together

Rather than one very long document containing every detail, as of version 1.2, the GS1 Digital Link standard comprises 4 discrete documents:

### URI syntax

This document provides some of the background to the design of GS1 Digital Link, highlighting existing techniques and practices that underpin the World Wide Web, and applying those to the GS1 system. The normative portions set out the detailed syntax of Web addresses (HTTP URIs) that encode GS1 identifiers with exactly the same precision and expressivity as the AI-based element syntax used across the GS1 system, notably in the GS1 General Specifications. The GS1 Digital Link URI syntax distinguishes between primary keys, such as GTIN and GLN, key qualifiers, such as batch/lot and GLN extension, and attributes such as expiry date and ship to address. The GS1 Digital Link URI syntax is the foundation on which all other aspects of the standard are built.

### Compression

A GS1 Digital Link URI that contains a set of identifiers and attributes may exceed the capacity of some data carriers. This document defines a compression/decompression algorithm that minimises the length of those Web URIs while retaining two critical features: 1) that the compressed form is still a URL on the same domain as the uncompressed form, that is, there is no change in ownership of the URL; 2) that it can be decompressed and the GS1 keys extracted *without* an online lookup.

### Resolution (this document)

A GS1 Digital Link URI is a particular form of URL and *can* be used in exactly same way as any other URL (this is an important design feature). However, it can also be the gateway to multiple sources of information, both human and machine-readable. This document defines how the keys in a GS1 Digital Link URI can be 'resolved' to those information sources in such a way that information systems and apps can discover them automatically. Resolvers are what makes the standard operational for the GS1 community and the industries served.

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<sup>1</sup> Unless otherwise specified, the term 'QR Code<sup>®</sup>' refers to the widely used [ISO/IEC 18004 QR Code<sup>®</sup>](#), excluding the GS1 QR Code that recognises the FNC1 character. 'QR Code' is a registered trademark of Denso Wave, a subsidiary of Denso Corporation. Both the [ISO/IEC 18004 QR Code<sup>®</sup>](#) and GS1 QR Code follow the encoding scheme described in ISO/IEC 18004 Information technology — Automatic identification and data capture techniques — QR Code bar code symbology specification, 3rd edition 2015-02-01.

## Semantics

Devices like scanners and point of sale terminals, PIM systems, product catalogues and more that are designed specifically to work with GS1 identifiers and data carriers, are all programmed to function within that particular framework. GS1 Digital Link puts things like GTINs, SSCCs and GRAIs onto the Web alongside countless other identifiers and ways of working. This document expresses the meaning behind the GS1 Digital Link standard in a way that the Web at large can understand and process. It makes use of, and extends, the GS1 Web Vocabulary.

## 1.2 Typographical conventions used in this document

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

```
https://example.com/gtin/{gtin} and
https://example.org/414/{gln}/254/{glnExtension}
https://example.org/01/{gtin}{?exp}
```

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

## 2 Definitions and namespaces

*This section is normative*

Throughout this document, the following prefixes and namespaces are used meaning that, for example, `gs1:pip` is equivalent to `https://gs1.org/voc/pip`.

**Table 2-1** Prefixes and namespaces used in this document

Prefix	Namespace
gs1	<code>https://gs1.org/voc/</code>
schema	<code>https://schema.org/</code>
dcterms	<code>http://purl.org/dcterms/</code>
skos	<code>http://www.w3.org/2004/02/skos/core#</code>
owl	<code>http://www.w3.org/2002/07/owl#</code>
rdf	<code>http://www.w3.org/1999/02/22-rdf-syntax-ns#</code>
rdfs	<code>http://www.w3.org/2000/01/rdf-schema#</code>
xsd	<code>http://www.w3.org/2001/XMLSchema#</code>

## 3 Conformance to GS1 Digital Link

*This section is normative*

The GS1 Digital Link standard comprises a number of discrete documents against which conformance can be asserted.

There is no single conformance statement for the entirety of GS1 Digital Link. It is therefore inappropriate to make a formal claim of broad conformance without citing the specific standard with which conformance is claimed.

Normative statements that use the keywords SHALL, SHOULD and MAY appear throughout the document as needed and are collated in section 4.16.

## 4 Resolving GS1 Digital Link URIs

*Unless otherwise stated, this section and all its subsections, except its introduction, are normative*

A GS1 conformant resolver connects a GS1-identified item to one or more online resources that are directly related to it. The item may be identified at any level of granularity, and the resources may be either human or machine readable. Examples include product information pages, instruction manuals, patient leaflets and clinical data, product data, service APIs, marketing experiences and more. By adhering to a common protocol based on existing GS1 identifiers and existing Web technologies, each conformant GS1 resolver is part of a coherent yet distributed network of information resources. The remainder of this chapter defines the minimum set of requirements of a resolver that make this vision possible.

The concept of resolving an identifier through an online service is not new or unique to GS1. For example, Digital Object Identifiers, [DOI] are in common use in scientific research as identifiers for papers and datasets. The DOI for the paper that describes the discovery of the Higgs Boson is 10.1103/PhysRevD.89.032002. This can be resolved through multiple services such as <http://hdl.handle.net/> and <https://oadoi.org/> as well as the DOI organisation's own resolver at <https://doi.org/>. Add '10.1103/PhysRevD.89.032002' to any of those URL 'stubs' and you'll be redirected to the relevant paper. Other examples of existing resolver services include ORCID's for identifying researchers / authors of academic publications, and numerous identifiers for things like chemicals and drugs.

The GS1 case is similar in that GS1 keys exist independently of any online system and a GS1 conformant resolver is a service for connecting that key, including any key qualifiers, to the Web. However, it is worth highlighting an important difference between resolver services such as those used for DOIs and the GS1 case. Resolvers typically offer a one-to-one redirection, that is, resolving an identifier always leads to the same, single, resource. A GS1 conformant resolver may redirect to any number of different resources related to the given set of identifiers and there is no need for all resolvers to include the same set of possible redirects. Furthermore, although redirection is the norm, and a GS1 conformant resolver may redirect to another resolver, it may also provide content directly with no redirection.

A resolver does not need to support all primary identification keys to be conformant with this standard, rather, it may support just a subset. For example, a conformant resolver may support just GTIN, or GTIN + GLN etc. However, for each supported primary identification key, all its key qualifiers and data attributes must be fully supported.

### 4.1 Core resolver functionality

Fundamentally, a resolver is a Web server. Therefore it SHALL operate according to the relevant standards that define HTTP 1.1 or higher for GET, HEAD and OPTIONS requests and SHALL support HTTP over TLS [HTTPS]. On top of HTTP, a resolver SHALL also implement Cross-Origin Resource Sharing [CORS] to allow client-side Javascript Web applications to access the resolver across domains.

This specification adds additional functionalities that define a GS1 conformant resolver. In summary, these are:

1. **Decompression:** Decompress the request URI if necessary (the **request URI** is the URI received and processed by the resolver).
2. **Validation:** Validate that the request URI is conformant with the GS1 Digital Link: URI syntax standard and therefore contains syntactically valid GS1 elements.
3. **Providing links** and/or content:

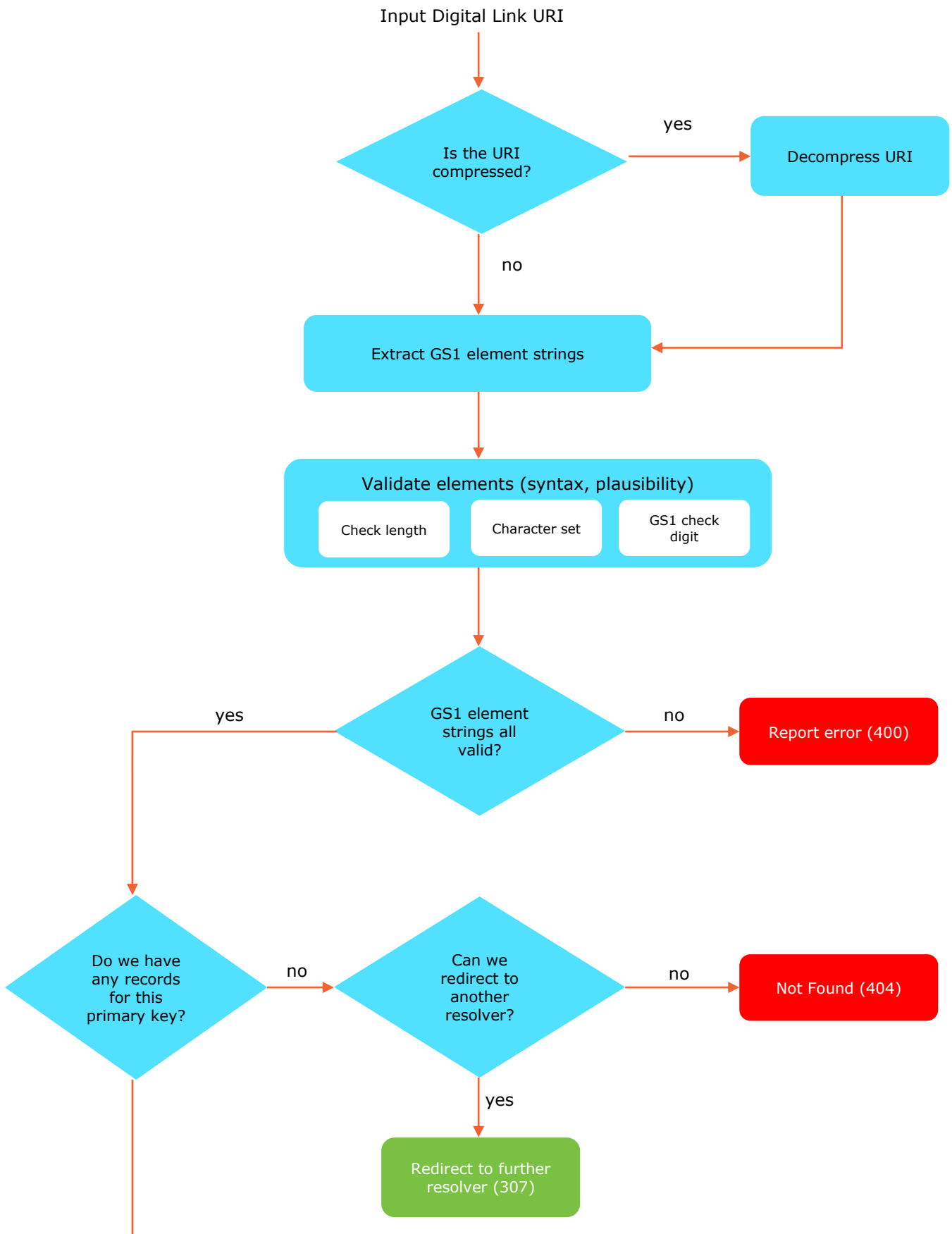


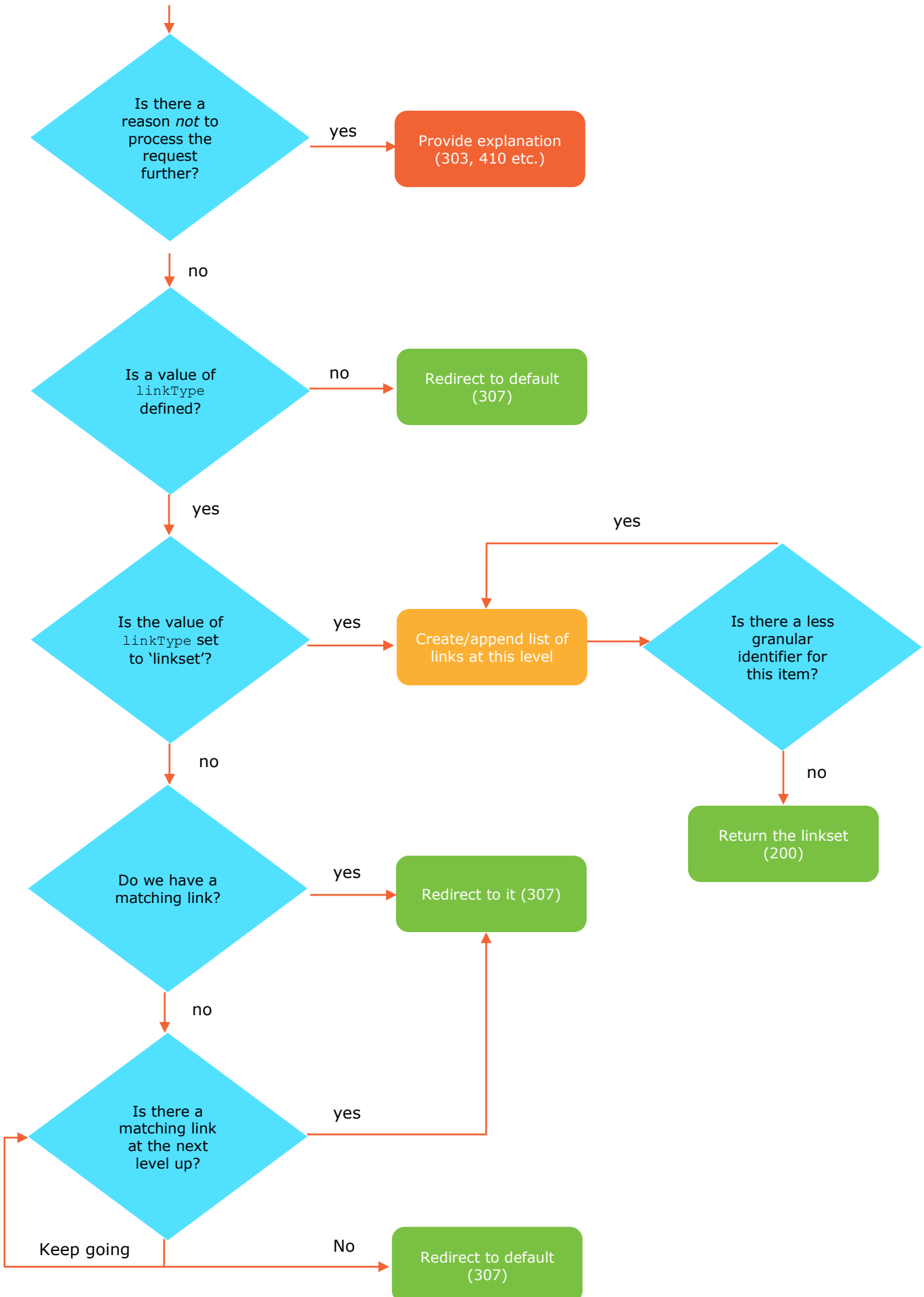
- a. Providing links to, or provide directly, resources related specifically to the item identified by the GS1 elements (hereafter called the **identified item**)
- b. One of the links SHALL be recognised by the resolver as the default, the resolver SHALL redirect to that URL unless there is information to the contrary. Such information may be provided by setting a `linkType` parameter in the query string of the request URI indicating the type of link desired. If a link to such a resource is known to the resolver, it SHALL redirect to that resource immediately. If the value of `linkType` is set to `linkset` then the resolver SHALL return a full list of links available to the client, following the Linkset standard [Linkset] (see section 4.9) The value of `all` for the `linkType` parameter, defined in version 1.1 of GS1 Digital Link [DL1.1], is deprecated. To support backwards compatibility, in response to a request with `linkType` set to `all`, the resolver MAY return a JSON object providing a list of available links although the precise structure of that JSON object is not defined.
- c. Even when redirecting, a GS1 conformant resolver SHOULD expose the link to the linkset in the HTTP Link header [RFC8288].

Note that when redirecting, by default all key=value pairs in the query string of the original GS1 Digital Link URI to be resolved SHALL be passed on without modification. This behaviour MAY be suppressed if including the incoming query parameters cause an error at the target resource.

Each of these is expanded upon with important detail in the following sections. The flowchart below provides a visual summary of the basic functionality of a resolver.

**Figure 4-1** Basic resolver flow chart





## 4.2 Decompression

As described in the GS1 Digital Link: Compression standard [DL-Comp], a GS1 Digital Link URI can be compressed to allow its direct encoding in a data carrier with limited capacity. An important feature of the compression algorithm is that it does not affect the domain name used and that the compressed GS1 Digital Link URI is still a valid URL. This means that a compressed GS1 Digital Link URI can be looked up on *exactly* the same resolver with *exactly the same result* as its uncompressed equivalent. Therefore, a GS1 conformant resolver SHALL recognise compressed GS1 Digital Link URIs and decompress them as a first processing step.

When responding to a compressed URI, a GS1 conformant resolver SHOULD NOT redirect to the equivalent uncompressed URI but SHALL expose it as follows:

1. In the Link header with a `linkType (rel)` value of `owl:sameAs`.
2. As the subject of its linkset (section 4.9).
3. When returning facts about the identified item expressed as RDF triples (see GS1 Digital Link: Semantics [DL-Semantics])

If redirecting to another resolver, the resolver SHOULD redirect to the uncompressed URI.

## 4.3 Validation

A GS1 conformant resolver SHALL validate the syntax of a GS1 Digital Link URI, as defined in Digital Link: URI syntax [DL-URI].

For a given request URI (decompressed if necessary) there are two basic error conditions:

1. the request URI does not contain syntactically valid GS1 identifiers;
2. the request URI is syntactically valid but the resolver does not have any information about the GS1 identifier(s).

It's important, from a developer perspective, that the resolver differentiates between these two error conditions. If the request URI is not a syntactically valid GS1 Digital Link URI, the resolver SHALL respond with an HTTP response code of 400 (Bad Request) [HTTPcodes].

If the request URI is a syntactically valid GS1 Digital Link URI, but the resolver has no information about the identified items then there are a number of possible responses:

1. redirection to an alternative resolver (with an HTTP Response code of 307 Temporary Redirect). Note that in practice a large number of redirections should be avoided as each redirection needs to be called by the client leading to a slow response time and a poor consumer experience. Implementers are encouraged to add checking routines to ensure that destination URLs do not lead to large numbers of redirects and/or circular redirections.
2. a simple 404 Not Found response.

There are other scenarios where the resolver is not able to provide any service for the identified item but does have information about *why* that is the case. For example, a licence for an identifier may have expired and not been renewed, a product is not yet on the market and no information has yet been made available. Implementations MAY use the HTTP response code 303 (See Other) to redirect to a resource that explains why the request URI cannot be resolved, at least at the time of asking. A more definite 'no longer available, please don't ask again' message can be signalled with the HTTP response code 410 (Gone). Best practice in such circumstances is to provide information about where information may be archived and how to contact the owner of the archive.

A GS1 conformant resolver SHALL NOT use a 200 OK response code with a resource that indicates an error condition.

### 4.3.1 Validation detail

This subsection defines the minimum validation steps that a conformant GS1 resolver SHALL perform. It does not include checking that the combination of GS1 keys, key qualifiers and attributes within the GS1 Digital Link URI conform to the General Specifications [GenSepcs] which include tables of combinations that are and are not valid. Such additional validation MAY be carried out by resolvers. However, such validation SHALL be carried out if the resolver provides a semantic interpretation of GS1 Digital Link URIs (see GS1 Digital Link: Semantics [DL-Semantics])

Validation should be done for each extracted value of GS1 primary identifier for which the resolver has documented support in the resolver description file as described in 8.11 and any key qualifier and/or attribute included in the request URI. The actual validation steps to be performed depend on whether the extracted value is a GS1 identification key, a key qualifier or a data attribute.

Before performing these validation tests, it is essential to convert any percent-encoded characters to their ASCII equivalent, as shown in [Table 4-1](#), because some symbol characters have a special meaning when used within Web URIs and URLs and therefore need to be 'escaped' via percent encoding (see section 2.1 of RFC 3986 [PercentEncoding] ) when they are used literally.

**Table 4-1** Percent-encoding of symbol characters within Web URIs

Percent-encoded	Character	ASCII code (decimal)	Name of character
%21	!	33	Exclamation mark
%20	(space)*	32	Space
%23	#	35	Octothorpe (also known as Hash or US pound symbol)
%25	%	37	Percent
%26	&	38	Ampersand
%28	(	40	Left bracket
%29	)	41	Right bracket
%2A	*	42	Asterisk
%2B	+	43	Plus
%2C	,	44	Comma
%2F	/	47	Solidus or Forward slash
%3A	:	58	Colon

\* Note that in the query string (only), the space character may be escaped as the + character (This common practice comes from HTML forms rather than IETF's URI specifications. See <https://www.w3.org/TR/html401/interact/forms.html#h-17.13.4.1>)

#### 4.3.1.1 Check the length

For any value, check that its total number of digits or characters is within the limits in the ABNF grammar specified in GS1 Digital Link: URI syntax [DL-URI] or within Figure 3.1-1 of the GS1 General Specifications [GENSPECS].

For example, if validating a GTIN value, the ABNF grammar states that the value should be exactly either 8, 12, 13 or 14 digits ( `gtin-value = 8DIGIT / 12DIGIT / 13DIGIT / 14DIGIT` ).

If validating a batch/lot number, the ABNF grammar states that the value should be up to 20 alphanumeric characters ( `lot-value = 1*20XCHAR` ) or `N2+X..20` in Figure 3.1-1 of the GS1 General Specifications [GENSPECS].

If validating a GTIN Serial number, the ABNF grammar states that the value should be up to 20 alphanumeric characters ( `ser-value = 1*20XCHAR` ) or `N2+X..20` in Figure 3.1-1 of the GS1 General Specifications [GENSPECS].

Similar checks should be made for other key qualifiers and data attribute values.

#### 4.3.1.2 Check the character set

For any value, check that each character is within the character set specified in the ABNF grammar defined in GS1 Digital Link: URI syntax [DL-URI] or within Figure 3.1-1 of the GS1 General Specifications [GENSPECS].

For example, if validating a GTIN value, the ABNF grammar states that the value should only consist of digits ( `gtin-value = 8DIGIT / 12DIGIT / 13DIGIT / 14DIGIT` ) or `N2+N14` in Figure 3.1-1 of the GS1 General Specifications [GENSPECS].

If validating a batch/lot number, the ABNF grammar states that the value should consist of alphanumeric characters in the 82-character subset of ISO/IEC 646 (see Figure 7.11-1 of the GS1 General Specifications [GENSPECS]) ( `lot-value = 1*20XCHAR` ) or `N2+X..20` in Figure 3.1-1 of the GS1 General Specifications [GENSPECS].

The alphanumeric character set corresponding to Figure 7.11-1 corresponds to the following regular expression `[\x21-\x22\x25-\x39\x41-\x5A\x5F\x61-\x7A]`

The alphanumeric character set corresponding to Figure 7.11-2 corresponds to the following regular expression `[\x23\x2D\x2F\x30-\x39\x41-\x5A]`

#### 4.3.1.3 Check the GS1 check digit (where appropriate)

For any value that corresponds to a GS1 identification key that has a GS1 check digit, perform the GS1 Check Digit calculation appropriate to that identifier as specified in section 7.9 of the GS1 General Specifications [GENSPECS] and check that it matches the value of the digit at the position where the Check Digit should appear.

Note that some GS1 identification keys do not include a check digit. Also note that the check digit is not always the final digit of a GS1 identification key. [Table 4-2](#) indicates which GS1 identification keys have a GS1 check digit - and its position within the identifier.

**Table 4-2** Presence and position of GS1 check digit in various GS1 identification keys



GS1 identification key	Check Digit present?	Position of Check Digit
GTIN	Yes	Final digit of GTIN-8, GTIN-12, GTIN-13 or GTIN-14
ITIP	Yes	14 (calculated over digits 1-13)
SSCC	Yes	18 (calculated over digits 1-17)
GDTI	Yes	13 (calculated over digits 1-12)
GLN	Yes	13 (calculated over digits 1-12)
GRAI	Yes	14 (calculated over digits 1-13)
GSRN	Yes	18 (calculated over digits 1-17)
GSRN-P	Yes	18 (calculated over digits 1-17)
GSIN	Yes	17 (calculated over digits 1-16)
GCN	Yes	13 (calculated over digits 1-12)
GIAI	No	
CPID	No	
GMN	No	

Additionally, for values of the following data attributes, check digits should be checked, as shown in [Table 4-3](#):

**Table 4-3** Position of GS1 check digit for various data attributes

AI for data attribute	Gen Specs data title	Position of Check Digit
02	CONTENT	Final digit of GTIN value
410	SHIP TO LOC	13 (calculated over digits 1-12)

AI for data attribute	Gen Specs data title	Position of Check Digit
411	BILL TO	13 (calculated over digits 1-12)
412	PURCHASE FROM	13 (calculated over digits 1-12)
413	SHIP FOR LOC	13 (calculated over digits 1-12)
414	LOC No	13 (calculated over digits 1-12)
415	PAY TO	13 (calculated over digits 1-12)
416	PROD/SERV LOC	13 (calculated over digits 1-12)

- 
**Note:** many of the validation checks on the length, character set and GS1 check digit (if any) can be performed at the time of inserting a redirection rule into the resolver for that specific identifier; the redirection will only happen for a specified identifier that is valid.
  
- 
**Note:** within some applications (such as healthcare Basic UDI-DI) the GMN has a well-defined checking scheme, however it is not considered to be part of the general GMN specification for GS1 Digital Link purposes. Note the GMN (AI 8013) has an optional check character pair that can be used in a symbol and the GMN (Basic UDI-DI) is not to be used in a symbol.

## 4.4 Link attributes – what the resolver needs to know

An important function of a resolver is to provide links to resources related to the identified item and, in many situations, immediately redirect requests to the most appropriate user experience. In order for resolvers to be able to match requests to available links, and for applications to automatically navigate those links without having to present the user with potentially confusing choices, it is necessary that each link stored in the resolver is accompanied by standardised metadata.

Three of the attributes are mandatory:

- The target URL itself
- The link relation type, i.e. the relationship between the identified item and the linked resource, such as a product information page, a warranty registration page, a related video etc.
- A title for the link that can be displayed to end users.

Further attributes for the links MAY be applied to links stored in the resolver. This can be useful to disambiguate links that have the same mandatory attributes and be used by applications to follow links of most relevance to their users. The primary options are:

- The human language of the resource.
- The media type for the content (`text/html` for HTML, `application/json` for JSON, `application/ld+json` for JSON-LD etc.).
- The 'context' in which a link is most appropriate, such as a particular territory or usage.

More detail on each of these attributes is provided in the following sections.

How this data is stored and managed within a resolver is up to the implementation. Section 4.5 describes how to expose this data for use by other applications.

### 4.4.1 The target URL

This is the link itself and therefore SHALL be provided. It should be the URL of a resource that is directly relevant to the identified item and not a general page such as a manufacturer's homepage or a set of search results. The resource identified by the target URL is known as the **target resource**.

Resolvers MAY support the definition of target URLs using URI Templates [RFC6570]. This is a compact way to define what amount to URL rewrite rules that can cover an arbitrarily large number of request URIs with the GS1 identifiers within them used in the substitution. It is foreseen as

being particularly useful for redirecting to an API where the GS1 identifiers, especially batch and serial numbers, are used as query parameters. For example, a GS1 DL URI such as `https://example.com/01/9506000134352/10/ABC` within a conformant resolver creates name/value pairs of

01 : 9506000134352

10 : ABC

Within a template URL, the name of the key is replaced by its value in the substitution, such that a template URL of

`https://brand.example/infoPageAboutThisThing?batch={10}` expands to `https://brand.example/infoPageAboutThisThing?batch=ABC` (GTIN is not used as the target's base URL is already product-specific)

Applying the rules in RFC6570 in the GS1 conformant resolver context we see that

`https://api.example {?01,10}` expands to `https://api.example?01=9506000134352&10=ABC` and `https://api.example {?01,10,21}` also expands to `https://api.example?01=9506000134352&10=ABC&21=` (there is no value for '21')

See also Pattern-based redirection to an alternative resolver 4.8.

#### 4.4.2 The link relation type (link type)

Links SHALL be annotated with information describing the kind(s) of resource available by following the link. This is known as the link relation type which we abbreviate to link type. The relationship(s) SHOULD be given as a URI defined in the GS1 Web vocabulary [GS1Voc] that is valid for the kind of identified item, typically both a `gs1:Product` and a `schema:Product`. Section 4.13 discusses supported link types and GS1 Digital Link:Semantics [DL-Semantics] is also an important reference when determining the precise meaning exposed to information systems when choosing a link type. If the GS1-defined link types are not suitable, then you MAY use your own URI which should dereference to information about the relationship. Using this method is likely to greatly reduce interoperability, however. It is therefore much better to seek to add terms to the GS1 vocabulary.


For example, resolving the GTIN of a product might return links with types such as

- `gs1:hasRetailers` (with a target URL that points to information about where the product can be purchased)
- `gs1:hasAllergenInfo` ((with a target URL that points to allergen information)

If the target URL points to a resource that fulfils a number of roles, such as a product information page that includes nutritional and allergen information, then more than one link type can describe the link.

The use of compact URIs (CURIEs), such as the `gs1:` prefix, is discussed further in section 4.15.

It is not an error for resolvers to offer multiple links of the same type, even if the linked resources are in the same (human) language or machine readable representation.

 **Note:** elsewhere in this document we use 'link type' as a shorthand for link relation type not the media type as described below.

#### 4.4.3 A title for the link

A human readable title SHALL be provided for use in applications that present links as options for an end user to follow. This is a natural language text string that can be in any language. It SHOULD be in the same language as the destination resource. Resolvers MAY support the provision of multiple titles in different languages where target resources are themselves multilingual.



#### 4.4.4 The human language of the linked resource

For human-readable resources, such as Web pages, or data that contains text strings in a specific language, hints concerning the language used in that resource MAY be provided. If this is done, the language SHALL be provided in accordance with IETF Best Current Practice for identifying languages [BCP47]. Multiple language tags can be applied where the target resource is itself multilingual.

#### 4.4.5 The Media Type for the content

Links MAY be annotated with a hint about the likely format (the serialisation) of the linked resource. If this is done, Media Types SHALL be used for this, such as `text/html`, `application/json`, `application/ld+json` etc. The normative list of Media Types is maintained by IANA [IANA MT].

As noted, the term 'link type' used elsewhere in this document refers to the link relationship type not the media type.

#### 4.4.6 The context

The context parameter MAY be used to disambiguate between multiple links that match the given link type. Examples:

- A food product might link to multiple recipe pages and the context parameter might distinguish between different sub categories like vegetarian, vegan, gluten-free etc.
- Information about a product may vary slightly between different territories.
- A link to availability and price information might use the context parameter to distinguish between different retailers.
- The GS1 Lightweight Messaging Standard for Verification of Product Identifiers [LMS] provides a concrete example: it envisages that when using the `verificationService` link type, the `context` parameter can be set to a specific value such as `dscsaSaleableReturn` to indicate that a verification service for product identifiers should be configured to use a profile defined by the US Drug Supply Chain Security Act; Saleable Returns, whereas a different value of the `context` parameter would cause the target resource to use a different profile, e.g. for a different jurisdiction or regulatory regime.

The value space of the context parameter is not defined in this specification and resolvers are not obliged to support it. For resolvers that do recognise it, the resolver description file (section [4.15](#)) SHOULD declare this and provide values that it recognises in one or other of the following ways:

1. by enumerating recognised values;
2. by linking to an external list of values.

Examples of this are included in section [4.15](#).

#### 4.4.7 Additional attributes

GS1 conformant resolvers MAY recognise further attributes. For example, the User Agent string might be useful in differentiating between resources suitable for different clients and operating systems, custom HTTP request headers from a brand owner's own application might be useful for a tailored experience.

### 4.5 Associating links with identified items

Links can be associated with identified items at any level of granularity. For example, an identified item might have links defined as follows:

#### GTIN

- Product information (default).
- Instruction manual (applies to all trade items with this GTIN).

### GTIN + Batch/Lot

- Traceability information (specific to this batch of this item).

### GTIN + CPV

- Recycling information (perhaps specific to seasonal packaging).

### GTIN + serial number

- Registration information (specific to this individual item).

This is one of the key reasons for GS1 Digital Link URIs being structured in the way they are, with identifiers becoming progressively more specific from left to right, separated by slashes, as distinct from attributes that can appear in any order in the query string. In the following section on Resolution and Redirection, this becomes particularly important when selecting the appropriate link(s) for a given item. To follow the example above, if the request URI is at the CPV level and asks for the instruction manual, the resolver 'walks up the tree' until it finds the appropriate link at the GTIN level.

A resolver MAY support grouping of top level identifiers. That is, a resolver may implement a system through which a request for links related to one primary identification key can be serviced by links defined for another. This has potential use when providing information related to products sold in different territories with trivial differences, such as the patient information leaflet for the same drug but in different languages, or an electronics item sold with a different mains lead for different countries.

The precise mechanism for doing this is not defined as it is likely to be driven by commercial decisions that will have no effect on the technological solution employed.

- ✓ **Note:** Great care must be taken when doing this to ensure that information provided by following a given link type about every identified item in the group applies to all.

## 4.5.1 The default link

Resolver operators – that is, the parties responsible for curating links – are encouraged to provide multiple links for each item to serve different end users. This is a key feature of the GS1 Digital Link ecosystem that underpins the notion of *one barcode performing multiple functions*. However, it is highly likely that the end user will expect to receive content (either machine or human readable) rather than a list of links. Likewise, resolver operators will be keen to provide end users with the information they're most likely to find useful. On the other hand, developers need to be able to discover and serve what they deem to be the content that best suits the needs of their users. These needs lead to the following details:

- For each identified item there SHALL be exactly one default link, the link type for which SHALL be `gs1:defaultLink`. This default is defined without any of the optional attributes, that is, it SHALL include a title, but SHALL NOT include other attributes.
- Resolver operators MAY define more refined default links that are disambiguated by attributes that can be determined through inspecting the HTTP client's request headers (only). This is likely to be particularly important for language variants of the default (see Table 4-7 for examples). If this feature is supported, the link type for these links SHALL be `gs1:defaultLink*` (note the asterisk). This follows the method defined in Web linking [RFC8288] for encoding multiple titles in different languages, which in turn builds on work in [RFC 8187].

In addition to `gs1:defaultLink` or `gs1:defaultLink*`, default links SHALL also be described using an appropriate additional link type. For example, an item's default might be a product information page, in which case, the link is both of type: `gs1:defaultLink` and `gs1:pip`.

## 4.5.2 The default link for granular identifiers

The structure of a GS1 Digital Link URI is such that the identification becomes more granular as you work from left to right in the path information, i.e. there's a subclass relationship [DL-Semantics]. So if the URI includes a GLN and a GLN extension, any facts at the GLN level also

apply at the GLN extension level. Likewise with an SGTIN, any fact about the GTIN also applies to the individual instance identified by the serial number. The reverse is not true: facts about the GLN extension may not apply to the GLN, facts about the serialised item may not apply to the GTIN. As an analogy, mammals are a subclass of animal, that is, all mammals are animals but not all animals are mammals.

This means that if the item is identified at a fine level of granularity, it is possible, but not necessary, to define links at that granular level. Rather, they can be defined at a less granular level. As a consequence, it is perfectly permissible to set the default link for the primary key and not further down the tree, if appropriate for the operating environment of the resolver. What is important is that for any entry point, that is, for any GS1 Digital Link URI, no matter how granular, there SHALL be a default link available either at the entry level or at a higher level.

This has positive consequences for resolvers that support a subset of the GS1 identifier space.

As noted in section [4.3.1](#), resolvers MAY support a subset of GS1 primary keys, rather than all of them. For example, it may support only GTIN and GLN, or GLN, SSCC and GRAI. The list of supported primary keys SHOULD be declared in the Resolver Description File (section [4.15](#)). For each supported primary key, a resolver SHALL support all its key qualifiers. So if the resolver supports GTIN, it must also be able to process GS1 Digital Link URIs that include CPV, batch/lot and serial number; support for GLN entails support for GLN extensions and so on. However, this does not mean that such a resolver must also support the provision of links at granular levels of identity since they can simply be provided at the primary key level and still be conformant.

## 4.6 Resolution and Redirection

The expectation is that in most cases, a resolver will respond to a request by redirecting to an appropriate resource. Provision of content directly (section [4.12](#)) is possible but it is anticipated that this will be the exception rather than the norm. This section defines how resolvers should perform redirection and how GS1 key licensees and client applications can exercise control over the redirection process.

There are three ways in which a client can query a GS1 conformant resolver:

1. A simple lookup that results in the default response. From a client perspective, this requires no special software or understanding of GS1 Digital Link or even that it is dealing with a resolver. It's a simple web request.
2. A request for a specific type of resource.
3. A request for all resources associated with a given GS1 identifier or set of identifiers.

The following sections discuss these in turn.

As noted in section [4.1](#), even when redirecting, conformant resolvers SHOULD expose the link to the linkset in the HTTP Link header. This is primarily to provide all client applications the ability to discover the links available to it through an HTTP HEAD request or by interrupting the redirect.

### 4.6.1 The default response

As set out in section [4.5.1](#), for each identified item there is exactly one default link that is defined without any additional metadata (other than its human-readable title). This exists so that the resolver can *always* provide a definite response, even when information received cannot be matched against the available links. For this reason, the cardinal rule is that:

Resolvers SHALL redirect to the default link *unless* there is information in the request that can be matched against available link metadata to provide a better response.

The request can include such additional information in two ways:

- in the HTTP request headers;
- in the query string.

Of relevance here is that HTTP request headers can specify preferences and absolute requirements that a client may have. For example, they can specify that only one media type is acceptable, or that one is preferred over another. The same is true for languages so that, for example, it's possible for the client to express that the user understands multiple languages but has a given

order of preference. The details of this are defined in the HTTP standards and are out of scope for GS1 Digital Link.

HTTP requests almost never come without *any* extra information that may be useful in determining a resolver's response. This is why we define the `gs1:defaultLink*` link type. Its use in any given resolver is optional but, if supported, it allows a resolver to take note of, for example, a user's language preferences to determine which of several available redirects are followed. The examples in section 4.7 will help to clarify this.

#### 4.6.2 Requesting a specific link type

Applications may wish to provide their users with a specific type of content for each item, irrespective of the default. For example, a dietary application may want to always follow a link to nutritional information, or a clinical application may always want to follow a link to a patient information leaflet.

Applications MAY include a request for a specific type of link by including a `linkType` parameter in the query string with the value of the desired link type. For example:

```
linkType=gs1:nutritionalInfo
```

```
linkType=gs1:epil
```

- If the requested `linkType` is not available the resolver SHALL redirect to the default link.
- If the specified link type is available, the resolver SHALL redirect to the link provided for that link type.

#### 4.6.3 Matching request parameters with link attributes

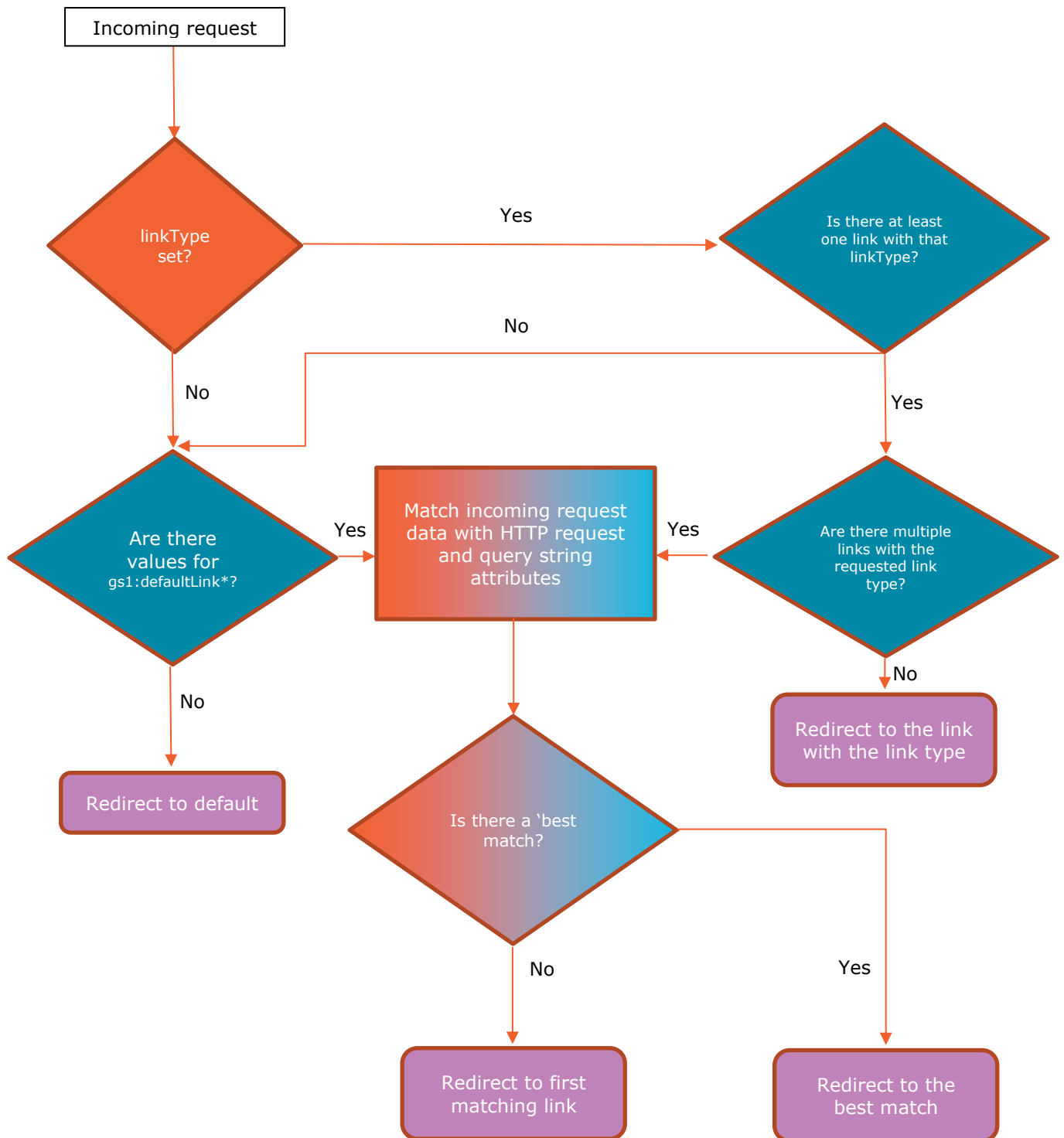
The link attributes described in section 4.4 allow GS1 conformant resolvers to match incoming requests with the links they have at hand for the given identifier(s). The requirement for the definition of a single default link is designed to ensure that this process is deterministic, however, the aim is to provide the best match between link attributes and an incoming request, and to fall back on the default if no direct match can be made. The overarching principles are:

1. The link type is the principal attribute to be taken into account.
2. After the link type, all other attributes are equal and GS1 conformant resolvers should make a best effort to provide the closest match.

Conformant GS1 resolvers may implement any algorithm that results in a deterministic response, however, the recommended approach to meeting those two principles is as follows:

1. If no link type is set in the query, or a link type is set and is not included in the available list, the choice is only between links with the `gs1:defaultLink` and `gs1:defaultLink*` link types.
2. If there are no links typed as `gs1:defaultLink*`, redirect to the `gs1:defaultLink`.
3. If a link type is set and matches a single link in the available data, redirect to it.
4. Where a choice has to be made between links with the same link type, including `gs1:defaultLink*`, the implementation is likely to make use of Web servers' existing algorithms that take into account information in the HTTP request headers. In essence: 'best match wins.'
5. Where it is impossible to determine which of multiple links of the same link type is the best match, redirect to the first one.

The flowchart below provides a visualisation of this, followed by some worked examples.



**Figure 4-2 Flow chart for matching incoming requests with links at hand**

## 4.7 Examples

*This section is informative*

Some examples should help to clarify the previous discussion.

### Example 1

An FMCG manufacturer operates their own resolver that just handles GTINs. For all identified items in the resolver's database there is exactly one link which is to the product's information page. In this situation all request URIs result in a redirection to the relevant product information page with the same link types of `gs1:pip` and `gs1:defaultLink` whether or not the URI includes CPV, batch/lot or serial number.

### Example 2

A GS1 Member Organisation operates a resolver. A consumer electronics manufacturer sets up links for one of their products as shown in the table below.

**Table 4-4 Initial data for example 2**

Link type	Resource description
<code>gs1:pip, gs1:defaultLink</code>	Product information page
<code>gs1:instructions</code>	The instruction manual
<code>gs1:certificationInfo</code>	A document showing compliance with the relevant regulations

This is the usual situation so that the GS1 Digital Link URI will redirect to the product information page, but for a limited period, the manufacturer wants to point potential consumers to a promotional campaign and adds another link so that their full set is:

**Table 4-5 Temporary data for example 2**

Link type	Resource description
<code>gs1:pip</code>	Product information page
<code>gs1:instructions</code>	The instruction manual
<code>gs1:certificationInfo</code>	A document showing compliance with the relevant regulations
<code>gs1:promotion, gs1:defaultLink</code>	Entry point for a promotional campaign

Note that the default link is now the same as the (temporary) `gs1:promotion`. This means that for the duration of the promotion, by default, the GS1 Digital Link URI will redirect to the promotion.

### Example 3

An independent organisation operates a repository of electronic patient information leaflets on behalf of a variety of pharmaceutical manufacturers. For each drug, they offer two types of information: one designed for patients (`gs1:epil`) and one for clinical staff (`gs1:smpc`). The leaflets are available in multiple languages and so there are multiple links for both supported link types. The manufacturer provides the list of available links as shown below.

**Table 4-6 Data for patient information leaflet example**

Link type	Resource description
<code>gs1:defaultLink</code>	Patient information (Dutch)
<code>gs1:epil, gs1:defaultLink*</code>	(1) Patient information (Dutch)

Link type	Resource description
	(2) Patient information (French)
	(3) Patient information (German)
gs1:smpc	(1) Summary product characteristics (Dutch)
	(2) Summary product characteristics (French)
	(3) Summary product characteristics (German)

In the absence of any information to the contrary, a resolver with these links available will redirect to the patient information leaflet (the ePIL) in Dutch. If there is no value for the `linkType` parameter then:

1. If the HTTP Accept-Language header sent by the client indicates a preference for 'nl', 'fr' or 'de' then the redirection would be to the patient information leaflet in the relevant language.
2. If the Accept-Language header declared a preference for a language not listed, then, again, the resolver will redirect to the default version (Dutch).

Support for `gs1:defaultLink*` is optional in any GS1 conformant resolver. If it were not supported in this case, then for anything other than the Dutch language patient information to be returned, the request URI would have to include the relevant `linkType` parameter and the HTTP Accept-Language header would need to match.

If an incoming request were received for the summary product characteristics (the term used to describe information for clinicians) by setting the `linkType` parameter to `gs1:smpc`, then:

1. If the client's language preferences can be matched, redirect to the SmPC in that language.
2. If the client's language cannot be matched, redirect to the first one in the list (in this case, Dutch).

The same reasoning applies in the `linkType` parameter were set to `gs1:epil`. In this case, the fact that the electronic information for patients is also the default is irrelevant.

If the `linkType` parameter were set to any value other than `gs1:epil` or `gs1:smpc`, the defaults are used exactly as if no value were set.

#### Example 4

A power tool manufacturer operates its own resolver and encourages its customers to register their purchase by including a GS1 Digital Link URI on the packaging, as follows:

`https://tools.example.com/01/9520123456788/21/12345`

The manufacturer sets the default to the link that is also labelled `gs1:instructions` which points to a video showing how the tool can be used. This is set at the GTIN level and so any consumer scanning the tool's packaging in any store would see the same video. However, the same GS1 Digital Link URI can be scanned using the retailer's app which asks for a link type of `gs1:registerProduct` (see next section). Combining information from both the retailer app, which includes information about the customer, with the manufacturer's information about the serialised product makes the registration process trivially easy for the consumer.

**Table 4-7 Sample data for remaining examples**

Link type	Target URL	Lang	Context
<code>gs1:defaultLink</code>	1. <code>https://example.com/en/defaultPage</code>		
<code>gs1:defaultLink*</code>	2. <code>https://example.com/en/defaultPage</code>	en	

gs1:defaultLink*	3. <a href="https://example.com/fr/defaultPage">https://example.com/fr/defaultPage</a>	fr	
gs1:pip	1. <a href="https://example.com/en/defaultPage">https://example.com/en/defaultPage</a>	en	
gs1:pip	2. <a href="https://example.com/fr/defaultPage">https://example.com/fr/defaultPage</a>	fr	
gs1:whatsInTheBox	1. <a href="https://example.com/en/packContents/GB">https://example.com/en/packContents/GB</a>	en	GB
gs1:whatsInTheBox	2. <a href="https://example.com/fr/packContents/FR">https://example.com/fr/packContents/FR</a>	fr	FR
gs1:whatsInTheBox	3. <a href="https://example.com/fr/packContents/CH">https://example.com/fr/packContents/CH</a>	fr	CH
gs1:relatedVideo	<a href="https://video.example">https://video.example</a>		

### Example 5

The the GS1 Digital Link URI to be resolved does not include a query string and the Accept-language header is not set. There is no data in the request to match and so the response is simple: redirect to the default (<https://example.com/en/defaultPage>)

### Example 6

The the DL URI to be resolved does not include a query string and the Accept-language is set to fr (French). There is no query string (and therefore no `linkType` set). There is, however, a match between the requested language and an available default. The resolver redirects to the French language default (<https://example.com/fr/defaultPage>)

### Example 7

The the DL URI to be resolved does not include a query string, the Accept-language is set to de (German), and there is no match between the requested language and an available default. The resolver redirects to the default (<https://example.com/en/defaultPage>)

### Example 8

The DL URI to be resolved does include the `linkType` parameter which is set to `gs1:relatedVideo`. The resolver redirects to <https://video.example>.

### Example 9

The DL URI to be resolved includes the `linkType` parameter which is set to `gs1:instructions`. The Accept-language header is set to fr. There is no match for the link type and so it will be one of the defaults that are used. There's a match in the set of defaults so the resolver redirects to the French language default at <https://example.com/fr/defaultPage>. Any other requested language with either no link type or a link type where there is no match, would end up at the English language default.

### Example 10

The DL URI to be resolved does include the `linkType` parameter which is set to `gs1:pip` and the Accept-language header is set to en. The resolver redirects to the English language page at <https://example.com/en/defaultPage>.

### Example 11

As the previous example with the `linkType` parameter which is set to `gs1:pip` but this time the Accept-language is set to vi (Vietnamese). Here there is a match for the link type but not the



language. In this case, there is no definite answer and so the resolver will redirect to the first choice in its list for that link type.

### Example 12

The DL URI to be resolved includes the `linkType` set to `gs1:whatsInTheBox`, the `Accept-language` is set to `fr` and the context parameter is set to `CH` (Switzerland). This means that there is a link with a matching link type and two further matching attributes. The resolver redirects to `https://example.com/fr/packContents/CH`


### Example 13

Similar to the previous request but this time the requested language is `en` and the requested context is again `CH`. There are three links with the same `gs1:whatsInTheBox` link type. One matches the request by language, another by context. In this case, the resolver implementation chooses to prioritise language over context and redirects to the English language page at `https://example.com/en/packContents/GB`, even though the context doesn't match. This is an implementation choice but the suggested order of priority is `media type` → `language` → `context`.

## 4.8 Pattern-based redirection to an alternative resolver

Resolvers MAY support redirection of all request URIs that match a given pattern to another resolver based on a template. In the GS1 context, this might be at the GS1 Member Organisation level or the GS1 Company Prefix level and amounts to a simple passing of the request on to another service without further processing. When exposing the target URL in the Link header, the `linkType` (the `rel` value) SHALL be `gs1:handledBy`, indicating that the request URI is handled by the target resolver.

## 4.9 Requesting the linkset

-  Formally, this section is informative as it refers to a draft standard. However, the intention is that the text becomes normative in a near future version of the GS1 Digital Link standard once the Internet Draft – currently at an advanced stage of maturity – is published by the IETF as an RFC [Linkset]. Inclusion in this document and its implementation is offered as encouragement for that transition to occur.

Existing resolver implementations (only) are recommended to continue to support the value of `all` for the `linkType` parameter and to return their existing payloads. However, as of this standard's ratification by GS1, that feature is now deprecated and new implementations should only implement the linkset as described below.

A client may request the full list of links available to it by setting the value of the `linkType` parameter to `linkset`. This amounts to a request by the client for a list of the options available to it, rather than a request for information about the identified item. In this situation, the resolver SHALL return the linkset, i.e. the set of available links. If the resolver provides content directly without any redirection (section 4.12), the returned linkset SHALL contain a single item that is the original request URI complete with relevant metadata.

If the request GS1 Digital Link URI includes one or more key qualifiers, any links associated with each level up to the primary key SHALL be included (see section 4.5).

This specification does not limit the techniques that may be used to represent the links associated with an identified item. It does, however, specify that GS1 conformant resolvers SHALL expose the full set of links available for an identified item according to *Linkset: Media Types and a Link Relation Type for Link Sets* [Linkset]. This specifies a total of three formats in which the linkset can be expressed and interpreted:

1. A payload comprising a text string that matches the syntax and semantics of an HTTP Link header [RFC8288].
2. As JSON object that organises the links with the link relation type (link type) as the primary distinguishing feature.

### 3. As JSON-LD for Linked Data applications.

The correct format is returned following standard HTTP content negotiation rules [RFC7231]. As a minimum, GS1 conformant resolvers SHALL support the JSON object serialisation and SHOULD also provide the HTTP Link header pointing to a JSON-LD context file. Support for the HTTP Link header-based serialisation is optional. Resolvers MAY provide further alternative representations of the linkset. An HTML rendering is likely to be particularly useful and is probably the best choice to make in the absence of a deterministic value for the `Accept` header.

#### 4.9.1 The linkset formatted as HTTP Link headers

The Web linking standard [RFC8288] defines a compact method for providing links associated with a Web resource, together with a detailed parsing algorithm. This allows linksets to be provided directly as values of the HTTP Link header. Formally, there is no limit to the number of links that can be expressed in this way. In practice, however, HTTP clients can fail if the value of any HTTP header is lengthy. As a result, *Linkset: Media Types and a Link Relation Type for Link Sets* [Linkset] defines a method for returning a linkset as a document formatted exactly as defined in RFC8288. As of this publication, GS1 Digital Link leverages that work at the IETF directly and fully.

Using an example GS1 DL URI of `https://example.com/01/9520123456788`, the URLs in Table 4-7 can be encoded as show below.

It's worth noting a number of features of this approach.

- The media type for a linkset document is `application/linkset`.
- The format is more compact than the alternatives but requires more specialised processing on the client as a result.
- The value space of the `rel` attribute is defined as a white space-separated list of link relation types so that the default link and its actual link type can be given in a single line.
- The `anchor` attribute – the original GS1 DL URI – is given for each link so that the linkset can be processed in any context and is not dependent on the data being received directly by looking up the GS1 DL URI on the resolver.
- HTTP Headers may only include ASCII characters. This limits what may be given as the value for the `title` attribute and this in turn is the primary reason for the Web linking standard defining the `title*` attribute (note the asterisk). This builds on a further standard *Indicating Character Encoding and Language for HTTP Header Field Parameters* [RFC8187].
- For titles that can be written entirely in ASCII (i.e. only using the Latin alphabet with no accented characters), use the `title` attribute, which takes a single string as a value that may include spaces and does not need to be percent encoded.
- For titles that use non-ASCII characters, use the `title*` attribute, which takes a white space-separated list of values and follow RFC8187's rules for including the character encoding and (optional) language tag as well as the actual title that will need to be percent encoded.
- The `hreflang` attribute may appear multiple times (hinting that the target resource is available in multiple languages) but others, most notably the `title` and `title*` attributes, may only appear once each.

```
<https://example.com/en/defaultPage>
  ; rel="gs1:defaultLink gs1:pip"
  ; title="Product information"
  ; anchor="https://example.com/01/9520123456788",
<https://example.com/en/defaultPage>
  ; rel="gs1:defaultLink* gs1:pip"
  ; hreflang="en"
  ; title="Product information"
  ; anchor="https://example.com/01/9520123456788",
<https://example.com/fr/defaultPage>
  ; rel="gs1:defaultLink* gs1:pip"
  ; hreflang="fr"
  ; title="Information produit"
  ; anchor="https://example.com/01/9520123456788",
<https://example.com/en/packContents/GB>
  ; rel="gs1:whatsInTheBox"
  ; hreflang="en"
  ; title="What's in the box?"
  ; context="GB"
  ; anchor="https://example.com/01/9520123456788",
<https://example.com/en/packContents/FR>
  ; rel="gs1:whatsInTheBox"
  ; hreflang="fr"
  ; title="Qu'y a-t-il dans la boite?"
  ; context="FR"
  ; anchor="https://example.com/01/9520123456788",
<https://example.com/en/packContents/CH>
  ; rel="gs1:whatsInTheBox"
  ; hreflang="fr"
  ; title="Qu'y a-t-il dans la boite?"
  ; context="CH"
  ; anchor="https://example.com/01/9520123456788",
<https://video.example>
  ; rel="gs1:relatedVideo"
  ; hreflang="en"
  ; hreflang="fr"
  ; title*=UTF-8'en'See%20it%20in%action%21 UTF-8'fr'Voyez-l%20en%20action%21
  ; anchor="https://example.com/01/9520123456788"
```

#### 4.9.2 The linkset as JSON

An alternative method of encoding links is as a JSON object. The mapping from the HTTP Link header serialisation above is not straightforward and it is important to note a number of differences.

The media type is `application/linkset+json`

The format is more verbose than for the HTTP Link header-based syntax.

The value of the `hreflang` attribute, which may not be repeated, is an array.

CURIEs may not be used as the link types (which need to be written as complete URLs unless they are registered with IANA [IANA-LR])

The value of the `title*` attribute is an array of objects and has a significantly different syntax to the alternative approach. Titles may use any character set and do not need to be percent encoded.

```
{
  "linkset": [
    {
      "anchor": "https://example.com/01/9520123456788",
      "itemDescription": "Example product",
      "https://gs1.org/voc/defaultLink": [
        {
          "href": "https://example.com/en/defaultPage"
        }
      ],
      "https://gs1.org/voc/defaultLink*": [
        {
          "href": "https://example.com/en/defaultPage",
          "hreflang": ["en"],
          "title": "Product information"
        },
        {
          "href": "https://example.com/fr/defaultPage",
          "hreflang": ["fr"],
          "title": "Information produit"
        }
      ],
      "https://gs1.org/voc/pip": [
        {
          "href": "https://example.com/en/defaultPage",
          "hreflang": ["en"],
          "title": "Product information"
        },
        {
          "href": "https://example.com/fr/defaultPage",
          "hreflang": ["fr"],
          "title": "Information produit"
        }
      ],
    }
  ],
}
```

```
"https://gs1.org/voc/whatsInTheBox": [
  {
    "href": "https://example.com/en/packContents/GB",
    "hreflang": ["en"],
    "title": "What's in the box?",
    "context": "GB"
  },
  {
    "href": "https://example.com/fr/packContents/FR",
    "hreflang": ["fr"],
    "title": "Qu'y a-t-il dans la boite?",
    "context": "FR"
  },
  {
    "href": "https://example.com/fr/packContents/CH",
    "hreflang": ["fr"],
    "title": "Qu'y a-t-il dans la boite?",
    "context": "CH"
  }
],
"https://gs1.org/voc/relatedVideo": [
  {
    "href": "https://video.example",
    "hreflang": ["en", "fr"],
    "title*": [ { "value": "See it in action!" , "language" : "en" }, {
"value": "Voyez-le en action!" , "language" : "fr" } ]
  }
]
}
```

### 4.9.3 The linkset as JSON-LD

As of JSON-LD version 1.1 [JSON-LD], JSON can be interpreted as JSON-LD simply by following a link in the HTTP Link header that points to an associated context file. In line with that standard, the link relation type SHALL be `http://www.w3.org/ns/json-ld#context` and the media type SHALL be `application/ld+json`.

Resolvers MAY provide their own JSON-LD context file and could potentially link to different context files for different linksets. However, the RECOMMENDED approach is to use the context file published and maintained by GS1 at <https://www.gs1.org/gs1-digital-link/artifacts/dl-resolver-context.jsonld> for all linksets and for this to be declared as the resolver's policy in its Resolver Description File (section 4.15). Including the HTTP Link header to this document when returning a linkset as JSON means that relevant applications can interpret the JSON as Linked Data with no further effort required.

**Table 4-8 Terms and mappings included in the GS1 JSON-LD context file for linksets**

JSON term	Maps to
itemDescription	rdfs:comment
hreflang	dcterms:language
title	dcterms:title
type	dcterms:format
context	gs1:context

Applying the GS1 context renders the JSON in the previous section as the JSON-LD below.

```
{
  "@id": "https://example.com/01/9520123456788",
  "http://www.w3.org/2000/01/rdf-schema#comment": "Example product",
  "https://gs1.org/voc/defaultLink": {
    "@id": "https://example.com/en/defaultPage",
    "http://purl.org/dc/terms/title": "Product information"
  },
  "https://gs1.org/voc/defaultLink*": [
    {
      "@id": "https://example.com/en/defaultPage",
      "http://purl.org/dc/terms/language": "en",
      "http://purl.org/dc/terms/title": "Product information"
    },
    {
      "@id": "https://example.com/fr/defaultPage",
      "http://purl.org/dc/terms/language": "fr",
      "http://purl.org/dc/terms/title": "Information produit"
    }
  ],
  "https://gs1.org/voc/pip": [
    {
      "@id": "https://example.com/en/defaultPage",
      "http://purl.org/dc/terms/language": "en",
      "http://purl.org/dc/terms/title": "Product information"
    },
    {
      "@id": "https://example.com/fr/defaultPage",
      "http://purl.org/dc/terms/language": "fr",
      "http://purl.org/dc/terms/title": "Information produit"
    }
  ]
}
```

```
    }
  ],
  "https://gs1.org/voc/relatedVideo": {
    "@id": "https://video.example",
    "http://purl.org/dc/terms/language": [
      "en",
      "fr"
    ],
    "http://purl.org/dc/terms/title": [
      {
        "@language": "en",
        "@value": "See it in action!"
      },
      {
        "@language": "fr",
        "@value": "Voyez-le en action!"
      }
    ]
  },
  "https://gs1.org/voc/whatsInTheBox": [
    {
      "@id": "https://example.com/en/packContents/GB",
      "http://purl.org/dc/terms/language": "en",
      "http://purl.org/dc/terms/title": "What's in the box?",
      "https://gs1.org/voc/context": "GB"
    },
    {
      "@id": "https://example.com/fr/packContents/FR",
      "http://purl.org/dc/terms/language": "fr",
      "http://purl.org/dc/terms/title": "Qu'y a-t-il dans la boite?",
      "https://gs1.org/voc/context": "FR"
    },
    {
      "@id": "https://example.com/fr/packContents/CH",
      "http://purl.org/dc/terms/language": "fr",
      "http://purl.org/dc/terms/title": "Qu'y a-t-il dans la boite?",
      "https://gs1.org/voc/context": "CH"
    }
  ]
}
```

Which, in turn, is equivalent to the following triples:

```

<https://example.com/01/9520123456788> <http://www.w3.org/2000/01/rdf-schema#comment> "Example product" .
<https://example.com/01/9520123456788> <https://gs1.org/voc/defaultLink*> <https://example.com/en/defaultPage> .
<https://example.com/01/9520123456788> <https://gs1.org/voc/defaultLink*> <https://example.com/fr/defaultPage> .
<https://example.com/01/9520123456788> <https://gs1.org/voc/defaultLink> <https://example.com/en/defaultPage> .
<https://example.com/01/9520123456788> <https://gs1.org/voc/pip> <https://example.com/en/defaultPage> .
<https://example.com/01/9520123456788> <https://gs1.org/voc/pip> <https://example.com/fr/defaultPage> .
<https://example.com/01/9520123456788> <https://gs1.org/voc/relatedVideo> <https://video.example> .
<https://example.com/01/9520123456788> <https://gs1.org/voc/whatsInTheBox>
<https://example.com/en/packContents/GB> .
<https://example.com/01/9520123456788> <https://gs1.org/voc/whatsInTheBox>
<https://example.com/fr/packContents/CH> .
<https://example.com/01/9520123456788> <https://gs1.org/voc/whatsInTheBox>
<https://example.com/fr/packContents/FR> .
<https://example.com/en/defaultPage> <http://purl.org/dc/terms/language> "en" .
<https://example.com/en/defaultPage> <http://purl.org/dc/terms/title> "Product information" .
<https://example.com/en/packContents/GB> <http://purl.org/dc/terms/language> "en" .
<https://example.com/en/packContents/GB> <http://purl.org/dc/terms/title> "What's in the box?" .
<https://example.com/en/packContents/GB> <https://gs1.org/voc/context> "GB" .
<https://example.com/fr/defaultPage> <http://purl.org/dc/terms/language> "fr" .
<https://example.com/fr/defaultPage> <http://purl.org/dc/terms/title> "Information produit" .
<https://example.com/fr/packContents/CH> <http://purl.org/dc/terms/language> "fr" .
<https://example.com/fr/packContents/CH> <http://purl.org/dc/terms/title> "Qu'y a-t-il dans la boite?" .
<https://example.com/fr/packContents/CH> <https://gs1.org/voc/context> "CH" .
<https://example.com/fr/packContents/FR> <http://purl.org/dc/terms/language> "fr" .
<https://example.com/fr/packContents/FR> <http://purl.org/dc/terms/title> "Qu'y a-t-il dans la boite?" .
<https://example.com/fr/packContents/FR> <https://gs1.org/voc/context> "FR" .
<https://video.example> <http://purl.org/dc/terms/language> "en" .
<https://video.example> <http://purl.org/dc/terms/language> "fr" .
<https://video.example> <http://purl.org/dc/terms/title> "See it in action!"@en .
<https://video.example> <http://purl.org/dc/terms/title> "Voyez-le en action!"@fr .
  
```

#### 4.10 Default link type may be set to linkset

Resolvers MAY support the setting of the default `linkType` to linkset. This can be applied at any level. What this means is that where a specific `linkType` is not requested, or a request for a specific `linkType` cannot be fulfilled, especially taking language and media type into account, the resolver will return the full list of links available to the client application.

Since support for this function is optional, if implemented it SHOULD be declared in the Resolver Description File (section [4.15](#)).

Furthermore, if returning the linkset *because the requested item is not available*, the resolver SHALL NOT use a 200 OK response code. Instead it SHALL use either of the following:

- 406 ([Not Acceptable](#))
- 300 ([Multiple Choices](#)) noting that, according to the specification of this header "If the server has a preferred choice of representation, it SHOULD include the specific URI for that representation in the Location field; user agents MAY use the Location field value for automatic redirection. This response is cacheable unless indicated otherwise."



## 4.11 Handling the query string

If present, the query string in an uncompressed GS1 Digital Link URI carries attributes of the identified item and does not form part of the GS1 standard identifier itself. Implementations MAY make use of query string parameters but this specification does not define a particular behaviour. The semantics are defined separately [DL-Semantics]. As a consequence, it's important that query strings are normally preserved through any redirection.

When redirecting, by default, a resolver SHALL transmit the entirety of the query string in the request URI to the target destination. This behaviour MAY be suppressed, i.e. the query string parameters not passed, if the target resource is adversely affected. The reason for this is as follows:

- Resolvers are not required to process the query string, therefore resolvers may not understand the query string.
- The target resource might understand the query string therefore the resolver should simply pass everything through.
- This is usually harmless, even where the target resource doesn't understand the query string parameters since Web applications typically ignore anything they don't understand. However, some Web resources are less tolerant and therefore can be adversely affected by the presence of key=value pairs they don't understand.

## 4.12 Providing content directly

Operators of resolver services may provide content and user experiences directly from a GS1 Digital Link Web URI. The nature of that content is, of course, entirely up to the operator. However; best practice recommendation is that content should be relevant to the specific item identified and not, for example, to a manufacturer's homepage or multiple products from the same brand.

## 4.13 Supported link relation types

The Web Linking standard [RFC8288] defines a registry of general purpose link relation types [IANA LR] such as `alternate`, `describedby` and `icon`. These can be used without qualification in HTTP Link headers (and therefore linksets). They are similar to, but managed and defined separately, from the list of link types that can be used in HTML documents [HTML LT]. Neither list includes the detailed set of link relation types needed for GS1 conformant resolvers, which are unlikely to be of sufficiently broad applicability to warrant addition to those registries. Therefore, the GS1 Web vocabulary [GS1Voc] defines a set of link relation types (link types). The Web Vocabulary is managed separately under the GS1 Standards Management Process but this standard includes a specific method for future change management of link types.

Where relevant, the Web vocabulary defines relationships between GS1 link types and terms in other vocabularies, notably `schema.org`, using semantic relationships defined in SKOS [SKOS].

The extension mechanism defined in the Web Linking standard states that values used as a link relation type other than those listed in the IANA registry must be a URI but may be serialised as strings that can be converted to a URI. We take advantage of this and express link types as CURIES [CURIE] that is, compact URIs.

Referring to the namespaces listed in section 2, for example, `gs1:pip` expands to `https://gs1.org/voc/pip`.

GS1 conformant resolvers that support multiple links per item SHALL recognise the link types defined in the `gs1:` namespace and MAY recognise further namespaces in which case they and the recognised prefixes SHOULD be declared in the resolver description file (see section 4.15).

**Table 4-9** shows some example link relation types defined in the Web vocabulary at the time of publication. In the case of any variance between these examples and the definitions published in the GS1 Web vocabulary, the latter is normative. The word 'document' used in the definitions means any kind of document: human or machine readable, text, image, video etc. The type of document is given in the relevant HTTP `content` header (as a media type) and/or in the document itself.

**Table 4-9** Examples of the initial set of link relation types for use in conformant GS1 resolvers. Further link types MAY be added to the GS1 Web vocabulary as described in section [4.14](#).

Link type	Definition	Default English title
gs1:pip	The URL of a document that provides information about the identified item, typically operated by the brand owner or a retailer of the product. It may include links to further information, product description, specifications etc. N.B. The page may be human or machine readable, or a combination of the two (such as an HTML page with embedded structured data).	Product information page
gs1:quickStartGuide	A document, video or graphic that shows the key features needed to be understood to begin using the item.	Quick start guide
gs1:allergenInfo	A document describing the allergens in the product.	Allergen information
gs1:whatsInTheBox	A document describing all the individual items in a packaged item	What's in the box
gs1:certificationInfo	Information on certification to which the product complies.	Certification information
gs1:traceability	A link to traceability information about the product	Traceability information
gs1:recallStatus	A link to information about whether the product has been recalled or not, typically an API	Recall status
gs1:recipeInfo	A website containing recipes associated with the product.	Recipe website
gs1:epil	Link to an electronic patient information leaflet	Patient information
gs1:smpc	Link to Summary Product Characteristics for healthcare professionals	Summary product characteristics (SmPC)
gs1:registerProduct	A link to an entry point for registering ownership of a product including for warranty purposes	Register purchase
gs1:socialMedia	A link to a social media channel. The title will typically be replaced by the name of the channel.	Social media

Link type	Definition	Default English title
gs1:support	A link to a source of support such as a helpdesk, chat support, email etc.	Support
gs1:purchaseSuppliesOrAccessories	A link to a page where supplies or accessories for the item can be purchased or ordered	Purchase supplies or accessories
gs1:hasRetailers	A link to a list of retailers for this item	Retailers

#### 4.14 Link type maintenance

Formal requests for new terms to be added may be made through a GSMP Work Request and, when considering the request, the following rules will be applied:

- Link relation types must be as broad as possible while conveying a specific meaning. For example, `gs1:allergenInfo` links to a document that provides allergen information in some way and is broad enough to encompass a variety of cases. Requests for new terms that point to specific kinds of allergen are unlikely to be accepted, noting that any descriptive title can be applied to a link. This rule is designed to keep the number of link types as low as possible while still covering the full range of use cases.
- Link types SHALL NOT be deleted from the GS1 Web vocabulary, they MAY, however, be deprecated and therefore their future use be discouraged.
- Definitions MAY be clarified but not substantially altered. If necessary, deprecate the existing link type and define a new one.
- GS1 link types are defined using lower camel case (e.g. `gs1:nutritionalInfo`) using formal semantics as part of the broader GS1 Web vocabulary. This follows best practice for defining vocabulary terms in this manner (using RDF). However, the Web Linking standard [RFC8288] requires that link relation types are all lower case. Therefore link types should be regarded as case insensitive.
- Link relation types SHALL NOT use the same terms as those defined in other GS1 standards, notably the Global Data Dictionary [GDD], unless the meaning is identical.

Informally, the GS1 Web vocabulary is developed on GitHub at <https://github.com/gs1/WebVoc>. New terms may be proposed and experimented with there.

#### 4.15 Resolver description file

This standard does not define a single resolver; rather, it defines the concept of a GS1 conformant resolver. Different resolvers are likely to serve different needs and there is no requirement, nor any expectation, that every resolver will offer the same set of links or content for the same identified item. Equally, it is not expected that every resolver will offer support for every combination of GS1 key or qualifier. In other words, it is the *behaviour* of the resolver that is standardised, not the specific service(s) that it links to or provides directly.

This, coupled with the support for extension key=value pairs in the query string (see [DL-URI]), means that it is possible for resolvers to offer different capabilities. A resolver might, for example, support a specific extension parameter or link types defined in an additional namespace other than the GS1 Web Vocabulary. It may include additional, proprietary compression mechanisms that sit on top of the standard GS1 approach see flowchart C14 in [DL-Compression].

Finally, note that the GS1 Digital Link URI syntax allows additional path elements between the domain name and the primary key, so that `https://example.com/extra/path/01/9520123456788` is valid.

Such flexibility is deliberate and allows different businesses to use GS1 Digital Link in the way that best suits them with the minimum of restriction. On the downside, the flexibility reduces

interoperability between resolvers. To address this, we define the Resolver Description File. It provides a machine-readable description of the resolver's capabilities using the terms defined below.

Providing this information allows applications to automatically detect a resolver's capabilities and act accordingly. Furthermore, it explicitly asserts the sovereignty of URLs within its own domain name. This is important for the architecture of the World Wide Web and is discussed further in [DL-Semantics]. For this reason, a GS1 conformant resolver SHALL make a resolver description file available at `/.well-known/gs1resolver`, in line with Defining Well-Known Uniform Resource Identifiers (URIs) [RFC8615]. The well-known location is recorded in the [IANA Registry](#).

The presence or absence of a Resolver Description File can be used to determine whether a URL that looks like a GS1 Digital Link URI does or does not point to a resolver.

1. The resolver root (the `customURIstem` as defined in [DL-URI]) (**required**)
  - a. property: `resolverRoot`
  - b. type: URI
2. Enumerate which Primary Keys & related Qualifiers are supported by the resolver (**required**)
  - a. property: `supportedPrimaryKeys`
    - i. type: array
    - ii. Allowed values: "all", "01", "8006", "8013", "8010", "414", "417", "8017", "8018", "255", "00", "253", "401", "402", "8003", "8004"
1. A name for the resolver
  - a. property: `name`
  - b. type: string
3. Additional namespace(s) of supported link types and associated prefixes (see section [4.13](#)). Support for the GS1 Web vocabulary is assumed
  - a. property: `supportedLinkType`
  - b. type: array of objects
    - i. property: `namespace`
    - ii. type: URI
    - iii. property: `prefix`
    - iv. type: string
4. Whether `linkset` is a supported default link type (section [4.10](#))
  - a. property: `linkTypeDefaultCanBeLinkset`
  - b. type: Boolean
  - c. default: false
5. The supported values (if any) for the context keyword. These can be provided through simple enumeration or by linking to an externally managed list.
  - a. property: `supportedContextValuesEnumerated`
  - b. type: array of strings
  - c. property: `supportedContextValuesExternal`
  - d. type: URI
6. Whether the resolver provides a semantic interpretation of request URIs
  - a. property: `supportsSemanticInterpretation`
  - b. type: Boolean

- c. default: false
- 7. Whether the resolver validates the combination of AIs according to the GS1 General Specifications
  - a. property: validatesAIcombinations
  - b. type: Boolean
  - c. default: false
- 8. Contact details for the resolver operator;
  - a. property: contact
  - b. type: VCard
- 9. A pointer to a document that describes any extensions the resolver supports, such as any extended key=value pairs and/or an additional supported compression/decompression capability
  - a. property: extension profile
  - b. type: URI
- 10. The URL of a complete set of GS1 Digital Link URIs and their associated links available from this resolver
  - a. property: dataDump
  - b. type: URI
- 11. If supported, the location of the JSON-LD context file referenced in the HTTP Link header when a linkset is served as a JSON object (section 4.9.3)
  - a. property: jsonLdContextLocation
  - b. type: URI

#### 4.15.1 JSON schema

The JSON schema against which resolver description files may be validated is published at <https://id.gs1.org/resolverdescriptionfile.schema.json>.

#### 4.15.2 Example

As an example, the GS1 Global Office resolver's description file (available from <https://id.gs1.org/.well-known/gs1resolver>) is reproduced below.

```
{
  "name": "The GS1 Global Office resolver",
  "resolverRoot": "https://id.gs1.org",
  "supportedLinkType" : [{"namespace": "http://gs1.org/voc/",
  "prefix": "gs1:"}, {"namespace": "http://schema.org/", "prefix": "schema:"}],
  "supportedPrimaryKeys": ["all"],
  "supportedContextValuesEnumerated": ["dscsaSaleableReturn"],
  "supportedContextValuesExternal": [{"nameOfList": "ISO-3166 Alpha-2",
  "url": "https://en.wikipedia.org/wiki/List_of_ISO_3166_country_codes"}],
  "linkTypeDefaultCanBeLinkset": true,
  "contact": {"fn": "GS1 AISBL", "hasAddress": {"streetAddress": "Avenue Louise 326",
  "locality": "Brussels", "country-name": "Belgium", "postal-code": "1050"},
  "hasTelepone": "tel:+32 2 788 78 00"},
  "supportsLanguageVariants": true,
  "supportsSemanticInterpretation": true,
}
```

```
"validatesAllcombinations": true
}
```

## 4.16 Conformance statement

Summarising the preceding discussion, a GS1 conformant resolver:

1. SHALL support HTTP 1.1 (or higher) GET, HEAD and OPTIONS requests (section 4.1).
4. SHALL support HTTP Over TLS (HTTPS) (section 4.1)
5. SHALL support CORS (section 4.1)
6. SHALL be able to decompress a URI to generate a GS1 Digital Link URI, in accordance with GS1 Digital Link: Compression [DL-Compression] (section 4.2).
7. If handling a compressed request URI, it SHALL expose the uncompressed URI in the Link response header with a `rel` value of `owl:sameAs` (section 4.2).
8. MAY support additional decompression algorithms.
9. SHALL extract and syntactically validate the URI in accordance with sections [2](#) and [4.3.1](#), and report errors with an HTTP response code of 400.
10. SHALL NOT use a 200 OK response code with a resource that indicates an error condition (section 4.3).
11. SHALL respond to a query parameter of `linkType` set to `linkset` by returning a list of links available to the client application. The list SHALL be available as per *Linkset: Media Types and a Link Relation Type for Link Sets* [Linkset]. If the request GS1 Digital Link URI includes one or more key qualifiers, any links associated with each level up to the primary key SHALL be included (section [4.9](#)). The URI used as the subject of facts presented SHALL be the uncompressed version.
12. SHOULD expose link to the linkset in an HTTP Link header, even when redirecting (section 4.1).
13. SHALL recognise one available link as the default for any given request URI (section 4.5.1).
14. All links exposed SHALL include the target URL, the link relationship type (the link type) and a human-readable title (section [4.4](#))
15. SHALL redirect to the requested `linkType` if available (section 4.6.2).
16. By default, SHALL pass on all key=value pairs in the query string of the request URI (if present) when redirecting (section 4.11).
17. MAY support use of the Accept-Language and Accept HTTP Request Headers (section 4.6.3), and the `context` keyword in the query string, to disambiguate between multiple links of the same `linkType` (section [4.4.6](#))
18. SHALL provide a resolver description file at `/.well-known/gs1resolver` (section [4.15](#))
19. If supporting multiple links per identified item, SHALL recognise the GS1 Web vocabulary namespace, noting its change management practice. A resolver MAY recognise additional namespaces but link types defined elsewhere SHALL NOT duplicate link types available from GS1 (section 4.13).
20. If supporting redirection based on an MO or Global Company Prefix with no further processing taking place on the resolver, redirections SHALL be annotated with the `gs1:handledBy` link type (section [4.8](#)).
21. MAY provide content directly with no redirection (section [4.12](#)).
22. SHOULD tolerate trailing slashes at the end of GS1 Digital Link URIs, i.e. the resolver SHOULD NOT fail if one is present (see GS1 Digital Link: Semantics [DL-Semantics]).

#### 4.17 GS1 Class Two resolver

The working group recognises that there are multiple possible methods by which identified objects can be linked to sources of information. This document specifies a particular method that combines the GS1 system with Web principles, including Linked Data. Existing and future systems may of course, take a different approach designed to meet other needs. In an effort to bridge the gap between such alternative systems and the GS1 Digital Link ecosystem, we define a GS1 Class Two resolver, which has the following characteristic:

When dereferencing a URI that identifies an item that can also be identified using the GS1 system, the response from the server SHALL include a conformant GS1 Digital Link URI in the HTTP Link header. The GS1 Digital Link URI SHOULD point to a fully conformant GS1 resolver.

## 5 Glossary

The glossary lists the terms and definitions that are applied in this document. Please refer to the [www.gs1.org/glossary](http://www.gs1.org/glossary) for the online version.

Term	Definition
Attribute	An element string that provides additional information about an entity identified with a GS1 identification key, such as batch number associated with a Global Trade Item Number (GTIN).
Brand Owner	The organisation that owns the specifications of a trade item, regardless of where and by whom it is manufactured. The brand owner is normally responsible for the management of the Global Trade Item Number (GTIN).
Consumer	Often considered as the "recipient" of the supply chain in the past, today's consumer is an active part of the supply chain and expects more data, with higher accuracy, and greater ease.
Consumer Product Variant (CPV)	An alphanumeric attribute of a GTIN assigned to a retail consumer trade item variant for its lifetime.
Content Negotiation	Content negotiation is a mechanism for offering information in different data formats and different languages. When a user agent (such as a browser) makes an HTTP request, it sends along some HTTP headers to indicate what data formats and language it prefers. The server then selects the best match from its file system or generates the desired content on demand, and sends it back to the client.
Data Field	A field that contains a GS1 identification key, an RCN, or attribute information
Data titles	Data titles are the abbreviated descriptions of element strings which are used to support manual interpretation of barcodes.
Dereferencing a URI	The use of an appropriate access mechanism (e.g. Web request) to perform an action on the URI's resource (e.g. to retrieve an information representation via HTTP GET or to send data to a resource via an HTTP POST operation). Dereferencing a URI is often considered synonymous with making a Web request or 'looking up' a URI on the Web.
Domain name	<p>A domain name is an identification string that defines a realm of administrative autonomy, authority or control within the Internet. Domain names are formed by the rules and procedures of the Domain Name System (DNS). Any name registered in the DNS is a domain name. Domain names are used in various networking contexts and application-specific naming and addressing purposes.</p> <p>Domain names provide a abstraction layer that separates a registered name for an organisation or activity from the actual internet addresses (IP addresses) that provide its associated information services such as its Website, its e-mail server etc. The system that connects the domain names with the corresponding IP addresses is the Domain Name System (DNS).</p>
Element string	The combination of a GS1 Application Identifier and GS1 Application Identifier data field.
GS1 Application identifier	The field of two or more digits at the beginning of an element string that uniquely defines its format and meaning.
GS1 Application identifier data field	The data used in a business application defined by one GS1 Application Identifier.
GS1 Barcode	A data carrier which encodes GS1 Application Identifier element strings.
GS1 Barcode using GS1 Application Identifiers	All GS1 endorsed barcode symbologies that can encode more than a GTIN namely GS1-128, GS1 DataMatrix, GS1 DataBar and Composite and GS1 QR Code.
GS1 Identification key	A unique identifier for a class of objects (e.g. a trade item) or an instance of an object (e.g. a logistic unit).
GS1 key qualifier	A key qualifier is an additional attribute that is designated for use as part of a compound key (e.g., GTIN + serial number is a compound key, with the serial number being a key qualifier for the GTIN)
GS1 Digital Link URI	A Web URI conforming to the GS1 Digital Link URI syntax.
HTTP status codes	The status-code element is a three-digit integer code giving the result of the attempt to understand and satisfy the request.



Term	Definition
Identification number	A numeric or alphanumeric field intended to enable the recognition of one entity versus another.
Identified item	The item, real or virtual, identified by the GS1 Digital Link URI
LGTIN (GTIN + Lot/Batch)	A compound key formed from the combination of GTIN [ AI (01) ] and Batch/Lot identifier [ AI (10) ]. LGTIN is defined as an EPC Class URN in the current GS1 Tag Data Standard (v1.11), sections 6.4.1 and 7.14, which describes the mapping between the EPC Class URN format for LGTIN and the corresponding element string.
Media Type (also known as MIME type or Content type)	A two-part string identifier that indicates a data format as a pair of type and subtype, e.g. image/jpeg, image/gif, image/png, text/html, text/rtf Media types are sometimes also referred to as MIME types (MIME is an acronym of Multipurpose Internet Mail Extensions) or Content Types (after the HTTP header that indicates the Media type)
Mobile scanning	An approach to giving consumers access to additional information or services about trade items through their mobile device. It is the ability to retrieve additional information about the trade item through mobile devices or in general between link a trade item with virtual information or services.
Parsing	The process of analysing the structure of a sentence or URI structure in order to extract relevant information from it. Note that within the context of EPC URN structures, parsing refers to the ability to extract structural components within the EPC structure, e.g. for the purpose of matching against EPC URN patterns.
QR Code®	A two-dimensional matrix symbology consisting of square modules arranged in a square pattern. The symbology is characterised by a unique finder pattern located at three corners of the symbol. QR Code® symbols are read by two-dimensional imaging scanners or vision systems
Reference GS1 Digital Link URI	A GS1 Digital Link URI that uses the id.gs1.org domain
Resolver	The term 'resolver' is not unique to GS1. It is the name for any service that accepts an identifier as input and passes the request on to the identified item to get information about it. In the GS1 context, a resolver connects a GS1-identified item to one or more online resources that are directly related to it. The item may be identified at any level of granularity, and the resources may be either human or machine readable. Examples include product information pages, instruction manuals, patient leaflets and clinical data, product data, service APIs, marketing experiences and more.
Retailer	An organisation engaged in the sale and distribution of products to consumers. Also includes online retailers / e-tailers
Request URI	The URI that is received and processed by the resolver.
SGTIN (Serialised GTIN)	A compound key formed from the combination of a GTIN [AI (01) ] with Serial Number [ AI (21) ] which provides globally unique identification for every instance of a product. The term SGTIN appears in section 6.3.1 and 7.1 of the current GS1 Tag Data Standard, v1.11
Subdomain	A subdomain is a domain that is part of a main domain. Although example.com is a subdomain of the top-level domain (.com), we most often think of a subdomain as the part of the hostname that precedes the registered domain name. For example, the registered domain name gs1.org has one subdomain ('www') [ as in www.gs1.org ] that is used for its Website. It also has a subdomain ('id') [ as in id.gs1.org] that is used for Web-based data services for GS1.
Target resource	The resource linked to from the resolver, identified by the target URL and described by the link metadata. Examples include web pages, APIs, files etc.
URI	Uniform Resource Identifier. A string of characters used to identify a resource. The resource may be an information resource such as a Web page or a thing in the real world, such as a physical object, person or location. URIs refer to the superset of Uniform Resource Names (URNs), Uniform Resource Locators (URLs) and Web URIs (which can function both as globally unambiguous names, while also behaving like URLs by enabling intuitive retrieval of related information via the Web).

Term	Definition
URI fragment identifier	<p>The fragment identifier component of a URI allows indirect identification of a secondary resource by reference to a primary resource and additional identifying information. The identified secondary resource may be some portion or subset of the primary resource, some view on representations of the primary resource, or some other resource defined or described by those representations. A fragment identifier component is indicated by the presence of an octothorpe / hash / number sign ("#") character and terminated by the end of the URI.</p> <p>A typical use of a URI fragment identifier is to provide a direct link to a specific section within a very long Web document such as  <a href="https://www.w3.org/TR/dwbp/#DataIdentifiers">https://www.w3.org/TR/dwbp/#DataIdentifiers</a></p>
URI path information	<p>A path consists of a sequence of path segments separated by a slash ("/") character. A path is always defined for a URI, though the defined path may be empty (zero length). The path component contains data, usually organized in hierarchical form, that, along with data in the non-hierarchical query component, serves to identify a resource within the scope of the URI's scheme and naming authority (if any). The path is terminated by the first question mark ("?") or number sign ("#") character, or by the end of the URI.</p>
URI query string	<p>The query component contains non-hierarchical data that, along with data in the path component, serves to identify a resource within the scope of the URI's scheme and naming authority (if any). The query component is indicated by the first question mark ("?") character and terminated by a number sign ("#") character or by the end of the URI.</p>
URL	<p>Uniform Resource Locator (URL), a specific type of URI colloquially known as Web address.</p> <p>A URL is a URI starting with http or https .</p>

## 6 Change log

Changes since GS1 Digital Link version 1.1 [DL 1.1]

1. Previous versions of the GS1 DL standard were published as a single document. To enable greater flexibility and manageability of future versions, and readability of the current work, the standard was split into 4 interlinked documents.
2. In terms of substance, the major change is the adherence to the linkset (draft) standard. An earlier draft of this was cited in version 1.1 but was presented as optional. This led to confusion and lack of interoperability so that a normative approach was required. The deprecation of `linkType=all` in favour of `linkType=linkset` is a natural facet of this change.
3. Efforts have been made to clarify what metadata a resolver will require to describe each link and how a resolver should match that against information received as part of the incoming request. The link types of `gs1:defaultLink` and `gs1:defaultLink*` have been introduced as part of this.
4. The previous version stated that in addition to link types defined in the GS1 Web vocabulary, resolvers SHOULD also recognise relevant terms in `schema.org`. This has been removed although, of course, resolvers MAY use such terms.

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## A.1 Intellectual Property

### A.1.1 Introduction and Disclaimer

GS1<sup>®</sup>, under its IP Policy, seeks to avoid uncertainty regarding intellectual property claims by requiring the participants in the Work Group that developed the GS1 Digital Link: Resolution standard release 1.2 (for the purpose of this paragraph A.1.1, the “**Standard**”) to agree to grant to GS1 members a royalty-free licence or a RAND licence to Necessary Claims, as that term is defined in the GS1 IP Policy. Furthermore, attention is drawn to the possibility that an implementation of one or more features of the Standard may be the subject of a patent or other intellectual property right that does not involve a Necessary Claim. Any such patent or other intellectual property right is not subject to the licencing obligations of GS1. Moreover, the agreement to grant licences provided under the GS1 IP Policy does not include IP rights and any claims of third parties who were not participants in the Work Group.

Accordingly, GS1 recommends that any organisation developing an implementation designed to be in conformance with the Standard should determine whether there are any patents that may encompass a specific implementation that the organisation is developing in compliance with the Standard and whether a licence under a patent or other intellectual property right is needed. Such a determination of a need for licencing should be made in view of the details of the specific system designed by the organisation in consultation with their own patent counsel.

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### A.1.2 Notices

#### A.1.2.1 US Patent No. US 7 9,794,321

EVERYTHNG Limited of 122 East Road, London N16FB (United Kingdom), the owner of the US Patent No. 9,794,321 (for the purpose of this specific paragraph A.1.2.1, the “**Patent**”), who participated to the Work Group designing the GS1 Digital Link Standard Release 1.1, gave notice that they believe the Patent contains Essential Claims for the implementation of GS1 Digital Link Standard Release 1.1 for the following sections:

- 4.1 Resolver Functionality
- 4.5 Associating links with identified items
- 4.5.2 Granular identifiers
- 4.7 Examples
- 4.6.2 Requesting a specific link type (client side)
- 4.4.6 The context keyword
- 4.6.3 Recognising the user’s language and requested media type

The owners have offered to grant a royalty free, non-exclusive license to the Patent to users of the GS1 Digital Link Standard Release 1.1, for use with their application of resolvers, and subject to (i) GS1 including a notice of the availability of the license in its documentation of the Standard, (ii) users who wish to benefit of the license registering with the owner to receive the license (via <https://evrythng.com/gs1-license/>).

The term of the offered license will be for the life of the Patent. For the avoidance of any doubt, this licencing offer pertains only to implementations of Release 1.1 of the GS1 Digital Link Standard.

The statements given in this section are from the patent holders. GS1 makes no explicit or implicit representation on the validity of the aforementioned patent nor on the claimed presence of Essential Claims reading on the GS1 Digital Link Standard 1.1. This note is not legal advice and GS1 takes no responsibility for the accuracy, legal correctness or fitness for any purpose of the information provided in this section.

#### **A.1.2.2 Patents and Patent Applications of Mobilead SAS**

MobiLead SAS of 1 Cour du Havre, 75008 Paris (France), the owner of the granted patent and five patent applications listed in this sub-section (for the purpose of this specific paragraph A.1.2.2, the "**Patent and patent applications**") who participated to the Work Group designing the GS1 Digital Link Standard Release 1.1, gave notice that they believe the Patent and patent applications contain Essential Claims for the implementation of the GS1 Digital Link Standard Release 1.1 as follows.

For the patent applications US 20180025195, EP 3276503 & CN 107657291, relevance is claimed for the following sections:

- 4.4 Link metadata
- 4.6 Redirection

For the patent and if the patent applications materialise, Mobilead SAS grants a royalty free license according to the GS1 IP Policy but only as far as methods are described explicitly in the GS1 Digital Link Standard Release 1.1. Implementations that extend in implementation what is described in GS1 Digital Link Standard Release 1.1 can contact Mobilead SAS for licensing.

The statements given in this section are from the patent holders. GS1 makes no explicit or implicit representation on the validity of the aforementioned patent nor on the claimed presence of Essential Claims reading on the GS1 Digital Link Standard Release 1.1. This note is not legal advice and GS1 takes no responsibility for the accuracy, legal correctness or fitness for any purpose of the information provided in this section.

#### **A.1.2.3 Patents and Patent Applications from Servicetag SAS**

Servicetag SAS of 171 bis, Avenue Charles de Gaulle, 92200 Neuilly-sur-Seine (France), the applicant of the patent application EP 18306189 (for the purpose of this specific paragraph A.1.2.3, the "**Patent Application**"), who participated to the Work Group designing the GS1 Digital Link Standard Release 1.1, gave notice that they believe their Patent Application contains Essential Claims for the implementation of the GS1 Digital Link Standard Release 1.1 for the following sections:

- 4.2 Resolver Functionality (Decompression)

If the patent application materialises, Servicetag SAS grants a royalty free license according to the GS1 IP Policy but only as far as methods are described explicitly in the GS1 Digital Link Standard Release 1.1. Implementations that extend in implementation what is described in GS1 Digital Link Standard Release 1.1 can contact Servicetag SAS for licensing.