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Terminals; 5G System; Common
Data Types for Service Based
Interfaces; Stage 3)



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Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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where:

- x the first digit:
 - 1 presented to TSG for information;
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- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document specifies the stage 3 protocol and data model for common data types that are used or may be expected to be used by multiple Service Based Interface APIs supported by the same or different Network Function(s).

The Principles and Guidelines for Services Definition are specified in 3GPP TS 29.501 [2].

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".
- [3] OpenAPI: "OpenAPI 3.0.0 Specification", <https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.0.md>.
- [4] IETF RFC 1166: "Internet Numbers".
- [5] IETF RFC 5952: "A recommendation for IPv6 address text representation".
- [6] IETF RFC 3986: "Uniform Resource Identifier (URI): Generic Syntax".
- [7] 3GPP TS 23.003: "Numbering, addressing and identification".
- [8] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".
- [9] IETF RFC 7807: "Problem Details for HTTP APIs".
- [10] IETF RFC 3339: "Date and Time on the Internet: Timestamps".
- [11] 3GPP TS 38.413: "NG-RAN; NG Application Protocol (NGAP)".
- [12] IETF RFC 6901: "JavaScript Object Notation (JSON) Pointer".
- [13] 3GPP TS 24.007: " Mobile radio interface signalling layer 3; General aspects".
- [14] IETF RFC 6902: "JavaScript Object Notation (JSON) Patch".
- [15] IETF RFC 4122: "A Universally Unique IDentifier (UUID) URN Namespace"
- [16] 3GPP TS 36.413: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)".
- [17] IETF RFC 7042: "IANA Considerations and IETF Protocol and Documentation Usage for IEEE 802 Parameters".
- [18] IETF RFC 6733: "Diameter Base Protocol".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

5GC	5G Core Network
GPSI	Generic Public Subscription Identifier
GUAMI	Globally Unique AMF Identifier
PEI	Permanent Equipment Identifier
SBI	Service Based Interface
SUPI	Subscription Permanent Identifier

4 Overview

For the different 5GC SBI API, data types shall be defined. Data types identified as common data types shall be defined in this Technical specification and should be referenced from individual 5GC SBI API specifications.

Data types applicable or intended to be applicable to several 5GC SBI API specifications should be interpreted as common data types.

5 Common Data Types

5.1 Introduction

In the following subclauses, common data types for the following areas are defined:

- Data types for generic usage
- Data types for Subscription, Identification and Numbering
- Data types related to 5G Network
- Data types related to 5G QoS

5.2 Data Types for Generic Usage

5.2.1 Introduction

This clause defines common data types for generic usage.

5.2.2 Simple Data Types

This subclause specifies common simple data types.

Table 5.2.2-1: Simple Data Types

Type Name	Type Definition	Description
Binary	string	String with format "binary" as defined in OpenAPI Specification [3]
Bytes	string	String with format "byte" as defined in OpenAPI Specification [3], i.e. base64-encoded characters,
Date	string	String with format "date" as defined in OpenAPI Specification [3]
DateTime	string	String with format "date-time" as defined in OpenAPI Specification [3]
DiameterIdentity	string	String with format "DiameterIdentity" according to clause 4.3 of IETF RFC 6733 [18]. In an OpenAPI Specification [3] schema, the format shall be designated as string with pattern as '^([A-Za-z0-9]+(-[A-Za-z0-9]+)+[a-z]{2,})\$'.
Double	number	Number with format "double" as defined in OpenAPI Specification [3]
DurationSec	integer	Unsigned integer identifying a period of time in units of seconds. In an OpenAPI Specification [3] schema, the format shall be designated as "DurationSec".
Float	number	Number with format "float" as defined in OpenAPI Specification [3]
Uint16	integer	Unsigned 16-bit integers, i.e. only value between 0 and 65535 are permissible.
Int32	integer	Integer with format "int32" as defined in OpenAPI Specification [3]
Int64	integer	Integer with format "int64" as defined in OpenAPI Specification [3]
Ipv4Addr	string	String identifying a IPv4 address formatted in the "dotted decimal" notation as defined in IETF RFC 1166 [4]. In an OpenAPI Specification [3] schema, the format shall be designated as "Ipv4Addr".
Ipv6Addr	string	String identifying a IPv6 address formatted according to clause 4 of IETF RFC 5952 [5]. The mixed IPv4 IPv6 notation according to clause 5 of IETF RFC 5952 [5] shall not be used. In an OpenAPI Specification [3] schema, the format shall be designated as "Ipv6Addr".
Ipv6Prefix	string	String identifying a IPv6 address prefix formatted according to clause 4 of IETF RFC 5952 [5]. In an OpenAPI Specification [3] schema, the format shall be designated as "Ipv6Prefix".
MacAddr48	string	String identifying a MAC address formatted in the hexadecimal notation according to subclause 1.1 and subclause 2.1 of IETF RFC 7042 [17]. In an OpenAPI Specification [3] schema, the format shall be designated as string with pattern of '^([0-9a-fA-F]{2})(-[0-9a-fA-F]{2}){5}\$'.
SupportedFeatures	string	A string used to indicate the features supported by an API that is used as defined in subclause 6.6 in 3GPP TS 29.501 [2]. The string shall contain a bitmask indicating supported features in hexadecimal representation: Each character in the string shall take a value of "0" to "9" or "A" to "F" and shall represent the support of 4 features as described in table 5.2.2-3. The most significant character representing the highest-numbered features shall appear first in the string, and the character representing features 1 to 4 shall appear last in the string. The list of features and their numbering (starting with 1) are defined separately for each API. If the string contains a lower number of characters than there are defined features for an API, all features that would be represented by characters that are not present in the string are not supported. In an OpenAPI Specification [3] schema, the format shall be designated as "SupportedFeatures".
UInteger	integer	Unsigned Integer, i.e. only value 0 and integers above 0 are permissible. In an OpenAPI Specification [3] schema, the format shall be designated as "UInteger".
Uint32	integer	Unsigned 32-bit integers, i.e. only value 0 and 32-bit integers above 0 are permissible. In an OpenAPI Specification [3] schema, the format shall be designated as "Uint32".
Uint64	integer	Unsigned 64-bit integers, i.e. only value 0 and 64-bit integers above 0 are permissible. In an OpenAPI Specification [3] schema, the format shall be designated as "Uint64".
Uri	string	String providing an URI formatted according to IETF RFC 3986 [6]. In an OpenAPI Specification [3] schema, the format shall be

		designated as "Uri".
TimeZone	string	<p>String with format "<time-numoffset>" optionally appended by "<daylightSavingTime>", where:</p> <ul style="list-style-type: none"> - <time-numoffset> shall represent the time zone adjusted for daylight saving time and be encoded as time-numoffset as defined in subclause 5.6 of IETF RFC 3339 [10]; - <daylightSavingTime> shall represent the adjustment that has been made and be encoded as "+1" or "+2" for a +1 or +2 hours adjustment. <p>In an OpenAPI Specification [3] schema, the format shall be designated as "TimeZone".</p> <p>Example: "-08:00+1" (for 8 hours behind UTC, +1 hour adjustment for Daylight Saving Time).</p>

Table 5.2.2-2: Reused OpenAPI data types

Type Name	Description
boolean	As defined in OpenAPI Specification [3]
integer	As defined in OpenAPI Specification [3]
number	As defined in OpenAPI Specification [3]
string	As defined in OpenAPI Specification [3]
NOTE	Data types defined in OpenAPI Specification [3] do not follow the UpperCamel convention for data types in 3GPP TS 29.501 [2]

Table 5.2.2-3: Meaning of a Hexadecimal Character in SupportedFeatures Type

Character	Feature n+3 supported	Feature n+2 supported	Feature n+1 supported	Feature n supported
0	no	no	no	no
1	no	no	no	yes
2	no	no	yes	no
3	no	no	yes	yes
4	no	yes	no	no
5	no	yes	no	yes
6	no	yes	yes	no
7	no	yes	yes	yes
8	yes	no	no	no
9	yes	no	no	yes
A	yes	no	yes	no
B	yes	no	yes	yes
C	yes	yes	no	no
D	yes	yes	no	yes
E	yes	yes	yes	no
F	yes	yes	yes	yes
NOTE 1	"n" shall be $i * 4 + 1$, where "i" is zero or a natural number, i.e permissible values of "n" are 1, 5, 9, ...			
NOTE 2	If a feature is not defined, it shall be indicated with value "no".			

For example, if only the first feature defined in the feature list is set to 1, the corresponding SupportedFeatures attribute would have a value of "1", or "001" (any amount of 0's to the left of the 1 would result into an equivalent feature list). If we have 32 features defined, and only the last feature in a feature list is set to 1, the corresponding SupportedFeatures attribute would have a value of "80000000".

5.2.3 Enumerations

5.2.3.1 Enumeration: PatchOperation

Table 5.2.3.1-1: Enumeration PatchOperation

Enumeration value	Description
"add"	Add operation as defined in IETF RFC 6902 [14].
"copy"	Copy operation as defined in IETF RFC 6902 [14].
"move"	Move operation as defined in IETF RFC 6902 [14].
"remove"	Remove operation as defined in IETF RFC 6902 [14].
"replace"	Replace operation as defined in IETF RFC 6902 [14].
"test"	Test operation as defined in IETF RFC 6902 [14].

5.2.4 Structured Data Types

5.2.4.1 Type: ProblemDetails

Table 5.2.4-1: Definition of type ProblemDetails

Attribute name	Data type	P	Cardinality	Description
type	Uri	O	0..1	A URI reference according to IETF RFC 3986 [6] that identifies the problem type.
title	string	O	0..1	A short, human-readable summary of the problem type. It should not change from occurrence to occurrence of the problem.
status	integer	O	0..1	The HTTP status code for this occurrence of the problem.
detail	string	O	0..1	A human-readable explanation specific to this occurrence of the problem.
instance	Uri	O	0..1	A URI reference that identifies the specific occurrence of the problem.
cause	string	C	0..1	A machine-readable application error cause specific to this occurrence of the problem This IE should be present and provide application-related error information, if available.
invalidParams	array(InvalidParam)	O	0..N	Description of invalid parameters, for a request rejected due to invalid parameters.

NOTE 1: See IETF RFC 7807 [9] for detailed information and guidance for each attribute, and 3GPP TS 29.501 [2] for guidelines on error handling support by 5GC SBI APIs.
NOTE 2: Additional attributes may be defined per API.

5.2.4.2 Type: Link

Table 5.2.4.2-1: Definition of type link

Attribute name	Data type	P	Cardinality	Description
href	Uri	M	1	It contains the URI of the linked resource.

5.2.4.3 Type PatchItem

Table 5.2.4.3-1: Definition of type PatchItem

Attribute name	Data type	P	Cardinality	Description	Applicability
op	PatchOperation	M	1	This IE indicates the patch operation as defined in IETF RFC 6902 [14] to be performed on resource.	
path	string	M	1	This IE contains a JSON pointer value (as defined in IETF RFC 6901 [12]) that references a location of a resource on which the patch operation shall be performed.	
from	string	C	0..1	This IE indicates the path of the source JSON element (according to JSON Pointer syntax) being moved or copied to the location indicated by the "path" attribute. It shall be present if the patch operation is "move" or "copy".	
value	Any type	C	0..1	This IE indicates a new value for the resource specified in the path attribute. It shall be present if the patch operation is "add", "replace" or "test". The data type of this attribute shall be the same as the type of the resource on which the patch operation shall be performed. The null value shall be allowed.	

5.2.4.4 Type _LinksValueSchema

Table 5.2.4.4-1: Definition of type LinksValueSchema as a list of mutually exclusive alternatives

Data type	Cardinality	Description
array(Link)	1..N	Array of links
Link	1	link

5.2.4.5 Type _SelfLink

Table 5.2.4.5-1: Definition of type SelfLink

Attribute name	Data type	P	Cardinality	Description
self	Link	M	1	It contains the URI of the linked resource.

5.2.4.6 Type: InvalidParam

Table 5.2.4.6-1: Definition of type InvalidParam

Attribute name	Data type	P	Cardinality	Description
param	string	M	1	Attribute's name encoded as a JSON Pointer.
reason	string	O	0..1	A human-readable reason, e.g. "must be a positive integer".

Editor's Note: Error handling for invalid headers is FFS.

5.3 Data Types related to Subscription, Identification and Numbering

5.3.1 Introduction

This clause defines common data types related to subscription, identification and numbering information.

5.3.2 Simple Data Types

This subclause specifies common simple data types.

Table 5.3.2-1: Simple Data Types

Type Name	Type Definition	Description
Dnn	string	String representing a Data Network as defined in subclause 9A of 3GPP TS 23.003 [7].
Gpsi	string	String identifying a Gpsi shall contain either an External Id or an MSISDN. It shall be formatted as follows for: -External Identifier "extid-<extid>, <extid> shall be formatted according to subclause 19.7.2 of 3GPP TS 23.003 [7] that describes an External Identifier. -MSISDN "msisdn-<msisdn>, <msisdn> shall be formatted according to subclause 3.3 of 3GPP TS 23.003 [7] that describes an MSISDN. In an OpenAPI Specification [3] schema, the format shall be designated as "Gpsi". pattern: '(msisdn-[0-9]{5,15} extid-.+ .+)'
GroupId	string	String identifying a group of devices network internal globally unique ID which identifies a set of IMSI subclause 19.9 of 3GPP TS 23.003 [7]s. pattern: '^groupid-[A-Fa-f0-9]{8}-[0-9]{3}-[0-9]{2,3}-([A-Fa-f0-9][A-Fa-f0-9]){1,10}\$'
Pei	string	String Identifying a Permanent Equipment, if it contains an IMEI or IMEISV it is defined as specified in subclause 6.2 of 3GPP TS 23.003 [7]. pattern: '(imei-[0-9]{15} imeisv-[0-9]{16} .+)'
Supi	string	String identifying a Supi shall contain either an IMSI or an NAI. It shall be formatted as follows for: -IMSI "imsi-<imsi>, <imsi> shall be formatted according to subclause 2.2 of 3GPP TS 23.003 [7] that describes an IMSI. -NAI "nai-<nai>, <nai> shall be formatted according to subclause 14.3 of 3GPP TS 23.003 [7] that describes an NAI. To enable that the value is used as part of a URI, the string shall only contain characters allowed according to the "lower-with-hyphen" naming convention defined in 3GPP TS 29.501 [2]. In an OpenAPI Specification [3] schema, the format shall be designated as "Supi". pattern: '(imsi-[0-9]{5,15} nai-.+ .+)'
NfInstanceId	string	String uniquely identifying a NF instance. The format of the NF Instance ID shall be a Universally Unique Identifier (UUID) version 4, as described in IETF RFC 4122 [15].
AmfId	string	String identifying the AMF ID composed of AMF Region ID (16 bits), AMF Set ID (4 bits) and AMF Pointer (4 bits) as specified in subclause 2.10.1 of 3GPP TS 23.003 [7]. It is encoded as a string of 6 hexadecimal characters (i.e., 24 bits) Pattern: '^([A-Fa-f0-9]){6}\$'
RfspIndex	integer	Unsigned integer represents the "Subscriber Profile ID for RAT/Frequency Priority" as specified in 3GPP TS 36.413 [16]. Minimum = 1. Maximum = 256.

5.3.3 Enumerations

5.3.3.1 Enumeration: <EnumType1>

The enumeration <EnumType1> represents <something>. It shall comply with the provisions defined in table 5.2.3.1-1.

Table 5.3.3.1-1: Enumeration < EnumType1>

Enumeration value	Description

5.3.4 Structured Data Types

5.3.4.1 Type: Guami

Table 5.3.4.1-1: Definition of type Guami

Attribute name	Data type	P	Cardinality	Description
plmnId	PlmnId	M	1	PLMN Identity
amfId	AmfId	M	1	AMF Identity

5.3.4.2 Type: NetworkId

Table 5.3.4.2-1: Definition of type NetworkId

Attribute name	Data type	P	Cardinality	Description
mcc	Mcc	C	0..1	Mobile Country Code
mnc	Mnc	C	0..1	Mobile Network Code
NOTE: At least one MNC or MCC shall be included.				

5.4 Data Types related to 5G Network

5.4.1 Introduction

This clause defines common data types related to 5G Network (other than related to 5G QoS).

5.4.2 Simple Data Types

This subclause specifies common simple data types.

Table 5.4.2-1: Simple Data Types

Type Name	Type Definition	Description
ApplicationId	string	String providing an application identifier and formatted FFS.
PduSessionId	integer	Unsigned integer identifying a PDU session, within the range 0 to 255, as specified in subclause 11.2.3.1.5, bits 5 to 8, of 3GPP TS 24.007 [13].
Mcc	string	Mobile Country Code part of the PLMN, comprising 3 digits, as defined in 3GPP TS 38.413 [11]. In an OpenAPI Specification [3] schema, the format shall be designated as "Mcc". pattern: '^0-9{3}\$'
Mnc	string	Mobile Network Code part of the PLMN, comprising 2 or 3 digits, as defined in 3GPP TS 38.413 [11]. In an OpenAPI Specification [3] schema, the format shall be designated as "Mnc". Pattern: '^0-9{2,3}\$'
Tac	string	2 or 3-octet string identifying a tracking area code as specified in subclause 9.3.3.10 of 3GPP TS 38.413 [11], in hexadecimal representation. Each character in the string shall take a value of "0" to "9" or "A" to "F" and shall represent 4 bits. The most significant character representing the 4 most significant bits of the TAC shall appear first in the string, and the character representing the 4 least significant bit of the TAC shall appear last in the string. In an OpenAPI Specification [3] schema, the format shall be designated as "Tac". Examples: A legacy TAC 0x4305 shall be encoded as "4305". An extended TAC 0x63F84B shall be encoded as "63F84B"
EutraCellId	string	28-bit string identifying an E-UTRA Cell Id as specified in subclause 9.3.1.9 of 3GPP TS 38.413 [11], in hexadecimal representation. Each character in the string shall take a value of "0" to "9" or "A" to "F" and shall represent 4 bits. The most significant character representing the 4 most significant bits of the Cell Id shall appear first in the string, and the character representing the 4 least significant bit of the Cell Id shall appear last in the string. In an OpenAPI Specification [3] schema, the format shall be designated as "EutraCellId". Example: An E-UTRA Cell Id 0x5BD6007 shall be encoded as "5BD6007". Pattern: '^A-Fa-f0-9{7}\$'
NrCellId	string	36-bit string identifying an NR Cell Id as specified in subclause 9.3.1.7 of 3GPP TS 38.413 [11], in hexadecimal representation. Each character in the string shall take a value of "0" to "9" or "A" to "F" and shall represent 4 bits. The most significant character representing the 4 most significant bits of the Cell Id shall appear first in the string, and the character representing the 4 least significant bit of the Cell Id shall appear last in the string. In an OpenAPI Specification [3] schema, the format shall be designated as "NrCellId". Example: An NR Cell Id 0x225BD6007 shall be encoded as "225BD6007". Pattern: '^A-Fa-f0-9{9}\$'

5.4.3 Enumerations

5.4.3.1 Enumeration: AccessType

Table 5.4.3.1-1: Enumeration AccessType

Enumeration value	Description
3GPP_ACCESS	3GPP access
NON_3GPP_ACCESS	Non-3GPP access

5.4.3.2 Enumeration: RatType

Table 5.4.3.2-1: Enumeration RatType

Enumeration value	Description
NR	New Radio
EUTRA	(WB) Evolved Universal Terrestrial Radio Access
WLAN	Wireless LAN
VIRTUAL	Virtual (see NOTE)
NOTE:	Virtual shall be used if the N3IWF does not know the access technology used for an untrusted non-3GPP access.

Editor's Note: It is FFS whether and how to signal that a RAN is a NG-RAN.

5.4.3.3 Enumeration: PduSessionType

The enumeration PduSessionType indicates the type of a PDU session. It shall comply with the provisions defined in table 5.4.3.3-1.

Table 5.4.3.3-1: Enumeration PduSessionType

Enumeration value	Description
IPV4V6	IPv4v6 (see subclause 5.8.2.2.1 of 3GPP TS 23.501 [8])
IPV4	IPv4
IPV6	IPv6
UNSTR	Unstructured
ETHER	Ethernet

5.4.3.4 Enumeration: UpIntegrity

The enumeration UpIntegrity indicates whether UP integrity protection is required, preferred or not needed for all the traffic on the PDU Session. It shall comply with the provisions defined in table 5.4.3.4-1.

Table 5.4.3.4-1: Enumeration UpIntegrity

Enumeration value	Description
"REQUIRED"	UP integrity protection shall apply for all the traffic on the PDU Session.
"PREFERRED"	UP integrity protection should apply for all the traffic on the PDU Session.
"NOT_NEEDED"	UP integrity protection shall not apply on the PDU Session.

5.4.3.5 Enumeration: UpConfidentiality

The enumeration UpConfidentiality indicates whether UP confidentiality protection is required, preferred or not needed for all the traffic on the PDU Session. It shall comply with the provisions defined in table 5.4.3.5-1.

Table 5.4.3.5-1: Enumeration UpConfidentiality

Enumeration value	Description
"REQUIRED"	UP confidentiality protection shall apply for all the traffic on the PDU Session.
"PREFERRED"	UP confidentiality protection should apply for all the traffic on the PDU Session.
"NOT_NEEDED"	UP confidentiality protection shall not apply on the PDU Session.

5.4.3.6 Enumeration: SscMode

The enumeration SscMode represents the service and session continuity mode.

Table 5.4.3.6-1: Enumeration SscMode

Enumeration value	Description
"SSC_MODE_1"	see 3GPP TS 23.501 [2]
"SSC_MODE_2"	see 3GPP TS 23.501 [2]
"SSC_MODE_3"	see 3GPP TS 23.501 [2]

5.4.4.7 Type: RefToBinaryData

Table 5.4.4.7-1: Definition of type RefToBinaryData

Attribute name	Data type	P	Cardinality	Description
contentId	string	M	1	This IE shall contain the value of the Content-ID header of the referenced binary body part.

5.4.4 Structured Data Types

5.4.4.1 Type: DefaultQosInformation

Table 5.4.4.1-1: Definition of type DefaultQosInformation

Attribute name	Data type	P	Cardinality	Description
FFS				

5.4.4.2 Type: Snssai

Table 5.4.4.2-1: Definition of type Snssai

Attribute name	Data type	P	Cardinality	Description
sst	UInteger	M	1	Unsigned integer, within the range 0 to 255, representing the Slice/Service Type. It indicates the expected Network Slice behaviour in terms of features and services. Values 0 to 127 correspond to the standardized SST range. Values 128 to 255 correspond to the Operator-specific range. See subclause 28.4.2 of 3GPP TS 23.003 [7]. Standardized values are defined in subclause 5.15.2.2 of 3GPP TS 23.501 [8].
sd	string	O	0..1	3-octet string, representing the Slice Differentiator, in hexadecimal representation. Each character in the string shall take a value of "0" to "9" or "A" to "F" and shall represent 4 bits. The most significant character representing the 4 most significant bits of the SD shall appear first in the string, and the character representing the 4 least significant bit of the SD shall appear last in the string. This is an optional parameter that complements the Slice/Service type(s) to allow to differentiate amongst multiple Network Slices of the same Slice/Service type. Examples: A SD 0xD143A5 shall be encoded as "D143A5".

5.4.4.3 Type: PlmnId

Table 5.4.4.3-1: Definition of type PlmnId

Attribute name	Data type	P	Cardinality	Description
mcc	Mcc	M	1	Mobile Country Code
mnc	Mnc	M	1	Mobile Network Code

5.4.4.4 Type: Tai

Table 5.4.4.4-1: Definition of type Tai

Attribute name	Data type	P	Cardinality	Description
plmnId	PlmnId	M	1	PLMN Identity
tac	Tac	M	1	Tracking Area Code

5.4.4.5 Type: Ecgi

Table 5.4.4.5-1: Definition of type Ecgi

Attribute name	Data type	P	Cardinality	Description
plmnId	PlmnId	M	1	PLMN Identity
eutraCellId	EutraCellId	M	1	E-UTRA Cell Identity

Editor's Note: It is FFS whether to define the Ecgi as a structured data type as proposed above or as a string.

5.4.4.6 Type: Ncgi

Table 5.4.4.6-1: Definition of type Ncgi

Attribute name	Data type	P	Cardinality	Description
plmnId	PlmnId	M	1	PLMN Identity
nrCellId	NrCellId	M	1	NR Cell Identity

Editor's Note: It is FFS whether to define the Ncgi as a structured data type as proposed above or as a string.

5.4.4.7 Type: UserLocation

Table 5.4.4.7-1: Definition of type UserLocation

Attribute name	Data type	P	Cardinality	Description
eutraLocation	EutraLocation	C	0..1	E-UTRA user location (see NOTE).
nrLocation	NrLocation	C	0..1	NR user location (see NOTE).
n3gaLocation	N3gaLocation	C	0..1	Non-3GPP access user location (see NOTE).
NOTE: At least one of eutraLocation, nrLocation and n3gaLocation shall be present. Several of them may be present.				

5.4.4.8 Type: EutraLocation

Table 5.4.4.8-1: Definition of type EutraLocation

Attribute name	Data type	P	Cardinality	Description
tai	Tai	M	1	Tracking Area Identity
ecgi	Ecgi	M	1	E-UTRA Cell Identity

5.4.4.9 Type: NrLocation

Table 5.4.4.9-1: Definition of type NrLocation

Attribute name	Data type	P	Cardinality	Description
tai	Tai	M	1	Tracking Area Identity
ncgi	Ncgi	M	1	NR Cell Identity

5.4.4.10 Type: N3gaLocation

Table 5.4.4.10-1: Definition of type N3gaLocation

Attribute name	Data type	P	Cardinality	Description
n3gppTai	Tai	M	1	The unique non 3GPP TAI used in the PLMN.
n3lwfId	string	M	1	This IE shall contain the N3IWF identifier received over NGAP and shall be encoded as a string of hexadecimal characters. Pattern: '^([A-Fa-f0-9])+\$'
ueIpv4Addr	Ipv4Addr	C	0..1	UE local IPv4 address (used to reach the N3IWF). The ueIpv4Addr or the ueIpv6Addr shall be present.
ueIpv6Addr	Ipv6Addr	C	0..1	UE local IPv6 address (used to reach the N3IWF). The ueIpv4Addr or the ueIpv6Addr shall be present.
portNumber	UInteger	C	0..1	UDP or TCP source port number. It shall be present if NAT is detected.

5.4.4.11 Type: UpSecurity

Table 5.4.4.11-1: Definition of type UpSecurity

Attribute name	Data type	P	Cardinality	Description
upIntegr	UpIntegrity	M	1	This IE shall indicate whether UP integrity protection is required, preferred or not needed for all the traffic on the PDU Session.
upConfid	UpConfidentiality	M	1	This IE shall indicate whether UP confidentiality protection is required, preferred or not needed for all the traffic on the PDU Session.

5.5 Data Types related to 5G QoS

5.5.1 Introduction

This clause defines common data types related to 5G QoS.

5.5.2 Simple Data Types

This subclause specifies common simple data types.

Table 5.5.2-1: Simple Data Types

Type Name	Type Definition	Description
Qfi	integer	Unsigned integer identifying a QoS flow, within the range 0 to 63. In an OpenAPI Specification [3] schema, the format shall be designated as "Qfi".
5qi	integer	Unsigned integer representing a 5G QoS Identifier (see subclause 5.7.2.1 of 3GPP TS 23.501 [8]), within the range 0 to 255. In an OpenAPI Specification [3] schema, the format shall be designated as "5qi".
BitRate	string	String representing a bit rate that shall be formatted as follows: Pattern: '^d+(\.d+)? (bps Kbps Mbps Gbps Tbps)\$' Examples: "125 Mbps", "0.125 Gbps", "125000 Kbps" In an OpenAPI Specification [3] schema, the format shall be designated as "BitRate".
ArpPriorityLevel	integer	Unsigned integer indicating the ARP Priority Level (see subclause 5.7.2.2 of 3GPP TS 23.501 [8]), within the range 1 to 15. Values are ordered in decreasing order of priority, i.e. with 1 as the highest priority and 15 as the lowest priority. In an OpenAPI Specification [3] schema, the format shall be designated as "ArpPriorityLevel".
5qiPriorityLevel	integer	Unsigned integer indicating the 5QI Priority Level (see subclauses 5.7.3.3 and 5.7.4 of 3GPP TS 23.501 [8]), within the range 1 to 127. Values are ordered in decreasing order of priority, i.e. with 1 as the highest priority and 127 as the lowest priority. In an OpenAPI Specification [3] schema, the format shall be designated as "5qiPriorityLevel".
PacketDelBudget	Integer	Unsigned integer indicating Packet Delay Budget (see subclauses 5.7.3.4 and 5.7.4 of 3GPP TS 23.501 [8]), expressed in milliseconds. Minimum = 1.
PacketErrRate	Integer	Unsigned integer indicating Packet Error Rate (see subclause 5.7.3.5 and 5.7.4 of 3GPP TS 23.501 [8]). Examples: Packer Error Rate 10^{-6} shall be encoded as "6". Packer Error Rate 10^{-2} shall be encoded as "2".
PacketLossRate	Integer	Unsigned integer indicating Packet Loss Rate (see subclauses 5.7.2.8 and 5.7.4 of 3GPP TS 23.501 [8]), expressed in tenth of percent. Minimum = 0. Maximum = 1000.
AverWindow	FFS	Averaging Window
MaxDataBurstVol	Integer	Unsigned integer indicating Maximum Data Burst Volume (see subclauses 5.7.3.7 and 5.7.4 of 3GPP TS 23.501 [8]), expressed in Bytes. Minimum = 1.

5.5.3 Enumerations

5.5.3.1 Enumeration: PreemptionCapability

The enumeration PreemptionCapability indicates the pre-emption capability of a request on other QoS flows. See subclause 5.7.2.2 of 3GPP TS 23.501 [8]. It shall comply with the provisions defined in table 5.5.3.1-1.

Table 5.5.3.1-1: Enumeration PreemptionCapability

Enumeration value	Description
NOT_PREEMPT	Shall not trigger pre-emption.
MAY_PREEMPT	May trigger pre-emption.

5.5.3.2 Enumeration: PreemptionVulnerability

The enumeration PreemptionVulnerability indicates the pre-emption vulnerability of the QoS flow to pre-emption from other QoS flows. See subclause 5.7.2.2 of 3GPP TS 23.501 [8]. It shall comply with the provisions defined in table 5.5.3.2-1.

Table 5.5.3.2-1: Enumeration PreemptionVulnerability

Enumeration value	Description
NOT_PREEMPTABLE	Shall not be pre-empted.
PREEMPTABLE	May be pre-empted.

5.5.3.3 Enumeration: ReflectiveQoSAttribute

The enumeration ReflectiveQoSAttribute indicates whether certain traffic of the QoS flow may be subject to Reflective QoS (see subclause 5.7.2.3 of 3GPP TS 23.501 [2]). It shall comply with the provisions defined in table 5.5.3.3-1.

Table 5.5.3.3-1: Enumeration ReflectiveQoSAttribute

Enumeration value	Description
RQOS	Certain traffic of the QoS flow may be subject to Reflective QoS.
NO_RQOS	Traffic of the QoS flow is not subject to Reflective QoS.

5.5.3.4 Enumeration: DelayCritical

The enumeration DelayCritical indicates whether a GBR QoS flow is delay critical or not (see subclauses 5.7.3.4 and 5.7.3.5 of 3GPP TS 23.501 [2]). It shall comply with the provisions defined in table 5.5.3.4-1.

Table 5.5.3.4-1: Enumeration DelayCritical

Enumeration value	Description
CRITICAL	Delay Critical GBR QoS flow.
NON_CRITICAL	Non-delay critical GBR QoS flow.

5.5.3.5 Enumeration: NotificationControl

The enumeration NotificationControl indicates whether notifications are requested from the RAN when the GFBR can no longer (or again) be fulfilled for a QoS Flow during the lifetime of the QoS Flow (see subclause 5.7.2.4 of 3GPP TS 23.501 [2]). It shall comply with the provisions defined in table 5.5.3.5-1.

Table 5.5.3.5-1: Enumeration NotificationControl

Enumeration value	Description
REQUESTED	Notifications are requested from the RAN.
NOT_REQUESTED	Notifications are not requested from the RAN.

5.5.4 Structured Data Types

5.5.4.1 Type: Arp

Table 5.5.4.1-1: Definition of type Arp

Attribute name	Data type	P	Cardinality	Description
priorityLevel	ArpPriorityLevel	M	1	Defines the relative importance of a resource request.
preemptCap	PreemptionCapability	M	1	Defines whether a service data flow may get resources that were already assigned to another service data flow with a lower priority level.
preemptVuln	PreemptionVulnerability	M	1	Defines whether a service data flow may lose the resources assigned to it in order to admit a service data flow with higher priority level.

5.5.4.2 Type: Ambr

Table 5.5.4.2-1: Definition of type Ambr

Attribute name	Data type	P	Cardinality	Description
uplink	BitRate	M	1	AMBR for uplink
downlink	BitRate	M	1	AMBR for downlink

Annex A (normative): OpenAPI specification

A.1 General

This Annex specifies the formal definition of common data types. It consists of an OpenAPI 3.0.0 specification, in YAML format.

A.2 Data related to Common Data Types

```

openapi: 3.0.0
info:
  version: '1.R15.0.0'
  title: 'Common Data Types'
  description: 'Common Data Types'
paths: {}
#
# Definition based on 3GPP TS 29.571 version 0.7.0
#
components:
  schemas:
#
# Common Data Types for Generic usage definitions as defined in subclause 5.2
#
# COMMON SIMPLE DATA TYPES
#
  Binary:
    format: binary
    type: string
  Bytes:
    format: byte
    type: string
  Date:
    format: date
    type: string
  DateTime:

```

```

    format: date-time
    type: string
DiameterIdentity:
    type: string
    pattern: '^([A-Za-z0-9]+(-[A-Za-z0-9]+).)+[a-z]{2,}$'
Double:
    format: double
    type: number
DurationSec:
    type: integer
Float:
    format: float
    type: number
Int32:
    format: int32
    type: integer
Int64:
    type: integer
    format: int64
Ipv4Addr:
    type: string
Ipv6Addr:
    type: string
Ipv6Prefix:
    type: string
MacAddr48:
    type: string
    pattern: '^([0-9a-fA-F]{2})((-[0-9a-fA-F]{2}){5})$'
SupportedFeatures:
    type: string
    pattern: '^[A-Fa-f0-9]*$'
UInteger:
    type: integer
    minimum: 0
UInt16:
    type: integer
    minimum: 0
    maximum: 65535
UInt32:
    format: int32
    type: integer
    minimum: 0
UInt64:
    format: int64
    type: integer
    minimum: 0
Uri:
    type: string
TimeZone:
    format: TimeZone
    type: string
#
# ENUMERATED
#
PatchOperation:
    anyOf:
    - type: string
      enum:
      - "add"
      - "copy"
      - "move"
      - "remove"
      - "replace"
      - "test"
    - type: string
#
# COMMON STRUCTURED DATA TYPES
#
ProblemDetails:
    type: object
    properties:
    type:
      $ref: '#/components/schemas/Uri'
    title:
      type: string
    status:
      type: integer
    instance:

```



```

    $ref: '#/components/schemas/Uri'
  cause:
    type: string
  invalidParams:
    type: array
    items:
      $ref: '#/components/schemas/InvalidParam'
    minItems: 0
Link:
  type: object
  properties:
    href:
      $ref: '#/components/schemas/Uri'
PatchItem:
  type: object
  properties:
    op:
      $ref: '#/components/schemas/PatchOperation'
    path:
      type: string
    from:
      type: string
    value:
      nullable: true
  required:
    - op
    - path
LinksValueSchema:
  oneOf:
    - type: array
      items:
        $ref: '#/components/schemas/Link'
      minItems: 1
    - $ref: '#/components/schemas/Link'
SelfLink:
  type: object
  properties:
    self:
      $ref: '#/components/schemas/Link'
  required:
    - self
InvalidParam:
  type: object
  properties:
    param:
      type: string
    reason:
      type: string
  required:
    - param
#
# Data Types related to Subscription, Identification and Numbering as defined in subclause 5.3
#
# SIMPLE DATA TYPES
#
Dnn:
  type: string
Gpsi:
  type: string
  pattern: '^(msisdn-[0-9]{5,15}|extid-.[+].+)$'
GroupId:
  type: string
  pattern: '^(groupid-[A-Fa-f0-9]{14,34}|.[+].+)$'
Pei:
  type: string
  pattern: '^(imei-[0-9]{15}|imeisv-[0-9]{16}|.[+].+)$'
Supi:
  format: Supi
  type: string
  pattern: '^(imsi-[0-9]{5,15}|nai-.[+].+)$'
NfInstanceId:
  type: string
  format: uuid
AmfId:
  type: string
  pattern: '^[A-Fa-f0-9]{6}$'
RfspIndex:
  type: integer

```

```

        minimum: 1
        maximum: 256
#
# STRUCTURED DATA TYPES
#
    Guami:
        type: object
        properties:
            plmnId:
                $ref: '#/components/schemas/PlmnId'
            amfId:
                $ref: '#/components/schemas/AmfId'
        required:
            - plmnId
            - amfId
    NetworkId:
        type: object
        properties:
            mnc:
                $ref: '#/components/schemas/Mnc'
            mcc:
                $ref: '#/components/schemas/Mcc'
        minProperties: 1
#
# Data Types related to 5G Network as defined in subclause 5.4
#
# SIMPLE DATA TYPES
#
    ApplicationId:
        type: string
    PduSessionId:
        type: integer
        minimum: 0
        maximum: 255
    Mcc:
        type: string
        pattern: '^d{3}$'
    Mnc:
        type: string
        pattern: '^d{2,3}$'
    Tac:
        type: string
        pattern: '^[A-Fa-f0-9]{4}$|^[A-Fa-f0-9]{6}$'
    EutraCellId:
        type: string
        pattern: '^[A-Fa-f0-9]{7}$'
    NrCellId:
        type: string
        pattern: '^[A-Fa-f0-9]{9}$'
#
# Enumerations
#
    AccessType:
        type: string
        enum:
            - 3GPP_ACCESS
            - NON_3GPP_ACCESS
    RatType:
        anyOf:
            - type: string
              enum:
                - NR
                - EUTRA
                - WLAN
                - VIRTUAL
            - type: string
    PduSessionType:
        anyOf:
            - type: string
              enum:
                - IPV4V6
                - IPV4
                - IPV6
                - UNSTR
                - ETHER
            - type: string
    UpIntegrity:

```

```

    anyOf:
      - type: string
        enum:
          - "REQUIRED"
          - "PREFERRED"
          - "NOT_NEEDED"
      - type: string
    UpConfidentiality:
      anyOf:
        - type: string
          enum:
            - "REQUIRED"
            - "PREFERRED"
            - "NOT_NEEDED"
        - type: string
    SscMode:
      anyOf:
        - type: string
          enum:
            - "SSC_MODE_1"
            - "SSC_MODE_2"
            - "SSC_MODE_3"
        - type: string
#
# Structured Data Types
#
# the following data type is FFS
DefaultQosInformation:
  type: string #FFS
Snssai:
  type: object
  properties:
    sst:
      $ref: '#/components/schemas/UInteger'
      minimum: 0
      maximum: 255
    sd:
      type: string
  required:
    - sst
PlmnId:
  type: object
  properties:
    mcc:
      $ref: '#/components/schemas/Mcc'
    mnc:
      $ref: '#/components/schemas/Mnc'
  required:
    - mcc
    - mnc
Tai:
  type: object
  properties:
    plmnId:
      $ref: '#/components/schemas/PlmnId'
    tac:
      $ref: '#/components/schemas/Tac'
  required:
    - plmnId
    - tac
Ecgi:
  type: object
  properties:
    plmnId:
      $ref: '#/components/schemas/PlmnId'
      # PLMN Identity
    eutraCellId:
      $ref: '#/components/schemas/EutraCellId'
  required:
    - plmnId
    - eutraCellId
Ncgi:
  type: object
  properties:
    plmnId:
      $ref: '#/components/schemas/PlmnId'
    nrCellId:
      $ref: '#/components/schemas/NrCellId'

```

```

    required:
      - plmnId
      - nrCellId
  UserLocation:
    type: object
    properties:
      eutraLocation:
        $ref: '#/components/schemas/EutraLocation'
      nrLocation:
        $ref: '#/components/schemas/NrLocation'
      n3gaLocation:
        $ref: '#/components/schemas/N3gaLocation'
  EutraLocation:
    type: object
    properties:
      tai:
        $ref: '#/components/schemas/Tai'
      ecgi:
        $ref: '#/components/schemas/Ecgi'
    required:
      - tai
      - ecgi
  NrLocation:
    type: object
    properties:
      tai:
        $ref: '#/components/schemas/Tai'
      ncgi:
        $ref: '#/components/schemas/Ncgi'
    required:
      - tai
      - ncgi
  N3gaLocation:
    type: object
    properties:
      n3gppTai:
        $ref: '#/components/schemas/Tai'
      n3IwfId:
        type: string
        pattern: '^[A-Fa-f0-9]+$'
      ueIpv4Addr:
        $ref: '#/components/schemas/Ipv4Addr'
      ueIpv6Addr:
        $ref: '#/components/schemas/Ipv6Addr'
      portNumber:
        $ref: '#/components/schemas/UInteger'
    required:
      - n3gppTai
      - n3IwfId
  UpSecurity:
    type: object
    properties:
      upIntegr:
        $ref: '#/components/schemas/UpIntegrity'
      upConfid:
        $ref: '#/components/schemas/UpConfidentiality'
    required:
      - upIntegr
      - upConfid
  RefToBinaryData:
    type: object
    properties:
      contentId:
        type: string
    required:
      - contentId
#
# Data related to Data Types related to 5G QoS as defined in subclause 5.5
#
#
# SIMPLE DATA TYPES
#
#
  Qfi:
    type: integer
    minimum: 0
    maximum: 63
  5qi:

```

```

    type: integer
    minimum: 0
    maximum: 255
  BitRate:
    type: string
    pattern: '^\\d+(\\.\\d+)? (bps|Kbps|Mbps|Gbps|Tbps)$'
  ArpPriorityLevel:
    type: integer
    minimum: 1
    maximum: 15
  5qiPriorityLevel:
    type: integer
    minimum: 1
    maximum: 127
  PacketDelBudget:
    type: integer
    minimum: 1
  PacketErrRate:
    type: integer
  PacketLossRate:
    type: integer
    minimum: 0
    maximum: 1000
  AverWindow:
    type: string #FFS
  MaxDataBurstVol:
    type: integer
    minimum: 1

# Enumerations
#
  PreemptionCapability:
    anyOf:
      - type: string
        enum:
          - NOT_PREEMPT
          - MAY_PREEMPT
      - type: string
  DelayCritical:
    anyOf:
      - type: string
        enum:
          - CRITICAL
          - NON_CRITICAL
      - type: string
  PreemptionVulnerability:
    anyOf:
      - type: string
        enum:
          - NOT_PREEMPTABLE
          - PREEMPTABLE
      - type: string
  ReflectiveQoSAttribute:
    anyOf:
      - type: string
        enum:
          - RQOS
          - NO_RQOS
      - type: string
  NotificationControl:
    anyOf:
      - type: string
        enum:
          - REQUESTED
          - NOT_REQUESTED
      - type: string

#
# Structured Data Types
#
  Arp:
    type: object
    properties:
      priorityLevel:
        $ref: '#/components/schemas/ArpPriorityLevel'
      preemptCap:
        $ref: '#/components/schemas/PreemptionCapability'
      preemptVuln:
        $ref: '#/components/schemas/PreemptionVulnerability'

```

```
    required:
      - priorityLevel
      - preemptCap
      - preemptVuln
  Ambr:
    type: object
    properties:
      uplink:
        $ref: '#/components/schemas/BitRate'
      downlink:
        $ref: '#/components/schemas/BitRate'
    required:
      - uplink
      - downlink
#
# HTTP responses
#
responses:
  '400':
    description: Bad request
    content:
      application/problem+json:
        schema:
          $ref: '#/components/schemas/ProblemDetails'
  '401':
    description: Unauthorized
    content:
      application/problem+json:
        schema:
          $ref: '#/components/schemas/ProblemDetails'
  '403':
    description: Forbidden
    content:
      application/problem+json:
        schema:
          $ref: '#/components/schemas/ProblemDetails'
  '404':
    description: Not Found
    content:
      application/problem+json:
        schema:
          $ref: '#/components/schemas/ProblemDetails'
  '405':
    description: Method Not Allowed
  '408':
    description: Request Timeout
    content:
      application/problem+json:
        schema:
          $ref: '#/components/schemas/ProblemDetails'
  '409':
    description: Conflict
    content:
      application/problem+json:
        schema:
          $ref: '#/components/schemas/ProblemDetails'
  '410':
    description: Gone
    content:
      application/problem+json:
        schema:
          $ref: '#/components/schemas/ProblemDetails'
  '411':
    description: Length Required
    content:
      application/problem+json:
        schema:
          $ref: '#/components/schemas/ProblemDetails'
  '413':
    description: Payload Too Large
    content:
      application/problem+json:
        schema:
          $ref: '#/components/schemas/ProblemDetails'
  '414':
    description: URI Too Long
    content:
      application/problem+json:
```

```
    schema:
      $ref: '#/components/schemas/ProblemDetails'
  '415':
    description: Unsupported Media Type
    content:
      application/problem+json:
        schema:
          $ref: '#/components/schemas/ProblemDetails'
  '500':
    description: Internal Server Error
    content:
      application/problem+json:
        schema:
          $ref: '#/components/schemas/ProblemDetails'
  '501':
    description: Not Implemented
  '503':
    description: Service Unavailable
    content:
      application/problem+json:
        schema:
          $ref: '#/components/schemas/ProblemDetails'
  '504':
    description: Gateway Timeout
    content:
      application/problem+json:
        schema:
          $ref: '#/components/schemas/ProblemDetails'
  default:
    description: Generic Error
```

Annex B (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2017-10	CT4#80	C4-175048				Initial Draft.	0.1.0
2017-10	CT4#80	C4-175400				Skeleton and scope	0.2.0
2017-12	CT4#81	C4-176442				After CT4#81	0.3.0
2018-01	CT4#82	C4-181395				After CT4#82	0.4.0
2018-03	CT4#83	C4-182440				After CT4#83	0.5.0
2018-04	CT4#84	C4-183521				After CT4#84	0.6.0
2018-05	CT4#85	C4-184635				After CT4#85	0.7.0
2018-06	CT#80	CP-181110				Presented for informaion and approval	1.0.0
2018-06	CT#80					Approved in CT#80	15.0.0