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Stage 3
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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.
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- [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".
- [19] 3GPP TS 32.422: "Telecommunication management; Subscriber and equipment trace; Trace control and configuration management".
- [20] 3GPP TS 24.501: "Non-Access-Stratum (NAS) Protocol for 5G System (5GS); Stage 3".

- [21] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".
- [22] 3GPP TS 38.413: "NG Application Protocol (NGAP)".
- [23] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".
- [24] ITU-T Recommendation Q.763 (1999): "Specifications of Signalling System No.7; Formats and codes".

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
DNAI	Data Network Access Identifier
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;
- Data types related to 5G Trace.

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]
BinaryRm	string	This data type is defined in the same way as the "Binary" data type, but with the OpenAPI "nullable: true" property.
Bytes	string	String with format "byte" as defined in OpenAPI Specification [3], i.e. base64-encoded characters,
BytesRm	string	This data type is defined in the same way as the "Bytes" data type, but with the OpenAPI "nullable: true" property.
Date	string	String with format "date" as defined in OpenAPI Specification [3]
DateRm	string	This data type is defined in the same way as the "Date" data type, but with the OpenAPI "nullable: true" property.
DateTime	string	String with format "date-time" as defined in OpenAPI Specification [3]
DateTimeRm	string	This data type is defined in the same way as the "DateTime" data type, but with the OpenAPI "nullable: true" property.
DiameterIdentity	string	String containing a Diameter Identity, according to clause 4.3 of IETF RFC 6733 [18]. Pattern: '^([A-Za-z0-9]+(-[A-Za-z0-9]+).)+[a-z]{2,}\$'
DiameterIdentityRm	string	This data type is defined in the same way as the "DiameterIdentity" data type, but with the OpenAPI "nullable: true" property.
Double	number	Number with format "double" as defined in OpenAPI Specification [3]
DoubleRm	number	This data type is defined in the same way as the "Double" data type, but with the OpenAPI "nullable: true" property.
DurationSec	integer	Unsigned integer identifying a period of time in units of seconds.
DurationSecRm	integer	This data type is defined in the same way as the "DurationSec" data type, but with the OpenAPI "nullable: true" property.
Float	number	Number with format "float" as defined in OpenAPI Specification [3]
FloatRm	number	This data type is defined in the same way as the "Float" data type, but with the OpenAPI "nullable: true" property.
Uint16	integer	Unsigned 16-bit integers, i.e. only value between 0 and 65535 are permissible.
Uint16Rm	integer	This data type is defined in the same way as the "Uint16" data type, but with the OpenAPI "nullable: true" property.
Int32	integer	Integer with format "int32" as defined in OpenAPI Specification [3]
Int32Rm	integer	This data type is defined in the same way as the "Int32" data type, but with the OpenAPI "nullable: true" property.
Int64	integer	Integer with format "int64" as defined in OpenAPI Specification [3]
Int64Rm	integer	This data type is defined in the same way as the "Int64" data type, but with the OpenAPI "nullable: true" property.
Ipv4Addr	string	String identifying a IPv4 address formatted in the "dotted decimal" notation as defined in in IETF RFC 1166 [4].
Ipv4AddrRm	string	This data type is defined in the same way as the "Ipv4Addr" data type, but with the OpenAPI "nullable: true" property.
Ipv6Addr	string	String identifying an 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.
Ipv6AddrRm	string	This data type is defined in the same way as the "Ipv6Addr" data type, but with the OpenAPI "nullable: true" property.
Ipv6Prefix	string	String identifying an 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".
Ipv6PrefixRm	string	This data type is defined in the same way as the "Ipv6Prefix" data type, but with the OpenAPI "nullable: true" property.
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]. Pattern: '^([0-9a-fA-F]{2})(-([0-9a-fA-F]{2}){5})\$'
MacAddr48Rm	string	This data type is defined in the same way as the "MacAddr48" data type, but with the OpenAPI "nullable: true" property.

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.
UInteger	integer	Unsigned Integer, i.e. only value 0 and integers above 0 are permissible.
UIntegerRm	integer	This data type is defined in the same way as the "UInteger" data type, but with the OpenAPI "nullable: true" property.
UInt32	integer	Unsigned 32-bit integers, i.e. only value 0 and 32-bit integers above 0 are permissible.
UInt32Rm	integer	This data type is defined in the same way as the "UInt32" data type, but with the OpenAPI "nullable: true" property.
UInt64	integer	Unsigned 64-bit integers, i.e. only value 0 and 64-bit integers above 0 are permissible.
UInt64Rm	integer	This data type is defined in the same way as the "UInt64" data type, but with the OpenAPI "nullable: true" property.
Uri	string	String providing an URI formatted according to IETF RFC 3986 [6].
UriRm	string	This data type is defined in the same way as the "Uri" data type, but with the OpenAPI "nullable: true" property.
VarUeld	string	String represents the SUPI or GPSI. Pattern: " <code>^(imsi-[0-9]{5,15} nai-.[+] msisdn-[0-9]{5,15} extid-.[+])\$</code> ".
TimeZone	string	String with format "<time-numoffset>" optionally appended by "<daylightSavingTime>", where: - <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 shall be encoded as "+1" or "+2" for a +1 or +2 hours adjustment. In an OpenAPI Specification [3] schema, the format shall be designated as "TimeZone". Example: "-08:00+1" (for 8 hours behind UTC, +1 hour adjustment for Daylight Saving Time).
TimeZoneRm	string	This data type is defined in the same way as the "TimeZone" data type, but with the OpenAPI "nullable: true" property.

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].

5.2.3.2 Enumeration: UriScheme

Table 5.2.3.2-1: Enumeration UriScheme

Enumeration value	Description
"http"	HTTP URI scheme
"https"	HTTPS URI scheme

5.2.3.3 Enumeration: ChangeType

Table 5.2.3.3-1: Enumeration ChangeType

Enumeration value	Description
"ADD"	This value indicates new attribute has been added to the resource
"MOVE"	This value indicates existing attribute has been moved to a different path in the resource.
"REMOVE"	This value indicates existing attribute has been deleted from the resource.
"REPLACE"	This value indicates existing attribute has been updated with new value.

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".

5.2.4.7 Type: LinkRm

This data type is defined in the same way as the "Link" data type, but with the OpenAPI "nullable: true" property.

5.2.4.8 Type Changeltem

Table 5.2.4.8-1: Definition of type Changeltem

Attribute name	Data type	P	Cardinality	Description	Applicability
op	ChangeType	M	1	This IE indicates the change type which happens to the resource.	
path	string	M	1	This IE contains a JSON pointer value (as defined in IETF RFC 6901 [12]) that references a location of an attribute on which the change has been applied.	
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 "op" attribute is of value "MOVE".	
origValue	Any type	O	0..1	This IE indicates the original value of the attribute specified in the path attribute. This attribute only applies when the "op" attribute is of value "DELETE", "REPLACE" or "MOVE" Based on the use case, this attribute may be included.	
newValue	Any type	C	0..1	This IE indicates a new value of the attribute specified in the path attribute. It shall be present if the "op" attribute is of value "ADD", "REPLACE". The data type of this attribute shall be the same as the type of the resource on which the change has happened. The null value shall be allowed.	

5.2.4.9 Type Notifyltem

Table 5.2.4.9-1: Definition of type Notifyltem

Attribute name	Data type	P	Cardinality	Description	Applicability
resourceId	Uri	M	1	This IE contains the URI of the resource which has been changed.	
changes	array(Changeltem)	M	1..N	This IE contains the changes which have been applied on the resource identified by the resourceId attribute.	

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 subclass 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].
DnnRm	string	This data type is defined in the same way as the "Dnn" data type, but with the OpenAPI "nullable: true" property.
Gpsi	string	String identifying a Gpsi shall contain either an External Id or an MSISDN. It shall be formatted as follows: -External Identifier: "extid-<extid>", where <extid> shall be formatted according to subclause 19.7.2 of 3GPP TS 23.003 [7] that describes an External Identifier. -MSISDN: "msisdn-<msisdn>", where <msisdn> shall be formatted according to subclause 3.3 of 3GPP TS 23.003 [7] that describes an MSISDN. Pattern: '^(\msisdn-[0-9]{5,15} extid-.\+@.\+.)\$'
GpsiRm	string	This data type is defined in the same way as the "Gpsi" data type, but with the OpenAPI "nullable: true" property.
Groupld	string	String identifying a group of devices network internal globally unique ID which identifies a set of IMSIs, as specified in subclause 19.9 of 3GPP TS 23.003 [7]. Pattern: '^groupid-[A-Fa-f0-9]{8}-[0-9]{3}-[0-9]{2,3}-([A-Fa-f0-9][A-Fa-f0-9]){1,10}\$'.
GroupldRm	string	This data type is defined in the same way as the "Groupld" data type, but with the OpenAPI "nullable: true" property.
Pei	string	String representing a Permanent Equipment Identifier, 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}).+\$'
PeiRm	string	This data type is defined in the same way as the "Pei" data type, but with the OpenAPI "nullable: true" property.
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 28.6.2 of 3GPP TS 23.003 [7] that describes an NAI. To enable that the value is used as part of an URI, the string shall only contain characters allowed according to the "lower-with-hyphen" naming convention defined in 3GPP TS 29.501 [2]. Pattern: '^(\imsi-[0-9]{5,15} nai-.\+.)\$'
SupiRm	string	This data type is defined in the same way as the "Supi" data type, but with the OpenAPI "nullable: true" property.
NfInstanceld	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].
Amfld	string	String identifying the AMF ID composed of AMF Region ID (8 bits), AMF Set ID (10 bits) and AMF Pointer (6 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 representing the "Subscriber Profile ID for RAT/Frequency Priority" as specified in 3GPP TS 36.413 [16]. Minimum = 1. Maximum = 256.
RfspIndexRm	integer	This data type is defined in the same way as the "RfspIndex" data type, but with the OpenAPI "nullable: true" property.

5.3.3 Enumerations

For Data Types related to Subscription, Identification and Numbering, no Enumerations data types are defined in this version of the specification.

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.				

5.3.4.3 Type: GuamiRm

This data type is defined in the same way as the "Guami" data type, but with the OpenAPI "nullable: true" property.

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 .
ApplicationIdRm	string	This data type is defined in the same way as the "ApplicationId" data type, but with the OpenAPI "nullable: true" property.
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 subclause 9.3.3.5 of 3GPP TS 38.413 [11]. Pattern: '^[0-9]{3}\$'
MccRm	string	This data type is defined in the same way as the "Mcc" data type, but with the OpenAPI "nullable: true" property.
Mnc	string	Mobile Network Code part of the PLMN, comprising 2 or 3 digits, as defined in subclause 9.3.3.5 of 3GPP TS 38.413 [11]. Pattern: '^[0-9]{2,3}\$'
MncRm	string	This data type is defined in the same way as the "Mnc" data type, but with the OpenAPI "nullable: true" property.
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. Examples: A legacy TAC 0x4305 shall be encoded as "4305". An extended TAC 0x63F84B shall be encoded as "63F84B"
TacRm	string	This data type is defined in the same way as the "Tac" data type, but with the OpenAPI "nullable: true" property.
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. Pattern: '^[A-Fa-f0-9]{7}\$'
EutraCellIdRm	string	This data type is defined in the same way as the "EutraCellId" data type, but with the OpenAPI "nullable: true" property. Example: An E-UTRA Cell Id 0x5BD6007 shall be encoded as "5BD6007".
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. Pattern: '^[A-Fa-f0-9]{9}\$'
NrCellIdRm	string	This data type is defined in the same way as the "NrCellId" data type, but with the OpenAPI "nullable: true" property. Example: An NR Cell Id 0x225BD6007 shall be encoded as "225BD6007".
Dnai	string	DNAI (Data network access identifier), see subclause 5.6.7 of 3GPP TS 23.501 [8].
DnaiRm	string	This data type is defined in the same way as the "Dnai" data type, but with the OpenAPI "nullable: true" property.

5GMMCause	UInteger	This represents the 5GMM cause code values as specified in 3GPP TS 24.501 [20].
AreaCodeRm	string	This data type is defined in the same way as the "AreaCode" data type, but with the OpenAPI "nullable: true" property.
AmfName	string	FQDN (Fully Qualified Domain Name) of the AMF as defined in subclause 28.3.2.5 of 3GPP TS 23.003 [7].
AreaCode	string	Values are operator specific.
NgRanIdentifier	string	This represents the identifier of the NG RAN node. The string shall be formatted with following pattern: 'gNB-[A-Fa-f0-9]{6,8} MacroNGeNB-[A-Fa-f0-9]{5} LMacroNGeNB-[A-Fa-f0-9]{6} SMacroNGeNB-[A-Fa-f0-9]{5}' The value of the RAN Node ID shall be encoded 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 RAN Node ID shall appear first in the string, and the character representing the 4 least significant bit of the RAN Node ID shall appear last in the string. Examples: "gNB-382A3F47" indicates a gNB ID with value 0x382A3F47 "sMacroNGeNB-F4B89" indicates a Short Macro NG-eNB ID with value 0xF4B89

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.

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]

5.4.3.7 Enumeration: DnaiChangeType

The enumeration DnaiChangeType represents the type of a DNAI change. A NF service consumer may subscribe to "EARLY", "LATE" or "EARLY_LATE" types of DNAI change. The types of observed DNAI change the SMF may notify are "EARLY" or "LATE". The DnaiChangeType data type shall comply with the provisions defined in table 5.6.3.x-1.

Table 5.4.3.x-1: Enumeration DnaiChangeType

Enumeration value	Description	Applicability
EARLY	Early notification of UP path reconfiguration.	
EARLY_LATE	Early and late notification of UP path reconfiguration. This value shall only be present in the subscription to the DNAI change event.	
LATE	Late notification of UP path reconfiguration.	

5.4.3.8 Enumeration: RestrictionType

Table 5.4.3.8-1: Enumeration RestrictionType

Enumeration value	Description
"ALLOWED_AREAS"	This value indicates that areas are allowed.
"NOT_ALLOWED_AREAS"	This value indicates that areas are not allowed.

5.4.3.9 Enumeration: CoreNetworkType

Table 5.4.3.9-1: Enumeration CoreNetworkType

Enumeration value	Description
"5GC"	5G Core
"EPC"	Evolved Packet Core

5.4.3.10 Enumeration: AccessTypeRm

This enumeration is defined in the same way as the "AccessType" enumeration, but with the OpenAPI "nullable: true" property.

5.4.3.11 Enumeration: RatTypeRm

This enumeration is defined in the same way as the "RatType" enumeration, but with the OpenAPI "nullable: true" property.

5.4.3.12 Enumeration: PduSessionTypeRm

This enumeration is defined in the same way as the "PduSessionType" enumeration, but with the OpenAPI "nullable: true" property.

5.4.3.13 Enumeration: UpIntegrityRm

This enumeration is defined in the same way as the "UpIntegrity" enumeration, but with the OpenAPI "nullable: true" property.

5.4.3.14 Enumeration: UpConfidentialityRm

This enumeration is defined in the same way as the "UpConfidentiality" enumeration, but with the OpenAPI "nullable: true" property.

5.4.3.15 Enumeration: SscModeRm

This data type is defined in the same way as the "SscMode" enumeration, but with the OpenAPI "nullable: true" property.

5.4.3.17 Enumeration: DnaiChangeTypeRm

This data type is defined in the same way as the "DnaiChangeType" enumeration, but with the OpenAPI "nullable: true" property.

5.4.3.18 Enumeration: RestrictionTypeRm

This data type is defined in the same way as the "RestrictionType" enumeration, but with the OpenAPI "nullable: true" property.

5.4.3.19 Enumeration: CoreNetworkType

This data type is defined in the same way as the "CoreNetworkType" enumeration, but with the OpenAPI "nullable: true" property.

5.4.3.20 Enumeration: PresenceState

Table 5.4.3.20-1: Enumeration PresenceState

Enumeration value	Description
"IN_AREA"	Indicates that the UE is inside or enters the presence reporting area.
"OUT_OF_AREA"	Indicates that the UE is outside or leaves the presence reporting area.
"UNKNOWN"	Indicates it is unknown whether the UE is in the presence reporting area or not.
"INACTIVE"	Indicates that the presence reporting area is inactive in the serving node.

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
5qi	5Qi	M	1	Default 5G QoS identifier
nonDynamic5Qi	NonDynamic5Qi	C	0..1	This attribute may only be used for a standardized or pre-configured 5QI. When present, this attribute provides QoS characteristics that override the default values for a standardized or pre-configured 5QI.
dynamic5Qi	Dynamic5Qi	C	0..1	This attribute shall only be used for a 5QI that is neither standardized nor pre-configured. When present, this attribute provides an explicit set of QoS characteristics.
arp	Arp	O	0..1	Default allocation and retention priority

5.4.4.2 Type: Sns sai

Table 5.4.4.2-1: Definition of type Sns sai

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. Pattern: '[A-Fa-f0-9]{6}\$'

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

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

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
ageOfLocationInformation	integer	O	0..1	The value represents the elapsed time in minutes since the last network contact of the mobile station. Value "0" indicates that the location information was obtained after a successful paging procedure for Active Location Retrieval when the UE is in idle mode or after a successful NG-RAN location reporting procedure with the eNB when the UE is in connected mode. Any other value than "0" indicates that the location information is the last known one. See 3GPP TS 29.002 [21] subclause 17.7.8.
ueLocationTimestamp	DateTime	O	0..1	The value represents the UTC time when the UeLocation information was acquired.
geographicalInformation	string	O	0..1	Refer to geographical Information. See 3GPP TS 23.032 [23] subclause 7.3.2. Only the description of an ellipsoid point with uncertainty circle is allowed to be used. Allowed characters are 0-9 and A-F;
geodeticInformation	string	O	0..1	Refers to Calling Geodetic Location. See ITU-T Recommendation Q.763 (1999) [24] subclause 3.88.2. Only the description of an ellipsoid point with uncertainty circle is allowed to be used. Allowed characters are 0-9 and A-F.
globalNgenbld	GlobalRanNodel d	O	0..1	It indicates the global identity of the ng-eNodeB in which the UE is currently located. See 3GPP TS 38.413 [22] subclause 9.3.1.8.

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
ageOfLocationInformation	integer	O	0..1	The value represents the elapsed time in minutes since the last network contact of the mobile station. Value "0" indicates that the location information was obtained after a successful paging procedure for Active Location Retrieval when the UE is in idle mode or after a successful NG-RAN location reporting procedure with the gNB when the UE is in connected mode. Any other value than "0" indicates that the location information is the last known one. See 3GPP TS 29.002 [21] subclause 17.7.8.
ueLocationTimestamp	DateTime	O	0..1	The value represents the UTC time when the UeLocation information was acquired.
geographicalInformation	string	O	0..1	Refer to geographical Information. See 3GPP TS 23.032 [23] subclause 7.3.2. Only the description of an ellipsoid point with uncertainty circle is allowed to be used. Allowed characters are 0-9 and A-F;
geodeticInformation	string	O	0..1	Refers to Calling Geodetic Location. See ITU-T Recommendation Q.763 (1999) [24] subclause 3.88.2. Only the description of an ellipsoid point with uncertainty circle is allowed to be used. Allowed characters are 0-9 and A-F.
globalGnbld	GlobalRanNodeBld	O	0..1	It indicates the global identity of the gNodeB in which the UE is currently located. See 3GPP TS 38.413 [22] subclause 9.3.1.6.

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	C	0..1	The unique non 3GPP TAI used in the PLMN. It shall be present over the 3GPP PLMN internal interfaces, but shall not be present over the N5 interface.
n3lwfld	string	C	0..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]+' It shall be present over the 3GPP PLMN internal interfaces, but shall not be present over the N5 interface.
uelpv4Addr	Ipv4Addr	C	0..1	UE local IPv4 address (used to reach the N3IWF). The uelPv4Addr or the uelPv6Addr shall be present.
uelpv6Addr	Ipv6Addr	C	0..1	UE local IPv6 address (used to reach the N3IWF). The uelPv4Addr or the uelPv6Addr 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.

5.4.4.12 Type: NgApCause

Table 5.4.4.12-1: Definition of type NgApCause

Attribute name	Data type	P	Cardinality	Description
group	UInteger	M	1	This IE shall indicate the group of the NGAP cause. The value of this IE shall equal to the ASN.1 value of the specified NGAP cause group. NGAP supports following cause groups defined as separate enumerations, as specified in subclause 9.4.5 of 3GPP TS 38.413 [11], with following values: 0 – radioNetwork 1 – transport 2 – nas 3 – protocol 4 – misc
value	UInteger	M	1	This IE shall carry the NG AP cause value in specific cause group identified by the "group" attribute, as specified in subclause 9.4.5 of 3GPP TS 38.413 [11].

5.4.4.13 Type: BackupAmfInfo

Table 5.4.4.13-1: Definition of type BackupAmfInfo

Attribute name	Data type	P	Cardinality	Description
backupAmf	AmfName	M	1	This IE shall contain the AMF name of the backup AMF related to the specific GUAMI(s) (see subclause 5.21.2.3 of 3GPP TS 23.501 [2]). If no GUAMI is included in BackupAmfinfo, the AMF name of the backup AMF is related to all the GUAMI(s) supported by the AMF.
guamiList	array(Guami)	C	0..N	If present, this IE shall contain the GUAMI(s).

5.4.4.14 Type: RefToBinaryData

Table 5.4.4.14-1: 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.

5.4.4.15 Type RouteToLocation

Table 5.4.4.15-1: Definition of type RouteToLocation

Attribute name	Data type	P	Cardinality	Description
dnai	Dnai	M	1	Identifies the location of the application.
routelInfo	RouteInformation	C	0..1	Includes the traffic routing information.
routeProflId	string	C	0..1	Identifies the routing profile Id.
NOTE: Either the "routelInfo" attribute or the "routeProflId" attribute shall be included in the "RouteToLocation" data type.				

5.4.4.16 Type RouteInformation

Table 5.4.4.16-1: Definition of type RouteInformation

Attribute name	Data type	P	Cardinality	Description
ipv4Addr	Ipv4Addr	C	0..1	Ipv4address of the tunnel end point in the data network.
ipv6Addr	Ipv6Addr	C	0..1	Ipv6 address of the tunnel end point in the data network.
portNumber	UInteger	M	1	UDP port number of the tunnel end point in the data network.
NOTE: Either the "ipv4Addr" attribute or the "ipv6Addr" attribute shall be included in the "RouteInformation" data type.				

5.4.4.17 Type: Area

Table 5.4.4.17-1: Definition of type Area

Attribute name	Data type	P	Cardinality	Description
tacs	array(Tac)	O	0..N	List of TACs
areaCodes	array(AreaCode)	O	0..N	List of Area Codes

5.4.4.18 Type: ServiceAreaRestriction

Table 5.4.4.18-1: Definition of type ServiceAreaRestriction

Attribute name	Data type	P	Cardinality	Description
restrictionType	RestrictionType	C	0..1	string "ALLOWED_AREAS" or "NOT_ALLOWED_AREAS" shall be present if and only if the areas attribute is present
areas	array(Area)	O	0..N	A list of Areas. These areas are: - allowed areas if RestrictionType is "ALLOWED_AREAS" - not allowed areas if RestrictionType is "NOT_ALLOWED_AREAS"
maxNumOfTAs	UInteger	O	0..1	Maximum number of allowed tracking areas.

5.4.4.19 Type: PlmnIdRm

This data type is defined in the same way as the "PlmnIdi" data type, but with the OpenAPI "nullable: true" property.

5.4.4.20 Type: TaiRm

This data type is defined in the same way as the "Tai" data type, but with the OpenAPI "nullable: true" property.

5.4.4.21 Type: EcgiRm

This data type is defined in the same way as the "Ecgi" data type, but with the OpenAPI "nullable: true" property.

5.4.4.22 Type: NcgiRm

This data type is defined in the same way as the "Ncgi" data type, but with the OpenAPI "nullable: true" property.

5.4.4.23 Type: EutraLocationRm

This data type is defined in the same way as the "EutraLocation" data type, but with the OpenAPI "nullable: true" property.

5.4.4.24 Type: NrLocationRm

This data type is defined in the same way as the "NrLocation" data type, but with the OpenAPI "nullable: true" property.

5.4.4.25 Type: UpSecurityRm

This data type is defined in the same way as the "UpSecurityRm" data type, but with the OpenAPI "nullable: true" property.

5.4.4.26 Type: RefToBinaryDataRm

This data type is defined in the same way as the "RefToBinaryData" data type, but with the OpenAPI "nullable: true" property.

5.4.4.27 Type: PresenceInfo

Table 5.4.4.27-1: Definition of type PresenceInfo

Attribute name	Data type	P	Cardinality	Description
prald	String	C	0..1	Represents an identifier to the specified area. This IE shall be present if the Area of Interest subscribed or reported is a Presence Reporting Area.
presenceState	PresenceState	C	0..1	Indicates whether the UE is inside or outside of the area of interest (e.g presence reporting area or the LADN area), or if the presence reporting area is inactive in the serving node.
trackingAreaList	Array(Tai)	C	1..N	Represents the list of tracking areas that constitutes the area. This IE shall be present if the subscription or the event report is for tracking UE presence in the tracking areas. For non 3GPP access the TAI shall be the N3GPP TAI.
ecgiList	array(Ecgi)	C	0..N	Represents the list of EUTRAN cell Ids that constitutes the area. This IE shall be present if the Area of Interest subscribed is a list of EUTRAN cell Ids.
ncgiList	array(Ncgi)	C	0..N	Represents the list of NR cell Ids that constitutes the area. This IE shall be present if the Area of Interest subscribed is a list of NR cell Ids.
globalRanNodeIdList	array(GlobalRanNodeId)	C	0..N	Represents the list of NG RAN node identifiers that constitutes the area. This IE shall be present if the Area of Interest subscribed is a list of NG RAN node identifiers.

5.4.4.28 Type: GlobalRanNodeId

Table 5.4.4.28-1: Definition of type GlobalRanNodeId

Attribute name	Data type	P	Cardinality	Description
plmnId	PlmnId	M	1	Indicates the identity of the PLMN that the RAN node belongs to.
n3Iwfd	string	C	0..1	This IE shall be included if the RAN node belongs to non 3GPP access (i.e a N3IWF). If included, this IE shall contain the FQDN of the N3IWF.
ngRanNodeId	NgRanIdentifier	C	0..1	This IE shall be included if the RAN node belongs to 3GPP access type (i.e gNB / Ng-eNB). If included, this IE shall include the identity of the RAN node.

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.
QfiRm	integer	This data type is defined in the same way as the "Qfi" data type, but with the OpenAPI "nullable: true" property.
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.
5QiRm	integer	This data type is defined in the same way as the "5Qi" data type, but with the OpenAPI "nullable: true" property.
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"
BitRateRm	string	This data type is defined in the same way as the "BitRate" data type, but with the OpenAPI "nullable: true" property.
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.
ArpPriorityLevelRm	integer	This data type is defined in the same way as the "ArpPriorityLevel" data type, but with the OpenAPI "nullable: true" property.
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.
5QiPriorityLevelRm	integer	This data type is defined in the same way as the "5QiPriorityLevel" data type, but with the OpenAPI "nullable: true" property.
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.
PacketDelBudgetRm	integer	This data type is defined in the same way as the "PacketDelBudget" data type, but with the OpenAPI "nullable: true" property.
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".
PacketErrRateRm	Integer	This data type is defined in the same way as the "PacketErrRate" data type, but with the OpenAPI "nullable: true" property.
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.
PacketLossRateRm	Integer	This data type is defined in the same way as the "PacketLossRate" data type, but with the OpenAPI "nullable: true" property.
AverWindow	Integer	Unsigned integer indicating Averaging Window (see subclause 5.7.3.6 and 5.7.4 of 3GPP TS 23.501 [8]), expressed in milliseconds. Minimum = 1.
AverWindowRm	integer	This data type is defined in the same way as the "AverWindow" data type, but with the OpenAPI "nullable: true" property.
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.
MaxDataBurstVolRm	Integer	This data type is defined in the same way as the "MaxDataBurstVol" data type, but with the OpenAPI "nullable: true" property.

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 Void

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.

5.5.3.6 Enumeration: QosResourceType

The enumeration QosResourceType indicates whether a QoS Flow is non-GBR, delay critical GBR, or non-delay critical GBR (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 5.5.3.6-1.

Table 5.5.3.6-1: Enumeration QoSResourceType

Enumeration value	Description
"NON_GBR"	Non-GBR QoS Flow.
"NON_CRITICAL_GBR"	Non-delay critical GBR QoS flow.
"CRITICAL_GBR"	Delay critical GBR QoS flow.

5.5.3.7 Enumeration: PreemptionCapabilityRm

This enumeration is defined in the same way as the "PreemptionCapability" enumeration, but with the OpenAPI "nullable: true" property.

5.5.3.8 Enumeration: PreemptionVulnerabilityRm

This enumeration is defined in the same way as the "PreemptionVulnerability" enumeration, but with the OpenAPI "nullable: true" property.

5.5.3.9 Enumeration: ReflectiveQoSAttributeRm

This enumeration is defined in the same way as the "ReflectiveQoSAttribute" enumeration, but with the OpenAPI "nullable: true" property.

5.5.3.10 Enumeration: NotificationControlRm

This enumeration is defined in the same way as the "NotificationControl" enumeration, but with the OpenAPI "nullable: true" property.

5.5.3.11 Enumeration: QoSResourceTypeRm

This enumeration is defined in the same way as the "QoSResourceType" enumeration, but with the OpenAPI "nullable: true" property.

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

5.5.4.3 Type: Dynamic5Qi

Table 5.5.4.3-1: Definition of type Dynamic5Qi

Attribute name	Data type	P	Cardinality	Description	Applicability
resourceType	QosResourceType	M	1	Defines the 5QI resource type. See subclause 5.5.3.6.	
priorityLevel	5QIPriorityLevel	M	1	Defines the 5QI Priority Level. See subclause 5.5.2.	
packetDelayBudget	PacketDelBudget	M	1	Defines the packet delay budget. See subclause 5.5.2.	
packetErrRate	PacketErrRate	M	1	Defines the packet error rate. See subclause 5.5.2.	
averWindow	AverWindow	C	0..1	Defines the averaging window. See subclause 5.5.2. This IE shall be present only for a GBR QoS flow or a Delay Critical GBR QoS flow.	
maxDataBurstVol	MaxDataBurstVol	C	0..1	Defines the maximum data burst volume. See subclause 5.5.2. This IE shall be present for a Delay Critical GBR QoS flow.	

5.5.4.4 Type: NonDynamic5Qi

Table 5.5.4.4-1: Definition of type NonDynamic5Qi

Attribute name	Data type	P	Cardinality	Description	Applicability
priorityLevel	5QIPriorityLevel	O	0..1	Defines the 5QI Priority Level. See subclause 5.5.2. When present, it contains the 5QI Priority Level value that overrides the standardized or pre-configured value.	
averWindow	AverWindow	O	0..1	Defines the averaging window. See subclause 5.5.2. This IE may be present for a GBR QoS flow or a Delay Critical GBR QoS flow. When present, it contains the Averaging Window that overrides the standardized or pre-configured value.	
maxDataBurstVol	MaxDataBurstVol	O	0..1	Defines the maximum data burst volume. See subclause 5.5.2. This IE may be present for a Delay Critical GBR QoS flow. When present, it contains the Maximum Data Burst Volume value that overrides the standardized or pre-configured value.	

5.5.4.5 Type: ArpRm

This data type is defined in the same way as the "Arp" data type, but with the OpenAPI "nullable: true" property.

5.5.4.6 Type: AmbrRm

This data type is defined in the same way as the "Ambr" data type, but with the OpenAPI "nullable: true" property.

5.6 Data Types related to 5G Trace

5.6.1 Introduction

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

5.6.2 Simple Data Types

This subclause specifies common simple data types.

Table 5.6.2-1: Simple Data Types

Type Name	Type Definition	Description

5.6.3 Enumerations

5.6.3.1 Enumeration: TraceDepth

The enumeration TraceDepth defines how detailed information should be recorded in the trace. See 3GPP TS 32.422 [19] for further description of the values. It shall comply with the provisions defined in table 5.6.3.1-1.

Table 5.6.3.1-1: Enumeration TraceDepth

Enumeration value	Description
"MINIMUM"	Minimum
"MEDIUM"	Medium
"MAXIMUM"	Maximum
"MINIMUM_WO_VENDOR_EXTENSION"	Minimum without vendor specific extension
"MEDIUM_WO_VENDOR_EXTENSION"	Medium without vendor specific extension
"MAXIMUM_WO_VENDOR_EXTENSION"	Maximum without vendor specific extension

5.6.3.2 Enumeration: TraceDepthRm

This enumeration is defined in the same way as the "TraceDepth" enumeration, but with the OpenAPI "nullable: true" property.

5.6.4 Structured Data Types

5.6.4.1 Type: TraceData

Table 5.6.4.1-1: Definition of type TraceData

Attribute name	Data type	P	Cardinality	Description
traceRef	string	M	1	Trace Reference (see 3GPP TS 32.422 [19]). It shall be encoded as the concatenation of MCC, MNC and Trace ID as follows: <MCC><MNC>-<Trace ID> The Trace ID shall be encoded as a 3 octet string in hexadecimal representation. Each character in the Trace ID 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 Trace ID shall appear first in the string, and the character representing the 4 least significant bit of the Trace ID shall appear last in the string. Pattern: '^[0-9]{3}[0-9]{2,3}-[A-Fa-f0-9]{6}\$'
traceDepth	TraceDepth	M	1	Trace Depth (see 3GPP TS 32.422 [19]).
neTypeList	string	M	1	List of NE Types (see 3GPP TS 32.422 [19]). It shall be encoded as an octet string 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 shall appear first in the string, and the character representing the 4 least significant bit shall appear last in the string. Octets shall be coded according to 3GPP TS 32.422 [19]. Pattern: '^[A-Fa-f0-9]+\$'
eventList	string	M	1	Triggering events (see 3GPP TS 32.422 [19]). It shall be encoded as an octet string 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 shall appear first in the string, and the character representing the 4 least significant bit shall appear last in the string. Octets shall be coded according to 3GPP TS 32.422 [19]. Pattern: '^[A-Fa-f0-9]+\$'
collectionEntityIpv4Addr	Ipv4Addr	C	0..1	IPv4 Address of the Trace Collection Entity (see 3GPP TS 32.422 [x]). At least one of the collectionEntityIpv4Addr or collectionEntityIpv6Addr attributes shall be present.
collectionEntityIpv6Addr	Ipv6Addr	C	0..1	IPv6 Address of the Trace Collection Entity (see 3GPP TS 32.422 [x]). At least one of the collectionEntityIpv4Addr or collectionEntityIpv6Addr attributes shall be present.

interfaceList	string	O	0..1	<p>List of Interfaces (see 3GPP TS 32.422 [19]).</p> <p>It shall be encoded as an octet string 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 shall appear first in the string, and the character representing the 4 least significant bit shall appear last in the string.</p> <p>Octets shall be coded according to 3GPP TS 32.422 [19].</p> <p>If this attribute is not present, all the interfaces applicable to the list of NE types indicated in the neTypeList attribute should be traced.</p> <p>Pattern: '[A-Fa-f0-9]+\$'</p>
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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.PreR15.1.0'
  title: 'Common Data Types'
  description: 'Common Data Types for Service Based Interfaces '
externalDocs:
  description: 3GPP TS Common Data Types for Service Based Interfaces, version 15.1.0
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.571/'

paths: {}
components:
  schemas:

#
# Common Data Types for Generic usage definitions as defined in subclause 5.2
#

#
# COMMON SIMPLE DATA TYPES
#
  Binary:
    format: binary
    type: string
  BinaryRm:
    format: binary
    type: string
    nullable: true
  Bytes:
    format: byte
    type: string
  BytesRm:
    format: byte
    type: string
    nullable: true
  Date:
    format: date
    type: string
  DateRm:
    format: date
    type: string
    nullable: true
  DateTime:
    format: date-time
    type: string
  DateTimeRm:
    format: date-time
    type: string
    nullable: true
  DiameterIdentity:
    type: string
    pattern: '^[A-Za-z0-9]+(-[A-Za-z0-9]+).)+[a-z]{2,}$'
  DiameterIdentityRm:
    type: string
    pattern: '^[A-Za-z0-9]+(-[A-Za-z0-9]+).)+[a-z]{2,}$'
    nullable: true
  Double:
    format: double
    type: number
  DoubleRm:
    format: double
    type: number
    nullable: true
  DurationSec:

```

```

    type: integer
DurationSecRm:
    type: integer
    nullable: true
Float:
    format: float
    type: number
FloatRm:
    format: float
    type: number
    nullable: true
Int32:
    format: int32
    type: integer
Int32Rm:
    format: int32
    type: integer
    nullable: true
Int64:
    type: integer
    format: int64
Int64Rm:
    format: int64
    type: integer
    nullable: true
Ipv4Addr:
    type: string
Ipv4AddrRm:
    type: string
    nullable: true
Ipv6Addr:
    type: string
Ipv6AddrRm:
    type: string
    nullable: true
Ipv6Prefix:
    type: string
Ipv6PrefixRm:
    type: string
    nullable: true
MacAddr48:
    type: string
    pattern: '^([0-9a-fA-F]{2})((-[0-9a-fA-F]{2}){5})$'
MacAddr48Rm:
    type: string
    pattern: '^([0-9a-fA-F]{2})((-[0-9a-fA-F]{2}){5})$'
    nullable: true
SupportedFeatures:
    type: string
    pattern: '^[A-Fa-f0-9]*$'
UInteger:
    type: integer
    minimum: 0
UIntegerRm:
    type: integer
    minimum: 0
    nullable: true
Uint16:
    type: integer
    minimum: 0
    maximum: 65535
Uint16Rm:
    type: integer
    minimum: 0
    maximum: 65535
    nullable: true
Uint32:
    format: int32
    type: integer
    minimum: 0
Uint32Rm:
    format: int32
    type: integer
    minimum: 0
    nullable: true
Uint64:
    format: int64
    type: integer

```

```

    minimum: 0
  Uint64Rm:
    format: int64
    type: integer
    minimum: 0
    nullable: true
  Uri:
    type: string
  UriRm:
    type: string
    nullable: true
  VarUeId:
    type: string
    pattern: '^(\imsi-[0-9]{5,15}|nai-.\+|msisdn-[0-9]{5,15}|extid-.\+|.+)\$'
  TimeZone:
    type: string
  TimeZoneRm:
    type: string
    nullable: true

```

```

#
# COMMON ENUMERATED DATA TYPES
#

```

```

PatchOperation:
  anyOf:
    - type: string
      enum:
        - add
        - copy
        - move
        - remove
        - replace
        - test
    - type: string
UriScheme:
  anyOf:
    - type: string
      enum:
        - http
        - https
    - type: string
ChangeType:
  anyOf:
    - type: string
      enum:
        - ADD
        - MOVE
        - REMOVE
        - REPLACE
    - type: string

```

```

#
# COMMON STRUCTURED DATA TYPES
#

```

```

ProblemDetails:
  type: object
  properties:
    type:
      type:
        $ref: '#/components/schemas/Uri'
    title:
      type: string
    status:
      type: integer
    detail:
      type: string
    instance:
      type:
        $ref: '#/components/schemas/Uri'
    cause:
      type: string
    invalidParams:
      type: array
      items:
        type:
          $ref: '#/components/schemas/InvalidParam'
      minItems: 0
Link:
  type: object

```

```

    properties:
      href:
        $ref: '#/components/schemas/Uri'
  LinkRm:
    type: object
    properties:
      href:
        $ref: '#/components/schemas/Uri'
    nullable: true
  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
  ChangeItem:
    type: object
    properties:
      op:
        $ref: '#/components/schemas/ChangeType'
      path:
        type: string
      from:
        type: string
      origValue: {}
      newValue: {}
    required:
      - op
      - path
  NotifyItem:
    type: object
    properties:
      resourceId:
        $ref: '#/components/schemas/Uri'
      changes:
        type: array
        items:
          $ref: '#/components/schemas/ChangeItem'

```

```

#
# Data Types related to Subscription, Identification and Numbering as defined in subclause 5.3
#

```

```

#
# SIMPLE DATA TYPES
#

```

```

Dnn:
  type: string
DnnRm:
  type: string
  nullable: true
Gpsi:
  type: string
  pattern: '^(\msisdn-[0-9]{5,15}|extid-.\+|.+)\$'
GpsiRm:
  type: string
  pattern: '^(\msisdn-[0-9]{5,15}|extid-.\+|.+)\$'
  nullable: true
GroupId:
  type: string
  pattern: '^groupid-[A-Fa-f0-9]{8}-[0-9]{3}-[0-9]{2,3}-([A-Fa-f0-9][A-Fa-f0-9]){1,10}\$'

GroupIdRm:
  type: string
  pattern: '^(\groupid-[A-Fa-f0-9]{14,34}|.\+)\$'
  nullable: true
Pei:
  type: string
  pattern: '^(\imei-[0-9]{15}|imeisv-[0-9]{16}|.\+)\$'
PeiRm:
  type: string
  pattern: '^(\imei-[0-9]{15}|imeisv-[0-9]{16}|.\+)\$'
  nullable: true
Supi:
  type: string
  pattern: '^(\imsi-[0-9]{5,15}|nai-.\+|.+)\$'
SupiRm:
  type: string
  pattern: '^(\imsi-[0-9]{5,15}|nai-.\+|.+)\$'
  nullable: true
NfInstanceId:
  type: string
  format: uuid
AmfId:
  type: string
  pattern: '^([A-Fa-f0-9]){6}\$'
RfspIndex:
  type: integer
  minimum: 1
  maximum: 256
RfspIndexRm:
  type: integer
  minimum: 1
  maximum: 256
  nullable: true

```

```

#
# STRUCTURED DATA TYPES
#

```

```

Guami:
  type: object
  properties:
    plmnId:
      $ref: '#/components/schemas/PlmnId'
    amfId:
      $ref: '#/components/schemas/AmfId'
  required:
    - plmnId
    - amfId
GuamiRm:
  type: object
  properties:
    plmnId:
      $ref: '#/components/schemas/PlmnId'
    amfId:
      $ref: '#/components/schemas/AmfId'
  required:
    - plmnId
    - amfId
  nullable: true
NetworkId:
  type: object
  properties:
    mnc:

```

```

    $ref: '#/components/schemas/Mnc'
  mcc:
    $ref: '#/components/schemas/Mcc'

#
# Data Types related to 5G Network as defined in subclause 5.4
#
#
# SIMPLE DATA TYPES
#
  ApplicationId:
    type: string
  ApplicationIdRm:
    type: string
    nullable: true
  PduSessionId:
    type: integer
    minimum: 0
    maximum: 255
  Mcc:
    type: string
    pattern: '^\\d{3}$'
  MccRm:
    type: string
    pattern: '^\\d{3}$'
    nullable: true
  Mnc:
    type: string
    pattern: '^\\d{2,3}$'
  MncRm:
    type: string
    pattern: '^\\d{2,3}$'
    nullable: true
  Tac:
    type: string
    pattern: '^[A-Fa-f0-9]{4}$|^[A-Fa-f0-9]{6}$'
  TacRm:
    type: string
    pattern: '^[A-Fa-f0-9]{4}$|^[A-Fa-f0-9]{6}$'
    nullable: true
  EutraCellId:
    type: string
    pattern: '^[A-Fa-f0-9]{7}$'
  EutraCellIdRm:
    type: string
    pattern: '^[A-Fa-f0-9]{7}$'
    nullable: true
  NrCellId:
    type: string
    pattern: '^[A-Fa-f0-9]{9}$'
  NrCellIdRm:
    type: string
    pattern: '^[A-Fa-f0-9]{9}$'
    nullable: true
  Dnai:
    type: string
  DnaiRm:
    type: string
    nullable: true
  5GmmCause:
    $ref: '#/components/schemas/Uinteger'
  AmfName:
    type: string
  AreaCode:
    type: string
  AreaCodeRm:
    type: string
    nullable: true
  NgRanIdentifier:
    type: string
    pattern: '^(gNB-[A-Fa-f0-9]{6,8}|MacroNGeNB-[A-Fa-f0-9]{5}|LMacroNGeNB-[A-Fa-f0-9]{6}|SMacroNGeNB-[A-Fa-f0-9]{5})$'

#
# ENUMERATED DATA TYPES
#

```

```
AccessType:
  type: string
  enum:
    - 3GPP_ACCESS
    - NON_3GPP_ACCESS
AccessTypeRm:
  type: string
  enum:
    - 3GPP_ACCESS
    - NON_3GPP_ACCESS
  nullable: true
RatType:
  anyOf:
    - type: string
      enum:
        - NR
        - EUTRA
        - WLAN
        - VIRTUAL
    - type: string
RatTypeRm:
  anyOf:
    - type: string
      enum:
        - NR
        - EUTRA
        - WLAN
        - VIRTUAL
    - type: string
  nullable: true
PduSessionType:
  anyOf:
    - type: string
      enum:
        - IPV4V6
        - IPV4
        - IPV6
        - UNSTR
        - ETHER
    - type: string
PduSessionTypeRm:
  anyOf:
    - type: string
      enum:
        - IPV4V6
        - IPV4
        - IPV6
        - UNSTR
        - ETHER
    - type: string
  nullable: true
UpIntegrity:
  anyOf:
    - type: string
      enum:
        - REQUIRED
        - PREFERRED
        - NOT_NEEDED
    - type: string
UpIntegrityRm:
  anyOf:
    - type: string
      enum:
        - REQUIRED
        - PREFERRED
        - NOT_NEEDED
    - type: string
  nullable: true
UpConfidentiality:
  anyOf:
    - type: string
      enum:
        - REQUIRED
        - PREFERRED
        - NOT_NEEDED
    - type: string
UpConfidentialityRm:
```



```

anyOf:
  - type: string
    enum:
      - REQUIRED
      - PREFERRED
      - NOT_NEEDED
  - type: string
nullable: true
SscMode:
  anyOf:
    - type: string
      enum:
        - SSC_MODE_1
        - SSC_MODE_2
        - SSC_MODE_3
    - type: string
SscModeRm:
  anyOf:
    - type: string
      enum:
        - SSC_MODE_1
        - SSC_MODE_2
        - SSC_MODE_3
    - type: string
nullable: true
DnaiChangeType:
  anyOf:
    - type: string
      enum:
        - EARLY
        - EARLY_LATE
        - LATE
    - type: string
      description: >
        This string provides forward-compatibility with future
        extensions to the enumeration but is not used to encode
        content defined in the present version of this API.
      description: >
        Possible values are
        - EARLY: Early notification of UP path reconfiguration.
        - EARLY_LATE: Early and late notification of UP path reconfiguration. This value shall only
        be present in the subscription to the DNAI change event.
        - LATE: Late notification of UP path reconfiguration.
DnaiChangeTypeRm:
  anyOf:
    - type: string
      enum:
        - EARLY
        - EARLY_LATE
        - LATE
    - type: string
nullable: true
RestrictionType:
  anyOf:
    - type: string
      enum:
        - ALLOWED_AREAS
        - NOT_ALLOWED_AREAS
    - type: string
RestrictionTypeRm:
  anyOf:
    - type: string
      enum:
        - ALLOWED_AREAS
        - NOT_ALLOWED_AREAS
    - type: string
nullable: true
CoreNetworkType:
  anyOf:
    - type: string
      enum:
        - 5GC
        - EPC
    - type: string
CoreNetworkTypeRm:
  anyOf:
    - type: string
      enum:

```

```

    - 5GC
    - EPC
  - type: string
  nullable: true
  PresenceState:
    anyOf:
      - type: string
        enum:
          - IN_AREA
          - OUT_OF_AREA
          - UNKNOWN
          - INACTIVE
      - type: string

```

```

#
# STRUCTURED DATA TYPES
#

```

```

Snssai:
  type: object
  properties:
    sst:
      type: integer
      minimum: 0
      maximum: 255
    sd:
      type: string
      pattern: '^[A-Fa-f0-9]{6}$'
  required:
    - sst
PlmnId:
  type: object
  properties:
    mcc:
      $ref: '#/components/schemas/Mcc'
    mnc:
      $ref: '#/components/schemas/Mnc'
  required:
    - mcc
    - mnc
PlmnIdRm:
  type: object
  properties:
    mcc:
      $ref: '#/components/schemas/Mcc'
    mnc:
      $ref: '#/components/schemas/Mnc'
  required:
    - mcc
    - mnc
  nullable: true
Tai:
  type: object
  properties:
    plmnId:
      $ref: '#/components/schemas/PlmnId'
    tac:
      $ref: '#/components/schemas/Tac'
  required:
    - plmnId
    - tac
TaiRm:
  type: object
  properties:
    plmnId:
      $ref: '#/components/schemas/PlmnId'
    tac:
      $ref: '#/components/schemas/Tac'
  required:
    - plmnId
    - tac
  nullable: true
Ecgi:
  type: object
  properties:
    plmnId:
      $ref: '#/components/schemas/PlmnId'
      # PLMN Identity

```

```

    eutraCellId:
      $ref: '#/components/schemas/EutraCellId'
    required:
      - plmnId
      - eutraCellId
  EcgiRm:
    type: object
    properties:
      plmnId:
        $ref: '#/components/schemas/PlmnId'
        # PLMN Identity
      eutraCellId:
        $ref: '#/components/schemas/EutraCellId'
    required:
      - plmnId
      - eutraCellId
    nullable: true
  Ncgi:
    type: object
    properties:
      plmnId:
        $ref: '#/components/schemas/PlmnId'
      nrCellId:
        $ref: '#/components/schemas/NrCellId'
    required:
      - plmnId
      - nrCellId
  NcgiRm:
    type: object
    properties:
      plmnId:
        $ref: '#/components/schemas/PlmnId'
      nrCellId:
        $ref: '#/components/schemas/NrCellId'
    required:
      - plmnId
      - nrCellId
    nullable: true
  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'
      ageOfLocationInformation:
        type: integer
        minimum: 0
        maximum: 32767
      ueLocationTimestamp:
        $ref: '#/components/schemas/DateTime'
      geographicalInformation:
        type: string
        pattern: '^([0-9A-F]{16})$'
      geodeticInformation:
        type: string
        pattern: '^([0-9A-F]{20})$'
      globalNgenbId:
        $ref: '#/components/schemas/GlobalRanNodeId'
    required:
      - tai
      - ecgi
  EutraLocationRm:
    type: object
    properties:
      tai:
        $ref: '#/components/schemas/Tai'
      ecgi:
        $ref: '#/components/schemas/Ecgi'

```

```

    ageOfLocationInformation:
      type: integer
      minimum: 0
      maximum: 32767
    ueLocationTimestamp:
      $ref: '#/components/schemas/DateTime'
    geographicalInformation:
      type: string
      pattern: '^[0-9A-F]{16}$'
    geodeticInformation:
      type: string
      pattern: '^[0-9A-F]{20}$'
    globalNgenbId:
      $ref: '#/components/schemas/GlobalRanNodeId'
  required:
    - tai
    - ecgi
  nullable: true
NrLocation:
  type: object
  properties:
    tai:
      $ref: '#/components/schemas/Tai'
    ncgi:
      $ref: '#/components/schemas/Ncgi'
    ageOfLocationInformation:
      type: integer
      minimum: 0
      maximum: 32767
    ueLocationTimestamp:
      $ref: '#/components/schemas/DateTime'
    geographicalInformation:
      type: string
      pattern: '^[0-9A-F]{16}$'
    geodeticInformation:
      type: string
      pattern: '^[0-9A-F]{20}$'
    globalGnbId:
      $ref: '#/components/schemas/GlobalRanNodeId'
  required:
    - tai
    - ncgi
NrLocationRm:
  type: object
  properties:
    tai:
      $ref: '#/components/schemas/Tai'
    ncgi:
      $ref: '#/components/schemas/Ncgi'
    ageOfLocationInformation:
      type: integer
      minimum: 0
      maximum: 32767
    ueLocationTimestamp:
      $ref: '#/components/schemas/DateTime'
    geographicalInformation:
      type: string
      pattern: '^[0-9A-F]{16}$'
    geodeticInformation:
      type: string
      pattern: '^[0-9A-F]{20}$'
    globalGnbId:
      $ref: '#/components/schemas/GlobalRanNodeId'
  required:
    - tai
    - ncgi
  nullable: true
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'
  UpSecurity:
    type: object
    properties:
      upIntegr:
        $ref: '#/components/schemas/UpIntegrity'
      upConfid:
        $ref: '#/components/schemas/UpConfidentiality'
    required:
      - upIntegr
      - upConfid
  UpSecurityRm:
    type: object
    properties:
      upIntegr:
        $ref: '#/components/schemas/UpIntegrity'
      upConfid:
        $ref: '#/components/schemas/UpConfidentiality'
    required:
      - upIntegr
      - upConfid
  nullable: true
  NgApCause:
    type: object
    properties:
      group:
        $ref: '#/components/schemas/UInteger'
      value:
        $ref: '#/components/schemas/UInteger'
    required:
      - group
      - value
  BackupAmfInfo:
    type: object
    properties:
      backupAmf:
        $ref: '#/components/schemas/AmfName'
      guamiList:
        type: array
        items:
          $ref: '#/components/schemas/Guami'
    required:
      - backupAmf
  RefToBinaryData:
    type: object
    properties:
      contentId:
        type: string
    required:
      - contentId
  RefToBinaryDataRm:
    type: object
    properties:
      contentId:
        type: string
    required:
      - contentId
  nullable: true
  RouteToLocation:
    type: object
    properties:
      dnai:
        $ref: '#/components/schemas/Dnai'
      routeInfo:
        $ref: '#/components/schemas/RouteInformation'
      routeProfId:
        type: string
        nullable: true
    required:
      - dnai
  nullable: true
  RouteInformation:
    type: object
    properties:
      ipv4Addr:
        $ref: '#/components/schemas/Ipv4Addr'

```

```

    ipv6Addr:
      $ref: '#/components/schemas/Ipv6Addr'
    portNumber:
      $ref: '#/components/schemas/UInteger'
    required:
      - portNumber
    nullable: true
  DefaultQosInformation:
    type: object
    required:
      - 5qi
    properties:
      5qi:
        $ref: '#/components/schemas/5Qi'
      nonDynamic5Qi:
        $ref: '#/components/schemas/NonDynamic5Qi'
      dynamic5Qi:
        $ref: '#/components/schemas/Dynamic5Qi'
      arp:
        $ref: '#/components/schemas/Arp'
  Area:
    type: object
    properties:
      tacs:
        type: array
        items:
          $ref: '#/components/schemas/Tac'
      areaCodes:
        type: array
        items:
          $ref: '#/components/schemas/AreaCode'
  ServiceAreaRestriction:
    type: object
    properties:
      restrictionType:
        $ref: '#/components/schemas/RestrictionType'
      areas:
        type: array
        items:
          $ref: '#/components/schemas/Area'
      maxNumOfTAs:
        $ref: '#/components/schemas/UInteger'
  PresenceInfo:
    type: object
    properties:
      praId:
        type: string
      presenceState:
        $ref: '#/components/schemas/PresenceState'
      trackingAreaList:
        type: array
        items:
          $ref: '#/components/schemas/Tai'
        minItems: 0
      ecgiList:
        type: array
        items:
          $ref: '#/components/schemas/Ecgi'
        minItems: 0
      ncgiList:
        type: array
        items:
          $ref: '#/components/schemas/Ncgi'
        minItems: 0
      globalRanNodeIdList:
        type: array
        items:
          $ref: '#/components/schemas/GlobalRanNodeId'
  GlobalRanNodeId:
    type: object
    properties:
      plmnId:
        $ref: '#/components/schemas/PlmnId'
      n3IwfId:
        type: string
      ngRanNodeId:
        $ref: '#/components/schemas/NgRanIdentifier'
    required:

```

- plmnID

```

#
# Data Types related to 5G QoS as defined in subclause 5.5
#
#
# SIMPLE DATA TYPES
#
#
Qfi:
  type: integer
  minimum: 0
  maximum: 63
QfiRm:
  type: integer
  minimum: 0
  maximum: 63
  nullable: true
5Qi:
  type: integer
  minimum: 0
  maximum: 255
5QiRm:
  type: integer
  minimum: 0
  maximum: 255
  nullable: true
BitRate:
  type: string
  pattern: '^\\d+(\\.\\d+)? (bps|Kbps|Mbps|Gbps|Tbps)$'
BitRateRm:
  type: string
  pattern: '^\\d+(\\.\\d+)? (bps|Kbps|Mbps|Gbps|Tbps)$'
  nullable: true
ArpPriorityLevel:
  type: integer
  minimum: 1
  maximum: 15
  nullable: true
5QiPriorityLevel:
  type: integer
  minimum: 1
  maximum: 127
5QiPriorityLevelRm:
  type: integer
  minimum: 1
  maximum: 127
  nullable: true
PacketDelBudget:
  type: integer
  minimum: 1
PacketDelBudgetRm:
  type: integer
  minimum: 1
  nullable: true
PacketErrRate:
  type: integer
PacketErrRateRm:
  type: integer
  nullable: true
PacketLossRate:
  type: integer
  minimum: 0
  maximum: 1000
PacketLossRateRm:
  type: integer
  minimum: 0
  maximum: 1000
  nullable: true
AverWindow:
  type: integer
  minimum: 1
AverWindowRm:
  type: integer
  minimum: 1
  nullable: true

```

```
MaxDataBurstVol:
  type: integer
  minimum: 1
MaxDataBurstVolRm:
  type: integer
  minimum: 1
  nullable: true

#
# ENUMERATED DATA TYPES
#

PreemptionCapability:
  anyOf:
    - type: string
      enum:
        - NOT_PREEMPT
        - MAY_PREEMPT
    - type: string
PreemptionCapabilityRm:
  anyOf:
    - type: string
      enum:
        - NOT_PREEMPT
        - MAY_PREEMPT
    - type: string
  nullable: true
PreemptionVulnerability:
  anyOf:
    - type: string
      enum:
        - NOT_PREEMPTABLE
        - PREEMPTABLE
    - type: string
PreemptionVulnerabilityRm:
  anyOf:
    - type: string
      enum:
        - NOT_PREEMPTABLE
        - PREEMPTABLE
    - type: string
  nullable: true
ReflectiveQoSAttribute:
  anyOf:
    - type: string
      enum:
        - RQOS
        - NO_RQOS
    - type: string
ReflectiveQoSAttributeRm:
  anyOf:
    - type: string
      enum:
        - RQOS
        - NO_RQOS
    - type: string
  nullable: true
NotificationControl:
  anyOf:
    - type: string
      enum:
        - REQUESTED
        - NOT_REQUESTED
    - type: string
NotificationControlRm:
  anyOf:
    - type: string
      enum:
        - REQUESTED
        - NOT_REQUESTED
    - type: string
  nullable: true
QoSResourceType:
  anyOf:
    - type: string
      enum:
        - NON_GBR
        - NON_CRITICAL_GBR
```



```

    - CRITICAL_GBR
  - type: string
QosResourceTypeRm:
  anyOf:
  - type: string
  enum:
  - NON_GBR
  - NON_CRITICAL_GBR
  - CRITICAL_GBR
  - type: string
  nullable: true

```

#

#

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
ArpRm:
  type: object
  properties:
    priorityLevel:
      $ref: '#/components/schemas/ArpPriorityLevel'
    preemptCap:
      $ref: '#/components/schemas/PreemptionCapability'
    preemptVuln:
      $ref: '#/components/schemas/PreemptionVulnerability'
  required:
  - priorityLevel
  - preemptCap
  - preemptVuln
  nullable: true
Ambr:
  type: object
  properties:
    uplink:
      $ref: '#/components/schemas/BitRate'
    downlink:
      $ref: '#/components/schemas/BitRate'
  required:
  - uplink
  - downlink
AmbrRm:
  type: object
  properties:
    uplink:
      $ref: '#/components/schemas/BitRate'
    downlink:
      $ref: '#/components/schemas/BitRate'
  required:
  - uplink
  - downlink
  nullable: true
Dynamic5Qi:
  type: object
  properties:
    resourceType:
      $ref: '#/components/schemas/QosResourceType'
    priorityLevel:
      $ref: '#/components/schemas/5QiPriorityLevel'
    packetDelayBudget:
      $ref: '#/components/schemas/PacketDelBudget'
    packetErrRate:
      $ref: '#/components/schemas/PacketErrRate'
    averWindow:
      $ref: '#/components/schemas/AverWindow'

```

```

    maxDataBurstVol:
      $ref: '#/components/schemas/MaxDataBurstVol'
    required:
      - resourceType
      - priorityLevel
      - packetDelayBudget
      - packetErrRate
  NonDynamic5Qi:
    type: object
    properties:
      priorityLevel:
        $ref: '#/components/schemas/5QiPriorityLevel'
      averWindow:
        $ref: '#/components/schemas/AverWindow'
      maxDataBurstVol:
        $ref: '#/components/schemas/MaxDataBurstVol'
    minProperties: 0

#
# Data Types related to 5G Trace as defined in subclause 5.6
#

#
# SIMPLE DATA TYPES
#
#
# Enumerations
#
  TraceDepth:
    anyOf:
      - type: string
        enum:
          - MINIMUM
          - MEDIUM
          - MAXIMUM
          - MINIMUM_WO_VENDOR_EXTENSION
          - MEDIUM_WO_VENDOR_EXTENSION
          - MAXIMUM_WO_VENDOR_EXTENSION
      - type: string
  TraceDepthRm:
    anyOf:
      - type: string
        enum:
          - MINIMUM
          - MEDIUM
          - MAXIMUM
          - MINIMUM_WO_VENDOR_EXTENSION
          - MEDIUM_WO_VENDOR_EXTENSION
          - MAXIMUM_WO_VENDOR_EXTENSION
      - type: string
    nullable: true

#
# STRUCTURED DATA TYPES
#
  TraceData:
    type: object
    nullable: true
    properties:
      traceRef:
        type: string
        pattern: '^[0-9]{3}[0-9]{2,3}-[A-Fa-f0-9]{6}$'
      traceDepth:
        $ref: '#/components/schemas/TraceDepth'
      neTypeList:
        type: string
        pattern: '^[A-Fa-f0-9]+$'
      eventList:
        type: string
        pattern: '^[A-Fa-f0-9]+$'
      collectionEntityIpv4Addr:
        $ref: '#/components/schemas/Ipv4Addr'
      collectionEntityIpv6Addr:
        $ref: '#/components/schemas/Ipv6Addr'
      interfaceList:
        type: string
        pattern: '^[A-Fa-f0-9]+$'
    required:

```

- traceRef
- traceDepth
- neTypeList
- eventList

```
#
# 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 information and approval	1.0.0
2018-06	CT#80					Approved in CT#80	15.0.0
2018-09	CT#81	CP-182065	0001		F	ProblemDetails	15.1.0
2018-09	CT#81	CP-182065	0002		F	Structure of Amfld	15.1.0
2018-09	CT#81	CP-182065	0012		B	DNAI change notification type	15.1.0
2018-09	CT#81	CP-182065	0015		F	RatType	15.1.0
2018-09	CT#81	CP-182065	0017		B	Definition of DNAI	15.1.0
2018-09	CT#81	CP-182068	0008	1	B	Add support for 5G Trace	15.1.0
2018-09	CT#81	CP-182065	0010	1	F	OpenAPI Corrections	15.1.0
2018-09	CT#81	CP-182065	0013	1	B	Structure of ECGI and NCGI	15.1.0
2018-09	CT#81	CP-182065	0007	1	F	Averaging Window	15.1.0
2018-09	CT#81	CP-182065	0020	1	F	sd pattern	15.1.0
2018-09	CT#81	CP-182065	0021	1	F	Correction of the title of clauses 5.2.4.4 _LinksValueSchema and 5.2.4.5 _ SelfLink	15.1.0
2018-09	CT#81	CP-182065	0023		F	NAI format in 5G System	15.1.0
2018-09	CT#81	CP-182065	0031		F	GroupId Definition	15.1.0
2018-09	CT#81	CP-182065	0009	1	F	Removal of systematic references to the "format" keyword in data type definitions	15.1.0
2018-09	CT#81	CP-182065	0033		F	Naming Conventions	15.1.0
2018-09	CT#81	CP-182065	0027	1	F	5GMMCause and NGAP Cause	15.1.0
2018-09	CT#81	CP-182173	0006	3	F	BackUp AMF Info	15.1.0
2018-09	CT#81	CP-182065	0035		F	URI Scheme	15.1.0
2018-09	CT#81	CP-182065	0024	2	F	Cleanup of the specification	15.1.0
2018-09	CT#81	CP-182065	0025	1	F	Correction to Regular Expression Pattern of GPSI	15.1.0
2018-09	CT#81	CP-182065	0005	4	F	Common data types: NonDynamic5qi and Dynamic5qi	15.1.0
2018-09	CT#81	CP-182065	0028	1	F	Common data type used in both TS 29.505 and TS 29.519	15.1.0
2018-09	CT#81	CP-182065	0029	1	B	n6 Traffic Routing Information data type	15.1.0
2018-09	CT#81	CP-182065	0019	4	F	DefaultQosInformation	15.1.0
2018-09	CT#81	CP-182065	0034	1	F	Update of N3gaLocation data type	15.1.0
2018-09	CT#81	CP-182065	0016	3	F	Mobility Restriction	15.1.0
2018-09	CT#81	CP-182042	0030	3	F	Adding "nullable" property to OpenAPI definitions of data types	15.1.0
2018-09	CT#81	CP-182174	0026	3	F	Presence Reporting Area	15.1.0
2018-09	CT#81	CP-182011	0032	4	F	Adding age of location, geographic information and other missing ones in the UserLocation type	15.1.0
2018-09	CT#81	CP-182183	0036	1	B	Common data type for data change notification	15.1.0
2018-09	CT#81	CP-182065	0037		F	API version number update	15.1.0

History

Document history		
V15.0.0	September 2018	Publication
V15.1.0	October 2018	Publication