ETSI GS MEC 012 V2.1.1 (2019-12)

Multi-access Edge Computing (MEC); Radio Network Information API

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Contents

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Foreword

This Group Specification (GS) has been produced by ETSI Industry Specification Group (ISG) Multi-access Edge Computing (MEC).

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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1 Scope

The present document focuses on the Radio Network Information MEC service. It describes the message flows and the required information. The present document also specifies the RESTful API with the data model.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://docbox.etsi.org/Reference.

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The following referenced documents are necessary for the application of the present document.

[1] ETSI GS MEC 001: "Multi-access Edge Computing (MEC) Terminology".

[2] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".

NOTE: Available at https://tools.ietf.org/html/rfc6749.

[3] IETF RFC 6750: "The OAuth 2.0 Authorization Framework: Bearer Token Usage".

NOTE: Available at https://tools.ietf.org/html/rfc6750.

[4] IETF RFC 5246: "The Transport Layer Security (TLS) Protocol Version 1.2".

NOTE: Available at https://tools.ietf.org/html/rfc5246.

[5] IETF RFC 2818: "HTTP Over TLS".

NOTE: Available at https://tools.ietf.org/html/rfc2818.

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI GS MEC 002: "Multi-access Edge Computing (MEC); Phase 2: Use Cases and Requirements".

[i.2] ETSI GS MEC 003: "Multi-access Edge Computing (MEC) Framework and reference architecture".

[i.3] ETSI TS 136 413:"LTE; Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP) (3GPP TS 36 413)".

[i.4] ETSI TS 123 401: "LTE; General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access (3GPP TS 23.401)".

[i.5] ETSI TS 136 214: "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer; Measurements (3GPP TS 36 214)".

[i.6] ETSI GS MEC 011: "Multi-access Edge Computing (MEC) MEC Platform Application Enablement".

[i.7] ETSI TS 136 331:"LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification (3GPP TS 36.331)".

[i.8] ETSI GS MEC 009: "Multi-access Edge Computing (MEC) General principles for MEC Service APIs".

[i.9] OpenAPI Specification.

NOTE: Available at https://github.com/OAI/OpenAPI-Specification.

[i.10] Protocol Buffers Language Specification.

NOTE 1: Available at https://developers.google.com/protocol-buffers/.

NOTE 2: Protocol Buffers Version 3 Language Specification is recommended as it is the official release at the time of publication.

[i.11] ETSI TS 136 314: " Evolved Universal Terrestrial Radio Access (E-UTRA); Layer 2 - Measurements (3GPP TS 36.314)".

[i.12] ETSI TS 136 423: " Evolved Universal Terrestrial Radio Access (E-UTRA); X2 application protocol (X2AP) (3GPP TS 36.423)".

[i.13] ETSI TS 138 331: "5G; NR; Radio Resource Control (RRC); Protocol specification (3GPP TS 38.331)".

[i.14] ETSI TS 138 133: "5G; NR; Requirements for support of radio resource management (3GPP TS 38.133)".

[i.15] ETSI TS 138 101 (all parts): "5G; NR; User Equipment (UE) radio transmission and reception; (3GPP TS 38.101)".

[i.16] ETSI TS 136 133: "Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management (3GPP TS 36.133)".

[i.17] ETSI TS 138 423: "5G; NG-RAN; Xn Application Protocol (XnAP) (3GPP TS 38.423)".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI GS MEC 001 [1] apply.

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI GS MEC 001 [1] and the following apply:

3GPP	3rd Generation Partnership Project
API	Application Programming Interface
DL	DownLink
ECGI	E-UTRAN Cell Global Identifier
E-RAB	E-UTRAN Radio Access Bearer
E-UTRAN	Evolved Universal Terrestrial Radio Access Network
GBR	Guaranteed Bit Rate
GTP	GPRS Tunnelling Protocol
GTP-U	GPRS Tunneling Protocol - User plane
GW	GateWay
HTTP	HyperText Transfer Protocol
HTTPS	HTTP over TLS
IE	Information Element
IP	Internet Protocol
JSON	JavaScript Object Notation
MCC	Mobile Country Code
MMEC	MME Code
MNC	Mobile Network Code
OAI	Open API Initiative
PLMN	Public Land Mobile Network
QCI	Quality Class Indicator
QoS	Quality of Service
PRB	Physical Resource Block
RAB	Radio Access Bearer
REST	REpresentational State Transfer
RFC	Request For Comments
RNI	Radio Network Information
RNIS	Radio Network Information Service
RSRP	Reference Signal Received Power
RSRQ	Reference Signal Received Quality
SGW	Serving Gateway
TEID	Tunnel End Point Identifier
TLS	Transport Layer Security
TMSI	Temporary Mobile Subscriber Entity
UE	User Equipment
UL	Uplink
URI	Uniform Resource Indicator
UTC	Coordinated Universal Time

4 Overview

The present document specifies the Radio Network Information API to support the requirements defined for Multi-access Edge Computing in ETSI GS MEC 002 [i.1].

Clause 5 introduces how Radio Network Information Service (RNIS) may be used by the MEC applications and by the MEC platform. It describes the information flows used for RNI.

The information that can be exchanged over the RNI API is described in clause 6 which provides detailed description on all information elements that are used for RNI.

Clause 7 describes the actual RNI API providing detailed information how information elements are mapped into a RESTful API design.

5 Description of the service (informative)

5.1 RNIS service introduction

Multi-access Edge Computing allows running the MEC applications at the edge of the network where the environment is characterized by low latency, proximity, high bandwidth and exposure to location and up-to-date radio network information. The information on current radio conditions are shared via the MEC platform over Radio Network Information Service.

Radio Network Information Service (RNIS) is a service that provides radio network related information to MEC applications and to MEC platforms. The Radio Network Information Service is available for authorized MEC applications and is discovered over the Mp1 reference point [i.2]. The granularity of the radio network information may be adjusted based on parameters such as information per cell, per User Equipment, per QCI class or it may be requested over period of time. Typical information that may be provided is listed as follows:

- up-to-date radio network information regarding radio network conditions;
- measurement information related to the user plane based on 3GPP specifications;
- information about UEs connected to the radio node(s) associated with the MEC host, their UE context and the related radio access bearers;
- changes on information related to UEs connected to the radio node(s) associated with the MEC host, their UE context and the related radio access bearers.

The Radio Network Information may be used by the MEC applications and MEC platform to optimize the existing services and to provide new type of services that are based on up to date information on radio conditions. An example of MEC application that uses radio network information to optimize current services is video throughput guidance. Throughput guidance radio analytics MEC application uses services of Multi-access Edge Computing to provide the backend video server with a near real-time indication on the throughput estimated to be available at the radio downlink interface in the next time instant. The throughput guidance radio analytics MEC application computes throughput guidance based on the required radio network information it obtains from a MEC service running on the MEC host ETSI GS MEC 002 [i.1].

Radio Network Information may be also used by the MEC platform to optimize the mobility procedures required to support service continuity.

Radio Network Information may cater for a wide range of use cases, where certain MEC application requests a single piece of information using a simple request-response model while other MEC applications subscribe to multiple different notifications regarding information changes. It is reasonable to assume that for simple queries the RESTful methods are used. However there may be cases where the frequency of updates is so high and the amount of information is so large that RESTful methods do not scale anymore. In addition, there may be aspects of one-to-many communications, which cannot be efficiently addressed by RESTful interfaces. For those cases, the Radio Network Information may be provided over the message broker of the MEC platform. The present document does not specify the actual protocol for a message broker but rather addresses the interoperability aspects by defining stage 2 level definitions to different message types of RNI and by defining the message types in JSON and Protobuf format together with the present document. A MEC application queries information on a message broker via the transport information query procedure as defined in ETSI GS MEC 011 [i.6]. In addition, the transport information may be pre-provisioned to the MEC application via configuration.

The following clauses describe how the service consumers interact with the Radio Network Information Service over RNI API to obtain contextual information from the radio access network. The sequence diagrams that are relevant for Radio Network Information are presented.

5.2 Sequence diagrams

5.2.1 Introduction

The service consumers communicate with the Radio Network Information Service over RNI API to get contextual information from the radio access network. Both the MEC application and MEC platform may be service consumers. Radio Network Information may be provided by both the MEC platform and the MEC application.

The Radio Network Information API supports both queries and subscriptions (pub/sub mechanism) that are used over the RESTful API or over the message broker of the MEC platform. A message broker is not specified in detail in the present document, but the sequence diagrams and message types that are used over a message broker are defined. For RESTful architectural style, the present document defines the HTTP protocol bindings.

5.2.2 Sending a request for RAB information

Figure 5.2.2-1 shows a scenario where the service consumer (e.g. a MEC application or a MEC platform) sends a request to receive a cell level Radio Access Bearer information from the cells that are associated with the requested MEC application instance. The response contains information on users in the cells such as the identifiers of the cells, the identifiers associated to UEs in the cells and information on their E-RABs, consisting of the QCI and QoS information.

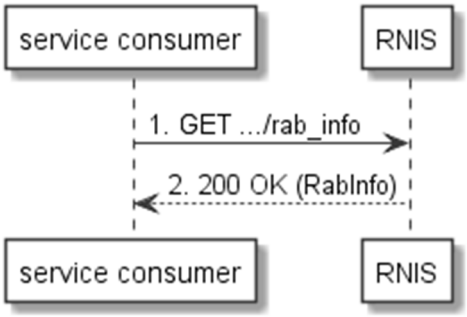

Figure 5.2.2-1: Flow of service consumer requesting Radio Access Bearer information

A service consumer requesting Radio Access Bearer information, as illustrated in figure 5.2.2-1, consists of the following steps:

1) Service consumer sends a GET request to the resource representing the RAB information. The request contains a MEC application instance identifier as an input parameter.

2) RNIS responds with "200 OK" with the message body containing the RabInfo.

5.2.3 Sending a request for PLMN information

Figure 5.2.3-1 shows a scenario where the service consumer (e.g. MEC application or MEC platform) sends a query to receive cell level PLMN information related to specific MEC application instance(s). The response contains information on cells that are associated with the requested MEC application instance(s).

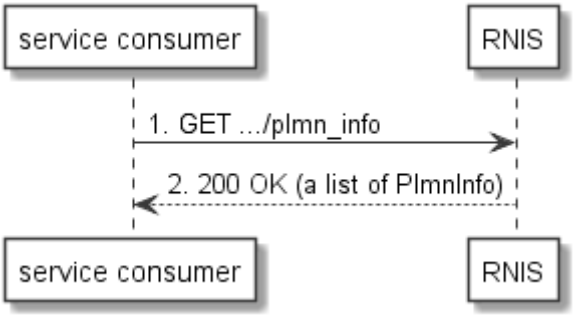

Figure 5.2.3-1: Flow of service consumer requesting PLMN information

A service consumer requesting PLMN information, as illustrated in figure 5.2.3-1, consists of the following steps:

1) Service consumer sends a GET request to the resource representing the PLMN information. The request contains MEC application instance identifier(s) as an input parameter.

2) RNIS responds with "200 OK" with the message body containing the list of PlmnInfo associated with the requested MEC application instance(s).

5.2.4 Sending a request for S1 bearer information

With the S1 bearer information acquired from the RNIS, the service consumer (e.g. the MEC application or the MEC platform) for example optimizes the relocation of MEC applications, or uses the acquired information for managing the traffic rules for the related application instances. Figure 5.2.4-1 shows a scenario where the MEC application or the MEC platform sends a query to receive the S1 bearer information.

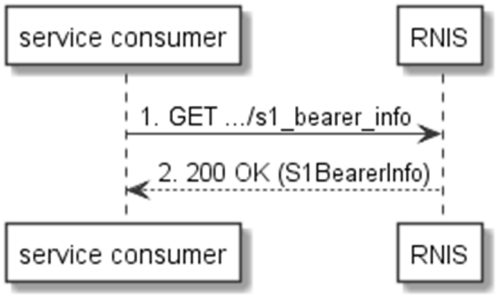

Figure 5.2.4-1: Flow of service consumer requesting S1 bearer information

Requesting S1 bearer information, as illustrated in figure 5.2.4-1, consists of the following steps:

1) Service consumer sends a GET request to the resource representing the S1 bearer information.

2) RNIS responds with "200 OK" with the message body containing the S1 bearer information.

5.2.4a Sending a request for Layer 2 measurements information

Figure 5.2.4a-1 shows a scenario where the service consumer (e.g. a MEC application or a MEC platform) sends a request to receive the Layer 2 measurements information from one or more eNBs that are associated with the requested MEC application instance. The response contains information of the Layer 2 measurements performed by the eNBs and/or the UEs as specified in ETSI TS 136 314 [i.11].

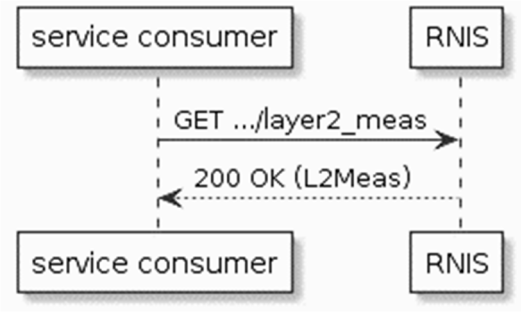

Figure 5.2.4a-1: Flow of service consumer requesting Layer 2 measurements information

A service consumer requesting Layer 2 measurements information, as illustrated in figure 5.2.4a-1, consists of the following steps:

1) Service consumer sends a GET request to the resource representing the Layer 2 measurements information.

2) RNIS responds with "200 OK" with the message body containing the Layer 2 measurement information.

5.2.5 REST based subscribe-notify model

5.2.5.1 Subscribing to RNI event notifications

To receive notifications on selected RNI events, the service consumer creates a subscription to certain specific RNI event that is available at RNIS. Figure 5.2.5.1-1 shows a scenario where the service consumer uses REST based procedures to create a subscription for RNI event notifications.

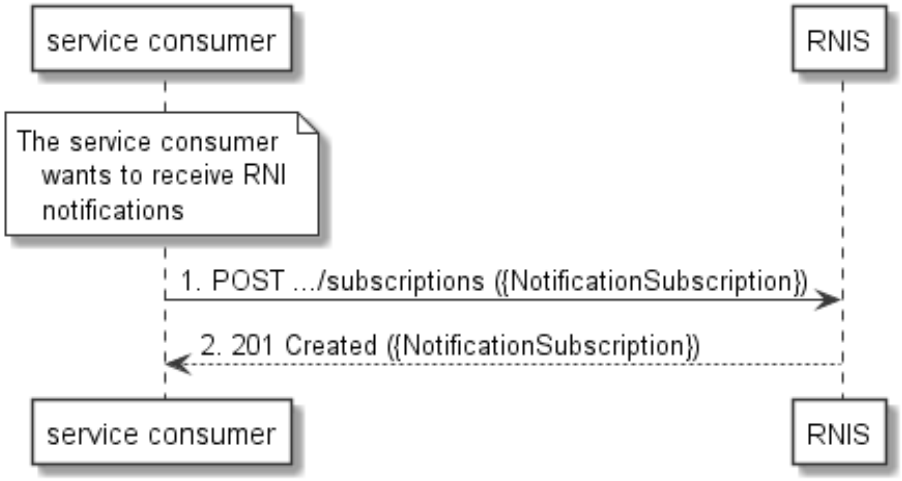

Figure 5.2.5.1-1: Flow of subscribing to the RNI event notifications

Subscribing to the RNI event notifications, as illustrated in figure 5.2.5.1-1, consists of the following steps.

When the service consumer wants to receive notifications about the RNI events, it creates a subscription to the RNI event notifications:

1) The service consumer sends a POST request with the message body containing the {NotificationSubscription} data structure to the resource representing RNI subscription. The variable {NotificationSubscription} is replaced with the data type specified for different RNI event subscriptions as specified in clauses 6.3.2 through 6.3.9 and in 6.3.11 , and it defines the subscribed event, the filtering criteria and the address where the service consumer wishes to receive the RNI event notifications.

2) RNIS sends "201 Created" response with the message body containing the data structure specific to that RNI event subscription. The data structure contains the address of the resource created and the subscribed RNI event type.

5.2.5.2 Receiving notification on expiry of RNI event subscription

RNIS may define an expiry time for the RNI event subscription. In case expiry time is used, the time will be included in the {NotificationSubscription} data structure that is included in the response message to the subscription. Prior the expiry, RNIS will also send a notification to the service consumer that owns the subscription.

Figure 5.2.5.2-1 shows a scenario where the service consumer receives a subscription expiry notification for the existing subscription.

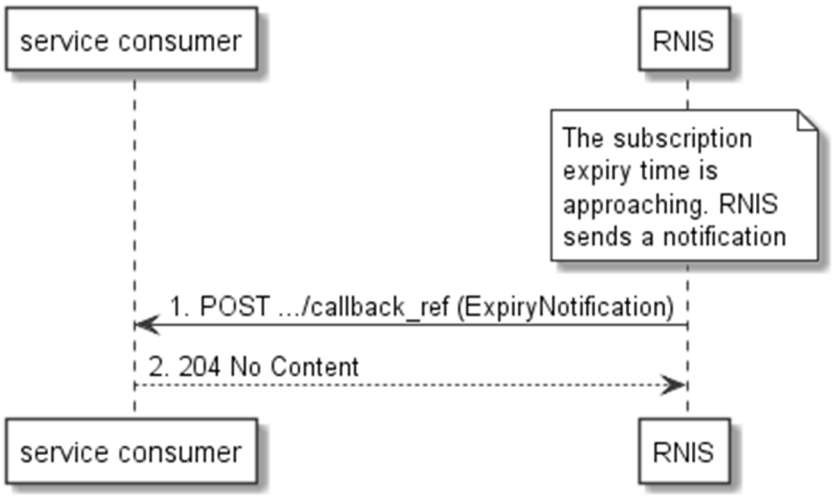

Figure 5.2.5.2-1: Flow of RNIS sending a notification on expiry of the subscription

Sending a notification on expiry of the subscription, as illustrated in figure 5.2.5.2-1 consists of the following steps. If RNIS has defined an expiry time for the subscription, RNIS will send a notification prior the expiry:

1) RNIS sends a POST request to the callback reference address included by the service consumer in the subscription request. The POST request contains a data structure ExpiryNotification.

2) Service consumer sends a "204 No Content" response.

5.2.5.3 Updating subscription for RNI event notifications

Figure 5.2.5.3-1 shows a scenario where the service consumer needs to update an existing subscription for a RNI event notification. The subscription update is triggered e.g. by the need to change the existing subscription, or due to the expiry of the subscription.

Figure 5.2.5.3-1: Flow of service consumer updating subscription for RNI event notifications

Updating subscription for RNI event notifications, as illustrated in figure 5.2.5.3-1, consists of the following steps.

When the service consumer needs to modify an existing subscription for RNI event notifications, it can update the corresponding subscription as follows:

1) Service consumer updates the subscription resource by sending a PUT request to the resource representing the RNI event subscription that was created with the modified data structure specific to that RNI event subscription.

2) RNIS returns "200 OK" with the message body containing the accepted data structure specific to that RNI event subscription.

5.2.5.4 Unsubscribing from RNI event notifications

When the service consumer does not want to receive notifications anymore after subscribing to RNI events, the service consumer unsubscribes from the RNI event notifications. Figure 5.2.5.4-1 shows a scenario where the service consumer uses REST based procedures to delete the subscription for RNI event notifications.

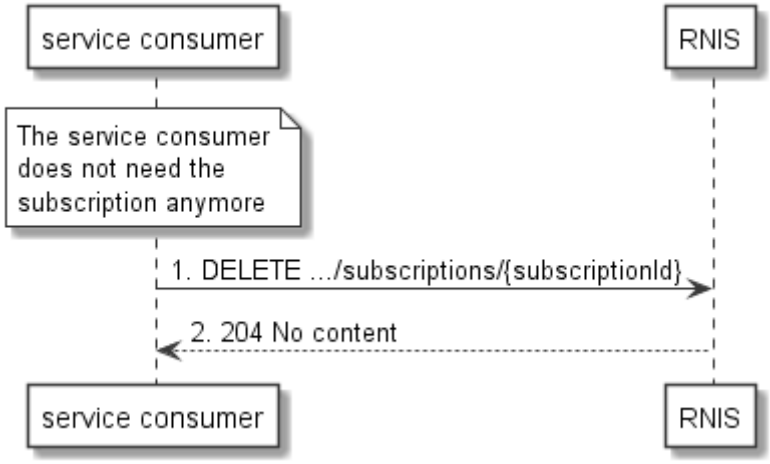

Figure 5.2.5.4-1: Flow of unsubscribing from the RNI event notifications

Unsubscribing from the RNI event notifications, as illustrated in figure 5.2.5.4-1, consists of the following steps.

When the service consumer does not want to receive the notifications anymore, it can unsubscribe from the RNI notification events by deleting the subscription:

1) Service consumer sends a DELETE request to the resource representing the RNI event subscription that was created.

2) RNIS sends "204 No content" response.

5.2.6 Receiving RNI event notifications about cell changes

Figure 5.2.6-1 presents the scenario where the RNIS sends RNI event notification on cell changes to the service consumer. The notification contains the identifiers related to the UE and both the source and target cells.

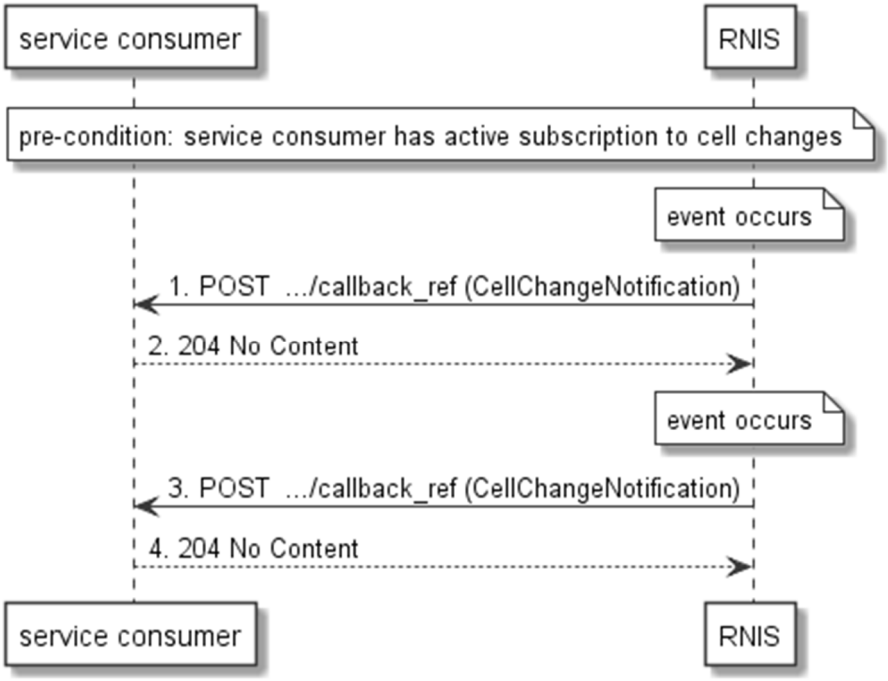

Figure 5.2.6-1: Flow of receiving RNI event notifications on cell changes

Receiving RNI event notifications on cell changes, as illustrated in figure 5.2.6-1, consists of the following steps:

1) RNIS sends a POST request with the message body containing the CellChangeNotification data structure to the callback reference address included by the service consumer in the RNI cell change event subscription.

2) Service consumer sends a "204 No Content" response to the RNIS.

5.2.7 Receiving RNI event notifications about Radio Access Bearer establishment

Figure 5.2.7-1 presents the scenario where the RNIS sends RNI event notification on RAB establishment to the service consumer.

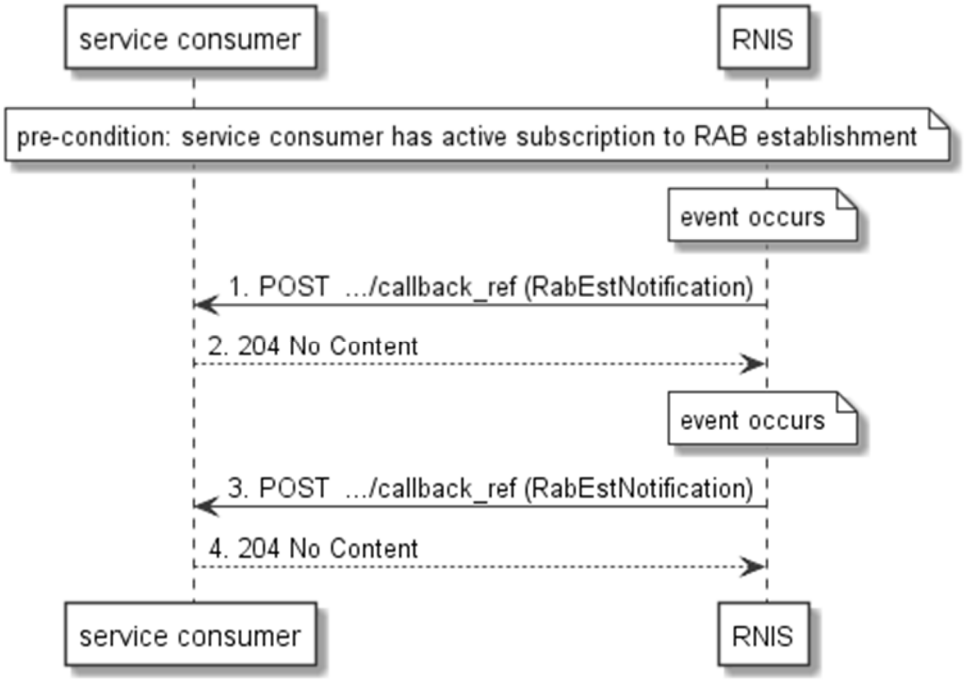

Figure 5.2.7-1: Flow of receiving RNI event notifications on RAB establishment

Receiving RNI event notifications on RAB establishment, as illustrated in figure 5.2.7-1, consists of the following steps:

1) RNIS sends a POST request with the message body containing the RabEstNotification data structure to the callback reference address included by the service consumer in the RNI RAB establishment event subscription.

2) Service consumer sends a "204 No Content" response to the RNIS.

5.2.8 Receiving RNI event notifications about Radio Access Bearer modification

Figure 5.2.8-1 presents the scenario where the RNIS sends RNI event notification on RAB modification to the service consumer.

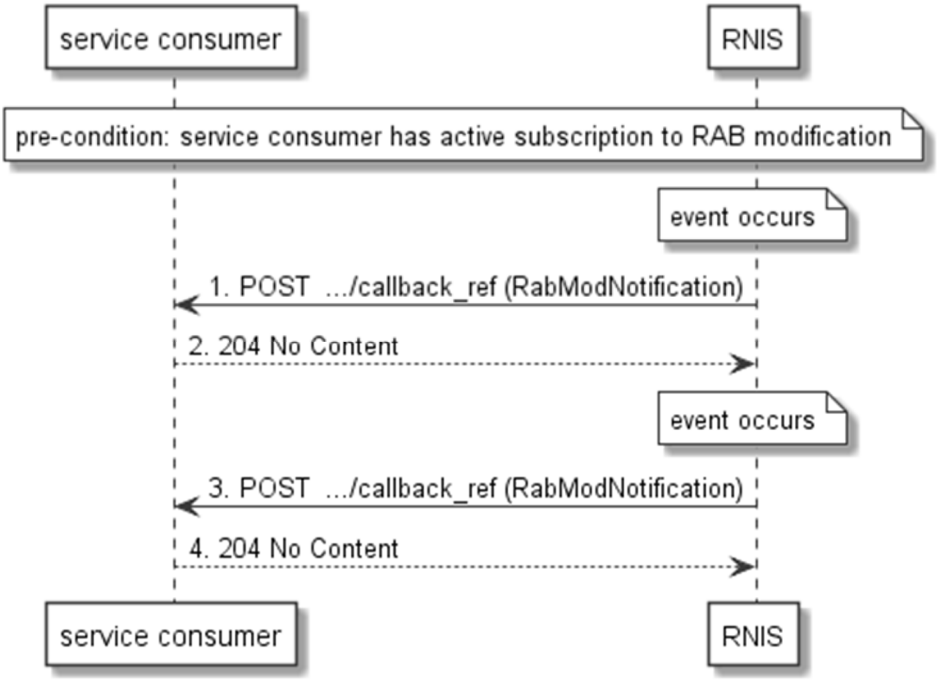

Figure 5.2.8-1: Flow of receiving RNI event notifications on RAB modification

Receiving RNI event notifications on RAB establishment, as illustrated in figure 5.2.8-1, consists of the following steps:

1) RNIS sends a POST request with the message body containing the RabModNotification data structure to the callback reference address included by the service consumer in the RNI RAB modification event subscription.

2) Service consumer sends a "204 No Content" response to the RNIS.

5.2.9 Receiving RNI event notifications about Radio Access Bearer release

Figure 5.2.9-1 presents the scenario where the RNIS sends RNI event notification on RAB release to the service consumer.

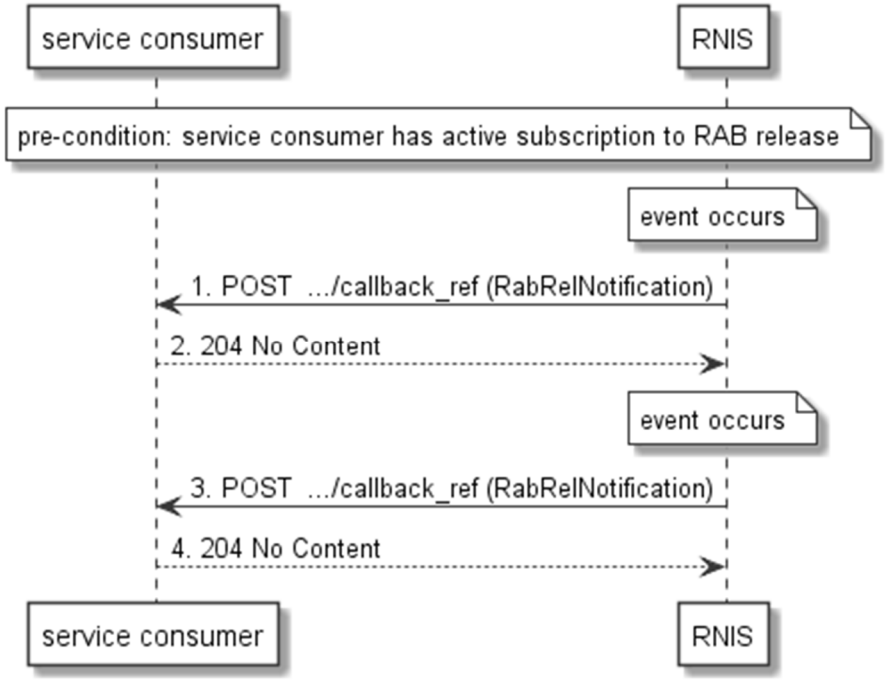

Figure 5.2.9-1: Flow of receiving RNI event notifications on RAB release

Receiving RNI event notifications on RAB release, as illustrated in figure 5.2.9-1, consists of the following steps:

1) RNIS sends a POST request with the message body containing the RabRelNotification data structure to the callback reference address included by the service consumer in the RNI RAB release event subscription.

2) Service consumer sends a "204 No Content" response to the RNIS.

5.2.10 Receiving RNI event notifications about UE measurement reports

Figure 5.2.10-1 presents the scenario where the RNIS sends RNI event notification on UE measurement report to the service consumer.

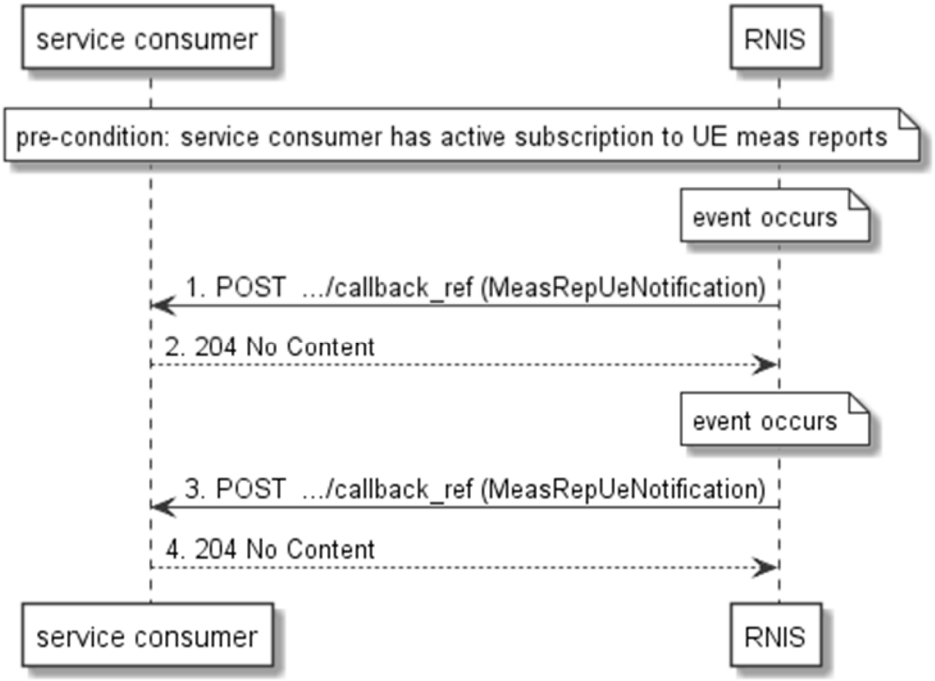

Figure 5.2.10-1: Flow of receiving RNI event notifications on UE measurement reports

Receiving RNI event notifications on UE measurement reports, as illustrated in figure 5.2.10-1, consists of the following steps:

1) RNIS sends a POST request with the message body containing the MeasRepUeNotification data structure to the callback reference address included by the service consumer in the RNI UE measurement report event subscription.

2) Service consumer sends a "204 No Content" response to the RNIS.

5.2.11 Receiving RNI event notifications about UE timing advance

Figure 5.2.11-1 presents the scenario where the RNIS sends RNI event notification on UE timing advance to the service consumer.

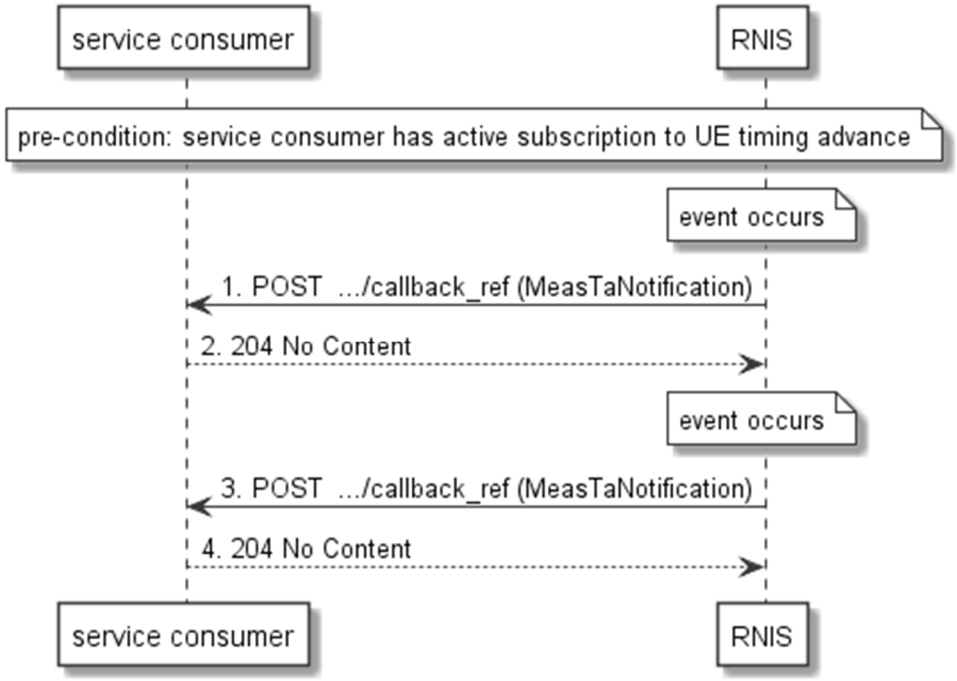

Figure 5.2.11-1: Flow of receiving RNI event notifications on UE timing advance

Receiving RNI event notifications on UE timing advance, as illustrated in figure 5.2.11-1, consists of the following steps:

1) RNIS sends a POST request with the message body containing the MeasTaNotification data structure to the callback reference address included by the service consumer in the RNI UE timing advance event subscription.

2) Service consumer sends a "204 No Content" response to the RNIS.

5.2.12 Receiving RNI event notifications about carrier aggregation reconfiguration

Figure 5.2.12-1 presents the scenario where the RNIS sends RNI event notification on carrier aggregation reconfiguration to the service consumer.

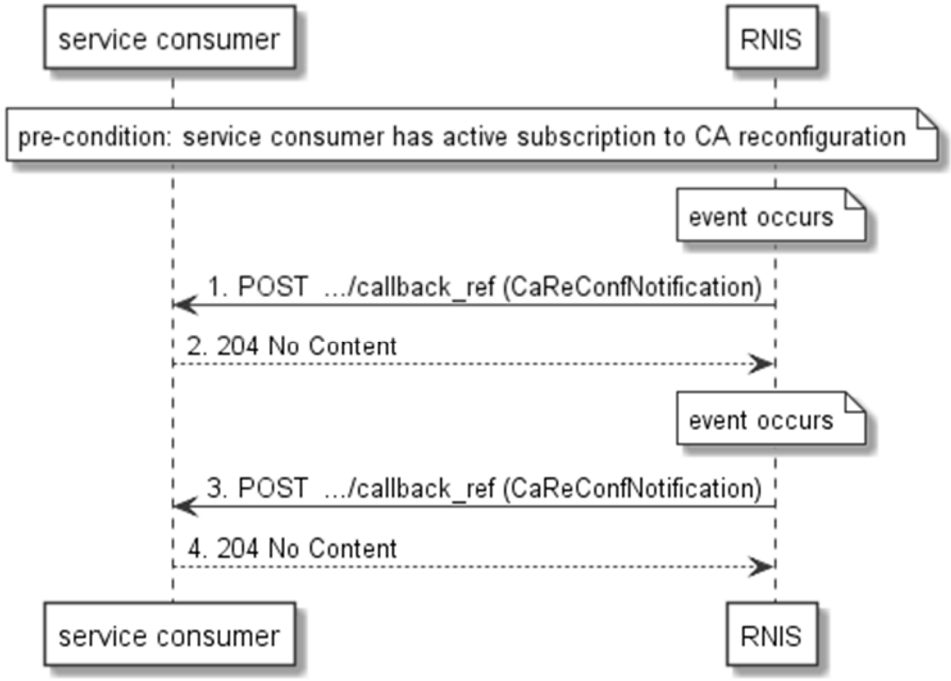

Figure 5.2.12-1: Flow of receiving RNI event notifications on carrier aggregation reconfiguration

Receiving RNI event notifications on carrier aggregation reconfiguration, as illustrated in figure 5.2.12-1, consists of the following steps:

1) RNIS sends a POST request with the message body containing the CaReConfNotification data structure to the callback reference address included by the service consumer in the RNI carrier aggregation reconfiguration event subscription.

2) Service consumer sends a "204 No Content" response to the RNIS.

5.2.13 Receiving RNI event notifications about S1 bearer

Figure 5.2.13-1 presents the scenario where the RNIS sends RNI event notification on S1 bearer to the service consumer.

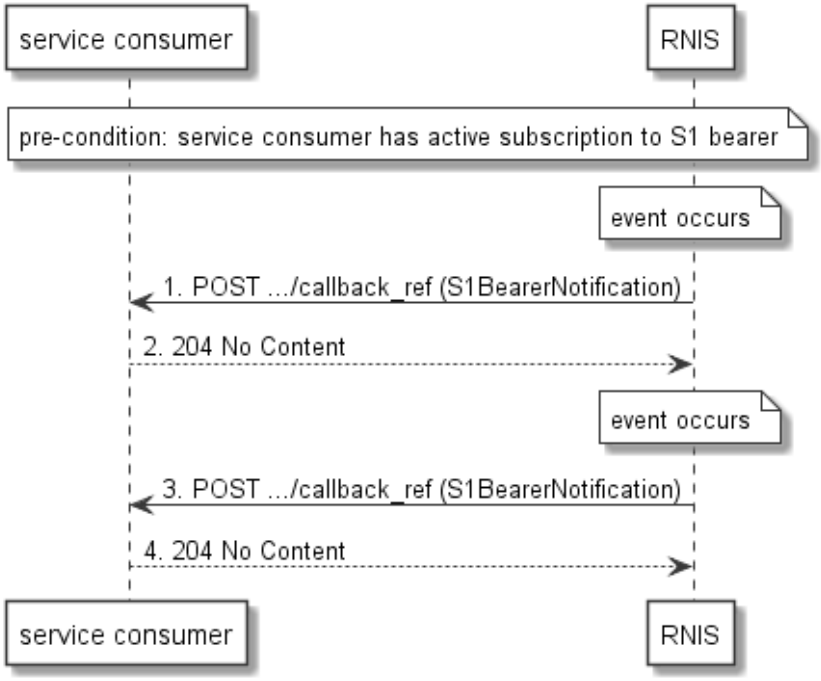

Figure 5.2.13-1: Flow of receiving RNI event notifications on S1 bearer

Receiving RNI event notifications on S1 bearer, as illustrated in figure 5.2.13-1, consists of the following steps:

1) RNIS sends a POST request with the message body containing the S1BearerNotification data structure to the callback reference address included by the service consumer in the RNI UE S1 bearer event subscription.

2) Service consumer sends a "204 No Content" response to the RNIS.

5.2.14 Receiving RNI event notifications about 5G UE measurement reports

Figure 5.2.14-1 presents the scenario where the RNIS sends RNI event notification on 5G UE measurement report to the service consumer.

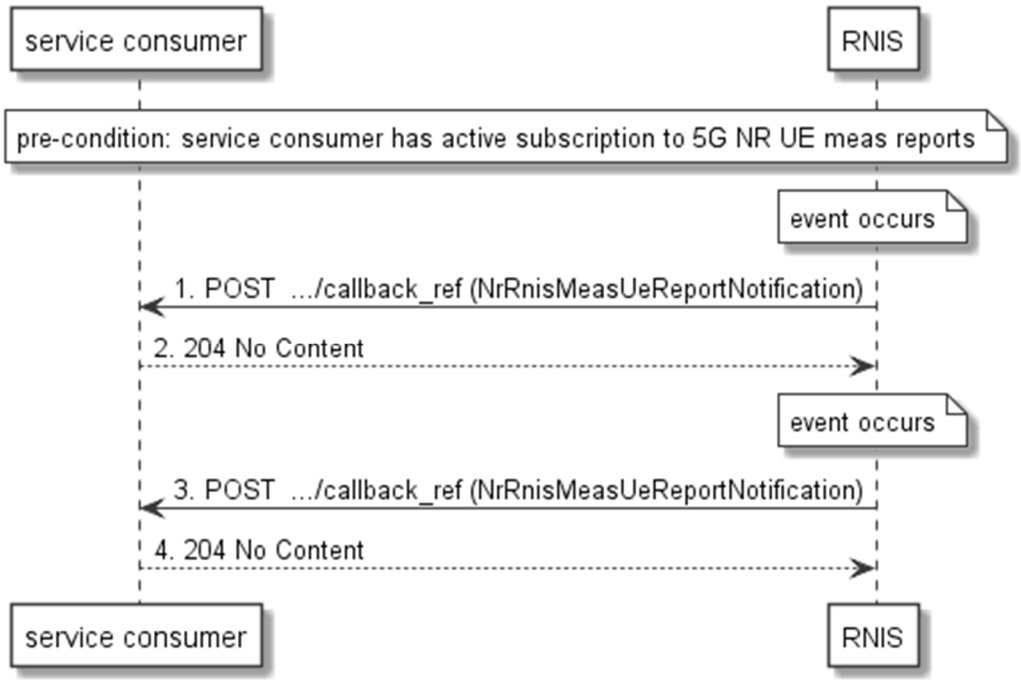

Figure 5.2.14-1: Flow of receiving RNI event notifications on 5G UE measurement reports

Receiving RNI event notifications on 5G UE measurement reports, as illustrated in figure 5.2.14-1, consists of the following steps:

1) RNIS sends a POST request with the message body containing the NrMeasRepUeNotification data structure to the callback reference address included by the service consumer in the RNI 5G UE measurement report event subscription.

2) Service consumer sends a "204 No Content" response to the RNIS.

6 Data model

6.1 Introduction

The following clauses provide the description of the data model.

6.2 Resource data types

6.2.1 Introduction

This clause defines data structures that shall be used in the resource representations.

6.2.2 Type: PlmnInfo

This type represents the information on Mobile Network(s), which a MEC application instance is associated to.

The attributes of the PlmnInfo shall follow the notations provided in table 6.2.2-1.

Table 6.2.2-1: Attributes of the PlmnInfo

Attribute name	Data type	Cardinality	Description
timeStamp	TimeStamp	0..1	Time stamp.
appInstanceId	String	1	Unique identifier for the MEC application instance.
plmn	Plmn	1..N	Public Land Mobile Network Identity.

6.2.3 Type: RabInfo

This type represents the information on existing E-RABs that are associated with a specific MEC application instance.

The attributes of the RabInfo shall follow the notations provided in table 6.2.3-1.

Table 6.2.3-1: Attributes of the RabInfo

Attribute name	Data type	Cardinality	Description
timeStamp	TimeStamp	0..1	Time stamp.
appInstanceId	String	1	Unique identifier for the MEC application instance.
requestId	String	1	Unique identifier allocated by the service consumer for the RAB Information request.
cellUserInfo	Structure (inlined)	0..N	The information on users per cell as defined below.
>ecgi	Ecgi	1	E-UTRAN Cell Global Identifier.
>ueInfo	Structure (inlined)	1..N	Information on UEs in the specific cell as defined below.
>>associateId	AssociateId	0..N	0 to N identifiers to associate the event for a specific UE or flow.
>>erabInfo	Structure (inlined)	1..N	Information on E-RAB as defined below.
>>>erabId	Integer	1	The attribute that uniquely identifies a Radio Access bearer for specific UE as defined in ETSI TS 136 413 [i.3].
>>>erabQosParameters	Structure (inlined)	0..1	QoS parameters for the E-RAB as defined below.
>>>>qci	Integer	1	QoS Class Identifier as defined in ETSI TS 123 401 [i.4].
>>>>qosInformation	Structure (inlined)	0..1	The QoS information for the E-RAB.
>>>>>erabMbrDl	Integer	1	This attribute indicates the maximum downlink E-RAB Bit Rate as defined in ETSI TS 123 401 [i.4] for this bearer.
>>>>>erabMbrUl	Integer	1	This attribute indicates the maximum uplink E-RAB Bit Rate as defined in ETSI TS 123 401 [i.4] for this bearer.
>>>>>erabGbrDl	Integer	1	This attribute indicates the guaranteed downlink E-RAB Bit Rate as defined in ETSI TS 123 401 [i.4] for this bearer.
>>>>>erabGbrUl	Integer	1	This attribute indicates the guaranteed uplink E-RAB Bit Rate as defined in ETSI TS 123 401 [i.4] for this bearer.

6.2.4 Type: S1BearerInfo

This type represents the information on S1-U bearer.

The attributes of the S1BearerInfo shall follow the notations provided in table 6.2.4-1.

Table 6.2.4-1 Attributes of the S1BearerInfo

Attribute name	Data type	Cardinality	Description
timeStamp	TimeStamp	0..1	Time stamp.
s1UeInfo	Structure (inlined)	1..N	Information on a specific UE as defined below.
>tempUeId	Structure (inlined)	0..1	The temporary identifier allocated for the specific UE as defined below.
>>mmec	String	1	MMEC as defined in ETSI TS 136 413 [i.3].
>>mtmsi	String	1	M-TMSI as defined in ETSI TS 136 413 [i.3].
>associateId	AssociateId	1..N	1 to N identifiers to associate the information for a specific UE or flow.
>ecgi	Ecgi	1..N	E-UTRAN Cell Global Identifier.
>s1BearerInfoDetailed	Structure (inlined)	1..N	S1 bearer information as defined below.
>>erabId	Integer	1	The attribute that uniquely identifies a S1 bearer for a specific UE, as defined in ETSI TS 136 413 [i.3].
>>enbInfo	Structure (inlined)	1	S1 bearer information on eNB side as defined below.
>>>ipAddress	String	1	eNB transport layer address of this S1 bearer.
>>>tunnelId	String	1	eNB GTP-U TEID of this S1 bearer.
>>sGwInfo	Structure (inlined)	1	S1 bearer information on GW side as defined below.
>>>ipAddress	String	1	SGW transport layer address of this S1 bearer.
>>>tunnelId	String	1	SGW GTP-U TEID of this S1 bearer.

6.2.4a Type: L2Meas

This type represents the information on the Layer 2 measurements information from one or more eNBs that are associated with the requested MEC application instance.

The attributes of the L2Meas shall follow the notations provided in table 6.2.4a-1.

Table 6.2.4a-1: Attributes of the L2Meas

Attribute name	Data type	Cardinality	Description
timestamp	TimeStamp	0..1	Time stamp.
cellInfo	Structure (inlined)	0..N	The per cell measurement information as defined below.
>ecgi	Ecgi	1	E-UTRAN Cell Global Identifier.
>dl_gbr_prb_usage_cell	Integer (0..100)	0..1	It indicates the PRB usage for downlink GBR traffic, as defined in ETSI TS 136 314 [i.11] and ETSI TS 136 423 [i.12].
>ul_gbr_prb_usage_cell	Integer (0..100)	0..1	It indicates (in percentage) the PRB usage for uplink GBR traffic, as defined in ETSI TS 136 314 [i.11] and ETSI TS 136 423 [i.12].
>dl_nongbr_prb_usage_cell	Integer (0..100)	0..1	It indicates (in percentage) the PRB usage for downlink non-GBR traffic, as defined in ETSI TS 136 314 [i.11] and ETSI TS 136 423 [i.12].
>ul_nongbr_prb_usage_cell	Integer (0..100)	0..1	It indicates (in percentage) the PRB usage for uplink non-GBR traffic, as defined in ETSI TS 136 314 [i.11] and ETSI TS 136 423 [i.12].
>dl_total_prb_usage_cell	Integer (0..100)	0..1	It indicates (in percentage) the PRB usage for total downlink traffic, as defined in ETSI TS 136 314 [i.11] and ETSI TS 136 423 [i.12].

Attribute name	Data type	Cardinality	Description
>ul_total_prb_usage_cell	Integer (0..100)	0..1	It indicates (in percentage) the PRB usage for total uplink traffic, as defined in ETSI TS 136 314 [i.11] and ETSI TS 136 423 [i.12].
>received_dedicated_preambles_cell	Integer (0..100)	0..1	It indicates (in percentage) the received dedicated preamples, as defined in ETSI TS 136 314 [i.11].
>received_randomly_selected _preambles_low_range_cell	Integer (0..100)	0..1	It indicates (in percentage) the received randomly selected preambles in the low range, as defined in ETSI TS 136 314 [i.11].
>received_randomly_selected _preambles_high_range_cell	Integer (0..100)	0..1	It indicates (in percentage) the received randomly selected preambles in the high range, as defined in ETSI TS 136 314 [i.11].
>number_of_active_ue_dl_gbr_cell	Integer	0..1	It indicates the number of active UEs with downlink GBR traffic, as defined in ETSI TS 136 314 [i.11].
>number_of_active_ue_ul_gbr_cell	Integer	0..1	It indicates the number of active UEs with uplink GBR traffic, as defined in ETSI TS 136 314 [i.11].
>number_of_active_ue_dl_nongbr_cell	Integer	0..1	It indicates the number of active UEs with downlink non-GBR traffic, as defined in ETSI TS 136 314 [i.11].
>number_of_active_ue_ul_nongbr_cell	Integer	0..1	It indicates the number of active UEs with uplink non-GBR traffic, as defined in ETSI TS 136 314 [i.11].
>dl_gbr_pdr_cell	Integer (0..100)	0..1	It indicates the packet discard rate in percentage of the downlink GBR traffic in a cell, as defined in ETSI TS 136 314 [i.11].
>ul_gbr_pdr_cell	Integer (0..100)	0..1	It indicates the packet discard rate in percentage of the uplink GBR traffic in a cell, as defined in ETSI TS 136 314 [i.11].
>dl_nongbr_pdr_cell	Integer (0..100)	0..1	It indicates the packet discard rate in percentage of the downlink non-GBR traffic in a cell, as defined in ETSI TS 136 314 [i.11].
>ul_nongbr_pdr_cell	Integer (0..100)	0..1	It indicates the packet discard rate in percentage of the uplink non-GBR traffic in a cell, as defined in ETSI TS 136 314 [i.11].
cellUEInfo	Structure (inlined)	0..N	The per cell per UE layer 2 measurements information as defined below.
>ecgi	Ecgi	1	E-UTRAN Cell Global Identifier.
>associateId	AssociateId	1	Identifier to associate the information for a specific UE or flow.
>dl_gbr_delay_ue	Integer	0..1	It indicates the packet delay of the downlink GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
>ul_gbr_delay_ue	Integer	0..1	It indicates the packet delay of the uplink GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
>dl_nongbr_delay_ue	Integer	0..1	It indicates the packet delay of the downlink non-GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
>ul_nongbr_delay_ue	Integer	0..1	It indicates the packet delay of the uplink non-GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].

Attribute name	Data type	Cardinality	Description
>dl_gbr_pdr_ue	Integer (0..100)	0..1	It indicates the packet discard rate in percentage of the downlink GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
>ul_gbr_pdr_ue	Integer (0..100)	0..1	It indicates the packet discard rate in percentage of the uplink GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
>dl_nongbr_pdr_ue	Integer (0..100)	0..1	It indicates the packet discard rate in percentage of the downlink non-GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
>ul_nongbr_pdr_ue	Integer (0..100)	0..1	It indicates the packet discard rate in percentage of the uplink non-GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
>dl_gbr_throughput_ue	Integer	0..1	It indicates the scheduled throughput of the downlink GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
>ul_gbr_throughput_ue	Integer	0..1	It indicates the scheduled throughput of the uplink GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
>dl_nongbr_throughput_ue	Integer	0..1	It indicates the scheduled throughput of the downlink non-GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
>ul_nongbr_throughput_ue	Integer	0..1	It indicates the scheduled throughput of the uplink non-GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
>dl_gbr_data_volume_ue	Integer	0..1	It indicates the data volume of the downlink GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
>ul_gbr_data_volume_ue	Integer	0..1	It indicates the data volume of the uplink GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
>dl_nongbr_data_volume_ue	Integer	0..1	It indicates the data volume of the downlink non-GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
>ul_nongbr_data_volume_ue	Integer	0..1	It indicates the data volume of the uplink non-GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].

6.3 Subscription data types

6.3.1 Introduction

This clause defines data structures for subscriptions.

6.3.2 Type: CellChangeSubscription

This type represents a subscription to cell change notifications from Radio Network Information Service.

Table 6.3.2-1: Attributes of the CellChangeSubscription

Attribute name	Data type	Cardinality	Description
subscriptionType	String	1	Shall be set to "CellChangeSubscription".
callbackReference	URI	1	URI selected by the service consumerto receive notifications on the subscribed RNIS information. This shall be included both in the request and in response.
_links	Structure (inlined)	0..1	Hyperlink related to the resource. This shall be only included in the HTTP responses and in HTTP PUT requests.
>self	LinkType	1	Self referring URI. The URI shall be unique within the RNI API as it acts as an ID for the subscription.
filterCriteriaAssocHo	Structure (inlined)	1	List of filtering criteria for the subscription. Any filtering criteria from below, which is included in the request, shall also be included in the response.
>appInstanceId	String	0..1	Unique identifier for the MEC application instance.
>associateId	AssociateId	0..N	0 to N identifiers to associate the information for a specific UE or flow.
>ecgi	Ecgi	0..N	E-UTRAN Cell Global Identifier.
>hoStatus	Enum	0..N	In case hoStatus is not included in the subscription request, the default value 3 = COMPLETED shall be used and included in the response: 1 = IN_PREPARATION. 2 = IN_EXECUTION. 3 = COMPLETED. 4 = REJECTED. 5 = CANCELLED.
expiryDeadline	TimeStamp	0..1	Time stamp.

6.3.3 Type: RabEstSubscription

This type represents a subscription to RAB establishment notifications from Radio Network Information Service.

Table 6.3.3-1: Attributes of the RabEstSubscription

Attribute name	Data type	Cardinality	Description
subscriptionType	String	1	Shall be set to "RabEstSubscription".
callbackReference	URI	1	URI selected by the service consumer to receive notifications on the subscribed RNIS information. This shall be included both in the request and in response.
_links	Structure (inlined)	0..1	Hyperlink related to the resource. This shall be only included in the HTTP responses and in HTTP PUT requests.
>self	LinkType	1	Self referring URI. The URI shall be unique within the RNI API as it acts as an ID for the subscription.
filterCriteriaQci	Structure (inlined)	1	List of filtering criteria for the subscription. Any filtering criteria from below, which is included in the request, shall also be included in the response.
>appInstanceId	String	0..1	Unique identifier for the MEC application instance.
>ecgi	Ecgi	0..N	E-UTRAN Cell Global Identifier.
>qci	Integer	1	QoS Class Identifier as defined in ETSI TS 123 401 [i.4].
expiryDeadline	TimeStamp	0..1	Time stamp.

6.3.4 Type: RabModSubscription

This type represents a subscription to RAB modification notifications from Radio Network Information Service.

Table 6.3.4-1: Attributes of the RabModSubscription

Attribute name	Data type	Cardinality	Description
subscriptionType	String	1	Shall be set to "RabModSubscription".
callbackReference	URI	1	URI selected by the service consumer to receive notifications on the subscribed RNIS information. This shall be included both in the request and in response.
_links	Structure (inlined)	0..1	Hyperlink related to the resource. This shall be only included in the HTTP responses and in HTTP PUT requests.
>self	LinkType	1	Self referring URI. The URI shall be unique within the RNI API as it acts as an ID for the subscription.
filterCriteriaQci	Structure (inlined)	1	List of filtering criteria for the subscription. Any filtering criteria from below, which is included in the request, shall also be included in the response.
>appInstanceId	String	0..1	Unique identifier for the MEC application instance.
>erabId	Integer	1	The attribute that uniquely identifies a Radio Access bearer for specific UE as defined in ETSI TS 136 413 [i.3].
>ecgi	Ecgi	0..N	E-UTRAN Cell Global Identifier.
>qci	Integer	1	QoS Class Identifier as defined in ETSI TS 123 401 [i.4].
expiryDeadline	TimeStamp	0..1	Time stamp.

6.3.5 Type: RabRelSubscription

This type represents a subscription to RAB release notifications from Radio Network Information Service.

Table 6.3.5-1: Attributes of the RabRelSubscription

Attribute name	Data type	Cardinality	Description
subscriptionType	String	1	Shall be set to "RabRelSubscription".
callbackReference	URI	1	URI selected by the service consumer to receive notifications on the subscribed RNIS information. This shall be included both in the request and in response.
_links	Structure (inlined)	0..1	Hyperlink related to the resource. This shall be only included in the HTTP responses and in HTTP PUT requests.
>self	LinkType	1	Self referring URI. The URI shall be unique within the RNI API as it acts as an ID for the subscription.
filterCriteriaQci	Structure (inlined)	1	List of filtering criteria for the subscription. Any filtering criteria from below, which is included in the request, shall also be included in the response.
>appInstanceId	String	0..1	Unique identifier for the MEC application instance.
>erabId	Integer	1	The attribute that uniquely identifies a Radio Access bearer for specific UE as defined in ETSI TS 136 413 [i.3].
>ecgi	Ecgi	0..N	E-UTRAN Cell Global Identifier.
>qci	Integer	1	QoS Class Identifier as defined in ETSI TS 123 401 [i.4].
expiryDeadline	TimeStamp	0..1	Time stamp.

6.3.6 Type: MeasRepUeSubscription

This type represents a subscription to UE measurement report notifications from Radio Network Information Service for UEs served by E-UTRA Cells.

Table 6.3.6-1: Attributes of the MeasRepUeSubscription

Attribute name	Data type	Cardinality	Description
subscriptionType	String	1	Shall be set to "MeasRepUeSubscription".
callbackReference	URI	1	URI selected by the service consumer to receive notifications on the subscribed RNIS information. This shall be included both in the request and in response.

Attribute name	Data type	Cardinality	Description
_links	Structure (inlined)	0..1	Hyperlink related to the resource. This shall be only included in the HTTP responses and in HTTP PUT requests.
>self	LinkType	1	Self referring URI. The URI shall be unique within the RNI API as it acts as an ID for the subscription.
filterCriteriaAssocTri	Structure (inlined)	1	List of filtering criteria for the subscription. Any filtering criteria from below, which is included in the request, shall also be included in the response.
>appInstanceId	String	0..1	Unique identifier for the MEC application instance.
>associateId	AssociateId	0..N	0 to N identifiers to associate the information for a specific UE or flow.
>ecgi	Ecgi	0..N	E-UTRAN Cell Global Identifier.
>trigger	Trigger	0..N	Corresponds to a specific E-UTRAN UE Measurement Report trigger.
expiryDeadline	TimeStamp	0..1	Time stamp.

6.3.7 Type: MeasTaSubscription

This type represents a subscription to UE timing advance notifications from Radio Network Information Service.

Table 6.3.7-1: Attributes of the MeasTaSubscription

Attribute name	Data type	Cardinality	Description
subscriptionType	String	1	Shall be set to "MeasTaSubscription".
callbackReference	URI	1	URI selected by the service consumer to receive notifications on the subscribed RNIS information. This shall be included both in the request and in response.
_links	Structure (inlined)	0..1	Hyperlink related to the resource. This shall be only included in the HTTP responses and in HTTP PUT requests.
>self	LinkType	1	Self referring URI. The URI shall be unique within the RNI API as it acts as an ID for the subscription.
filterCriteriaAssoc	Structure (inlined)	1	List of filtering criteria for the subscription. Any filtering criteria from below, which is included in the request, shall also be included in the response.
>appInstanceId	String	0..1	Unique identifier for the MEC application instance.
>associateId	AssociateId	0..N	0 to N identifiers to associate the information for a specific UE or flow.
>ecgi	Ecgi	0..N	E-UTRAN Cell Global Identifier.
expiryDeadline	TimeStamp	0..1	Time stamp.

6.3.8 Type: CaReconfSubscription

This type represents a subscription to UE carrier aggregation reconfiguration notifications from Radio Network Information Service.

Table 6.3.8-1: Attributes of the CaReconfSubscription

Attribute name	Data type	Cardinality	Description
subscriptionType	String	1	Shall be set to "CaReconfSubscription".
callbackReference	URI	1	URI selected by the service consumer to receive notifications on the subscribed RNIS information. This shall be included both in the request and in response.
_links	Structure (inlined)	0..1	Hyperlink related to the resource. This shall be only included in the HTTP responses and in HTTP PUT requests.
>self	LinkType	1	Self referring URI. The URI shall be unique within the RNI API as it acts as an ID for the subscription.
filterCriteriaAssoc	Structure (inlined)	1	List of filtering criteria for the subscription. Any filtering criteria from below, which is included in the request, shall also be included in the response.
>appInstanceId	String	0..1	Unique identifier for the MEC application instance.
>associateId	AssociateId	0..N	0 to N identifiers to associate the information for a specific UE or flow.
>ecgi	Ecgi	0..N	E-UTRAN Cell Global Identifier.
expiryDeadline	TimeStamp	0..1	Time stamp.

6.3.9 Type: S1BearerSubscription

This type represents a subscription to S1-U bearer information notification from Radio Network Information Service.

Table 6.3.9-1: Attributes of the S1BearerSubscription

Attribute name	Data type	Cardinality	Description
subscriptionType	String	1	Shall be set to "S1BearerSubscription".
callbackReference	URI	1	URI selected by the service consumer, to receive notifications on the subscribed RNIS information. This shall be included in the request and response.
_links	Structure (inlined)	0..1	Hyperlink related to the resource. This shall be only included in the HTTP responses and in HTTP PUT requests.
>self	LinkType	1	Self referring URI. The URI shall be unique within the RNI API as it acts as an ID for the subscription.
eventType	Enum	1..N	Description of the subscribed event. The event is included both in the request and in the response. For the eventType, the following values are currently defined: 0 = RESERVED. 1 = S1_BEARER_ESTABLISH. 2 = S1_BEARER_MODIFY. 3 = S1_BEARER_RELEASE.
S1BearerSubscriptionCriteria	Structure (inlined)	1	As defined below.
>associateId	AssociateId	0..N	0 to N identifiers to associate the events for a specific UE or a flow.
>ecgi	Ecgi	0..N	E-UTRAN Cell Global Identifier.
>erabId	Integer	0..N	The attribute that uniquely identifies a S1 bearer for a specific UE, as defined in ETSI TS 136 413 [i.3].
expiryDeadline	TimeStamp	0..1	Time stamp.

6.3.10 Type: SubscriptionLinkList

This type represents a list of links related to currently existing subscriptions for the service consumer. This information is returned when sending a request to receive current subscriptions.

Table 6.3.10-1: Attributes of the SubscriptionLinkList

Attribute name	Data type	Cardinality	Description
_links	Structure (inlined)	1	List of hyperlinks related to the resource.
>self	LinkType	1	
>subscription	Structure (inlined)	0..N	A link to a subscription.
>>href	URI	1	The URI referring to the subscription.
>>subscriptionType	String	1	Type of the subscription. The string shall be set according to the "subscriptionType" attribute of the associated subscription data type event defined in clause 6.3.

6.3.11 Type: NrMeasRepUeSubscription

This type represents a subscription to 5G UE measurement report notifications from Radio Network Information Service for UEs served by NR Cells.

Table 6.3.11-1: Attributes of the NrMeasRepUeSubscription

Attribute name	Data type	Cardinality	Description
subscriptionType	String	1	Shall be set to "NrMeasRepUeSubscription".
callbackReference	URI	1	URI selected by the service consumer to receive notifications on the subscribed RNIS information. This shall be included both in the request and in response.
_links	Structure (inlined)	0..1	Hyperlink related to the resource. This shall be only included in the HTTP responses and in HTTP PUT requests.
>self	LinkType	1	Self-referring URI. The URI shall be unique within the RNI API as it acts as an ID for the subscription.
filterCriteriaNrMrs	Structure (inlined)	1	List of filtering criteria for the subscription. Any filtering criteria from below, which is included in the request, shall also be included in the response.
>appInstanceId	String	0..1	Unique identifier for the MEC application instance.
>associateId	AssociateId	0..N	0 to N identifiers to associate the information for a specific UE or flow.
>nrcgi	NRcgi	0..N	NR Cell Global Identier.
>triggerNr	TriggerNr	0..N	Corresponds to a specific 5G UE Measurement Report trigger.
expiryDeadline	TimeStamp	0..1	Time stamp.

6.4 Notification data types

6.4.1 Introduction

This clause defines data structures that define notifications.

6.4.2 Type: CellChangeNotification

This type represents a notification from RNIS with regards to cell change procedure. The Notification is sent by the Radio Network Information Service to inform about the Cell Change of a UE.

The attributes of the CellChangeNotification shall follow the indications provided in table 6.4.2-1.

Table 6.4.2-1: Attributes of the CellChangeNotification

Attribute name	Data type	Cardinality	Description
notificationType	String	1	Shall be set to "CellChangeNotification".
timeStamp	TimeStamp	0..1	Time stamp.
associateId	AssociateId	0..N	0 to N identifiers to associate the event for a specific UE or flow.
srcEcgi	Ecgi	1	E-UTRAN Cell Global Identifier of the source cell.
trgEcgi	Ecgi	1..N	E-UTRAN Cell Global Identifier of the target cell. NOTE: Cardinality N is valid only in case of statuses IN_PREPARATION, REJECTED and CANCELLED.
hoStatus	Enum	1	Indicate the status of the UE handover procedure. Values are defined as following: 1 = IN_PREPARATION. 2 = IN_EXECUTION. 3 = COMPLETED. 4 = REJECTED. 5 = CANCELLED.
tempUeId	Structure (inlined)	0..1	The temporary identifier allocated for the specific UE as defined below.
>mmec	String	1	MMEC as defined in ETSI TS 136 413 [i.3].
>mtmsi	String	1	M-TMSI as defined in ETSI TS 136 413 [i.3].

6.4.3 Type: RabEstNotification

This type represents a notification from RNIS with regards to RAB establishment procedure. The Notification is sent by the Radio Network Information Service to inform about the Radio Access Bearer establishment.

The attributes of the RabEstNotification shall follow the indications provided in table 6.4.3-1.

Table 6.4.3-1: Attributes of the RabEstNotification

Attribute name	Data type	Cardinality	Description
notificationType	String	1	Shall be set to "RabEstNotification".
timeStamp	TimeStamp	0..1	Time stamp.
ecgi	Ecgi	1	E-UTRAN Cell Global Identifier.
associateId	AssociateId	0..N	0 to N identifiers to bind the event for a specific UE or flow.
erabId	Integer	1	The attribute that uniquely identifies a Radio Access bearer for specific UE as defined in ETSI TS 136 413 [i.3].
erabQosParameters	Structure (inlined)	0..1	QoS parameters for the E-RAB as defined below.
>qci	Integer	1	QoS Class Identifier as defined in ETSI TS 123 401 [i.4].
>qosInformation	Structure (inlined)	0..1	The QoS information for the E-RAB.
>>erabMbrDl	Integer	1	This attribute indicates the maximum downlink E-RAB Bit Rate as defined in ETSI TS 123 401 [i.4] for this bearer.
>>erabMbrUl	Integer	1	This attribute indicates the maximum uplink E-RAB Bit Rate as defined in ETSI TS 123 401 [i.4] for this bearer.
>>erabGbrDl	Integer	1	This attribute indicates the guaranteed downlink E-RAB Bit Rate as defined in ETSI TS 123 401 [i.4] for this bearer.
>>erabGbrUl	Integer	1	This attribute indicates the guaranteed uplink E-RAB Bit Rate as defined in ETSI TS 123 401 [i.4] for this bearer.
tempUeId	Structure (inlined)	0..1	The temporary identifier allocated for the specific UE as defined below.
>mmec	String	1	MMEC as defined in ETSI TS 136 413 [i.3].
>mtmsi	String	1	M-TMSI as defined in ETSI TS 136 413 [i.3].

6.4.4 Type: RabModNotification

This type represents a notification from RNIS with regards to RAB modification procedure. The Notification is sent by the Radio Network Information Service to inform about the modification of a Radio Access Bearer.

The attributes of the RabModNotification shall follow the indications provided in table 6.4.4-1.

Table 6.4.4-1: Attributes of the RabModNotification

Attribute name	Data type	Cardinality	Description
notificationType	String	1	Shall be set to "RabModNotification".
timeStamp	TimeStamp	0..1	Time stamp.
ecgi	Ecgi	1	E-UTRAN Cell Global Identifier.
associateId	AssociateId	0..N	0 to N identifiers to bind the event for a specific UE or flow.
erabId	Integer	1	The attribute that uniquely identifies a Radio Access bearer for specific UE as defined in ETSI TS 136 413 [i.3].
erabQosParameters	Structure (inlined)	0..1	The QoS parameters for the E-RAB as defined below.
>qci	Integer	1	QoS Class Identifier as defined in ETSI TS 123 401 [i.4].
>qosInformation	Structure (inlined)	0..1	The QoS Information for the E-RAB as defined below.
>>erabMbrDl	Integer	1	This attribute indicates the maximum downlink E-RAB Bit Rate as defined in ETSI TS 123 401 [i.4] for this bearer.
>>erabMbrUl	Integer	1	This attribute indicates the maximum uplink E-RAB Bit Rate as defined in ETSI TS 123 401 [i.4] for this bearer.
>>erabGbrDl	Integer	1	This attribute indicates the guaranteed downlink E-RAB Bit Rate as defined in ETSI TS 123 401 [i.4] for this bearer.
>>erabGbrUl	Integer	1	This attribute indicates the guaranteed uplink E-RAB Bit Rate as defined in ETSI TS 123 401 [i.4] for this bearer.

6.4.5 Type: RabRelNotification

This type represents a notification from RNIS with regards to RAB release procedure. The Notification is sent by the Radio Network Information Service to inform about the release of a Radio Access Bearer.

The attributes of the RabRelNotification shall follow the indications provided in table 6.4.5-1.

Table 6.4.5-1: Attributes of the RabRelNotification

Attribute name	Data type	Cardinality	Description
notificationType	String	1	Shall be set to "RabRelNotification".
timeStamp	TimeStamp	0..1	Time stamp.
ecgi	Ecgi	1	E-UTRAN Cell Global Identifier.
associateId	AssociateId	0..N	0 to N identifiers to bind the event for a specific UE or flow as defined below.
erabReleaseInfo	Structure (inlined)	1	The release information for the E-RAB as defined below.
>erabId	Integer	1	The attribute that uniquely identifies a Radio Access bearer for specific UE as defined in ETSI TS 136 413 [i.3].

6.4.6 Type: MeasRepUeNotification

This type represents a notification from RNIS with regards to UE measurement report.

The Notification is sent by the Radio Network Information Service to send information about the measurement report received from the UE.

The attributes of the MeasRepUeNotification shall follow the indications provided in table 6.4.6-1.

Table 6.4.6-1: Attributes of the MeasRepUeNotification

Attribute name	Data type	Cardinality	Description
notificationType	String	1	Shall be set to "MeasRepUeNotification".
timeStamp	TimeStamp	0..1	Time stamp.
ecgi	Ecgi	1	E-UTRAN Cell Global Identifier of the Primary serving Cell (PCell), as defined in ETSI TS 136 331 [i.7].
associateId	AssociateId	0..N	0 to N identifiers to associate the event for a specific UE or flow.

Attribute name	Data type	Cardinality	Description
rsrp	Uint8	1	Reference Signal Received Power as defined in ETSI TS 136 214 [i.5].
rsrpEx	Uint8	0..1	Extended Reference Signal Received Power, with value mapping defined in ETSI TS 136 133 [i.16].
rsrq	Uint8	1	Reference Signal Received Quality as defined in ETSI TS 136 214 [i.5].
rsrqEx	Uint8	0..1	Extended Reference Signal Received Quality, with value mapping defined in ETSI TS 136 133 [i.16].
sinr	Uint8	0..1	Reference Signal "Signal to Interference plus Noise Ratio", with value mapping defined in ETSI TS 136 133 [i.16].
trigger	Trigger	1	Corresponds to a specific E-UTRAN UE Measurement Report trigger.
eutranNeighbourCellMeasInfo	Structure (inlined)	0..N	This parameter can be repeated to contain information of all the neighbouring cells up to N.
>ecgi	Ecgi	1	E-UTRAN Cell Global Identifier.
>rsrp	Uint8	0..1	Reference Signal Received Power as defined in ETSI TS 136 214 [i.5].
>rsrpEx	Uint8	0..1	Extended Reference Signal Received Power, with value mapping defined in ETSI TS 136 133 [i.16].
>rsrq	Uint8	0..1	Reference Signal Received Quality as defined in ETSI TS 136 214 [i.5].
>rsrqEx	Uint8	0..1	Extended Reference Signal Received Quality, with value mapping defined in ETSI TS 136 133 [i.16].
>sinr	Uint8	0..1	Reference Signal "Signal to Interference plus Noise Ratio", with value mapping defined in ETSI TS 136 133 [i.16].
carrierAggregationMeasInfo	Structure (inlined)	0..M	This parameter can be repeated to contain information of all the carriers assign for Carrier Aggregation up to M.
>cellIdSrv	CellId	1	E-UTRAN Cell Identity of a Secondary serving Cell (SCell), as defined in ETSI TS 136 331 [i.7].
>rsrpSrv	Uint8	0..1	Reference Signal Received Power as defined in ETSI TS 136 214 [i.5].
>rsrpSrvEx	Uint8	0..1	Extended Reference Signal Received Power, with value mapping defined in ETSI TS 136 133 [i.16].
>rsrqSrv	Uint8	0..1	Reference Signal Received Quality as defined in ETSI TS 136 214 [i.5].
>rsrqSrvEx	Uint8	0..1	Extended Reference Signal Received Quality, with value mapping defined in ETSI TS 136 133 [i.16].
>sinrSrv	Uint8	0..1	Reference Signal "Signal to Interference plus Noise Ratio", with value mapping defined in ETSI TS 136 133 [i.16].
>cellIdNei	CellId	0..1	E-UTRAN Cell Identity of the best neighbouring cell (NCell) associated with the SCell, as defined in ETSI TS 136 331 [i.7].
>rsrpNei	Uint8	0..1	Reference Signal Received Power as defined in ETSI TS 136 214 [i.5].
>rsrpNeiEx	Uint8	0..1	Extended Reference Signal Received Power, with value mapping defined in ETSI TS 136 133 [i.16].
>rsrqNei	Uint8	0..1	Reference Signal Received Quality as defined in ETSI TS 136 214 [i.5].
>rsrqNeiEx	Uint8	0..1	Extended Reference Signal Received Quality, with value mapping defined in ETSI TS 136 133 [i.16].
>sinrNei	Uint8	0..1	Reference Signal "Signal to Interference plus Noise Ratio", with value mapping defined in ETSI TS 136 133 [i.16].
heightUe	Int	0..1	Indicates height of the UE in meters relative to the sea level as defined in ETSI TS 136.331 [i.7].
newRadioMeasInfo	Structure (inlined)	0..N	5G New Radio secondary serving cells measurement information.
>nrCarrierFreq	Uint32	1	ARFCN applicable for a downlink, uplink or bi-directional (TDD) NR carrier frequency, as defined in ETSI TS 138.101 [i.15].
>nrSCs	Structure (inlined)	1	Measurement quantities concerning the secondary serving cells.

Attribute name	Data type	Cardinality	Description
>>nrSCellInfo	Structure (inlined)	1..P	Secondary serving cell(s) info.
>>>nrSCellPlmn	Plmn	1..P	Public land mobile network identities.
>>>nrSCellGId	NrCellId	1	Cell Global Identifier, as defined in ETSI TS 138 331 [i.13].
>>nrSCellRsrp	Uint8	0..1	Reference Signal Received Power measurement according to mapping table in ETSI TS 138.133 [i.14].
>>nrSCellRsrq	Uint8	0..1	Reference Signal Received Quality measurement according to mapping table in ETSI TS 138.133 [i.14].
>>nrSCellRssi	Uint8	0..1	Reference signal SINR measurement according to mapping table in ETSI TS 138.133 [i.14].
>nrBNCs	Structure (inlined)	0..1	Measurement quantities concerning the best neighbours of the secondary serving cells
>>nrBNCellInfo	Structure (inlined)	1..P	Best neighbours of the secondary serving cell(s) info
>>>nrBNCellPlmn	Plmn	1..P	Public land mobile network identities
>>>nrBNCellGId	NrCellId	1	Cell Global Identifier, as defined in ETSI TS 138 331 [i.13].
>>nrBNCellRsrp	Uint8	0..1	Reference Signal Received Power measurement according to mapping table in ETSI TS 138.133 [i.14].
>>nrBNCellRsrq	Uint8	0..1	Reference Signal Received Quality measurement according to mapping table in ETSI TS 138.133 [i.14].
>>nrBNCellRssi	Uint8	0..1	Reference signal SINR measurement according to mapping table in ETSI TS 138.133 [i.14].
newRadioMeasNeiInfo	Structure (inlined)	0..N	Measurement quantities concerning the 5G NR neighbours.
>nrNCellInfo	Structure (inlined)	1..P	5G NR neighbour cell info.
>>nrNCellPlmn	Plmn	1..P	Public land mobile network identities.
>>nrNCellGId	NrCellId	1	Cell Global Identifier, as defined in ETSI TS 138 331 [i.13].
>nrNCellRsrp	Uint8	0..1	Reference Signal Received Power measurement according to mapping table in ETSI TS 138.133 [i.14].
>nrNCellRsrq	Uint8	0..1	Reference Signal Received Quality measurement according to mapping table in ETSI TS 138.133 [i.14].
>nrNCellRssi	Uint8	0..1	Reference signal SINR measurement according to mapping table in ETSI TS 138.133 [i.14].
>rsIndexResults	RsIndexResults	0..1	Beam level measurements results of a NR cell.

6.4.7 Type: MeasTaNotification

This type represents a notification from RNIS with regards to UE Timing Advance measurements.

The Notification is sent by the Radio Network Information Service to send information about the Timing Advance value received from the UE.

The attributes of the MeasTaNotification shall follow the indications provided in table 6.4.7-1.

Table 6.4.7-1: Attributes of the MeasTaNotification

Attribute name	Data type	Cardinality	Description
notificationType	String	1	Shall be set to "MeasTaNotification".
timeStamp	TimeStamp	0..1	Time stamp.
ecgi	Ecgi	1	E-UTRAN Cell Global Identifier.
associateId	AssociateId	0..N	0 to N identifiers to associate the event for a specific UE or flow.
timingAdvance	Uint32	1	The timing advance as defined in ETSI TS 136 214 [i.5].

6.4.8 Type: CaReConfNotification

This type represents a notification from RNIS with regards to UE carrier aggregation reconfigurations.

The Notification is sent by the Radio Network Information Service to send information about the changes in the carrier aggregation configuration for a UE.

The attributes of the CaReConfNotification shall follow the indications provided in table 6.4.8-1.

Table 6.4.8-1: Attributes of the CaReConfNotification

Attribute name	Data type	Cardinality	Description
notificationType	String	1	Shall be set to "CaReConfNotification".
timeStamp	TimeStamp	0..1	Time stamp.
ecgi	Ecgi	1	E-UTRAN Cell Global Identifier.
associateId	AssociateId	0..N	0 to N identifiers to associate the event for a specific UE or flow.
secondaryCellAdd	Structure (inlined)	0..N	
>ecgi	Ecgi	1	E-UTRAN Cell Global Identifier.
secondaryCellRemove	Structure (inlined)	0..N	
>ecgi	Ecgi	1	E-UTRAN Cell Global Identifier.
carrierAggregationMeasInfo	Structure (inlined)	0..M	This parameter can be repeated to contain information of all the carriers assign for Carrier Aggregation up to M.
>cellIdSrv	CellId	1	E-UTRAN Cell Identity of a Carrier Aggregation serving cell.
>rsrpSrv	Uint32	0..1	Reference Signal Received Power as defined in ETSI TS 136 214 [i.5].
>rsrqSrv	Uint32	0..1	Reference Signal Received Quality as defined in ETSI TS 136 214 [i.5].
>cellIdNei	CellId	1	E-UTRAN Cell Identity of the best neighbouring cell associated with the Carrier Aggregation serving cell.
>rsrpNei	Uint32	0..1	Reference Signal Received Power as defined in ETSI TS 136 214 [i.5].
>rsrqNei	Uint32	0..1	Reference Signal Received Quality as defined in ETSI TS 136 214 [i.5].

6.4.9 Type: ExpiryNotification

This type represents a notification from RNIS with regards to expiry of the existing subscription.

The Notification is sent by the Radio Network Information Service to send information about expiry of a subscription.

Table 6.4.9-1: Attributes of the ExpiryNotification

Attribute name	Data type	Cardinality	Description
timeStamp	TimeStamp	0..1	Time stamp.
_links	Structure (inlined)	1	List of hyperlinks related to the resource.
>self	URI	1	Self referring URI. This shall be included in the response from the RNIS. The URI shall be unique within the RNI API as it acts as an ID for the subscription.
expiryDeadline	TimeStamp	1	Time stamp.

6.4.10 Type: S1BearerNotification

This type represents a notification from RNIS. The notification is sent by the Radio Network Information Service to inform about the S1 bearer information of specific UEs.

The attributes of the S1BearerNotification shall follow the indications provided in table 6.4.10-1.

Table 6.4.10-1 Attributes of the S1BearerNotification

Attribute name	Data type	Cardinality	Description
notificationType	String	1	Shall be set to "S1BearerNotification".
timeStamp	TimeStamp	0..1	Time stamp.
s1Event	Enum	1	The subscribed event that triggered this notification in S1BearerSubscription.
s1UeInfo	Structure (inlined)	1	Information on specific UE that matches the criteria in S1BearerSubscription as defined below.
>tempUeId	Structure (inlined)	0..1	The temporary identifier allocated for the specific UE as defined below.
>>mmec	String	1	MMEC as defined in ETSI TS 136 413 [i.3].
>>mtmsi	String	1	M-TMSI as defined in ETSI TS 136 413 [i.3].
>associateId	AssociateId	0..N	0 to N identifiers to associate the information for a specific UE or flow.
>ecgi	Ecgi	1..N	E-UTRAN Cell Global Identifier.
>s1BearerInfo	Structure (inlined)	1..N	S1 bearer information as defined below.
>>erabId	Integer	1	The attribute that uniquely identifies a S1 bearer for a specific UE, as defined in ETSI TS 136 413 [i.3].
>>enbInfo	Structure (inlined)	1	S1 bearer information on eNB side as defined below.
>>>ipAddress	String	1	eNB transport layer address of this S1 bearer.
>>>tunnelId	String	1	eNB GTP-U TEID of this S1 bearer.
>>sGwInfo	Structure (inlined)	1	S1 bearer information on GW side as defined below.
>>>ipAddress	String	1	SGW transport layer address of this S1 bearer.
>>>tunnelId	String	1	SGW GTP-U TEID of this S1 bearer.

6.4.11 Type: NrMeasRepUeNotification

This type represents a notification from RNIS with regards to 5G UE measurement report for UEs.

The Notification is sent by the Radio Network Information Service to send information about the 5G UE measurement report received from the UE.

The attributes of the NrMeasRepUeNotification shall follow the indications provided in table 6.4.11-1.

Table 6.4.11-1: Attributes of the NrMeasRepUeNotification

Attribute name	Data type	Cardinality	Description
notificationType	String	1	Shall be set to "NrMeasRepUeNotification".
timeStamp	TimeStamp	0..1	Time stamp.
associateId	AssociateId	0..N	0 to N identifiers to associate the event for a specific UE or flow.
triggerNr	TriggerNr	1	Corresponds to a specific 5G UE Measurement Report trigger.
servCellMeasInfo	Structure (inlined)	0..N	This parameter can be repeated to contain information of all the serving cells up to N.
>nrcgi	Nrcgi	1	NR Cell Global Identifier.
>sCell	Structure (inlined)	1	Measurement information relating to this serving cell.
>>measQuantityResultsSsbCell	MeasQuantityResultsNr	0..1	Measurement quantity results relating to the Synchronization Signal Block.
>>measQuantityResultsCsiRsCell	MeasQuantityResultsNr	0..1	Measurement quantity results relating to the Channel State Information Reference Signal.
>>rsIndexResults	RsIndexResults	0..1	Beam level measurement information
>nCell	Structure (inlined)	0..1	Measurement information relating to the best neighbour of this serving cell.
>>measQuantityResultsSsbCell	MeasQuantityResultsNr	0..1	Measurement quantity results relating to the Synchronization Signal Block.
>>measQuantityResultsCsiRsCell	MeasQuantityResultsNr	0..1	Measurement quantity results relating to the Channel State Information Reference Signal.
>>rsIndexResults	RsIndexResults	0..1	Beam level measurement information
nrNeighCellMeasInfo	Structure (inlined)	0..N	This parameter can be repeated to contain measurement information of all the neighbouring cells up to N. It shall not be included if eutraNeighCellMeasInfo is included.
>nrcgi	NrCellId	1	Cell Global Identifier.
>measQuantityResultsSsbCell	MeasQuantityResultsNr	0..1	Measurement quantity results relating to the Synchronization Signal Block of the neighbouring cells.
>measQuantityResultsCsiRsCell	MeasQuantityResultsNr	0..1	Measurement quantity results relating to the Channel State Information Reference Signal of the neighbouring cells.
>rsIndexResults	RsIndexResults	0..1	Beam level measurement information.
eutraNeighCellMeasInfo	Structure (inlined)	0..N	This parameter can be repeated to contain measurement information of all the neighbouring cells up to N. It shall not be included if nrNeighCellMeasInfo is included.
>ecgi	Ecgi	1	Cell Global Identifier.
>rsrp	Uint8	0..1	Reference Signal Received Power as defined in ETSI TS 138 331 [i.13].
>rsrq	Uint8	0..1	Reference Signal Received Quality as defined in ETSI TS 138 331 [i.13].
>sinr	Uint8	0..1	Reference Signal plus Interference Noise Ratio as defined in ETSI TS 138 331 [i.13].

6.5 Referenced structured data types

6.5.1 Introduction

This clause defines data structures that are referenced from data structures defined in the previous clauses, but are neither resource representations nor bound to any pub/sub mechanism.

6.5.2 Type: LinkType

This type represents a type of link.

Table 6.5.2-1: Attributes of the LinkType

Attribute name	Data type	Cardinality	Description
href	URI	1	URI referring to a resource

6.5.3 Type: TimeStamp

This type represents a time stamp.

Table 6.5.3-1: Attributes of the TimeStamp

Attribute name	Data type	Cardinality	Description
seconds	Uint32	1	The seconds part of the time. Time is defined as Unix-time since January 1, 1970, 00:00:00 UTC.
nanoSeconds	Uint32	1	The nanoseconds part of the time. Time is defined as Unix-time since January 1, 1970, 00:00:00 UTC.

6.5.4 Type: AssociateId

This type represents an associated identifier for a UE or flow that can be referenced from the data structures.

Table 6.5.4-1: Attributes of the AssociateId

Attribute	Data type	Cardinality	Description
type	Enum	1	Numeric value (0-255) corresponding to specified type of identifier as following: 0 = reserved. 1= UE_IPv4_ADDRESS. 2 = UE_IPV6_ADDRESS. 3 = NATED_IP_ADDRESS. 4 = GTP_TEID.
value	String	1	Value for the identifier.

6.5.5 Type: Plmn

This type represents an Public Land Mobile Network Identity as defined in ETSI TS 136 413 [i.3].that can be referenced from the data structures.

Table 6.5.5-1: Attributes of the Plmn

Attribute	Data type	Cardinality	Description
mcc	String	1	The Mobile Country Code part of PLMN Identity as defined in ETSI TS 136 413 [i.3].
mnc	String	1	The Mobile Network Code part of PLMN Identity as defined in ETSI TS 136 413 [i.3].

6.5.6 Type: Ecgi

This type represents an E-UTRAN CelI Global Identifier as defined in ETSI TS 136 413 [i.3] that can be referenced from the data structures.

Table 6.5.6-1: Attributes of the Ecgi

Attribute	Data type	Cardinality	Description
plmn	Plmn	1	Public Land Mobile Network Identity.
cellId	CellId	1	E-UTRAN Cell Global Identifier.

6.5.7 Type: NRcgi

This type represents an New Radio CelI Global Identifier as defined in ETSI TS 138 423 [i.17] that can be referenced from the data structures.

Table 6.5.7-1: Attributes of the Nrcgi

Attribute	Data type	Cardinality	Description
plmn	Plmn	1	Public Land Mobile Network Identity.
nrcellId	NrCellId	1	NR Cell Global Identifier.

6.5.8 Type: RsIndexResults

This type represents an Beam level measurement results for a NR cell as defined in ETSI TS 138 331 [i.13] that can be referenced from the data structures.

Table 6.5.8-1: Attributes of the RsIndexResults

Attribute	Data type	Cardinality	Description
resultsSsbIndexes	ResultsPerSsbIndexList	1	Beam level measurement results based on SS/PBCH related measurements.
resultsCsiRsIndexes	ResultsPerCsiRsIndexList	1	Beam level measurement results based on CSI-RS related measurements.

6.5.9 Type: ResultsPerSsbIndexList

This type represents an Beam level measurement results for a NR cell as defined in ETSI TS 138 331 [i.13] that can be referenced from the data structures.

Table 6.5.9-1: Attributes of the ResultsPerSsbIndexList

Attribute	Data type	Cardinality	Description
resultsPerSsbIndex	Structure (inline)	0..P	
>ssbIndex	Uint8	1	
>ssbResults	MeasQuantityResultsNr	0..1	

6.5.10 Type: ResultsPerCsiRsIndexList

This type represents an Beam level measurement results for a NR cell as defined in ETSI TS 138 331 [i.13] that can be referenced from the data structures.

Table 6.5.10-1: Attributes of the ResultsPerCsiRsIndexList

Attribute	Data type	Cardinality	Description
resultsPerCsiRsIndex	Structure (inline)	0…P	
>csiRsIndex	Uint8	1	
>csiRsResults	MeasQuantityResultsNr	0..1	

6.5.11 Type: MeasQuantityResultsNr

This type represents the collection of UE reported NR measurement quantity results as defined in ETSI TS 138 331 [i.13] that can be referenced from the data structures.

Table 6.5.11-1: Attributes of the MeasQuantityResultsNr

Attribute	Data type	Cardinality	Description
rsrp	Uint8	0..1	Reference Signal Received Power as defined in ETSI TS 138 331 [i.13].
rsrq	Uint8	0..1	Reference Signal Received Quality as defined in ETSI TS 138 331 [i.13].
sinr	Uint8	0..1	Reference Signal to Interference & Noise Ratio as defined in ETSI TS 138 331 [i.13].

6.6 Referenced simple data types and enumerations

6.6.1 Introduction

This clause defines simple data types that are referenced from data structures defined in the previous clauses, but are neither resource representations nor bound to any pub/sub mechanism.

6.6.2 Simple data types

The simple data types defined in table 6.6.2-1 shall be supported.

Table 6.6.2-1: CellId

Type name	Description
CellId	String representing the E-UTRAN Cell Identity. Encoded as a bit string (size (28)) as defined in ETSI TS 136 413 [i.3].
NrCellId	String representing the NR Cell Identity. Encoded as a bit string (size (36)) as defined in ETSI TS 138 423 [i.17].

6.6.3 Enumeration: Trigger

The enumeration Trigger represents specified triggers for a UE Measurement Report. Full details can be found in ETSI TS 136 331 [i.7]). It shall comply with the provisions defined in table 6.6.3-1 and has a numeric value (0-255).

There are two main groupings:

- Intra Radio Access Technology: A1, A2, A3, A4, A5, A6, C1, C2, V1, V2, H1, H2, periodical (reportStrongestCells, reportCGI)
- Inter Radio Access Technology: B1, B2, W1, W2, W3, periodical (reportStrongestCells, reportStrongestCellsForSON, reportCGI)

Table 6.6.3-1: Enumeration Trigger

Type name	Description
0 = NOT_AVAILABLE	
1 = PERIODICAL_REPORT_STRONGEST_CELLS	Ref ETSI TS 136 331 [i.7]
2 = PERIODICAL_REPORT_STRONGEST_CELLS_FOR_SON	Ref ETSI TS 136 331 [i.7]
3 = PERIODICAL_REPORT_CGI	Ref ETSI TS 136 331 [i.7]
4 = INTRA_PERIODICAL_REPORT_STRONGEST_CELLS	Ref ETSI TS 136 331 [i.7]
5 = INTRA_PERIODICAL_REPORT_CGI	Ref ETSI TS 136 331 [i.7]
10 = EVENT_A1	Ref ETSI TS 136 331 [i.7]
11 = EVENT_A2	Ref ETSI TS 136 331 [i.7]
12 = EVENT_A3	Ref ETSI TS 136 331 [i.7]
13 = EVENT_A4	Ref ETSI TS 136 331 [i.7]
14 = EVENT_A5	Ref ETSI TS 136 331 [i.7]
15 = EVENT_A6	Ref ETSI TS 136 331 [i.7]
20 = EVENT_B1	Ref ETSI TS 136 331 [i.7]
21 = EVENT_B2	Ref ETSI TS 136 331 [i.7]
20 = EVENT_B1-NR	Ref ETSI TS 136 331 [i.7]
21 = EVENT_B2-NR	Ref ETSI TS 136 331 [i.7]
30 = EVENT_C1	Ref ETSI TS 136 331 [i.7]
31 = EVENT_C2	Ref ETSI TS 136 331 [i.7]
40 = EVENT_W1	Ref ETSI TS 136 331 [i.7]
41 = EVENT_W2	Ref ETSI TS 136 331 [i.7]
42 = EVENT_W3	Ref ETSI TS 136 331 [i.7]
50 = EVENT_V1	Ref ETSI TS 136 331 [i.7]
51 = EVENT_V2	Ref ETSI TS 136 331 [i.7]
60 = EVENT_H1	Ref ETSI TS 136 331 [i.7]
61 = EVENT_H2	Ref ETSI TS 136 331 [i.7]

6.6.4 Enumeration: TriggerNr

The enumeration Trigger represents specified triggers for a 5G UE Measurement Report. Full details can be found in ETSI TS 138 331 [i.13]). It shall comply with the provisions defined in table 6.6.4-1 and has a numeric value (0-255).

Table 6.6.4-1: Enumeration TriggerNr

Type name	Description
0 = NOT_AVAILABLE	
1 = NR_PERIODICAL	Ref ETSI TS 138 331 [i.13]
2 = NR_CGI	Ref ETSI TS 138 331 [i.13]
10 = EVENT_A1	Ref ETSI TS 138 331 [i.13]
11 = EVENT_A2	Ref ETSI TS 138 331 [i.13]
12 = EVENT_A3	Ref ETSI TS 138 331 [i.13]
13 = EVENT_A4	Ref ETSI TS 138 331 [i.13]
14 = EVENT_A5	Ref ETSI TS 138 331 [i.13]
15 = EVENT_A6	Ref ETSI TS 138 331 [i.13]
20 = INTER_RAT_PERIODICAL	Ref ETSI TS 138 331 [i.13]
21 = INTER_RAT_CGI	Ref ETSI TS 138 331 [i.13]
30 = EVENT_B1	Ref ETSI TS 138 331 [i.13]
31 = EVENT_B2	Ref ETSI TS 138 331 [i.13]

7 API definition

7.1 Introduction

This clause defines the resources and operations of the Radio Network Information API (RNI API).

7.2 Global definitions and resource structure

All resource URIs of this API shall have the following root:

{apiRoot}/{apiName}/{apiVersion}/

"apiRoot" and "apiName" are discovered using the service registry. It includes the scheme ("http" or "https"), host and optional port, and an optional prefix string. The "apiName" shall be set to "rni" and "apiVersion" shall be set to "v2" for the current version of the specification. The API shall support HTTP over TLS (also known as HTTPS [5], see IETF RFC 2818 [5]). TLS version 1.2 as defined by IETF RFC 5246 [4] shall be supported. HTTP without TLS is not recommended. All resource URIs in the clauses below are defined relative to the above root URI.

The content format of JSON shall be supported.

The JSON format is signalled by the content type "application/json".

This API shall require the use of the OAuth 2.0 client credentials grant type according to IETF RFC 6749 [2] with bearer tokens according to IETF RFC 6750 [3]. See clause 7.16 of ETSI GS MEC 009 [i.8] for more information. The token endpoint can be discovered as part of the service availability query procedure defined in ETSI GS MEC 011 [i.6]. How the client credentials are provisioned into the MEC application is out of scope of the present document.

This API supports additional application-related error information to be provided in the HTTP response when an error occurs. See clause 7.15 of ETSI GS MEC 009 [i.8] for more information.

Figure 7.2-1 illustrates the resource URI structure of this API. Table 7.2-1 provides an overview of the resources defined by the present document, and the applicable HTTP methods.

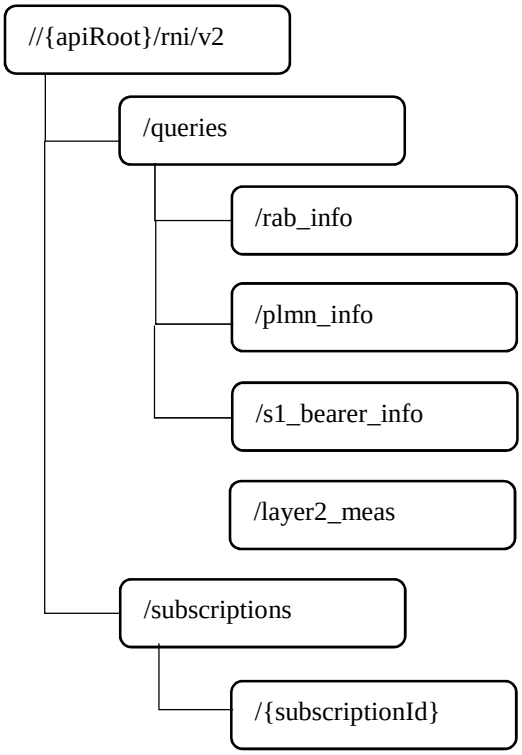

Figure 7.2-1: Resource URI structure of the RNI API

Table 7.2-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Meaning
RAB information	/queries/rab_info	GET	Retrieve current status of Radio Access Bearer information
PLMN information	/queries/plmn_info	GET	Retrieve current status of PLMN information
S1 Bearer information	/queries/s1_bearer_info	GET	Retrieve current status of S1 bearer information
Layer 2 measurements	/queries/layer2_meas	GET	Retrieve current status of layer 2 measurements information
All subscriptions for a subscriber	/subscriptions	GET	Retrieve a list of active subscriptions for this subscriber
		POST	Create a new subscription
Existing subscription	/subscriptions/{subscriptionId}	GET	Retrieve information on current specific subscription
		PUT	Modify existing subscription by sending a new data structure
		DELETE	Cancel the existing subscription
Notification callback	Client provided callback reference	POST	Send a notification

7.3 Resource: rab_info

7.3.1 Description

This resource is queried to retrieve information on Radio Access Bearers.

7.3.2 Resource definition

Resource URI: **{apiRoot}/rni/v2/queries/rab_info**

This resource shall support the resource URI variables defined in table 7.3.2-1.

Table 7.3.2-1: Resource URI variables for resource "rab_info"

Name	Definition
apiRoot	See clause 7.2

7.3.3 Resource methods

7.3.3.1 GET

The GET method is used to query information about the Radio Access Bearers.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the tables 7.3.3.1-1 and 7.3.3.1-2.

Table 7.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
app_ins_id	String	0..1	Comma separated list of application instance identifiers
cell_id	CellId	0..N	Comma separated list of E-UTRAN Cell Identities
ue_ipv4_address	String	0..N	Comma separated list of IE IPv4 addresses as defined for the type for AssociateId in clause 6.5.4
ue_ipv6_address	String	0..N	Comma separated list of IE IPv6 addresses as defined for the type for AssociateId in clause 6.5.4
nated_ip_address	String	0..N	Comma separated list of NATed IP addresses as defined for the type for AssociateId in clause 6.5.4
gtp_teid	String	0..N	Comma separated list of GTP TEID addresses as defined for the type for AssociateId in clause 6.5.4
erab_id	Integer	0..1	E-RAB identifier
qci	Integer	0..1	QoS Class Identifier as defined in ETSI TS 123 401 [i.4]
erab_mbr_dl	Integer	0..1	Maximum downlink E-RAB Bit Rate as defined in ETSI TS 123 401 [i.4]
erab_mbr_ul	Integer	0..1	Maximum uplink E-RAB Bit Rate as defined in ETSI TS 123 401 [i.4]
erab_gbr_dl	Integer	0..1	Guaranteed downlink E-RAB Bit Rate as defined in ETSI TS 123 401 [i.4]
erab_gbr_ul	Integer	0..1	Guaranteed uplink E-RAB Bit Rate as defined in ETSI TS 123 401 [i.4]

Table 7.3.3.1-2: Data structures supported by the GET request/response on this resource

Request body	Data type	Cardinality	Remarks	
	n/a			
Response body	**Data type**	**Cardinality**	**Response Codes**	**Remarks**
	RabInfo	1	200 OK	Upon success, a response body containing the Radio Access Bearer information is returned.
	ProblemDetails	0..1	400 Bad Request	It is used to indicate that incorrect parameters were passed in the request. This error condition can also occur if the target area for the request is considered too large. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	401 Unauthorized	It is used when the client did not submit credentials. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	1	403 Forbidden	The operation is not allowed given the current status of the resource. More information shall be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	0..1	404 Not Found	It is used when a client provided a URI that cannot be mapped to a valid resource URI. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	406 Not Acceptable	It is used to indicate that the server cannot provide the any of the content formats supported by the client. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	429 Too Many Requests	It is used when a rate limiter has triggered. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.

7.3.3.2 PUT

Not applicable.

7.3.3.3 PATCH

Not applicable.

7.3.3.4 POST

Not applicable.

7.3.3.5 DELETE

Not applicable.

7.4 Resource: plmn_info

7.4.1 Description

This resource is queried to retrieve information on the underlying Mobile Network that the MEC application is associated to.

7.4.2 Resource definition

Resource URI: **{apiRoot}/rni/v2/queries/plmn_info**

This resource shall support the resource URI variables defined in table 7.4.2-1.

Table 7.4.2-1: Resource URI variables for resource "plmn_info"

Name	Definition
apiRoot	See clause 7.2

7.4.3 Resource methods

7.4.3.1 GET

The GET method is used to query information about the Mobile Network.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in tables 7.4.3.1-1 and 7.4.3.1-2.

Table 7.4.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
app_ins_id	String	1..N	Comma separated list of application instance identifiers

Table 7.4.3.1-2: Data structures supported by the GET request/response on this resource

Request body	Data type	Cardinality	Remarks	
	n/a			
Response body	**Data type**	**Cardinality**	**Response Codes**	**Remarks**
	PlmnInfo	0..N	200 OK	Upon success, a response body containing the array of Mobile Network information is returned.
	ProblemDetails	0..1	400 Bad Request	It is used to indicate that incorrect parameters were passed to the request. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	401 Unauthorized	It is used when the client did not submit credentials. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	1	403 Forbidden	The operation is not allowed given the current status of the resource. More information shall be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	0..1	404 Not Found	It is used when a client provided a URI that cannot be mapped to a valid resource URI. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	406 Not Acceptable	It is used to indicate that the server cannot provide the any of the content formats supported by the client. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	429 Too Many Requests	It is used when a rate limiter has triggered. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.

7.4.3.2 PUT

Not applicable.

7.4.3.3 PATCH

Not applicable.

7.4.3.4 POST

Not applicable.

7.4.3.5 DELETE

Not applicable.

7.5 Resource: s1_bearer_info

7.5.1 Description

This resource is queried to retrieve S1-U bearer information related to specific UE(s).

7.5.2 Resource definition

Resource URI: **{apiRoot}/rni/v2/queries/s1_bearer_info**

This resource shall support the resource URI variables defined in table 7.5.2-1.

Table 7.5.2-1: Resource URI variables for resource "s1_bearer_info"

Name	Definition
apiRoot	See clause 7.2

7.5.3 Resource methods

7.5.3.1 GET

The GET method is used to query information about the S1 bearer(s).

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in tables 7.5.3.1-1 and 7.5.3.1-2.

Table 7.5.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
temp_ue_id	String	0..N	Comma separated list of temporary identifiers allocated for the specific UEs as defined in ETSI TS 136 413 [i.3].
ue_ipv4_address	String	0..N	Comma separated list of IE IPv4 addresses as defined for the type for AssociateId in clause 6.5.4.
ue_ipv6_address	String	0..N	Comma separated list of IE IPv6 addresses as defined for the type for AssociateId in clause 6.5.4.
nated_ip_address	String	0..N	Comma separated list of NATed IP addresses as defined for the type for AssociateId in clause 6.5.4.
gtp_teid	String	0..N	Comma separated list of GTP TEID addresses as defined for the type for AssociateId in clause 6.5.4.
cell_id	CellId	0..N	Comma separated list of E-UTRAN Cell Identities.
erab_id	Integer	0..N	Comma separated list of E-RAB identifiers.

Table 7.5.3.1-2: Data structures supported by the GET request/response on this resource

Request body	Data type	Cardinality	Remarks	
	n/a			
Response body	**Data type**	**Cardinality**	**Response Codes**	**Remarks**
	S1BearerInfo	1	200 OK	Upon success, a response body containing the UE S1-U bearer information is returned.
	ProblemDetails	0..1	400 Bad Request	It is used to indicate that incorrect parameters were passed to the request. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	401 Unauthorized	It is used when the client did not submit credentials. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	1	403 Forbidden	The operation is not allowed given the current status of the resource. More information shall be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	0..1	404 Not Found	It is used when a client provided a URI that cannot be mapped to a valid resource URI. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	406 Not Acceptable	It is used to indicate that the server cannot provide the any of the content formats supported by the client. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	429 Too Many Requests	It is used when a rate limiter has triggered. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.

7.5.3.2 PUT

Not applicable.

7.5.3.3 PATCH

Not applicable.

7.5.3.4 POST

Not applicable.

7.5.3.5 DELETE

Not applicable.

7.5a Resource: layer2_meas

7.5a.1 Description

This resource is queried to retrieve information on layer 2 measurements.

7.5a.2 Resource definition

Resource URI: **{apiRoot}/rni/v2/queries/layer2_meas**

This resource shall support the resource URI variables defined in table 7.5a.2-1.

Table 7.5a.2-1: Resource URI variables for resource "layer2_meas"

Name	Definition
apiRoot	See clause 7.2

7.5a.3 Resource methods

7.5a.3.1 GET

The GET method is used to query information about the layer 2 measurements.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the tables 7.5a.3.1-1 and 7.5a.3.1-2.

Table 7.5a.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
app_ins_id	String	0..1	Comma separated list of application instance identifiers.
cell_id	String	0..N	Comma separated list of E-UTRAN Cell Identities each defined as a bit string (size (28)), as defined in ETSI TS 136 413 [i.3].
ue_ipv4_address	String	0..N	Comma separated list of IE IPv4 addresses as defined for the type for AssociateId in clause 6.5.4.
ue_ipv6_address	String	0..N	Comma separated list of IE IPv6 addresses as defined for the type for AssociateId in clause 6.5.4.
nated_ip_address	String	0..N	Comma separated list of NATed IP addresses as defined for the type for AssociateId in clause 6.5.4.
gtp_teid	String	0..N	Comma separated list of GTP TEID addresses as defined for the type for AssociateId in clause 6.5.4.
dl_gbr_prb_usage_cell	Integer (0..100)	0..1	It indicates the PRB usage for downlink GBR traffic, as defined in ETSI TS 136 314 [i.11] and ETSI TS 136 423 [i.12].
ul_gbr_prb_usage_cell	Integer (0..100)	0..1	It indicates (in percentage) the PRB usage for uplink GBR traffic, as defined in ETSI TS 136 314 [i.11] and ETSI TS 136 423 [i.12].
dl_nongbr_prb_usage_cell	Integer (0..100)	0..1	It indicates (in percentage) the PRB usage for downlink non-GBR traffic, as defined in ETSI TS 136 314 [i.11] and ETSI TS 136 423 [i.12].
ul_nongbr_prb_usage_cell	Integer (0..100)	0..1	It indicates (in percentage) the PRB usage for uplink non-GBR traffic, as defined in ETSI TS 136 314 [i.11] and ETSI TS 136 423 [i.12].
dl_total_prb_usage_cell	Integer (0..100)	0..1	It indicates (in percentage) the PRB usage for total downlink traffic, as defined in ETSI TS 136 314 [i.11] and ETSI TS 136 423 [i.12].
ul_total_prb_usage_cell	Integer (0..100)	0..1	It indicates (in percentage) the PRB usage for total uplink traffic, as defined in ETSI TS 136 314 [i.11] and ETSI TS 136 423 [i.12].
received_dedicated_preambles_cell	Integer (0..100)	0..1	It indicates (in percentage) the received dedicated preamples, as defined in ETSI TS 136 314 [i.11].

Name	Data type	Cardinality	Remarks
received_ randomly_selecte _preambles_low_ range_cell	Integer (0..100)	0..1	It indicates (in percentage) the received randomly selected preambles in the low range, as defined in ETSI TS 136 314 [i.11].
received_ randomly_selecte d_preambles_hig h_range_cell	Integer (0..100)	0..1	It indicates (in percentage) the received randomly selected preambles in the high range, as defined in ETSI TS 136 314 [i.11].
number_of_active _ue_dl_gbr_cell	Integer	0..1	It indicates the number of active UEs with downlink GBR traffic, as defined in ETSI TS 136 314 [i.11].
number_of_active _ue_ul_gbr_cell	Integer	0..1	It indicates the number of active UEs with uplink GBR traffic, as defined in ETSI TS 136 314 [i.11].
number_of_active _ue_dl_nongbr_c ell	Integer	0..1	It indicates the number of active UEs with downlink non-GBR traffic, as defined in ETSI TS 136 314 [i.11].
number_of_active _ue_ul_nongbr_c ell	Integer	0..1	It indicates the number of active UEs with uplink non-GBR traffic, as defined in ETSI TS 136 314 [i.11].
dl_gbr_pdr_cell	Integer (0..100)	0..1	It indicates the packet discard rate in percentage of the downlink GBR traffic in a cell, as defined in ETSI TS 136 314 [i.11].
ul_gbr_pdr_cell	Integer (0..100)	0..1	It indicates the packet discard rate in percentage of the uplink GBR traffic in a cell, as defined in ETSI TS 136 314 [i.11].
dl_nongbr_pdr_c ell	Integer (0..100)	0..1	It indicates the packet discard rate in percentage of the downlink non-GBR traffic in a cell, as defined in ETSI TS 136 314 [i.11].
ul_nongbr_pdr_c ell	Integer (0..100)	0..1	It indicates the packet discard rate in percentage of the uplink non-GBR traffic in a cell, as defined in ETSI TS 136 314 [i.11].
dl_gbr_delay_ue	Integer	0..1	It indicates the packet delay of the downlink GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
ul_gbr_delay_ue	Integer	0..1	It indicates the packet delay of the uplink GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
dl_nongbr_delay_ ue	Integer	0..1	It indicates the packet delay of the downlink non-GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
ul_nongbr_delay_ ue	Integer	0..1	It indicates the packet delay of the uplink non-GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
dl_gbr_pdr_ue	Integer (0..100)	0..1	It indicates the packet discard rate in percentage of the downlink GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
ul_gbr_pdr_ue	Integer (0..100)	0..1	It indicates the packet discard rate in percentage of the uplink GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
dl_nongbr_pdr_u e	Integer (0..100)	0..1	It indicates the packet discard rate in percentage of the downlink non-GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
ul_nongbr_pdr_u e	Integer (0..100)	0..1	It indicates the packet discard rate in percentage of the uplink non-GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
dl_gbr_throughpu t_ue	Integer	0..1	It indicates the scheduled throughput of the downlink GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
ul_gbr_throughpu t_ue	Integer	0..1	It indicates the scheduled throughput of the uplink GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
dl_nongbr_throug hput_ue	Integer	0..1	It indicates the scheduled throughput of the downlink non-GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
ul_nongbr_throug hput_ue	Integer	0..1	It indicates the scheduled throughput of the uplink non-GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
dl_gbr_data_volu me_ue	Integer	0..1	It indicates the data volume of the downlink GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
ul_gbr_data_volu me_ue	Integer	0..1	It indicates the data volume of the uplink GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
dl_nongbr_data_v olume_ue	Integer	0..1	It indicates the data volume of the downlink non-GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].
ul_nongbr_data_v olume_ue	Integer	0..1	It indicates the data volume of the uplink non-GBR traffic of a UE, as defined in ETSI TS 136 314 [i.11].

Table 7.5a.3.1-2: Data structures supported by the GET request/response on this resource

Request body	**Data type**	**Cardinality**	**Remarks**	
	n/a			
Response body	**Data type**	**Cardinality**	**Response Codes**	**Remarks**
	L2Meas	1	200 OK	Upon success, a response body containing the layer 2 measurements information is returned.
	ProblemDetails	0..1	400 Bad Request	It is used to indicate that incorrect parameters were passed in the request. This error condition can also occur if the target area for the request is considered too large. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	401 Unauthorized	It is used when the client did not submit credentials. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	1	403 Forbidden	The operation is not allowed given the current status of the resource. More information shall be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	0..1	404 Not Found	It is used when a client provided a URI that cannot be mapped to a valid resource URI. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	406 Not Acceptable	It is used to indicate that the server cannot provide the any of the content formats supported by the client. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	414 URI Too Long	It is used to indicate that the server is refusing to process the request because the request URI is longer than the server is willing or able to process.
	ProblemDetails	0..1	429 Too Many Requests	It is used when a rate limiter has triggered. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.

7.5a.3.2 PUT

Not applicable.

7.5a.3.3 PATCH

Not applicable.

7.5a.3.4 POST

Not applicable.

7.5a.3.5 DELETE

Not applicable.

7.6 Resource: subscriptions

7.6.1 Description

This resource contains various resources related to subscriptions for notifications.

7.6.2 Resource definition

Resource URI: **{apiRoot}/rni/v2/subscriptions**

This resource shall support the resource URI variables defined in table 7.6.2-1.

Table 7.6.2-1: Resource URI variables for resource "subscriptions"

Name	Definition
apiRoot	See clause 7.2

7.6.3 Resource methods

7.6.3.1 GET

The GET method is used to request information about the subscriptions for this requestor. Upon success, the response contains entity body with the list of links to the subscriptions that are present for the requestor.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in tables 7.6.3.1-1 and 7.6.3.1-2.

Table 7.6.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
subscription_type	String	0..1	Query parameter to filter on a specific subscription type. Permitted values: • cell_change Cell Change • rab_est RAB Establishment • rab_mod RAB Modification • rab_rel RAB Release • meas_rep_ue UE Measurement Report • nr_meas_rep_ue 5G UE Measurement Report • timing_advance_ue UE Timing Advance • ca_reconf Carrier Aggregation Reconfig • s1_bearer S1 Bearer Notification

Table 7.6.3.1-2: Data structures supported by the GET request/response on this resource

Request body	Data type	Cardinality	Remarks	
	n/a			
Response body	**Data type**	**Cardinality**	**Response Codes**	**Remarks**
	SubscriptionLinkList	1	200 OK	Upon success, a response body containing the list of links to requestor's subscriptions is returned.
	ProblemDetails	0..1	400 Bad Request	It is used to indicate that incorrect parameters were passed to the request. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	401 Unauthorized	It is used when the client did not submit credentials. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	1	403 Forbidden	The operation is not allowed given the current status of the resource. More information shall be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	0..1	404 Not Found	It is used when a client provided a URI that cannot be mapped to a valid resource URI. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	406 Not Acceptable	It is used to indicate that the server cannot provide the any of the content formats supported by the client. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	429 Too Many Requests	It is used when a rate limiter has triggered. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.

7.6.3.2 PUT

Not applicable.

7.6.3.3 PATCH

Not applicable.

7.6.3.4 POST

The POST method is used to create a new subscription to Radio Network Information notifications. Upon success, the response contains entity body describing the created subscription.

This method shall support the request and response data structures, and response codes, as specified in table 7.6.3.4-1.

Table 7.6.3.4-1: Data structures supported by the POST request/response on this resource

	Data type	Cardinality	Response Codes	Remarks
Request body	{NotificationSubscription}	1		The entity body in the request contains data type of the specific RNI event subscription that is to be created, where the data type options are listed below and defined in clauses 6.3.2 through 6.3.9 and in 6.3.11: • CellChangeSubscription • RabEstSubscription • RabModSubscription • RabRelSubscription • MeasRepUeSubscription • NrMeasRepUeSubscription • MeasTaSubscription • CaReconfSubscription • S1BearerSubscription
Response body	{NotificationSubscription}	1	201 Created	Indicates successful resource creation, where the resource URI shall be returned in the HTTP Location header field. In the returned NotificationSubscription structure, the created subscription is described using the appropriate data type from the list below and as defined in clauses 6.3.2 through 6.3.9 and in 6.3.11: • CellChangeSubscription • RabEstSubscription • RabModSubscription • RabRelSubscription • MeasRepUeSubscription • NrMeasRepUeSubscription • MeasTaSubscription • CaReconfSubscription • S1BearerSubscription
	ProblemDetails	0..1	400 Bad Request	It is used to indicate that incorrect parameters were passed to the request. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	401 Unauthorized	It is used when the client did not submit credentials. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	1	403 Forbidden	The operation is not allowed given the current status of the resource. More information shall be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	0..1	404 Not Found	It is used when a client provided a URI that cannot be mapped to a valid resource URI. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	406 Not Acceptable	It is used to indicate that the server cannot provide the any of the content formats supported by the client. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.

	Data type	Cardinality	Response Codes	Remarks
Response Body	ProblemDetails	0..1	415 Unsupported Media Type	It is used to indicate that the server or the client does not support the content type of the entity body. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	422 Unprocessable Entity	It is used to indicate that the server understands the content type of the request entity and that the syntax of the request entity is correct but that the server is unable to process the contained instructions. This error condition can occur if an JSON request body is syntactically correct but semantically incorrect, for example if the target area for the request is considered too large. This error condition can also occur if the capabilities required by the request are not supported. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	429 Too Many Requests	It is used when a rate limiter has triggered. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.

7.6.3.5 DELETE

Not applicable.

7.7 Void

7.8 Resource: existing subscription

7.8.1 Description

This resource represents a subscription that the client has created to receive RNI event notifications.

7.8.2 Resource definition

Resource URI: **{apiRoot}/rni/v2/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 7.8.2-1.

Table 7.8.2-1: Resource URI variables for resource "existing subscription"

Name	Definition
apiRoot	See clause 7.2.
subscriptionId	Refers to created subscription, where the RNI API allocates a unique resource name for this subscription. The resource name can be also used to identify the resource.

7.8.3 Resource methods

7.8.3.1 GET

The GET method is used to retrieve information about this subscription. Upon success, the response contains entity body with the data type describing the subscription.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in tables 7.8.3.1-1 and 7.8.3.1-2.

Table 7.8.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
n/a			

Table 7.8.3.1-2: Data structures supported by the GET request/response on this resource

Request body	Data type	Cardinality	Remarks	
	n/a			
Response body	**Data type**	**Cardinality**	**Response Codes**	**Remarks**
	{NotificationSubscription}	1	200 OK	Upon success, a response body containing data type describing the specific RNI event subscription is returned. The allowed data types for subscriptions are defined in clauses 6.3.2 through 6.3.9 and in 6.3.11 and are as follows: • CellChangeSubscription • RabEstSubscription • RabModSubscription • RabRelSubscription • MeasRepUeSubscription • NrMeasRepUeSubscription • MeasTaSubscription • CaReconfSubscription • S1BearerSubscription
	ProblemDetails	0..1	400 Bad Request	It is used to indicate that incorrect parameters were passed to the request. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	401 Unauthorized	It is used when the client did not submit credentials. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	1	403 Forbidden	The operation is not allowed given the current status of the resource. More information shall be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	0..1	404 Not Found	It is used when a client provided a URI that cannot be mapped to a valid resource URI. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.

	Data type	Cardinality	Response Codes	Remarks
Response body	ProblemDetails	0..1	406 Not Acceptable	It is used to indicate that the server cannot provide the any of the content formats supported by the client. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	429 Too Many Requests	It is used when a rate limiter has triggered. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.

7.8.3.2 PUT

The PUT method is used to update the existing subscription. PUT method in this case has "replace" semantics. Upon successful operation, the target resource is updated with new Data Type received within the message body of the PUT request.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in tables 7.8.3.2-1 and 7.8.3.2-2.

Table 7.8.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	Cardinality	Remarks
n/a			

Table 7.8.3.2-2: Data structures supported by the PUT request/response on this resource

	Data type	Cardinality	Response Codes	Remarks
Request body	{NotificationSubscription}	1		New NotificationSubscription is included as entity body of the request. The allowed data types for subscriptions are defined in clauses 6.3.2 through 6.3.9 and in 6.3.11 and are as follows: • CellChangeSubscription • RabEstSubscription • RabModSubscription • RabRelSubscription • MeasRepUeSubscription • NrMeasRepUeSubscription • MeasTaSubscription • CaReconfSubscription • S1BearerSubscription
Response body	{NotificationSubscription}	1	200 OK	Upon success, a response body containing data type describing the updated subscription is returned. The allowed data types for subscriptions are defined in clauses 6.3.2 through 6.3.9 and in 6.3.11 and are as follows: • CellChangeSubscription • RabEstSubscription • RabModSubscription • RabRelSubscription • MeasRepUeSubscription • NrMeasRepUeSubscription • MeasTaSubscription • CaReconfSubscription • S1BearerSubscription

	Data type	Cardinality	Response Codes	Remarks
Response body	ProblemDetails	0..1	400 Bad Request	It is used to indicate that incorrect parameters were passed to the request. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	401 Unauthorized	It is used when the client did not submit credentials. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	1	403 Forbidden	The operation is not allowed given the current status of the resource. More information shall be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	0..1	404 Not Found	It is used when a client provided a URI that cannot be mapped to a valid resource URI. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	406 Not Acceptable	It is used to indicate that the server cannot provide the any of the content formats supported by the client. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	412 Precondition Failed	It is used when a condition has failed during conditional requests, e.g. when using ETags to avoid write conflicts when using PUT. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	422 Unprocessable Entity	It is used to indicate that the server understands the content type of the request entity and that the syntax of the request entity is correct but that the server is unable to process the contained instructions. This error condition can occur if an JSON request body is syntactically correct but semantically incorrect, for example if the target area for the request is considered too large. This error condition can also occur if the capabilities required by the request are not supported. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	429 Too Many Requests	It is used when a rate limiter has triggered. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.

7.8.3.3 PATCH

Not applicable.

7.8.3.4 POST

Not applicable.

7.8.3.5 DELETE

The DELETE method is used to cancel the existing subscription. Cancellation can be made by deleting the resource that represents existing subscription.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in tables 7.8.3.5-1 and 7.8.3.5-2.

Table 7.8.3.5-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	Cardinality	Remarks
n/a			

Table 7.8.3.5-2: Data structures supported by the DELETE request/response on this resource

Request body	Data type	Cardinality	Remarks	
	n/a			
Response body	**Data type**	**Cardinality**	**Response Codes**	**Remarks**
	n/a		204 No Content	Upon success, a response 204 No Content without any response body is returned.
	ProblemDetails	0..1	401 Unauthorized	It is used when the client did not submit credentials. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	1	403 Forbidden	The operation is not allowed given the current status of the resource. More information shall be provided in the "detail" attribute of the "ProblemDetails" structure.
	ProblemDetails	0..1	404 Not Found	It is used when a client provided a URI that cannot be mapped to a valid resource URI. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.
	ProblemDetails	0..1	429 Too Many Requests	It is used when a rate limiter has triggered. In the returned ProblemDetails structure, the "detail" attribute should convey more information about the error.

Annex A (informative): Mapping of permissions for RESTful API and topic based alternative transport

A.1 Overview

This annex provides mappings of permissions for topics between RESTful API and topic based alternative transport. ETSI GS MEC 009 [i.8] describes how permissions for topics between RESTful API and alternative transport can be mapped with each other. This annex uses the template for permissions mapping as defined in that group specification.

A.2 Mapping of permissions - RESTful and topic based alternative transport

Table A.2-1 lists the permission categories for each topic currently included in RNIS API specification.

Table A.2-1: Definition of permissions for RNIS

Permission identifier	Display name	Remarks
rab_info	RAB Info	Query
plmn_info	PLMN Info	Query
s1_bearer_info	S1 Bearer Info	Query
cell_change	Cell Change	Subscribe-Notify
rab_est	RAB Establishment	Subscribe-Notify
rab_mod	RAB Modification	Subscribe-Notify
rab_rel	RAB Release	Subscribe-Notify
meas_rep_ue	UE Measurement Report	Subscribe-Notify
nr_meas_rep_ue	5G UE Measurement Report	Subscribe-Notify
timing_advance_ue	UE Timing Advance	Subscribe-Notify
ca_reconf	Carrier Aggregation Reconfiguration	Subscribe-Notify
s1_bearer	S1 Bearer Notification	Subscribe-Notify

Table A.2-2 describes how permission identifiers can be mapped to resources in the RNIS RESTful API as defined in the present document.

Table A.2-2: Permission identifiers mapping for transport "REST"

Permission identifier	Specification
rab_info	Resource: …/rni/v2/queries/rab_info
plmn_info	Resource: …/rni/v2/queries/plmn_info
s1_bearer_info	Resource: …/rni/v2/queries/s1_bearer_info
cell_change	Resource: …/rni/v2/subscriptions/cell_change
rab_est	Resource: …/rni/v2/subscriptions/rab_est
rab_mod	Resource: …/rni/v2/subscriptions/rab_mod
rab_rel	Resource: …/rni/v2/subscriptions/rab_rel
meas_rep_ue	Resource: …/rni/v2/subscriptions/meas_rep_ue
nr_meas_rep_ue	Resource: …/rni/v2/subscriptions/nr_meas_rep_ue
timing_advance_ue	Resource: …/rni/v2/subscriptions/ta
ca_reconf	Resource: …/rni/v2/subscriptions/ca_reconf
s1_bearer	Resource: …/rni/v2/subscriptions/s1_bearer

Table A.2-3 describes how the permission identifiers can be mapped to topics offered over topic-based message bus.

Table A.2-3: Permission identifiers mapping for transport "Topic-based message bus"

Permission identifier	Specification
rab_info	Topic: /rni/enb/rab_info
plmn_info	Topic: /rni/enb/plmn_info
s1_bearer_info	Topic: /rni/enb/s1_bearer_info
cell_change	Topic: /rni/ue/mobility/cell_change
rab_est	Topic: /rni/ue/rab/establish
rab_mod	Topic: /rni/ue/rab/modify
rab_rel	Topic: /rni/ue/rab/release
meas_rep_ue	Topic: /rni/ue/meas/report
nr_meas_rep_ue	Topic: /rni/ue/meas/nr_report
timing_advance_ue	Topic: /rni/ue/meas/ta
ca_reconf	Topic: /rni/ue/ca_reconf
s1_bearer	Topic: /rni/ue/s1_bearer

Annex B (informative): Complementary material for API utilisation

To complement the definitions for each method and resource defined in the interface clauses of the present document, ETSI MEC ISG is providing for the Radio Network Information API a supplementary description file compliant to the OpenAPI Specification [i.9].

In addition, a further supplementary file defining the data types in protocol buffers format, as defined in the Protocol Buffers Language Specification [i.10], is provided.

In case of discrepancies between the supplementary files and the related data structure definitions in the present document, the data structure definitions take precedence.

The supplementary files, relating to the present document, are located at https://forge.etsi.org/rep/mec/gs012-rnis-api.

History

Document history		
V1.1.1	July 2017	Publication
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