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Publicly Available Specification (PAS); E2 interface: Application Protocol (O-RAN.WG3.E2AP-R003-v04.00)

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ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B
Association à but non lucratif enregistrée à la
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Foreword

This Technical Specification (TS) has been produced by O-RAN Alliance and approved by ETSI Technical Committee Mobile Standards Group (MSG).

The present document is part of a TS-family covering the E2 interface as identified below:

- "E2 interface: General Aspects and Principles";
- "E2 interface: Application Protocol"; and
- "E2 interface: Service Model".

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 specifies the Near-RT RIC layer signalling protocol for the E2 interface.

The E2 interface provides means for interconnecting a Near-RT RIC and an E2 Node. The E2 Application Protocol (E2AP) supports the functions of E2 interface by signalling procedures defined in the present document. E2AP is developed in accordance with the general principles stated in ETSI TS 104 038 [2].

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.

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

- [1] Void.
- [2] [ETSI TS 104 038](#): "Publicly Available Specification (PAS); E2 interface: General Aspects and Principles (O-RAN.WG3.E2GAP-R003-v04.01)".
- [3] [ETSI TS 104 040](#): "Publicly Available Specification (PAS); E2 interface: Service Model (O-RAN.WG3.E2SM-R003-v04.00)".
- [4] Void.
- [5] Void.
- [6] Void.
- [7] Void.
- [8] [ETSI TS 136 420](#): "LTE; Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 general aspects and principles (3GPP TS 36.420)".
- [9] Void.
- [10] [ETSI TS 138 410](#): "5G; NG-RAN; NG general aspects and principles (3GPP TS 38.410)".
- [11] [ETSI TS 138 420](#): "5G; NG-RAN; Xn general aspects and principles (3GPP TS 38.420)".
- [12] [ETSI TS 138 470](#): "5G; NG-RAN; F1 general aspects and principles (3GPP TS 38.470)".
- [13] [ETSI TS 136 410](#): "LTE; Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 general aspects and principles (3GPP TS 36.410)".
- [14] Void.
- [15] [Recommendation ITU-T X.691 \(07/2002\)](#): "Information technology - ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)".

- [16] [Recommendation ITU-T X.680 \(07/2002\)](#): "Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation".
- [17] [Recommendation ITU-T X.681 \(07/2002\)](#): "Information technology - Abstract Syntax Notation One (ASN.1): Information object specification".
- [18] Void.
- [19] [ETSI TS 138 413](#): "5G; NG-RAN; NG Application Protocol (NGAP) (3GPP TS 38.413)".
- [20] [ETSI TS 138 423](#): "5G; NG-RAN; Xn Application Protocol (XnAP) (3GPP TS 38.423)".
- [21] [ETSI TS 137 483](#): "5G; E1 Application Protocol (E1AP) (3GPP TS 37.483)".
- [22] [ETSI TS 138 473](#): "5G; NG-RAN; F1 Application Protocol (F1AP) (3GPP TS 38.473)".
- [23] [ETSI TS 137 473](#): "LTE; 5G; W1 interface; Application Protocol (W1AP) (3GPP TS 37.473)".
- [24] [ETSI TS 136 413](#): "LTE; Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP) (3GPP TS 36.413)".
- [25] [ETSI TS 136 423](#): "LTE; Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 Application Protocol (X2AP) (3GPP TS 36.423)".
- [26] [IETF RFC 5905](#): "Network Time Protocol Version 4: Protocol and Algorithms Specification".
- [27] [ETSI TS 103 982](#): "Publicly Available Specification (PAS); O-RAN Architecture Description (O-RAN.WG1.OAD-R003-v08.00)".

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.

NOTE 1: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

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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 TR 121 905: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; 5G; Vocabulary for 3GPP Specifications (3GPP TR 21.905)".
- [i.2] ETSI TR 125 921 (V7.0.0): "Universal Mobile Telecommunications System (UMTS); Guidelines and principles for protocol description and error handling (3GPP TR 25.921 version 7.0.0 Release 7)".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI TR 121 905 [i.1], ETSI TS 103 982 [27] and the following apply.

NOTE: A term defined in the present document takes precedence over the definition of the same term, if any, in ETSI TR 121 905 [i.1] and ETSI TS 103 982 [27].

E2 Node Component ID: local identifier used to uniquely identify an E2 Node component

Elementary Procedure: E2AP protocol consists of Elementary Procedures (EPs)

NOTE: An E2AP Elementary Procedure is a unit of interaction between the Near-RT RIC and an E2 Node. An EP consists of an initiating message and possibly a response message. Two kinds of EPs are used:

Class 1: Elementary Procedures with response (success or failure),

Class 2: Elementary Procedures without response.

Global E2 Node ID: global identifier of an E2 Node

NOTE: Defined as the global eNB or gNB identifier and an optional local identifier of an CU-UP or DU which is required when and if an individual DU or CU-UP supports a direct E2 interface.

Global RIC ID: global identifier of a Near-RT RIC

RAN Function: specific Function in a E2 Node; examples include termination of network interfaces (i.e. X2 [8], F1 [12], S1 [13], Xn [11], NGc [10]) and RAN internal functions handling UEs, Cells, etc.

RAN Function ID: local identifier of a specific RAN Function within an E2 Node that supports one or more RIC Services using a specific E2 Service Model

RAN Function OID: RAN Function Object Identifier used to identify specific RAN function definition (i.e. E2SM used by specific RAN Function)

RIC Action ID: local identifier used Near-RT RIC to identify a specific RIC Service Action within a specific RIC Subscription Request, used by E2 Node in subsequent RIC Indication messages

RIC Call Process ID: local identifier used by E2 Node to identify the suspended associated procedure instance during an Insert RIC Service Action, used by Near-RT RIC in subsequent RIC Control procedure

RIC Request ID: local identifier used to identify a specific RIC Functional procedure among all ongoing parallel procedures of the same type initiated by the same protocol peer

NOTE: Messages belonging to the same procedure use the same RIC Request ID. The RIC Request ID is determined by the initiating peer of a RIC Functional Procedure.

RIC Service: service provided on an E2 Node to provide access to messages and measurements and/or enable control of the E2 Node from the Near-RT RIC

Transaction ID: local identifier used to uniquely identify a Global Procedure among all ongoing parallel procedures of the same type initiated by the same protocol peer

NOTE: Messages belonging to the same procedure use the same Transaction ID. The Transaction ID is determined by the initiating peer of a Global Procedure (Near-RT RIC or E2 Node).

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI TR 121 905 [i.1], ETSI TS 103 982 [27] and the following apply.

NOTE: An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in ETSI TR 121 905 [i.1] and ETSI TS 103 982 [27].

EP Elementary Procedure

4 General

4.1 Procedure Specification Principles

The principle for specifying the procedure logic is to specify the functional behaviour of the terminating node exactly and completely. Any rule that specifies the behaviour of the originating node shall be possible to be verified with information that is visible within the system.

The following specification principles have been applied for the procedure text in clause 8:

- The procedure text discriminates between:

1) Functionality which "shall" be executed.

The procedure text indicates that the receiving node "shall" perform a certain function Y under a certain condition. If the receiving node supports procedure X but cannot perform functionality Y requested in the REQUEST message of a Class 1 EP, the receiving node shall respond with the message used to report unsuccessful outcome for this procedure, containing an appropriate cause value.

2) Functionality which "shall, if supported" be executed.

The procedure text indicates that the receiving node "shall, if supported," perform a certain function Y under a certain condition. If the receiving node supports procedure X but does not support functionality Y, the receiving node shall proceed with the execution of the EP, possibly informing the requesting node about the not supported functionality.

Any required inclusion of an optional IE in a response message is explicitly indicated in the procedure text. If the procedure text does not explicitly indicate that an optional IE shall be included in a response message, the optional IE shall not be included. For requirements on including Criticality Diagnostics IE, see clause 10.

4.2 Forwards and Backwards Compatibility

The forwards and backwards compatibility of the protocol is assured by mechanism where all current and future messages, and IEs or groups of related IEs, include ID and criticality fields that are coded in a standard format that will not be changed in the future. These parts can always be decoded regardless of the standard version.

4.3 Specification Notations

For the purposes of the present document, the following notations apply:

| | |
|-----------|--|
| Procedure | When referring to an Elementary Procedure (EP) in the present document the Procedure Name is written with the first letters in each word in upper case characters followed by the word "procedure", e.g. Handover Preparation procedure. |
| Message | When referring to a message in the present document the MESSAGE NAME is written with all letters in upper case characters followed by the word "message", e.g. HANDOVER REQUEST message. |

| | |
|----------------|---|
| IE | When referring to an Information Element (IE) in the present document the <i>Information Element Name</i> is written with the first letters in each word in upper case characters and all letters in Italic font followed by the abbreviation "IE", e.g. <i>E-RAB ID IE</i> . |
| Value of an IE | When referring to the value of an Information Element (IE) in the present document the "Value" is written as it is specified in the present document enclosed by quotation marks, e.g. "Value". |

5 E2AP Services

5.1 E2AP procedure modules

The E2 interface E2AP procedures are divided into two modules as follows:

1. RIC Functional Procedures;
2. Global Procedures.

The RIC functional procedures module contains procedures used to pass application specific messages between Near-RT RIC applications and a target RAN Function in an E2 node [2].

The Global Procedures module contains procedures that are not directly related to a specific application.

5.2 Parallel transactions

Parallel transactions, that is, multiple ongoing E2AP procedures related to the same Application and E2 node, are supported.

6 Services expected from Signalling Transport

The signalling connection shall provide in sequence delivery of E2AP messages. E2AP shall be notified if the signalling connection breaks.

7 Functions of E2AP

The functions of E2AP are described in ETSI TS 104 038 [2].

8 E2AP Procedures

8.1 Elementary Procedures

In Tables 8.1-1 and 8.1-2, all EPs are divided into Class 1 and Class 2 EPs.

Table 8.1-1: Class 1 Elementary Procedures

| Initiated by | Elementary Procedure | Initiating Message | Successful Outcome | Unsuccessful Outcome |
|------------------------|--|--|--|---------------------------------------|
| | | | Response message | Response message |
| Near-RT RIC | RIC Subscription | RIC SUBSCRIPTION REQUEST | RIC SUBSCRIPTION RESPONSE | RIC SUBSCRIPTION FAILURE |
| Near-RT RIC | RIC Subscription Delete | RIC SUBSCRIPTION DELETE REQUEST | RIC SUBSCRIPTION DELETE RESPONSE | RIC SUBSCRIPTION DELETE FAILURE |
| Near-RT RIC | RIC Subscription Modification | RIC SUBSCRIPTION MODIFICATION REQUEST | RIC SUBSCRIPTION MODIFICATION RESPONSE | RIC SUBSCRIPTION MODIFICATION FAILURE |
| E2 Node | RIC Subscription Modification Required | RIC SUBSCRIPTION MODIFICATION REQUIRED | RIC SUBSCRIPTION MODIFICATION CONFIRM | RIC SUBSCRIPTION MODIFICATION REFUSE |
| Near-RT RIC | RIC Control | RIC CONTROL REQUEST | RIC CONTROL ACKNOWLEDGE | RIC CONTROL FAILURE |
| Near-RT RIC | RIC Query | RIC QUERY REQUEST | RIC QUERY RESPONSE | RIC QUERY FAILURE |
| E2 Node | E2 Setup | E2 SETUP REQUEST | E2 SETUP RESPONSE | E2 SETUP FAILURE |
| E2 Node | RIC Service Update | RIC SERVICE UPDATE | RIC SERVICE UPDATE ACKNOWLEDGE | RIC SERVICE UPDATE FAILURE |
| E2 Node | E2 Node Configuration Update | E2 NODE CONFIGURATION UPDATE | E2 NODE CONFIGURATION UPDATE ACKNOWLEDGE | E2 NODE CONFIGURATION UPDATE FAILURE |
| Near-RT RIC | E2 Connection Update | E2 CONNECTION UPDATE | E2 CONNECTION UPDATE ACKNOWLEDGE | E2 CONNECTION UPDATE FAILURE |
| Near-RT RIC or E2 Node | Reset | RESET REQUEST | RESET RESPONSE | |
| Near-RT RIC or E2 Node | E2 Removal | E2 REMOVAL REQUEST | E2 REMOVAL RESPONSE | E2 REMOVAL FAILURE |

Table 8.1-2: Class 2 Elementary Procedures

| Initiated by | Elementary Procedure | Initiating Message |
|------------------------|----------------------------------|----------------------------------|
| E2 Node | RIC Indication | RIC INDICATION |
| Near-RT RIC | RIC Service Query | RIC SERVICE QUERY |
| E2 Node | RIC Subscription Delete Required | RIC SUBSCRIPTION DELETE REQUIRED |
| E2 Node or Near-RT RIC | Error Indication | ERROR INDICATION |

8.2 RIC Functional Procedures

8.2.1 RIC Subscription procedure

8.2.1.1 General

This procedure is used to establish RIC Subscriptions on E2 Node consisting of an event trigger and a sequence of RIC Service Actions.

This procedure shall be initiated by the Near-RT RIC.

This procedure uses RIC Service signalling.

8.2.1.2 Successful Operation

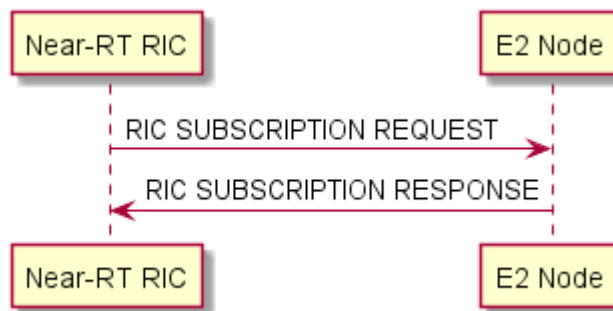


Figure 8.2.1.2-1: RIC Subscription procedure, successful operation

The Near-RT RIC initiates the procedure by sending a RIC SUBSCRIPTION REQUEST message, which shall contain a unique *RIC Request ID* IE, assigned by the Near-RT RIC, to the E2 Node.

When the Near-RT RIC sends the RIC SUBSCRIPTION REQUEST message, it shall start the timer $T_{\text{RICEVENTcreate}}$.

At reception of the RIC SUBSCRIPTION REQUEST message the E2 Node shall:

- Determine the target RAN Function using the information in the *RAN Function ID* IE and configure the requested event trigger using information in the *RIC Subscription Details* IE.
- If one or more Report, Insert and/or Policy RIC Service Actions are included in the *RIC Subscription Details* IE then the target RAN Function shall validate the event trigger and requested action sequence and, if accepted, store the required *RIC Request ID*, *RIC Event Trigger Definition* IE and sequence of RIC Service Actions.
- If optional *RIC Subscription Start Time* IE is present and has expired, then the E2 Node shall ignore the optional *RIC Subscription Start Time* IE.

If the requested trigger and at least one required RIC Service Action are accepted by the E2 Node, the E2 Node shall reserve for each admitted RIC Service Action the necessary resources and send the RIC SUBSCRIPTION RESPONSE message back to the Near-RT RIC.

The E2 Node shall include in the response message the RIC Service Actions for which resources have been prepared at the E2 Node in the *RIC Actions Admitted List* IE.

The E2 Node shall include the RIC Service Actions that have not been admitted in the *RIC Actions Not Admitted List* IE with an appropriate cause value.

Upon reception of the RIC SUBSCRIPTION RESPONSE message the Near-RT RIC shall stop timer $T_{\text{RICEVENTcreate}}$ and terminate the RIC Subscription procedure.

If more than one RIC Service Actions has been accepted by the E2 Node then, at each occurrence of the common Event Trigger, the sequence of RIC Service Actions shall be executed according to the following considerations:

- If optional *RIC Action Execution Order* IE is not present or is present and set to 0 ("Any order"), then the specific RIC Service Action in the sequence of RIC Service Actions may be executed in any order irrespective of the execution order of the other RIC Service Actions.
- If optional *RIC Action Execution Order* IE is present and set to a value greater than 0, then the specific RIC Service Action shall be executed in order according to the *RIC Action Execution Order* IE.
- If two or more RIC Service Actions have the same value for the optional *RIC Action Execution Order* IE then these RIC Service Actions shall be executed in parallel.

If the optional *RIC Subscription Start Time* IE is present, the E2 Node shall only enable the event trigger from the indicated start time.

If the optional *RIC Subscription End Time* IE is present, the E2 Node shall disable the event trigger when the indicated end time has expired.

Interactions with RIC Subscription Delete Required procedure:

If the optional *RIC Subscription End Time* IE is present and the indicated end time has expired, the E2 Node may send the RIC SUBSCRIPTION DELETE REQUIRED message to the Near-RT RIC with an appropriate cause value.

Interactions with RIC Subscription Delete procedure:

If the optional *RIC Subscription End Time* IE is present, the Near-RT RIC may initiate an RIC Subscription Delete procedure when the expected *RIC Subscription End Time* has expired.

8.2.1.3 Unsuccessful Operation

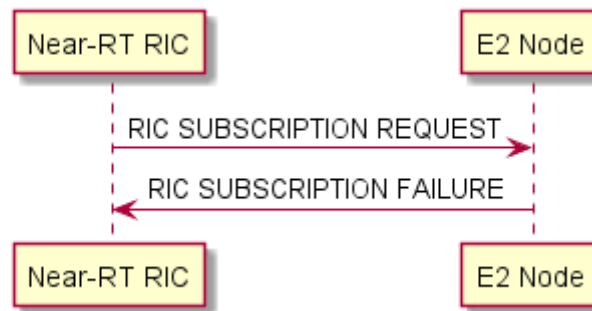


Figure 8.2.1.3-1: RIC Subscription procedure, unsuccessful operation

If a failure occurs during the RIC Subscription procedure the E2 Node shall send the RIC SUBSCRIPTION FAILURE message to the Near-RT RIC containing an appropriate cause value.

If the E2 Node admits none of the requested RIC Service Actions, or detects an inconsistency in the sequence of RIC ServiceActions, or in the optional *RIC Subsequent Action* IE definitions, the E2 Node shall send the RIC SUBSCRIPTION FAILURE message to the Near-RT RIC containing an appropriate cause value.

If the RIC Subscription procedure contains an invalid optional *RIC Subscription Start Time* IE and/or *RIC Subscription End Time* IE, the E2 Node shall send the RIC SUBSCRIPTION FAILURE message to the Near-RT RIC containing an appropriate cause value.

Upon reception of the RIC SUBSCRIPTION FAILURE message the Near-RT RIC shall stop the timer $T_{\text{RICEVENTcreate}}$ and terminate the RIC Subscription procedure.

Interactions with RIC Subscription Delete procedure:

If there is no response from the E2 Node to the RIC SUBSCRIPTION REQUEST message before timer $T_{\text{RICEVENTcreate}}$ expires in the Near-RT RIC, the Near-RT RIC shall initiate the RIC Subscription Delete procedure containing *RIC Request ID* IE that was previously assigned by the Near-RT RIC to cancel the RIC Subscription towards the E2 Node. The Near-RT RIC shall ignore any RIC SUBSCRIPTION RESPONSE or RIC SUBSCRIPTION FAILURE message containing *RIC Request ID* IE that was previously assigned by the Near-RT RIC received after the initiation of the RIC Subscription Delete procedure and release any resources related to the concerned E2 Node.

8.2.1.4 Abnormal Conditions

If the E2 Node receives a RIC SUBSCRIPTION REQUEST message containing *RIC Subscription Details* IE that does not align with the E2 Service Model [3], the E2 Node shall send the RIC SUBSCRIPTION FAILURE message to the Near-RT RIC containing an appropriate cause value.

If the E2 Node receives a RIC SUBSCRIPTION REQUEST message which contains an unknown *RAN Function ID* IE, the E2 Node shall send the RIC SUBSCRIPTION FAILURE message to the Near-RT RIC containing an appropriate cause value.

If the E2 Node receives a RIC SUBSCRIPTION REQUEST message containing identical contents the E2 Node shall send the RIC SUBSCRIPTION FAILURE message to the Near-RT RIC containing an appropriate cause value.

8.2.2 RIC Subscription Delete procedure

8.2.2.1 General

This procedure is used to delete RIC Subscriptions on E2 Node.

This procedure shall be initiated by the Near-RT RIC.

This procedure uses RIC Service signalling.

8.2.2.2 Successful Operation

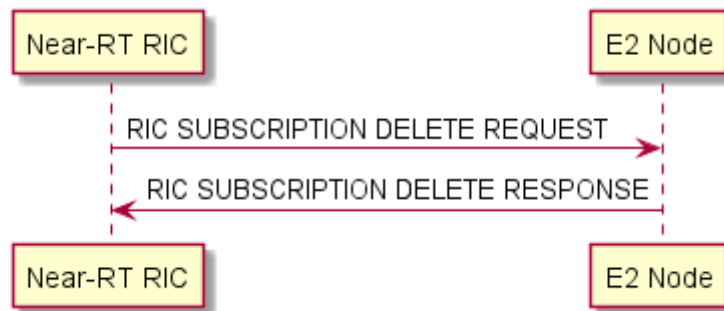


Figure 8.2.2.2-1: RIC Subscription Delete procedure, successful operation

The Near-RT RIC initiates the procedure by sending a RIC SUBSCRIPTION DELETE REQUEST message, containing *RIC Request ID* IE that was previously assigned by the Near-RT RIC during a successful RIC Subscription procedure, to the E2 Node.

When the Near-RT RIC sends the RIC SUBSCRIPTION DELETE REQUEST message, it shall start timer $T_{\text{RICEVENTdelete}}$.

At reception of the RIC SUBSCRIPTION DELETE REQUEST message the E2 Node shall delete the indicated RIC Subscription and release the corresponding necessary resources.

The E2 Node shall send the RIC SUBSCRIPTION DELETE RESPONSE message back to the Near-RT RIC.

Upon reception of the RIC SUBSCRIPTION DELETE RESPONSE message the Near-RT RIC shall stop timer $T_{\text{RICEVENTdelete}}$, release any necessary resources associated with that RIC Subscription and terminate the RIC Subscription Delete procedure.

8.2.2.3 Unsuccessful Operation

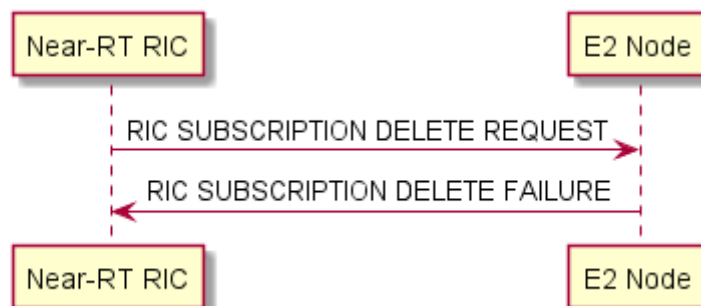


Figure 8.2.2.3-1: RIC Subscription Delete procedure, unsuccessful operation

If a failure occurs during the RIC Subscription Delete procedure, the E2 Node shall send the RIC SUBSCRIPTION DELETE FAILURE message to the Near-RT RIC containing an appropriate cause value.

If the *RIC Request ID* IE included in the RIC SUBSCRIPTION DELETE REQUEST message is unknown, the E2 Node shall send the RIC SUBSCRIPTION DELETE FAILURE message to the Near-RT RIC containing an appropriate cause value

Upon reception of the RIC SUBSCRIPTION DELETE FAILURE message the Near-RT RIC shall stop timer $T_{\text{RICEVENTdelete}}$ and terminate the RIC Subscription Delete procedure.

8.2.2.4 Abnormal Conditions

If the E2 Node receives a RIC SUBSCRIPTION DELETE REQUEST message contains an unknown *RAN Function ID* IE, the E2 Node shall send the RIC SUBSCRIPTION DELETE FAILURE message to the Near-RT RIC containing an appropriate cause value.

8.2.2A RIC Subscription Delete Required procedure

8.2.2A.1 General

This procedure is used to enable the E2 Node to request deletion of the existing RIC Subscriptions in the E2 Node previously created for the Near-RT RIC.

This procedure shall be initiated by the E2 Node.

This procedure uses RIC Service signalling.

8.2.2A.2 Successful Operation

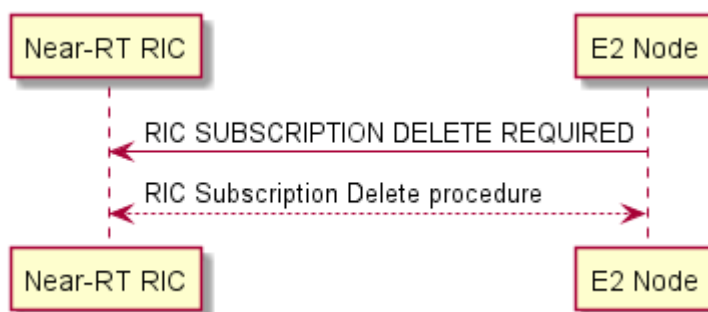


Figure 8.2.2A.2-1: RIC Subscription Delete Required procedure, successful operation

The E2 Node initiates the procedure by sending a RIC SUBSCRIPTION DELETE REQUIRED message, containing *RIC Request ID* IE that was previously assigned by the Near-RT RIC during a successful RIC Subscription procedure, to the Near-RT RIC.

The message shall contain an appropriate cause value for each RIC Subscription requesting to remove.

At reception of the RIC SUBSCRIPTION DELETE REQUIRED message, for each RIC Subscription associated with the included *RIC Request ID* IE and *RAN Function ID* IE, the Near-RT RIC may initiate the RIC Subscription Delete procedure toward the E2 Node.

8.2.2A.3 Abnormal Conditions

If the Near-RT RIC receives a RIC SUBSCRIPTION DELETE REQUIRED message which contains an unknown *RIC Request ID* IE and *RAN Function ID* IE, the Near-RT RIC shall ignore the message.

8.2.3 RIC Indication procedure

8.2.3.1 General

The purpose of the RIC Indication procedure is to transfer Report and/or Insert RIC Service Action associated with a RIC Subscription procedure.

This procedure shall be initiated by the E2 Node.

This procedure uses RIC Service signalling.

8.2.3.2 Successful Operation

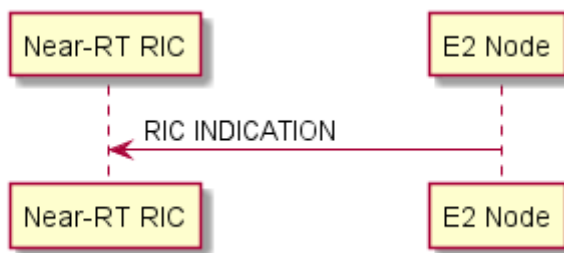


Figure 8.2.3.2-1: RIC Indication procedure, successful operation

An E2 Node initiates the procedure by sending RIC INDICATION message to the Near-RT RIC containing the *RIC Request ID* IE, that was previously assigned by the Near-RT RIC during a successful RIC Subscription procedure.

If the RIC Indication message is in response to an Insert RIC Service Action, then the E2 Node shall provide the *RIC Call Process ID* IE within the RIC INDICATION message, and the E2 Node shall store current call state, start the associated *RIC Time to Wait* timer, and suspend further processing of the associated RAN function.

Near-RT RIC may use the *RIC Call Process ID* IE in a subsequent RIC Control procedure.

If an *RIC Subsequent Action* IE was associated to the RIC Service Action then, after successful transmission of the RIC INDICATION message, the originating E2 Node shall progress accordingly:

- If the *RIC Subsequent Action Type* IE was set to Continue or Halt, and the associated *RIC Time to Wait* timer has not expired, and a RIC CONTROL REQUEST message is received with the same *RIC Call Process ID* IE, then the E2 Node shall use the RIC CONTROL REQUEST information along with the stored call state and continue to execute any remaining actions in the sequence of RIC Actions defined in the RIC Subscription procedure prior to resuming normal functionality of the associated RAN function.
- If the *RIC Subsequent Action Type* IE was set to Continue and the associated *RIC Time to Wait* timer has expired, then the E2 Node shall use the stored call state and continue to execute any remaining RIC Service Actions in the sequence of RIC Service Actions defined in the RIC Subscription procedure.
- If the *RIC Subsequent Action Type* IE was set to Halt and the associated *RIC Time to Wait* timer has expired, then the E2 Node shall abort further processing of the associated RAN function. In this case, any remaining RIC Service Actions in the sequence of RIC Actions defined in the RIC Subscription procedure shall also be aborted.

Table 8.2.3.2-1: RIC Indication procedure, successful operation

| Subsequent Action | RIC Time to Wait timer | Condition | Outcome |
|-------------------|------------------------|---|---|
| Continue or Halt | required | E2 Node detected the event trigger in the <i>RIC Event Trigger Definition</i> IE. | RIC INDICATION message shall provide the <i>RIC Call Process ID</i> IE and E2 Node shall store current call state, start the associated <i>RIC Time to Wait</i> timer, and suspend further processing of the associated RAN function. |
| Continue or Halt | not yet expired | E2 Node received the RIC CONTROL REQUEST message with the same <i>RIC call process ID</i> IE. | E2 Node shall use the RIC CONTROL information along with the stored call state and continue to execute any remaining actions in the sequence of RIC Actions defined in the RIC Subscription procedure. |
| Continue | expired | | E2 Node shall use the stored call state and continue to execute any remaining actions in the sequence of RIC Actions defined in the RIC Subscription procedure. |
| Halt | expired | | E2 Node shall abort normal functionality of the associated RAN function. |

8.2.3.3 Unsuccessful Operation

Not applicable.

8.2.3.4 Abnormal Conditions

Not applicable.

8.2.4 RIC Control procedure

8.2.4.1 General

The purpose of the RIC Control procedure is to initiate or resume a specific functionality in the E2 Node.

This procedure shall be initiated by the Near-RT RIC.

This procedure uses RIC Service signalling.

8.2.4.2 Successful Operation

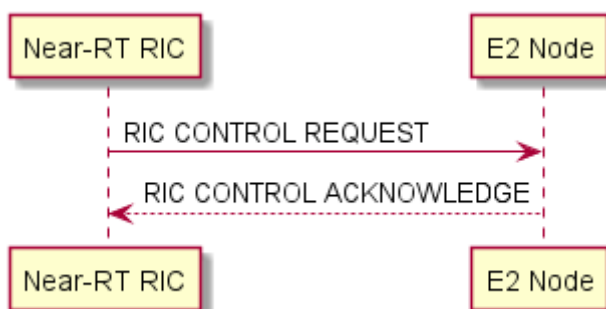


Figure 8.2.4.2-1: RIC Control procedure, successful operation

The Near-RT RIC initiates the procedure by sending a RIC CONTROL REQUEST message containing a unique *RIC Request ID* IE, assigned by the Near-RT RIC.

When the Near-RT RIC sends the RIC CONTROL REQUEST message and the optional *RIC Control Ack Request* IE has been set to "Ack", or is not present, the Near-RT RIC, it shall start the timer $T_{RICcontrol}$.

At reception of the RIC CONTROL REQUEST message the E2 Node shall:

- Determine the target RAN Function using the information in the *RAN Function ID* IE and initiate the requested RIC Control procedure action using information in the *RIC Control Message* IE.
- If the *RIC Call Process ID* IE is included in the RIC CONTROL REQUEST message, the E2 Node shall use this IE to identify a specific call process that was indicated in the RIC INDICATION message.
- If the RIC CONTROL REQUEST message contains the optional *RIC Control Ack Request* IE set to "Ack", or if the optional *RIC Control Ack Request* IE is not present, and the E2 Node has successfully processed the requested RIC Control procedure action, then the E2 Node shall respond with the RIC CONTROL ACKNOWLEDGE message.
- If the RIC CONTROL REQUEST message contains the optional *RIC Control Ack Request* IE set to "NoAck" and the E2 Node has successfully processed the requested RIC Control procedure action, then the E2 Node shall not send the RIC CONTROL ACKNOWLEDGE message.

Upon reception of the RIC CONTROL ACKNOWLEDGE message, the Near-RT RIC shall stop timer $T_{RICcontrol}$ and terminate the RIC Control procedure.

The Near-RT RIC may use the information contained in the optional *RIC Control Outcome* IE to determine subsequent actions.

8.2.4.3 Unsuccessful Operation

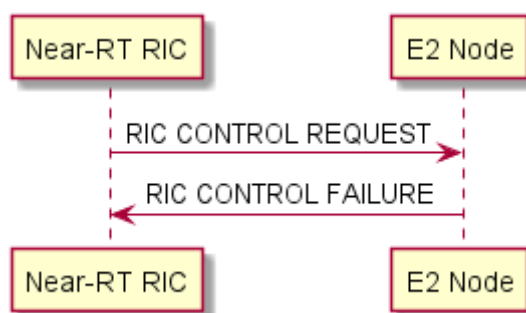


Figure 8.2.4.3-1: RIC Control procedure, unsuccessful operation

If the RIC CONTROL REQUEST message contains an invalid *RIC Call Process ID* IE, then the E2 Node shall respond with the RIC CONTROL FAILURE message with an appropriate cause value.

If the RIC CONTROL REQUEST message contains the optional *RIC Call Process ID* IE for which the associated *RIC Time to Wait* timer had expired, then the E2 Node shall respond with the RIC CONTROL FAILURE message with an appropriate cause value.

If the E2 Node fails to execute the requested RIC Control procedure E2SM specific action, then the E2 Node shall respond with the RIC CONTROL FAILURE message with an appropriate cause value.

If the E2 Node detects an encoding or functional error in the E2SM specific IEs contained in the RIC CONTROL REQUEST message, then the E2 Node shall respond with the RIC CONTROL FAILURE message with an appropriate cause value.

If the E2 Node receives a RIC CONTROL REQUEST message which contains an unknown *RAN Function ID* IE the E2 Node shall respond with the RIC CONTROL FAILURE message containing an appropriate cause value.

If the E2 Node does not support the specific RIC Control procedure action, then the E2 Node shall respond with the RIC CONTROL FAILURE message containing an appropriate cause value.

Upon reception of the RIC CONTROL FAILURE message the Near-RT RIC shall stop timer $T_{RICcontrol}$, if running, and terminate the RIC Control procedure.

The Near-RT RIC may use the information contained in the *Cause* IE and optional *RIC Control Outcome* IE to determine subsequent actions.

8.2.4.4 Abnormal Conditions

Upon reception of the ERROR INDICATION message including the *RIC Request ID* IE associated to the RIC CONTROL REQUEST message, the Near-RT RIC shall stop timer $T_{RICcontrol}$, if running, and terminate the RIC Control procedure.

If timer $T_{RICcontrol}$ was set when sending the RIC CONTROL REQUEST message and there was no response from the E2 node before the timer expiry, the Near-RT RIC shall send an ERROR INDICATION with the appropriate value for the *Cause* IE.

8.2.5 RIC Subscription Modification procedure

8.2.5.1 General

The purpose of the RIC Subscription Modification procedure is to modify an existing RIC subscription on an E2 node, in terms of its event trigger definition and/or the sequence of actions.

This procedure shall be initiated by the Near-RT RIC.

This procedure uses RIC Service signalling.

8.2.5.2 Successful Operation

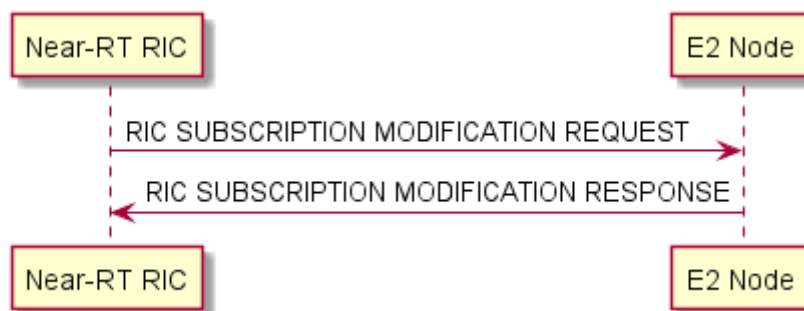


Figure 8.2.5.2-1: RIC Subscription Modification procedure, successful operation

The Near-RT RIC initiates this procedure by sending the RIC SUBSCRIPTION MODIFICATION REQUEST message to the E2 node, containing the *RIC Request ID* IE to uniquely identify the existing RIC Subscription in the E2 node.

When the Near-RT RIC sends the RIC SUBSCRIPTION MODIFICATION REQUEST message, it shall start timer $T_{RICEVENTmodify}$.

Upon reception of the RIC SUBSCRIPTION MODIFICATION REQUEST message, the E2 node shall determine the existing RIC Subscription and the target RAN Function from the *RIC Request ID* IE and the *RAN Function ID* IE, respectively.

If the *RIC Event Trigger Definition to be Modified* IE is included, then the E2 node shall validate and modify the event trigger defined for the existing RIC subscription based on the contents of the IE.

If the *RIC Actions to be Removed List* IE is included, then for every *RIC Action ID* IE included in the list, the E2 node shall delete the requested action and release the corresponding necessary resources.

If the *RIC Actions to be Modified List* IE is included, then for every *RIC Action ID* IE included in the list for which there exists a corresponding *RIC Action Definition* IE and/or *RIC Subsequent Action* IE, the E2 node shall modify the existing behaviour for the action with the requested modification in the respective IEs and modify the corresponding necessary resources.

If the *RIC Actions to be Modified List* IE is included, then for every *RIC Action ID* IE included in the list for which there exists a *RIC Action Execution Order* IE, the E2 node shall replace the current execution order for the action in the sequence of actions with the new execution order for the action in the sequence, as given in the *RIC Action Execution Order* IE.

If the *RIC Actions to be Added List IE* is included, then the E2 node shall validate and add the requested actions to the existing sequence of RIC Actions in order of the *RIC Action Execution Order IE* and reserve the necessary resources for the new actions.

The E2 node shall send the RIC SUBSCRIPTION MODIFICATION RESPONSE message back to the Near-RT RIC when one of the following cases is successfully executed:

- if the *RIC Event Trigger Definition to be Modified IE* is present in the RIC SUBSCRIPTION MODIFICATION REQUEST message and if the requested modification for the event trigger definition was successfully performed by the E2 node; or
- if the *RIC Event Trigger Definition to be Modified IE* is not present (i.e. no modification to the event trigger definition was requested) in the RIC SUBSCRIPTION MODIFICATION REQUEST message and if at least one of the requested actions to be added or modified or removed as requested by the Near-RT RIC in *RIC Actions To Be Added List IE* or *RIC Actions to be Modified List IE* or *RIC Actions to be Removed List IE*, respectively, in the RIC SUBSCRIPTION MODIFICATION REQUEST message, was successfully performed by the E2 node.

The E2 node shall report the result of all the requested modifications to the sequence of actions, if any, back to the Near-RT RIC in the RIC SUBSCRIPTION MODIFICATION RESPONSE message as follows:

- A list of actions requested to be removed, indexed by the *RIC Action ID IE*, which are successfully removed by the E2 node, shall be included in the *RIC Actions Removed List IE*.
- A list of actions requested to be removed, indexed by the *RIC Action ID IE*, which failed to get removed from the sequence by the E2 node, shall be included in the *RIC Actions Failed to be Removed List IE*, with appropriate cause values.
- A list of actions requested to be modified, indexed by the *RIC Action ID IE*, which are successfully modified by the E2 node, shall be included in the *RIC Actions Modified List IE*.
- A list of actions requested to be modified, indexed by the *RIC Action ID IE*, which failed to get modified by the E2 node, shall be included in the *RIC Actions Failed to be Modified List IE* with appropriate cause values.
- A list of actions requested to be added, indexed by the *RIC Action ID IE*, which are successfully added by the E2 node, shall be included in the *RIC Actions Added List IE*.
- A list of actions requested to be added, indexed by the *RIC Action ID IE*, which failed to get added to the sequence by the E2 node, shall be included in the *RIC Actions Failed to be Added List IE* with appropriate cause values.

If, for a given *RIC Action ID IE* in the *RIC Actions to be Modified List IE*, more than one modification to the RIC Service Action is requested in the form of *RIC Action Definition IE* and/or *RIC Action Execution Order IE* and/or *RIC Subsequent Action IE*, then the E2 node shall report that the requested action modification is successfully performed and shall include the action in the *RIC Actions Modified List IE*, if and only if, all the requested modifications to the action are successfully performed by the E2 node.

If one of the requested modifications to the RIC Service Action is not successfully performed by the E2 node, then the E2 node shall include the RIC Service Action in the *RIC Actions Failed to be Modified List IE*, along with an appropriate cause, to indicate failure for the requested modification to the RIC Service Action.

If, for a given *RIC Action ID IE* in the *RIC Actions to be Added IE*, either the action type in the *RIC Action Type IE* or the action definition in the *RIC Action Definition IE* or the action execution order in the *RIC Action Execution Order IE* or the subsequent action, if included, in the *RIC Subsequent Action IE* is not successfully processed by the E2 node, then the E2 node shall include the action in the *RIC Actions Failed to be Added List IE* with an appropriate cause, indicating failure to add the requested action to the existing sequence of actions.

If, after processing the RIC Subscription Modification procedure, more than one RIC Service Action remains accepted by the E2 Node then, at each occurrence of the common Event Trigger, the sequence of RIC Service Actions shall be executed according to the considerations defined in clause 8.2.1.2.

Upon reception of the RIC SUBSCRIPTION MODIFICATION RESPONSE message, the Near-RT RIC shall stop timer $T_{\text{RICEVENTmodify}}$ and terminate the RIC Subscription Modification procedure.

8.2.5.3 Unsuccessful Operation

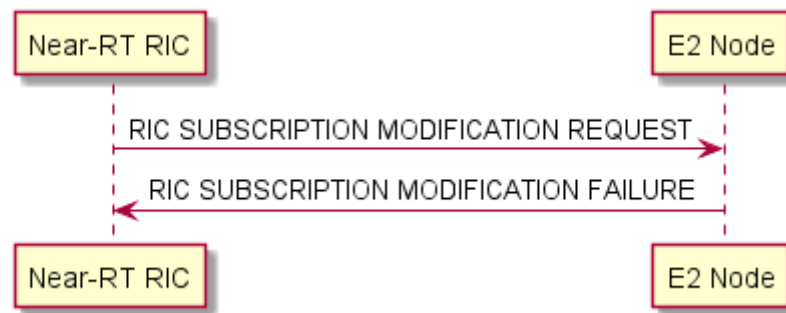


Figure 8.2.5.3-1: RIC Subscription Modification procedure, unsuccessful operation

If a failure occurs during the RIC Subscription Modification procedure, the E2 node shall send a RIC SUBSCRIPTION MODIFICATION FAILURE message to the Near-RT RIC with an appropriate cause value.

If the *RIC Event Trigger Definition to be Modified* IE is present in the RIC SUBSCRIPTION MODIFICATION REQUEST message and if the requested modification for the event trigger definition are not accepted by the E2 node, the E2 node shall send a RIC SUBSCRIPTION MODIFICATION FAILURE message to the Near-RT RIC with an appropriate cause value.

If the *RIC Event Trigger Definition to be Modified* IE is present in the RIC SUBSCRIPTION MODIFICATION REQUEST message and if the modification in the event trigger definition is inconsistent or disparate from the event trigger definition in the existing subscription, the E2 node shall send a RIC SUBSCRIPTION MODIFICATION FAILURE message to the Near-RT RIC with an appropriate cause value.

If the *RIC Event Trigger Definition to be Modified* IE is not present (i.e. no modification to the event trigger definition was requested) and if none of the requested modifications to the sequence of actions were successfully performed, that is if all of the following apply, the E2 node shall send a RIC SUBSCRIPTION MODIFICATION FAILURE message to the Near-RT RIC with an appropriate cause value:

- *RIC Actions to be Added List* IE was present in the RIC SUBSCRIPTION MODIFICATION REQUEST message and if none of the requested additions were successfully performed.
- *RIC Actions to be Modified List* IE was present in the RIC SUBSCRIPTION MODIFICATION REQUEST message and if none of the requested modifications were successfully performed.
- *RIC Actions to be Removed List* IE was present in the RIC SUBSCRIPTION MODIFICATION REQUEST message and if none of the requested removals were successfully performed.

If the *RIC Event Trigger Definition to be Modified* IE is not present (i.e. no modification to the event trigger definition was requested) and if the E2 node detects an inconsistency across the sequence of actions and/or the subsequent actions in *RIC Actions to be Added List* IE and/or *RIC Actions to be Modified List* IE and/or *RIC Actions to be Removed List* IE, the E2 node shall send a RIC SUBSCRIPTION MODIFICATION FAILURE message to the Near-RT RIC with an appropriate cause value.

If all RIC Service Action in the existing RIC Subscription are proposed for removal, the E2 node shall send a RIC SUBSCRIPTION MODIFICATION FAILURE message to the Near-RT RIC with an appropriate cause value.

Upon reception of the RIC SUBSCRIPTION FAILURE message, the Near-RT RIC shall stop the timer $T_{\text{RICEVENTmodify}}$ and terminate the RIC Subscription Modification procedure.

8.2.5.4 Abnormal Conditions

If the E2 node receives a RIC SUBSCRIPTION MODIFICATION REQUEST message including an unknown *RAN Function ID* IE, the E2 node shall send the RIC SUBSCRIPTION MODIFICATION FAILURE message to the Near-RT RIC with an appropriate cause value.

If the E2 node receives a RIC SUBSCRIPTION MODIFICATION REQUEST message including an unknown *RIC Request ID* IE, the E2 node shall send the RIC SUBSCRIPTION MODIFICATION FAILURE message to the Near-RT RIC with an appropriate cause value.

If the E2 node receives a RIC SUBSCRIPTION MODIFICATION REQUEST message containing the same *RIC Action ID* IE value across the *RIC Actions to be Added List* IE, *RIC Actions to be Modified List* IE and/or *RIC Actions to be Removed List* IE, then the E2 node shall send the RIC SUBSCRIPTION MODIFICATION FAILURE message to the Near-RT RIC with an appropriate cause value.

8.2.6 RIC Subscription Modification Required procedure

8.2.6.1 General

This procedure is used by the E2 Node to request the Near-RT RIC for modifying an existing RIC Subscription in the E2 Node.

This procedure shall be initiated by the E2 Node.

This procedure uses RIC Service signalling.

8.2.6.2 Successful Operation

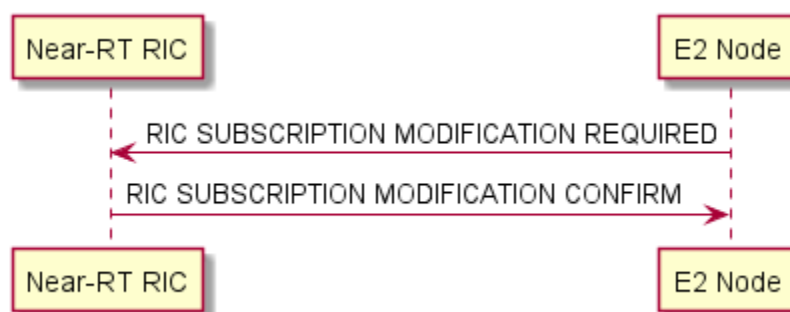


Figure 8.2.6.2-1: RIC Subscription Modification Required procedure, successful operation

The E2 Node initiates the procedure by sending the RIC SUBSCRIPTION MODIFICATION REQUIRED message, containing *RIC Request ID* IE that was previously assigned by the Near-RT RIC during a successful RIC Subscription procedure, to the Near-RT RIC.

Upon reception of the RIC SUBSCRIPTION MODIFICATION REQUIRED message, the Near-RT RIC shall determine the RIC Subscription from the *RIC Request ID* IE and the target RAN Function from the *RAN Function ID* IE.

If at least one of the requested actions in *RIC Actions Required to be Modified List* IE or *RIC Actions Required to be Removed List* IE is successfully confirmed by the Near-RT RIC, then the Near-RT RIC shall perform the required procedures to update the RIC Subscription and shall send the RIC SUBSCRIPTION MODIFICATION CONFIRM message to the E2 node.

The Near-RT RIC shall report the result to the E2 node in the RIC SUBSCRIPTION MODIFICATION CONFIRM as follows:

- A list of actions requested to be modified, indexed by the *RIC Action ID* IE, which are successfully confirmed for modification by the Near-RT RIC, shall be included in the *RIC Actions Confirmed for Modification List* IE.
- A list of actions requested to be modified, indexed by the *RIC Action ID* IE, which are refused to be modified by the Near-RT RIC, shall be included in the *RIC Actions Refused to be Modified List* IE with appropriate cause values.
- A list of actions requested to be removed, indexed by the *RIC Action ID* IE, which are successfully confirmed for removal by the Near-RT RIC, shall be included in the *RIC Actions Confirmed for Removal List* IE.
- A list of actions requested to be removed, indexed by the *RIC Action ID* IE, which are refused to be removed by the Near-RT RIC, shall be included in the *RIC Actions Refused for Removal List* IE with appropriate cause values.

If, after processing the RIC Subscription Modification Required procedure, more than one RIC Service Action remains in effect at the E2 node, then at each occurrence of the common Event Trigger, the sequence of RIC Service Actions shall be executed according to the considerations defined in clause 8.2.1.2.

Upon reception of the RIC SUBSCRIPTION MODIFICATION CONFIRM message, the E2 Node shall release the necessary resources for the actions that are confirmed for removal in the *RIC Actions Confirmed for Removal List IE*, if present, and shall modify the necessary resources for the actions that are confirmed for modification in the *RIC Actions Confirmed for Modification List IE*, if present.

8.2.6.3 Unsuccessful Operation

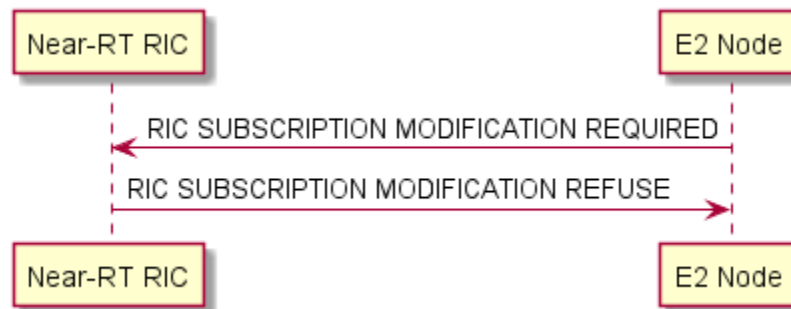


Figure 8.2.6.3-1: RIC Subscription Modification Required procedure, unsuccessful operation

If a failure occurs during the RIC Subscription Modification Required procedure the Near-RT RIC shall send the RIC SUBSCRIPTION MODIFICATION REFUSE message to the E2 node. If none of the requested modifications to the actions in the RIC SUBSCRIPTION MODIFICATION REQUIRED message (i.e. in the *RIC Actions Required to be Modified List IE* and the *RIC Actions Required to be Removed List IE*, if present) is successfully confirmed, the Near-RT RIC shall send the RIC SUBSCRIPTION MODIFICATION REFUSE message to the E2 node with an appropriate cause.

If the Near-RT RIC detects an inconsistency across the requested sequence of actions to be modified and removed in *RIC Actions Required to be Modified List IE* and the *RIC Actions Required to be Removed List IE* respectively, if present, the Near-RT RIC shall send the RIC SUBSCRIPTION MODIFICATION REFUSE message to the E2 node with an appropriate cause.

If all RIC Service Action in the existing RIC Subscription are proposed for removal, the Near-RT RIC shall send a RIC SUBSCRIPTION MODIFICATION REFUSE message to the E2 Node with an appropriate cause value.

8.2.6.4 Abnormal Conditions

If the Near-RT RIC receives a RIC SUBSCRIPTION MODIFICATION REQUIRED message which contains an unknown *RAN Function ID IE*, the Near-RT RIC shall send the RIC SUBSCRIPTION MODIFICATION REFUSE message to the E2 Node with an appropriate cause value.

If the Near-RT RIC receives a RIC SUBSCRIPTION MODIFICATION REQUIRED message containing an unknown *RIC Request ID IE*, the Near-RT RIC shall send the RIC SUBSCRIPTION MODIFICATION REFUSE message to the E2 Node with an appropriate cause value.

8.2.7 RIC Query procedure

8.2.7.1 General

This procedure is initiated by Near-RT RIC to request RAN and/or UE related information from E2 Node.

This procedure shall be initiated by the Near-RT RIC.

This procedure uses RIC Service signalling.

8.2.7.2 Successful Operation

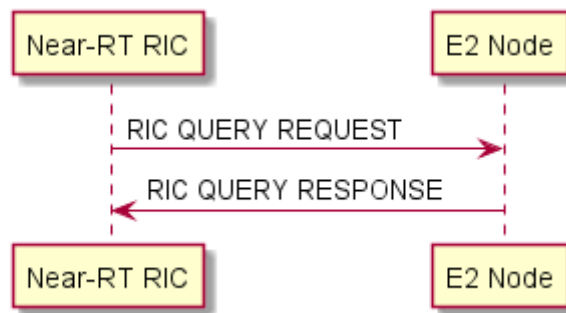


Figure 8.2.7.2-1: RIC Query procedure, successful operation

The Near-RT RIC initiates the procedure by sending the RIC QUERY REQUEST message, which shall contain a unique *RIC Request ID* IE, assigned by the Near-RT RIC, to the E2 Node. When the Near-RT RIC sends the RIC QUERY REQUEST message, it shall start timer $T_{RICQuery}$.

At reception of the RIC QUERY REQUEST message the E2 Node shall:

- Determine the target RAN Function using the information in the *RAN Function ID* IE.
- Validate the *RIC Query Header* IE and *RIC Query Definition* IE and if the requested information is available at E2 Node, then E2 Node shall respond back with RIC QUERY RESPONSE message containing the requested information.

Upon reception of the RIC QUERY RESPONSE message the Near-RT RIC shall stop timer $T_{RICQuery}$ and terminate the RIC Query procedure.

8.2.7.3 Unsuccessful Operation

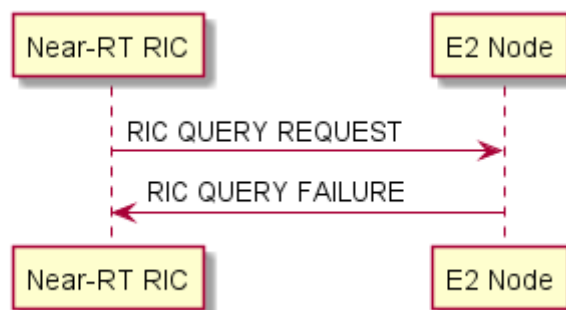


Figure 8.2.7.3-1: RIC Query procedure, unsuccessful operation

If the *RAN Function ID* IE in the RIC QUERY REQUEST message is not supported by E2 Node, then the E2 Node shall respond with the RIC QUERY FAILURE message to Near-RT RIC with an appropriate cause value.

If all of the requested information in the *RIC Query Definition* IE are invalid, then the E2 Node shall respond with the RIC QUERY FAILURE message to Near-RT RIC with an appropriate cause value.

If none of the requested information in the *RIC Query Definition* IE are available at E2 Node, then E2 Node shall respond with the RIC QUERY FAILURE message to Near-RT RIC with an appropriate cause value.

Upon reception of the RIC QUERY FAILURE message the Near-RT RIC shall stop timer $T_{RICQuery}$ and terminate the RIC Query Procedure.

8.2.7.4 Abnormal Conditions

Upon reception of the ERROR INDICATION message including the *RIC Request ID* IE corresponding to the previous RIC QUERY REQUEST message, the Near-RT RIC shall stop timer $T_{RICQuery}$, if running, and terminate the RIC Query procedure.

8.3 Global Procedures

8.3.1 E2 Setup procedure

8.3.1.1 General

The purpose of the E2 Setup procedure is to exchange application level data needed for the E2 Node and Near-RT RIC to correctly interoperate on the E2 interface. This procedure shall be the first E2AP procedure triggered after the TNL association has become operational.

This procedure erases any existing application level configuration data in the two nodes and replace it by the one received.

This procedure shall be initiated by the E2 Node.

This procedure uses E2 Support Function signalling.

8.3.1.2 Successful Operation

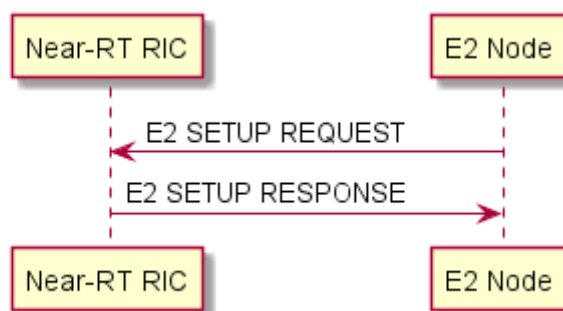


Figure 8.3.1.2-1: E2 Setup procedure, successful operation

The E2 Node initiates the procedure by sending the E2 SETUP REQUEST message including the appropriate data to a Near-RT RIC.

If the Near-RT RIC has successfully processed the *RAN Functions Added List* IE then Near-RT RIC shall contain, in the E2 SETUP RESPONSE message, the *RAN Functions Accepted List* IE and/or the *RAN Functions Rejected List* IE.

If the Near-RT RIC has successfully processed the *E2 Node Component Configuration Addition List* IE then Near-RT RIC shall contain, in the E2 SETUP RESPONSE message, the *E2 Node Component Configuration Addition Acknowledge List* IE.

8.3.1.3 Unsuccessful Operation

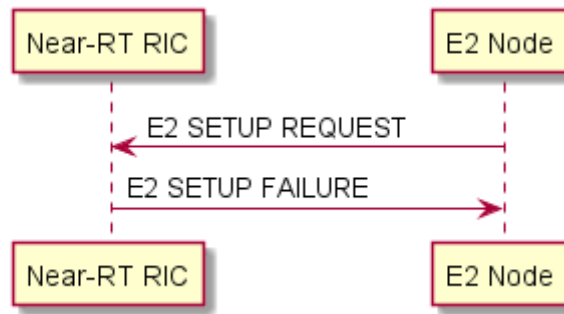


Figure 8.3.1.3-1: E2 Setup procedure, unsuccessful operation

If the Near-RT RIC cannot accept the setup it shall respond with an E2 SETUP FAILURE message with an appropriate cause value.

The Near-RT RIC may provide an alternative *Transport Layer Information* IE in the E2 SETUP FAILURE message for the E2 Node to use when reinitiating the E2 Setup procedure towards the Near-RT RIC.

If the E2 SETUP FAILURE message includes the *Time To Wait* IE, the E2 node shall wait at least for the indicated time before reinitiating the E2 Setup procedure towards the Near-RT RIC.

8.3.1.4 Abnormal Conditions

If the first message received for a specific TNL association is not an E2 SETUP REQUEST, E2 SETUP RESPONSE, E2 SETUP FAILURE or E2 NODE CONFIGURATION UPDATE message then this shall be treated as a logical error.

8.3.2 Reset procedure

8.3.2.1 General

The purpose of the Reset procedure is to initialize or re-initialize the E2 Node in the event of Near-RT RIC failure or vice-versa.

This procedure does not affect the application level data exchanged during the E2 Setup procedure, E2 Node Configuration Update procedure and RIC Service Update procedure.

This procedure shall be initiated by the E2 Node or the Near-RT RIC.

This procedure uses E2 Support Function signalling.

8.3.2.2 Successful Operation

This procedure may be initiated by either Near-RT RIC or E2 Node.

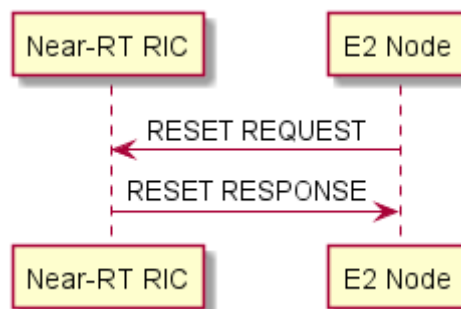


Figure 8.3.2.2-1: Reset, successful operation (E2 Node Initiated)

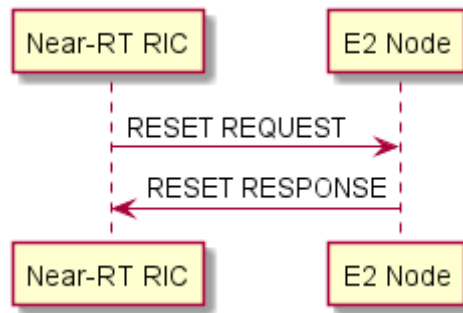


Figure 8.3.2.2-2: Reset, successful operation (Near-RT RIC Initiated)

When the Reset procedure is initiated, the Near-RT RIC and E2 Node shall:

- Delete any pre-established RIC Subscriptions.
- Gracefully terminate any ongoing Near-RT RIC call processes using Insert, Control or Policy RIC Service Actions while ensuring that impact to ongoing calls for connected UE is minimized.

After the Reset has been completed, the Near-RT RIC may re-issue any required RIC Subscriptions.

Interactions with other procedures:

If the RESET REQUEST message is received, any other ongoing procedure (except for another Reset procedure) on the same E2 interface related to ongoing RIC Services shall be aborted.

8.3.2.3 Unsuccessful Operation

Void.

8.3.2.4 Abnormal Conditions

Void.

8.3.3 Error Indication

8.3.3.1 General

The Error Indication procedure is initiated by either the E2 Node or the Near-RT RIC to report detected errors in one incoming message, provided they cannot be reported by an appropriate failure message.

This procedure shall be initiated by the E2 Node or the Near-RT RIC.

If the error situation arises due to reception of a message utilizing RIC Service signalling, then the Error Indication procedure uses RIC Service signalling. Otherwise the procedure uses E2 Support Function signalling.

8.3.3.2 Successful Operation

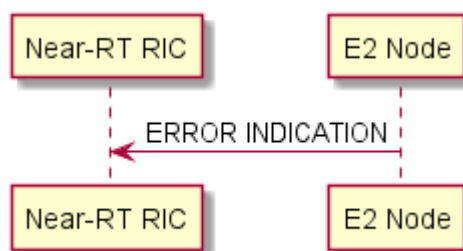


Figure 8.3.3.2-1: Error Indication, (E2 Node initiated) successful operation

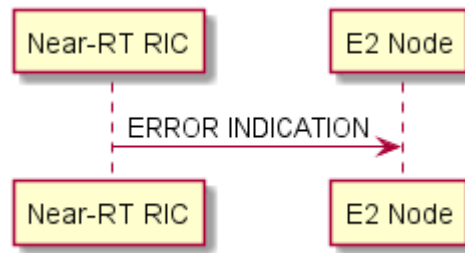


Figure 8.3.3.2-2: Error Indication, (Near-RT RIC Initiated) successful operation

When the conditions defined in clause 10 are fulfilled, the Error Indication procedure shall be initiated by an ERROR INDICATION message sent from the node detecting the error situation.

The ERROR INDICATION message shall contain at least either the *Cause* IE or the *Criticality Diagnostics* IE and may include *RAN Function ID* IE and *RIC Request ID* IE.

8.3.3.3 Unsuccessful Operation

Not applicable.

8.3.3.4 Abnormal Conditions

Not applicable.

8.3.4 RIC Service Update procedure

8.3.4.1 General

The purpose of the RIC Service Update procedure is to update application level RIC Service related data needed for E2 Node and Near-RT RIC to interoperate correctly over the E2 interface.

This procedure shall be initiated by the E2 Node.

This procedure uses E2 Support Function signalling.

8.3.4.2 Successful Operation

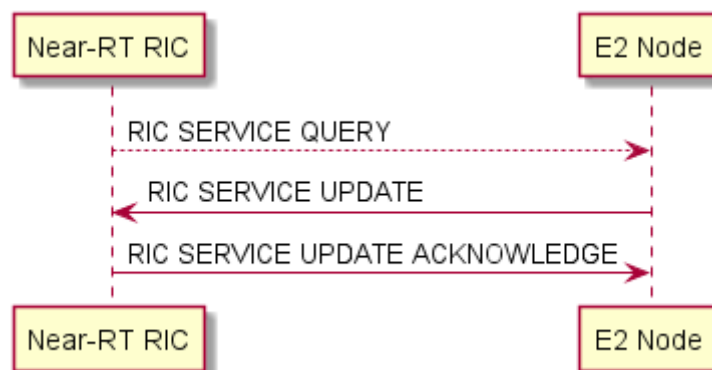


Figure 8.3.4.2-1: RIC Service Update procedure, successful operation

An E2 Node initiates the procedure by sending a RIC SERVICE UPDATE message to the Near-RT RIC.

If the E2 Node has taken into operational use one or more RAN Functions supporting RIC Services, the RIC SERVICE UPDATE message shall include the *RAN Functions Added List* IE.

If the E2 Node has modified one or more RAN Functions supporting RIC Services, the RIC SERVICE UPDATE message shall include the *RAN Functions Modified List IE*.

If the E2 Node has removed from operational use one or more RAN Functions supporting RIC Services, the RIC SERVICE UPDATE message shall include the *RAN Functions Deleted List IE*.

Upon reception of a RIC SERVICE UPDATE message, Near-RT RIC shall update the application level data for E2 Node as follows:

- If the *RAN Function Added List IE* is contained in the RIC SERVICE UPDATE message, Near-RT RIC shall add each listed accepted RAN Function according to the information in the *RAN Function ID IE* and *RAN Function Definition IE* and store the corresponding *RAN Function Revision IE*.
- If the *RAN Function Modified List IE* is contained in the RIC SERVICE UPDATE message, Near-RT RIC shall modify accepted information of supported RAN Functions according to the information in the *RAN Function Definition IE* and update the corresponding *RAN Function Revision IE*.
- If the *RAN Function Deleted List IE* is contained in the RIC SERVICE UPDATE message, Near-RT RIC shall delete information of RAN Function indicated by the *RAN Function ID IE* along with the corresponding *RAN Function Revision IE*.

These changes may be processed in the Near-RT-RIC and may be used when issuing RIC SUBSCRIPTION REQUEST and RIC CONTROL to provide valid *RAN Function ID IE*.

If at least one RAN Function update request present in the RIC SERVICE UPDATE message is successful, then the Near-RT RIC shall send the RIC SERVICE UPDATE ACKNOWLEDGE message to the initiating E2 Node with:

- *RAN Functions Accepted List IE* indicating accepted requests to add, modify, and/or delete the corresponding RAN Function information.
- If required, the *RAN Functions Rejected List IE* indicating rejected requests to add, modify, and/or delete the corresponding RAN Function information.

If the Near-RT RIC receives a RIC SERVICE UPDATE message without any IE except for *Message Type IE*, then the Near-RT RIC shall reply with RIC SERVICE UPDATE ACKNOWLEDGE message without any IE except for *Message Type IE*, and shall not perform any updates to the existing application level data.

Optionally, the RIC SERVICE UPDATE message to the Near-RT RIC may have been sent as a response to the Near-RT RIC initiated RIC SERVICE QUERY message.

Upon reception of the RIC SERVICE QUERY message:

- If the *RAN Function Accepted List IE* is not present, the E2 Node shall send the RIC SERVICE UPDATE message with the complete list of supported RAN Functions in the *RAN Function Added List IE*.
- If the *RAN Function Accepted List IE* is present and aligns with the list of supported RAN Functions at the E2 Node, the E2 Node shall send the RIC SERVICE UPDATE message without the *RAN Function Added List IE*, *RAN Function Modified List IE* and *RAN Function Deleted List IE*.
- If the *RAN Function Accepted List IE* is present and the list of RAN Functions in the *RAN Function Accepted List IE* does not align with the list of supported RAN Functions at the E2 node, the E2 Node shall send the RIC SERVICE UPDATE message with the *RAN Function Added List IE*, *RAN Function Modified List IE* and/or *RAN Function Deleted List IE* to ensure realignment of RAN Functions between the E2 Node and the Near-RT RIC.

8.3.4.3 Unsuccessful Operation

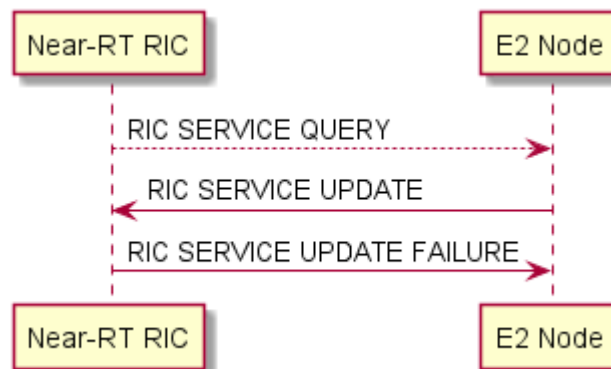


Figure 8.3.4.3-1: RIC Service Update procedure, unsuccessful operation

If the Near-RT RIC cannot accept the update it shall respond with a RIC SERVICE UPDATE FAILURE message with an appropriate cause value.

If the RIC SERVICE UPDATE FAILURE message includes the *Time To Wait* IE, the E2 Node shall wait at least for the indicated time before reinitiating the RIC Service Update procedure towards the same Near-RT RIC. Both nodes shall continue to operate the E2 with their existing RIC Service data.

8.3.4.4 Abnormal Conditions

Void.

8.3.5 E2 Node Configuration Update procedure

8.3.5.1 General

The purpose of the E2 Node Configuration Update procedure is to update application level E2 Node configuration data needed for E2 Node and Near-RT RIC to interoperate correctly over the E2 interface and to support E2 Node initiated TNL association removal.

This procedure shall be initiated by the E2 Node.

This procedure uses E2 Support Function signalling.

8.3.5.2 Successful Operation

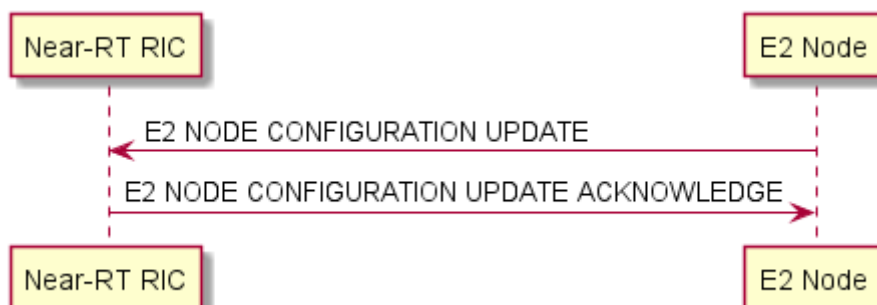


Figure 8.3.5.2-1: E2 Node Configuration Update procedure, successful operation

An E2 Node initiates the procedure by sending a E2 NODE CONFIGURATION UPDATE message to the Near-RT RIC. The message shall include an appropriate set of up-to-date E2 Node-related configuration data that the E2 Node has just taken into operational use.

Upon reception of the E2 NODE CONFIGURATION UPDATE message, Near-RT RIC shall update the application level data for the E2 Node as follows:

Update of E2 Node configuration information in Near-RT RIC:

- If *E2 Node Component Configuration Addition List* IE is contained in the E2 NODE CONFIGURATION UPDATE message, Near-RT RIC shall add the E2 Node Component Configuration information accordingly.
- If *E2 Node Component Configuration Update List* IE is contained in the E2 NODE CONFIGURATION UPDATE message, Near-RT RIC shall modify the E2 Node Component Configuration information accordingly.
- If *E2 Node Component Configuration Removal List* IE is contained in the E2 NODE CONFIGURATION UPDATE message, Near-RT RIC shall remove the E2 Node Component Configuration information accordingly.

If *Global E2 Node ID* IE is contained in the E2 NODE CONFIGURATION UPDATE message for a newly established SCTP association, the Near-RT RIC shall associate the TNL association with the related E2 Node.

If the E2 NODE CONFIGURATION UPDATE message includes *E2 Node TNL Association To Remove List* IE, and the *Endpoint IP address* IE and the *Port Number* IE for both TNL endpoints of the TNL association(s) are included in the *E2 Node TNL Association To Remove List* IE, the Near-RT RIC shall, if supported, consider that the TNL association(s) indicated by both received TNL endpoints will be removed by the E2 Node.

If the E2 NODE CONFIGURATION UPDATE message includes *E2 Node TNL Association To Remove List* IE, and the *Endpoint IP address* IE, or the *Endpoint IP address* IE and the *Port Number* IE for one or both of the TNL endpoints is included in the *E2 Node TNL Association To Remove List* IE in E2 NODE CONFIGURATION UPDATE message, the Near-RT RIC shall, if supported, consider that the TNL association(s) indicated by the received endpoint IP address(es) will be removed by the E2 Node.

After successful update of requested information, Near-RT RIC shall reply with the E2 NODE CONFIGURATION UPDATE ACKNOWLEDGE message to inform the initiating E2 Node that the requested update of application level data was performed successfully.

If the Near-RT RIC receives an E2 NODE CONFIGURATION UPDATE message without any IE except for *Message Type* IE and *Transaction ID* IE, the Near-RT RIC shall reply with the E2 NODE CONFIGURATION UPDATE ACKNOWLEDGE message without performing any updates to the existing configuration.

8.3.5.3 Unsuccessful Operation

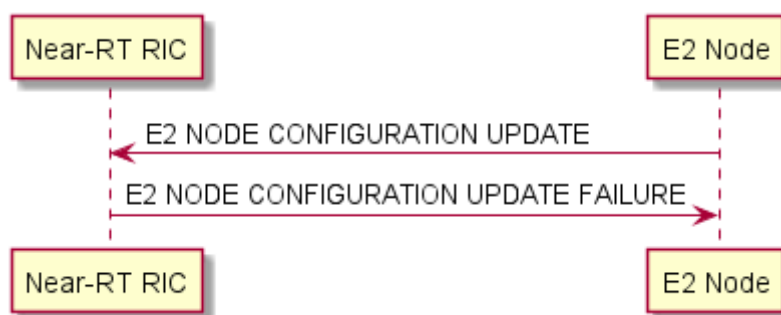


Figure 8.3.5.3-1: E2 Node Configuration Update procedure, unsuccessful operation

If Near-RT RIC cannot accept the E2 NODE CONFIGURATION UPDATE message it shall respond with the E2 NODE CONFIGURATION UPDATE FAILURE message with an appropriate cause value.

If the E2 NODE CONFIGURATION UPDATE FAILURE message includes the *Time To Wait* IE the E2 Node shall wait at least for the indicated time before reinitiating the E2 Node Configuration Update procedure towards the same Near-RT RIC.

If the Near-RT RIC receives an E2 NODE CONFIGURATION UPDATE message containing an *E2 Node Component Configuration Update Item* IE for an E2 Node component that was not previously declared by an *E2 Node Component Configuration Addition Item* IE then the Near-RT RIC shall indicate to the E2 Node that the update failed with appropriate cause value.

If the E2 Node Configuration Update procedure failure occurs, the Near-RT RIC and E2 Node shall continue to operate with their existing configuration data.

8.3.5.4 Abnormal Conditions

Void.

8.3.6 E2 Connection Update procedure

8.3.6.1 General

The purpose of the E2 Connection Update procedure is to allow the Near-RT RIC to update the TNL information associated with the E2 interface connection between the E2 Node and Near-RT RIC.

This procedure shall be initiated by the Near-RT RIC.

This procedure uses E2 Support Function signalling.

8.3.6.2 Successful Operation

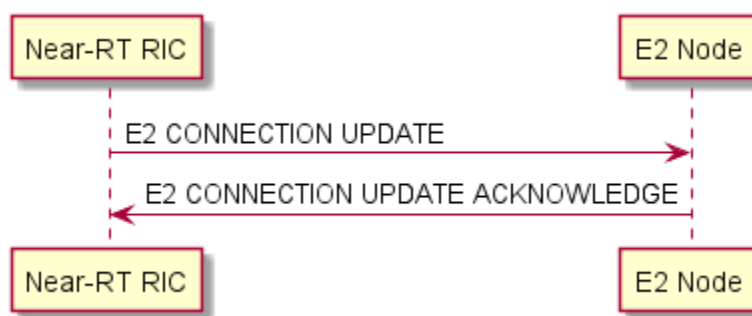


Figure 8.3.6.2-1: E2 Connection Update procedure, successful operation

The Near-RT RIC initiates the procedure by sending a E2 CONNECTION UPDATE message to the E2 Node. The message shall include an appropriate set of up-to-date E2 interface connection data that the E2 Node shall take into account when modifying the E2 interface connection.

Upon reception of a E2 CONNECTION UPDATE message, the E2 Node shall update as follows:

- If *E2 Connection To Add List* IE is contained in the E2 CONNECTION UPDATE message, then the E2 Node shall, if supported, use the information to establish additional TNL Association(s) and configure for use for RIC services and/or E2 support functions according to the *TNL Association Usage* IE in the message.
- If *E2 Connection To Modify List* IE is contained in the E2 CONNECTION UPDATE message, then the E2 Node shall, if supported, use the information to modify the existing usage for RIC services and/or E2 support functions, according to the *TNL Association Usage* IE in the message.
- If *E2 Connection To Remove List* IE is contained in the E2 CONNECTION UPDATE message, then the E2 Node shall, if supported, use the information to remove the existing connection(s). If only one connection remains after successful removal of other connections, the E2 Node shall use this remaining connection for all the RIC services and E2 support functions.

After successful update of E2 interface connection(s), the E2 Node shall reply with the E2 CONNECTION UPDATE ACKNOWLEDGE message to inform the initiating Near-RT RIC that the requested E2 connection update was performed successfully.

If the E2 Node receives a E2 CONNECTION UPDATE message without any IE except for *Message Type IE* and *Transaction ID IE*, the E2 Node shall reply with the E2 CONNECTION ACKNOWLEDGE message without performing any updates to the existing connections.

E2 NODE CONFIGURATION UPDATE procedure shall be the first E2AP procedure triggered on an additional TNLA of an already setup E2 interface instance after the TNL association has become operational, and the Near-RT RIC shall associate the TNLA to the E2 interface instance using the included *Global E2 Node ID*.

An empty E2 NODE CONFIGURATION UPDATE message (i.e. without any IE except for *Message Type IE* and *Transaction ID IE*) shall be sent by the Near-RT RIC as the first E2AP procedure on the new TNLA, if the E2 Node does not have any Configuration to be updated to Near-RT RIC.

8.3.6.3 Unsuccessful Operation

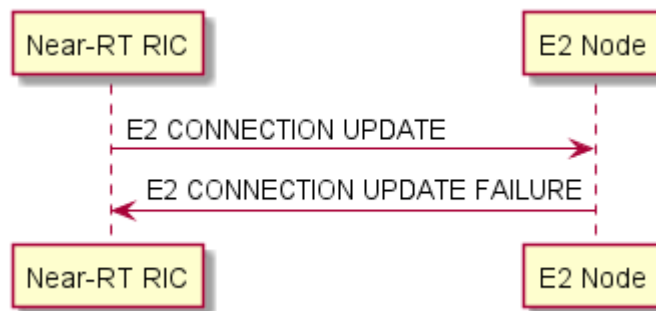


Figure 8.3.6.3-1: E2 Connection Update procedure, unsuccessful operation

If the E2 Node cannot accept the update, it shall respond with a E2 CONNECTION UPDATE FAILURE message with an appropriate cause value.

If the E2 CONNECTION UPDATE FAILURE message includes the *Time To Wait IE*, the Near-RT RIC shall wait at least for the indicated time before reinitiating the E2 Connection Update procedure towards the same E2 Node. Both nodes shall continue to operate with their existing connection(s).

8.3.6.4 Abnormal Conditions

Void.

8.3.7 E2 Removal procedure

8.3.7.1 General

The purpose of the E2 removal procedure is to remove the E2 signalling connection between the Near-RT RIC and the E2 node in a controlled manner.

This procedure shall be initiated by the E2 Node or the Near-RT RIC.

This procedure uses E2 Support Function signalling.

8.3.7.2 Successful Operation

This procedure may be initiated by either Near-RT RIC or E2 Node.

Successful E2 Removal, E2 Node initiated

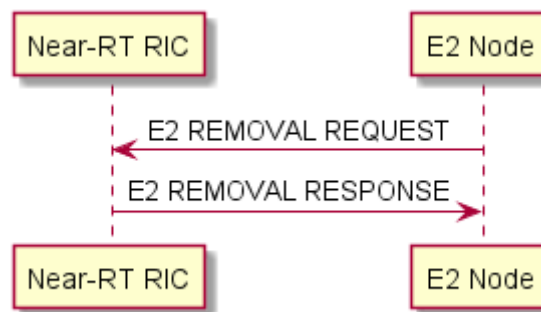


Figure 8.3.7.2-1: E2 Removal, successful operation (E2 Node Initiated)

The E2 Node shall initiate the procedure by sending the E2 REMOVAL REQUEST message to the Near-RT RIC.

Upon reception of the E2 REMOVAL REQUEST message, the Near-RT RIC shall reply with the E2 REMOVAL RESPONSE message.

After receiving the E2 REMOVAL RESPONSE message, the E2 Node shall initiate removal of the TNL association towards the Near-RT RIC, and shall release all resources associated with that E2 signalling connection.

The Near-RT RIC shall then release all resources associated with that E2 signalling connection and erase all application level data.

Successful E2 Removal, Near-RT RIC initiated

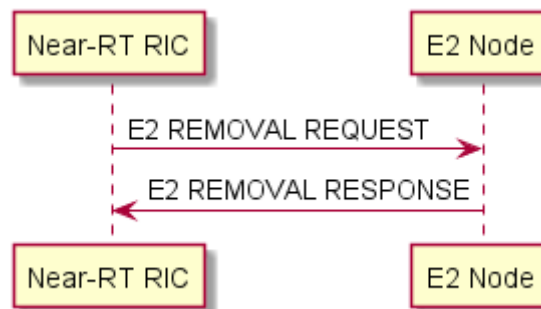


Figure 8.3.7.2-2: E2 Removal, successful operation (Near-RT RIC Initiated)

The Near-RT RIC shall initiate the procedure by sending the E2 REMOVAL REQUEST message to the E2 node.

Upon reception of the E2 REMOVAL REQUEST message, the E2 node shall reply with the E2 REMOVAL RESPONSE message.

After receiving the E2 REMOVAL RESPONSE message, the Near-RT RIC may initiate removal of the TNL association towards the E2 node, and shall release all resources associated with that E2 signalling connection and erase all application level data.

The E2 node shall then release all resources associated with that E2 signalling connection.

Interactions with other procedures:

If the E2 REMOVAL REQUEST message is received, any other ongoing procedure on the same E2 interface related to ongoing RIC Services shall be aborted.

8.3.7.3 Unsuccessful Operation

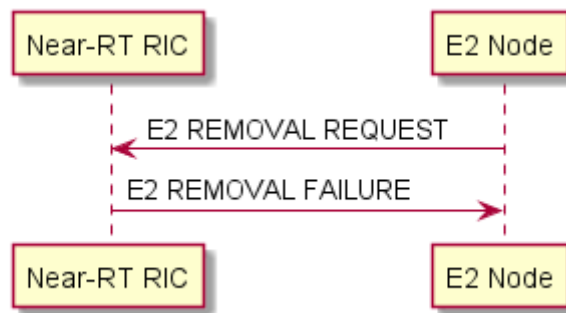


Figure 8.3.7.3-1: E2 Removal procedure (E2 Node Initiated), unsuccessful operation

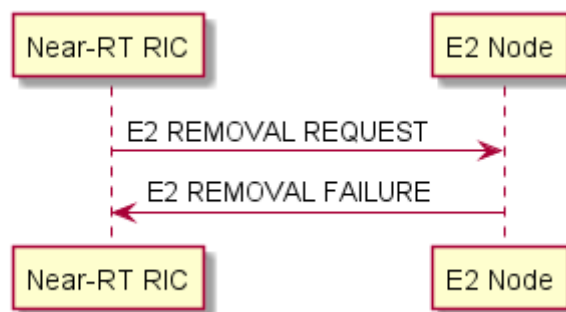


Figure 8.3.7.3-2: E2 Removal procedure (Near-RT RIC Initiated), unsuccessful operation

If the E2 Node cannot accept the E2 REMOVAL REQUEST it shall respond with E2 REMOVAL FAILURE message with an appropriate cause value.

If the Near-RT RIC cannot accept the E2 REMOVAL REQUEST it shall respond with E2 REMOVAL FAILURE message with an appropriate cause value.

8.3.7.4 Abnormal Conditions

Void.

9 Elements for E2AP Communication

9.0 General

Clauses 9.1 and 9.2 describe the structure of the messages and information elements required for the E2AP protocol in tabular format. Clause 9.3 provides the corresponding ASN.1 definition.

The following attributes are used for the tabular description of the messages and information elements: Presence, Range Criticality and Assigned Criticality. Their definition and use can be found in ETSI TS 136 413 [24].

NOTE: The messages have been defined in accordance with the guidelines specified in ETSI TR 125 921 [i.2].

9.1 Message Functional Definition and Content

9.1.1 Messages for RIC Functional Procedures

9.1.1.1 RIC SUBSCRIPTION REQUEST

This message is sent by the Near-RT RIC to an E2 Node to create a new RIC Subscription in the E2 Node.

Direction: Near-RT RIC → E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------------|----------|------------------------|-----------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |
| RIC Subscription Details | M | | | | YES | reject |
| >RIC Event Trigger Definition | M | | 9.2.9 | | - | |
| >Sequence of Actions | | 1.. <maxofRICActionID> | | | EACH | ignore |
| >>RIC Action ID | M | | 9.2.10 | | - | |
| >>RIC Action Type | M | | 9.2.11 | | - | |
| >>RIC Action Definition | O | | 9.2.12 | | - | |
| >>RIC Subsequent Action | O | | 9.2.13 | | - | |
| >>RIC Action Execution Order | O | | 9.2.35 | Used to define a specific execution order | - | |
| RIC Subscription Start Time | O | | 9.2.34 | | YES | reject |
| RIC Subscription End Time | O | | 9.2.34 | | YES | reject |

| Range bound | Explanation |
|------------------|---|
| maxofRICActionID | Maximum no. of Actions to be requested by Near-RT RIC. Value is 16. |

9.1.1.2 RIC SUBSCRIPTION RESPONSE

This message is sent by the E2 Node to accept the request from the Near-RT RIC to create a new RIC Subscription in the E2 Node.

Direction: E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------------|----------|------------------------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |
| RIC Actions Admitted List | | 1.. <maxofRICActionID> | | | YES | reject |
| >RIC Action ID | M | | 9.2.10 | | - | |
| RIC Actions Not Admitted List | | 0.. <maxofRICActionID> | | | YES | reject |
| >RIC Action ID | M | | 9.2.10 | | - | |
| >Cause | M | | 9.2.1 | | - | |

| Range bound | Explanation |
|------------------|---|
| maxofRICActionID | Maximum no. of Actions to be requested by Near-RT RIC. Value is 16. |

9.1.1.3 RIC SUBSCRIPTION FAILURE

This message is sent by the E2 Node to inform the Near-RT RIC that the request to create a new RIC Subscription in the E2 Node failed.

Direction: E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |
| Cause | M | | 9.2.1 | | YES | reject |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.1.4 RIC SUBSCRIPTION DELETE REQUEST

This message is sent by the Near-RT RIC to an E2 Node to request the deletion of an existing Subscription in the E2 Node.

Direction: Near-RT RIC → E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-----------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |

9.1.1.5 RIC SUBSCRIPTION DELETE RESPONSE

This message is sent by the E2 Node to accept the request from a Near-RT RIC to delete an existing RIC Subscription in the E2 Node

Direction: E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-----------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |

9.1.1.6 RIC SUBSCRIPTION DELETE FAILURE

This message is sent by the E2 Node to inform the Near-RT RIC that the request to delete an existing RIC Subscription in the E2 Node failed.

Direction: E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |
| Cause | M | | 9.2.1 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.1.6A RIC SUBSCRIPTION DELETE REQUIRED

This message is sent by the E2 Node to request deletion of the existing RIC Subscriptions in the E2 Node.

Direction: E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|----------------------------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| List of RIC Subscriptions To Be Removed | | 1.. <maxofRICrequestID> | | | EACH | ignore |
| >RIC Request ID | M | | 9.2.7 | | - | - |
| >RAN Function ID | M | | 9.2.8 | | - | - |
| >Cause | M | | 9.2.1 | | - | - |

| Range bound | Explanation |
|-------------------|---|
| maxofRICrequestID | Maximum no. of RIC subscription requests supported by Near-RT RIC toward an E2 Node. Value is <1024>. |

9.1.1.7 RIC INDICATION

This message is sent by an E2 Node to transfer Report and Insert RIC Service Action information to a Near-RT RIC.

Direction: E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |
| RIC Action ID | M | | 9.2.10 | | YES | reject |
| RIC Indication SN | O | | 9.2.14 | | YES | reject |
| RIC Indication Type | M | | 9.2.15 | | YES | reject |
| RIC Indication Header | M | | 9.2.17 | | YES | reject |
| RIC Indication Message | M | | 9.2.16 | | YES | reject |
| RIC Call process ID | O | | 9.2.18 | | YES | reject |

9.1.1.8 RIC CONTROL REQUEST

This message is sent by a Near-RT RIC to an E2 Node to initiate or resume a control function logic.

Direction: Near-RT RIC → E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |
| RIC Call Process ID | O | | 9.2.18 | | YES | reject |
| RIC Control Header | M | | 9.2.20 | | YES | reject |
| RIC Control Message | M | | 9.2.19 | | YES | reject |
| RIC Control Ack Request | O | | 9.2.21 | | YES | reject |

9.1.1.9 RIC CONTROL ACKNOWLEDGE

This message is sent by the E2 Node to inform the Near-RT RIC that the RIC CONTROL REQUEST message was received and to provide information on the outcome of the request.

Direction: E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |
| RIC Call process ID | O | | 9.2.18 | | YES | reject |
| RIC Control Outcome | O | | 9.2.25 | | YES | reject |

9.1.1.10 RIC CONTROL FAILURE

This message is sent by the E2 Node to inform the Near-RT RIC that the RIC CONTROL REQUEST message has failed to be executed.

Direction: E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |
| RIC Call process ID | O | | 9.2.18 | | YES | reject |
| Cause | M | | 9.2.1 | | YES | ignore |
| RIC Control Outcome | O | | 9.2.25 | | YES | Reject |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.1.11 RIC SUBSCRIPTION MODIFICATION REQUEST

This message is sent by the Near-RT RIC to an E2 Node to modify an existing Subscription in the E2 Node.

Direction: Near-RT RIC → E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|-----------------------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |
| RIC Event Trigger Definition to be Modified | O | | 9.2.9 | | YES | ignore |
| RIC Actions to be Removed List | | 0..1 | | | YES | ignore |
| >Action to be Removed Item IEs | | 1..<maxofRICactionID> | | | EACH | ignore |
| >>RIC Action ID | M | | 9.2.10 | | - | |
| RIC Actions to be Modified List | | 0..1 | | | YES | ignore |
| >Action to be Modified Item IEs | | 1..<maxofRICactionID> | | | EACH | ignore |
| >>RIC Action ID | M | | 9.2.10 | | - | |
| >>RIC Action Definition | O | | 9.2.12 | | - | |
| >>RIC Action Execution Order | O | | 9.2.35 | | | |
| >>RIC Subsequent Action | O | | 9.2.13 | | - | |
| RIC Actions to be Added List | | 0..1 | | | YES | ignore |
| >Action to be Added Item IEs | | 1..<maxofRICactionID> | | | EACH | ignore |
| >>RIC Action ID | M | | 9.2.10 | | - | |
| >>RIC Action Type | M | | 9.2.11 | | - | |
| >>RIC Action Definition | M | | 9.2.12 | | - | |
| >>RIC Action Execution Order | M | | 9.2.35 | | | |
| >>RIC Subsequent Action | O | | 9.2.13 | | - | |

| Range bound | Explanation |
|------------------|---|
| maxofRICActionID | Maximum no. of Actions to be requested by Near-RT RIC. Value is 16. |

9.1.1.12 RIC SUBSCRIPTION MODIFICATION RESPONSE

This message is sent by the E2 Node to accept the request from the Near-RT RIC to modify an existing E2 subscription in the E2 Node.

Direction: E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|-----------------------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |
| RIC Actions Removed List | | 0..1 | | | YES | ignore |
| >Action Removed Item IEs | | 1..<maxofRICactionID> | | | EACH | ignore |
| >>RIC Action ID | M | | 9.2.10 | | - | |
| RIC Actions Failed to be Removed List | | 0..1 | | | YES | ignore |
| >Action Failed to be Removed Item IEs | | 1..<maxofRICactionID> | | | EACH | ignore |
| >>RIC Action ID | M | | 9.2.10 | | - | |
| >>Cause | M | | 9.2.1 | | - | |
| RIC Actions Modified List | | 0..1 | | | YES | ignore |
| >Action Modified Item IEs | | 1..<maxofRICactionID> | | | EACH | ignore |
| >>RIC Action ID | M | | 9.2.10 | | - | |
| RIC Actions Failed to be Modified List | | 0..1 | | | YES | ignore |
| >Action Failed to be Modified Item IEs | | 1..<maxofRICactionID> | | | EACH | ignore |
| >>RIC Action ID | M | | 9.2.10 | | - | |
| >>Cause | M | | 9.2.1 | | - | |
| RIC Actions Added List | | 0..1 | | | YES | ignore |
| >Action Added Item IEs | | 1..<maxofRICactionID> | | | EACH | ignore |
| >>RIC Action ID | M | | 9.2.10 | | - | |
| RIC Actions Failed to be Added List | | 0..1 | | | YES | ignore |
| >Action Failed to be Added Item IEs | | 1..<maxofRICactionID> | | | EACH | ignore |
| >>RIC Action ID | M | | 9.2.10 | | - | |
| >>Cause | M | | 9.2.1 | | - | |

| Range bound | Explanation |
|------------------|---|
| maxofRICActionID | Maximum no. of Actions to be requested by Near-RT RIC. Value is 16. |

9.1.1.13 RIC SUBSCRIPTION MODIFICATION FAILURE

This message is sent by the E2 Node to inform the Near-RT RIC that the request to modify an existing E2 subscription in the E2 Node failed.

Direction: E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |
| Cause | M | | 9.2.1 | | YES | reject |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.1.14 RIC SUBSCRIPTION MODIFICATION REQUIRED

This message is sent by the E2 Node to request the Near-RT RIC to modify an existing E2 subscription in the E2 Node.

Direction: E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|-----------------------|--|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |
| RIC Actions Required to be Modified List | | 0..1 | | | YES | ignore |
| >Action Required to be Modified Item IEs | | | | | EACH | ignore |
| >>RIC Action ID | M | | 9.2.10 | | - | |
| >>RIC Time to Wait before subsequent action | M | | ENUMERATED (1ms, 2ms, 5ms, 10ms, 20ms, 30ms, 40ms, 50ms, 100ms, 200ms, 500ms, 1s, 2s, 5s, 10s, 20s, 60s, ...) | | - | |
| RIC Actions Required to be Removed List | | 0..1 | | | YES | ignore |
| >Action Required to be Removed Item IEs | | 1..<maxofRICactionID> | | | EACH | ignore |
| >>RIC Action ID | M | | 9.2.10 | | - | |
| >>Cause | M | | 9.2.1 | | - | |

| Range bound | Explanation |
|------------------|---|
| maxofRICActionID | Maximum no. of Actions to be requested by Near-RT RIC. Value is 16. |

9.1.1.15 RIC SUBSCRIPTION MODIFICATION CONFIRM

This message is sent by the Near-RT RIC to accept the request from the E2 Node to modify an existing E2 subscription in the E2 Node.

Direction: Near-RT RIC → E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|-----------------------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |
| RIC Actions Confirmed for Modification List | | 0..1 | | | YES | ignore |
| >RIC Action Confirmed for Modification Item IEs | | 1..<maxofRICactionID> | | | EACH | ignore |
| >>RIC Action ID | M | | 9.2.10 | | - | |
| RIC Actions Refused to be Modified List | | 0..1 | | | YES | ignore |
| >Action Refused to be Modified Item IEs | | 1..<maxofRICactionID> | | | EACH | ignore |
| >>RIC Action ID | M | | 9.2.10 | | - | |
| >>Cause | M | | 9.2.1 | | - | |
| RIC Actions Confirmed for Removal List | | 0..1 | | | YES | ignore |
| >Action Confirmed for Removal Item IEs | | 1..<maxofRICactionID> | | | EACH | ignore |
| >>RIC Action ID | M | | 9.2.10 | | - | |
| RIC Actions Refused to be Removed List | | 0..1 | | | YES | ignore |
| >Action Refused to be Removed Item IEs | | 1..<maxofRICactionID> | | | EACH | ignore |
| >>RIC Action ID | M | | 9.2.10 | | - | |
| >>Cause | M | | 9.2.1 | | - | |

| Range bound | Explanation |
|------------------|---|
| maxofRICActionID | Maximum no. of Actions to be requested by Near-RT RIC. Value is 16. |

9.1.1.16 RIC SUBSCRIPTION MODIFICATION REFUSE

This message is sent by the Near-RT RIC to deny the request from the E2 Node to modify an existing E2 subscription in the E2 Node.

Direction: Near-RT RIC → E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |
| Cause | M | | 9.2.1 | | YES | reject |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.1.17 RIC QUERY REQUEST

This message is sent by the Near-RT RIC to an E2 Node to request RAN and/or UE related information from the E2 Node.

Direction: Near-RT RIC → E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|----------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |
| RIC Query Header | M | | 9.2.36 | | YES | reject |
| RIC Query Definition | M | | 9.2.37 | | YES | reject |

9.1.1.18 RIC QUERY RESPONSE

This message is sent by the E2 Node to Near-RT RIC in response to RAN and/or UE related information requested by Near-RT RIC.

Direction: E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |
| RIC Query Outcome | M | | 9.2.38 | | YES | reject |

9.1.1.19 RIC QUERY FAILURE

This message is sent by the E2 Node to inform the Near-RT RIC that the requested RAN and/or UE related Information has failed.

Direction: E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| RIC Request ID | M | | 9.2.7 | | YES | reject |
| RAN Function ID | M | | 9.2.8 | | YES | reject |
| Cause | M | | 9.2.1 | | YES | reject |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.2 Messages for Global Procedures

9.1.2.1 ERROR INDICATION

This message is used to indicate that some error has been detected in the E2 Node or Near-RT RIC.

Direction: E2 Node → Near-RT RIC or Near-RT RIC → E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | ignore |
| Transaction ID | O | | 9.2.33 | Required if <i>RIC Request ID</i> IE is not present | YES | reject |
| RIC Request ID | O | | 9.2.7 | Required if <i>Transaction ID</i> IE is not present | YES | reject |
| RAN Function ID | O | | 9.2.8 | | YES | reject |
| Cause | O | | 9.2.1 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.2.2 E2 SETUP REQUEST

This message is sent by an E2 Node to a Near-RT RIC to transfer the initialization information.

Direction: E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|--------------------------------|-----------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| Transaction ID | M | | 9.2.33 | | YES | reject |
| Global E2 Node ID | M | | 9.2.6 | | YES | reject |
| RAN Functions Added List | | 1 | | List of RAN functions in E2 node | YES | reject |
| >RAN Function item | | 1.. <maxofRANfunctionID> | | | | |
| >>RAN Function ID | M | | 9.2.8 | Id of the declared Function | - | |
| >>RAN Function Definition | M | | 9.2.23 | Definition of Function | - | |
| >>RAN Function Revision | M | | 9.2.24 | Revision counter | - | |
| >>RAN Function OID | M | | 9.2.31 | Object identifier of corresponding E2SM | - | |
| E2 Node Component Configuration Addition List | | 1 | | List of E2 Node component configuration information | YES | reject |
| >E2 Node Component Configuration Addition Item | | 1.. <maxofE2nodeComponents> | | | EACH | reject |
| >>E2 Node Component Interface Type | M | | 9.2.26 | E2 Node component interface type | - | |
| >>E2 Node Component ID | O | | 9.2.32 | E2 Node Component Identifier | - | |
| >>E2 Node Component Configuration | M | | 9.2.27 | Contents depends on component interface type | - | |

| Range bound | Explanation |
|-----------------------|--|
| maxofRANfunctionID | Maximum no. of RAN Functions supported by E2 Node. Value is 256. |
| maxofE2nodeComponents | Maximum no. of E2 Node components supported by E2 Node. Value is 1024. |

9.1.2.3 E2 SETUP RESPONSE

This message is sent by a Near-RT RIC to an E2 Node to transfer the initialization information.

Direction: Near-RT RIC →E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|--------------------------------|-----------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| Transaction ID | M | | 9.2.33 | | YES | reject |
| Global RIC ID | M | | 9.2.4 | | YES | reject |
| RAN Functions Accepted List | | 0..1 | | Complete list of Functions accepted by Near-RT RIC | | |
| >RAN Functions ID item | | 1 .. <maxofRANfunctionID> | | | YES | Reject |
| >>RAN Function ID | M | | 9.2.8 | Id of the declared Function | - | |
| >>RAN Function Revision | M | | 9.2.24 | Revision counter | - | |
| RAN Functions Rejected List | | 0..1 | | Complete list of Functions not accepted by Near-RT RIC | | |
| RAN Functions ID Cause Item | | 1 .. <maxofRANfunctionID> | | | YES | reject |
| >>RAN Function ID | M | | 9.2.8 | Id of the declared Function | - | |
| >>Cause | M | | 9.2.1 | Reason for not accepting function | - | |
| E2 Node Component Configuration Addition Acknowledge List | | 1 | | Complete list of E2 Node Components in the E2 SETUP REQUEST message | YES | reject |
| >E2 Node Component Configuration Addition Acknowledge Item | | 1.. <maxofE2nodeComponents> | | | EACH | reject |
| >>E2 Node Component Interface Type | M | | 9.2.26 | E2 Node component interface type | - | |
| >>E2 Node Component ID | M | | 9.2.32 | E2 Node Component Identifier | - | |
| >>E2 Node Component Configuration Acknowledge | M | | 9.2.28 | Success or failure with Cause | - | |

| Range bound | Explanation |
|-----------------------|--|
| maxofRANfunctionID | Maximum no. of RAN Functions supported by E2 Node. Value is 256. |
| maxofE2nodeComponents | Maximum no. of E2 Node components supported by E2 Node. Value is 1024. |

9.1.2.4 E2 SETUP FAILURE

This message is sent by the Near-RT RIC to indicate E2 Setup failure.

Direction: Near-RT RIC → E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-----------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| Transaction ID | M | | 9.2.33 | | YES | reject |
| Cause | M | | 9.2.1 | | YES | ignore |
| Time To Wait | O | | 9.2.5 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |
| Transport Layer Information | O | | 9.2.29 | | YES | ignore |

9.1.2.5 RESET REQUEST

This message is sent from a Near-RT RIC to an E2 Node or from an E2 Node to a Near-RT RIC and is used to request the E2 interface between the E2 node and the Near-RT RIC to be reset.

Direction: Near-RT RIC → E2 Node, or E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|----------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| Transaction ID | M | | 9.2.33 | | YES | reject |
| Cause | M | | 9.2.1 | | YES | ignore |

9.1.2.6 RESET RESPONSE

This message is sent by an E2 Node to a Near-RT RIC or from a Near-RT RIC to an E2 Node as a response to a RESET REQUEST message.

Direction: Near-RT RIC → E2 Node, or E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| Transaction ID | M | | 9.2.33 | | YES | reject |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.2.7 RIC SERVICE UPDATE

This message is sent by an E2 Node to the Near-RT RIC to transfer updated information on RIC Services supported by the E2 Node.

Direction: E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------------------------|----------|------------------------------|-----------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| Transaction ID | M | | 9.2.33 | . | YES | reject |
| RAN Functions Added List | | 0..1 | | List of added RAN functions in E2 node | | |
| >RAN Functions Item | | 1 .. <maxofRANfunctionID> | | | YES | reject |
| >>RAN Function ID | M | | 9.2.8 | Id of the declared Function | - | |
| >>RAN Function Definition | M | | 9.2.23 | Definition of Function | - | |
| >>RAN Function Revision | M | | 9.2.24 | Revision counter | - | |
| >>RAN Function OID | M | | 9.2.31 | Object identifier of corresponding E2SM | - | |
| RAN Functions Modified List | | 0..1 | | List of Modified RAN functions in E2 node | | |
| >RAN Functions Item | | 1 .. <maxofRANfunctionID> | | | YES | reject |
| >>RAN Function ID | M | | 9.2.8 | Id of the declared Function | - | |
| >>RAN Function Definition | M | | 9.2.23 | Definition of Function | - | |
| >>RAN Function Revision | M | | 9.2.24 | Revision counter | - | |
| >>RAN Function OID | M | | 9.2.31 | Object identifier of corresponding E2SM | - | |
| RAN Functions Deleted List | | 0..1 | | List of deleted RAN functions in E2 node | | |
| >RAN Functions ID Item | | 1 .. <maxofRANfunctionID> | | | YES | reject |
| >>RAN Function ID | M | | 9.2.8 | Id of the declared Function | - | |
| >>RAN Function Revision | M | | 9.2.24 | Revision counter | - | |

| Range bound | Explanation |
|--------------------|---|
| maxofRANfunctionID | Maximum no. of Functions accepted by Near-RT RIC. Value is 256. |

9.1.2.8 RIC SERVICE UPDATE ACKNOWLEDGE

This message is sent by the Near-RT RIC to the E2 Node to acknowledge update of RIC Services supported by the E2 Node.

Direction: Near-RT RIC → E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------------------------|----------|------------------------------|-----------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| Transaction ID | M | | 9.2.33 | . | YES | reject |
| RAN Functions Accepted List | | 0..1 | | List of Functions accepted by Near-RT RIC | | |
| >RAN Functions ID Item | | 1 .. <maxofRANfunctionID> | | | YES | reject |
| >>RAN Function ID | M | | 9.2.8 | Id of the declared Function | - | |
| >>RAN Function Revision | M | | 9.2.24 | Revision counter | - | |
| RAN Functions Rejected List | | 0..1 | | List of Functions not accepted by Near-RT RIC | | |
| >RAN Functions Cause Item | | 1 .. <maxofRANfunctionID> | | | YES | reject |
| >>RAN Function ID | M | | 9.2.8 | Id of the declared Function | - | |
| >>Cause | M | | 9.2.1 | Reason for not accepting function | - | |

| Range bound | Explanation |
|--------------------|---|
| maxofRANfunctionID | Maximum no. of Functions accepted by Near-RT RIC. Value is 256. |

9.1.2.9 RIC SERVICE UPDATE FAILURE

This message is sent by the Near-RT RIC to the E2 Node to indicate RIC SERVICE Update Failure.

Direction: Near-RT RIC → E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| Transaction ID | M | | 9.2.33 | | YES | reject |
| Cause | M | | 9.2.1 | Reason for failure | YES | reject |
| Time To Wait | O | | 9.2.5 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.2.10 RIC SERVICE QUERY

This message is sent by a Near-RT RIC to an E2 Node to request a E2 Node initiated RIC Service Update procedure.

Direction: Near-RT RIC → E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------------------------|----------|------------------------------|-----------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| Transaction ID | M | | 9.2.33 | . | YES | reject |
| RAN Functions Accepted List | | 0..1 | | Complete list of Functions previously accepted by Near-RT RIC | | |
| >RAN Functions ID Item | | 1 .. <maxofRANfunctionID> | | | YES | reject |
| >>RAN Function ID | M | | 9.2.8 | Id of the declared Function | - | |
| >>RAN Function Revision | M | | 9.2.24 | Revision counter | - | |

| Range bound | Explanation |
|--------------------|---|
| maxofRANfunctionID | Maximum no. of Functions accepted by Near-RT RIC. Value is 256. |

9.1.2.11 E2 NODE CONFIGURATION UPDATE

This message is sent by an E2 Node to the Near-RT RIC to transfer updated information on the E2 Node Configuration information.

Direction: E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|--------------------------------|-----------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| Transaction ID | M | | 9.2.33 | | YES | reject |
| Global E2 Node ID | O | | 9.2.6 | Required when sent as first message on new TNL association. | YES | reject |
| E2 Node Component Configuration Addition List | | 0..1 | | | YES | reject |
| >E2 Node Component Configuration Addition Item | | 1.. <maxofE2nodeComponents> | | | EACH | reject |
| >>E2 Node Component Interface Type | M | | 9.2.26 | E2 Node component interface type. | - | |
| >>E2 Node Component ID | M | | 9.2.32 | E2 Node Component Identifier. | - | |
| >>E2 Node Component Configuration | M | | 9.2.27 | Contents depends on component type. | - | |
| E2 Node Component Configuration Update List | | 0..1 | | | YES | reject |
| >E2 Node Component Configuration Update Item | | 1.. <maxofE2nodeComponents> | | | EACH | reject |
| >>E2 Node Component Interface Type | M | | 9.2.26 | E2 Node component interface type. | - | |
| >>E2 Node Component ID | M | | 9.2.32 | E2 Node Component Identifier. | - | |
| >>E2 Node Component Configuration | M | | 9.2.27 | Contents depends on component type. | - | |
| E2 Node Component Configuration Removal List | | 0..1 | | | YES | reject |
| >E2 Node Component Configuration Removal Item | | 1.. <maxofE2nodeComponents> | | | EACH | reject |
| >>E2 Node Component Interface Type | M | | 9.2.26 | E2 Node component interface type. | - | |
| >>E2 Node Component ID | M | | 9.2.32 | E2 Node Component Identifier. | - | |
| E2 Node TNL Association To Remove List | | 0..1 | | | YES | reject |
| >E2 Node TNL Association To Remove Item IEs | | 1.. <maxofTNLA> | | | EACH | reject |
| >> Transport Layer Information | M | | 9.2.29 | Transport Layer Address of the E2 node. | - | - |
| >> Transport Layer Information Near-RT RIC | O | | 9.2.29 | Transport Layer Address of the Near-RT RIC. | - | - |

| Range bound | Explanation |
|-----------------------|--|
| maxofE2nodeComponents | Maximum no. of E2 Node components supported by E2 Node. Value is 1024. |
| maxofTNLA | Maximum no. of TNL Associations supported by E2 Node. Value is 32. |

9.1.2.12 E2 NODE CONFIGURATION UPDATE ACKNOWLEDGE

This message is sent by Near-RT RIC to E2 Node to acknowledge update of E2 Node Configuration supported by the E2 Node.

Direction: Near-RT RIC → E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|--------------------------------|-----------------------|----------------------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| Transaction ID | M | | 9.2.33 | | YES | reject |
| E2 Node Component Configuration Addition Acknowledge List | | 0..1 | | | YES | reject |
| >E2 Node Component Configuration Addition Acknowledge Item | | 1.. <maxofE2nodeComponents> | | | EACH | reject |
| >>E2 Node Component Interface Type | M | | 9.2.26 | E2 Node component interface type | - | |
| >>E2 Node Component ID | M | | 9.2.32 | E2 Node Component Identifier | - | |
| >>E2 Node Component Configuration Acknowledge | M | | 9.2.28 | Success or failure with Cause | - | |
| E2 Node Component Configuration Update Acknowledge List | | 0..1 | | | YES | reject |
| >E2 Node Component Configuration Update Acknowledge Item | | 1.. <maxofE2nodeComponents> | | | EACH | reject |
| >>E2 Node Component Interface Type | M | | 9.2.26 | E2 Node component interface type | - | |
| >>E2 Node Component ID | O | | 9.2.32 | E2 Node Component Identifier | - | |
| >>E2 Node Component Configuration Update Acknowledge | M | | 9.2.28 | Success or failure with Cause | - | |
| E2 Node Component Configuration Removal Acknowledge List | | 0..1 | | | YES | reject |
| >E2 Node Component Configuration Removal Acknowledge Item | | 1.. <maxofE2nodeComponents> | | | EACH | reject |
| >>E2 Node Component Interface Type | M | | 9.2.26 | E2 Node component interface type | - | |
| >>E2 Node Component ID | M | | 9.2.32 | E2 Node Component Identifier | - | |
| >>E2 Node Component Configuration Acknowledge | M | | 9.2.28 | Success or failure with Cause | - | |

| Range bound | Explanation |
|-----------------------|--|
| maxofE2nodeComponents | Maximum no. of E2 Node components supported by E2 Node. Value is 1024. |

9.1.2.13 E2 NODE CONFIGURATION UPDATE FAILURE

This message is sent by Near-RT RIC to E2 Node to indicate E2 Node Configuration Update Failure.

Direction: Near-RT RIC → E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| Transaction ID | M | | 9.2.33 | . | YES | reject |
| Cause | M | | 9.2.1 | Cause | YES | reject |
| Time To Wait | O | | 9.2.5 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.2.14 E2 CONNECTION UPDATE

This message is sent by Near-RT RIC to E2 Node to initiate update of E2 Connection supported by the E2 Node.

Direction: Near-RT RIC → E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------------------|----------|-----------------|-----------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| Transaction ID | M | | 9.2.33 | . | YES | reject |
| E2 Connection To Add List | | 0..1 | | | YES | ignore |
| >E2 Connection to Add Item IEs | | 1.. <maxofTNLA> | | | EACH | ignore |
| >>Transport Layer Information | M | | 9.2.29 | Transport layer address and port number of Near-RT RIC | | |
| >>TNL Association Usage | M | | 9.2.30 | Indicates how E2 connection is to be used | | |
| E2 Connection To Remove List | | 0..1 | | | YES | ignore |
| >E2 Connection to Remove Item IEs | | 1.. <maxofTNLA> | | | EACH | ignore |
| >>Transport Layer Information | M | | 9.2.29 | Transport layer address and port number of Near-RT RIC | | |
| E2 Connection To Modify List | | 0..1 | | | YES | ignore |
| >E2 Connection to Modify Item IEs | | 1.. <maxofTNLA> | | | EACH | ignore |
| >>Transport Layer Information | M | | 9.2.29 | Transport layer address and port number of Near-RT RIC | | |
| >>TNL Association Usage | M | | 9.2.30 | Indicates how E2 connection is to be used | | |

| Range bound | Explanation |
|-------------|--|
| maxofTNLA | Maximum no. of TNL Associations supported by E2 Node. Value is 32. |

9.1.2.15 E2 CONNECTION UPDATE ACKNOWLEDGE

This message is sent by E2 Node to the Near-RT RIC to acknowledge update of E2 Connection supported by the E2 Node.

Direction: E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|---|----------|-----------------|-----------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| Transaction ID | M | | 9.2.33 | | YES | reject |
| E2 Connection Setup List | | 0..1 | | | YES | ignore |
| >E2 Connection Setup Item IEs | | 1.. <maxofTNLA> | | | EACH | ignore |
| >>Transport Layer Information | M | | 9.2.29 | Transport layer address and port number of Near-RT RIC | | |
| >>TNL Association Usage | M | | 9.2.30 | Indicates how E2 connection is to be used | | |
| E2 Connection Failed to Setup List | | 0..1 | | | YES | ignore |
| >E2 Connection failed to setup Item IEs | | 1.. <maxofTNLA> | | | EACH | ignore |
| >>Transport Layer Information | M | | 9.2.29 | Transport layer address and port number of Near-RT RIC | | |
| >>Cause | M | | 9.2.1 | | | |

| Range bound | Explanation |
|-------------|--|
| maxofTNLA | Maximum no. of TNL Associations supported by E2 Node. Value is 32. |

9.1.2.16 E2 CONNECTION UPDATE FAILURE

This message is sent by E2 Node to the Near-RT RIC to inform failure of the requested E2 Connection updates.

Direction: E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| Transaction ID | M | | 9.2.33 | | YES | reject |
| Cause | M | | 9.2.1 | | YES | reject |
| Time To Wait | O | | 9.2.5 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.2.17 E2 REMOVAL REQUEST

This message is sent by either the E2 Node or the Near-RT RIC to initiate the removal of the E2 signalling connection and the related resources.

Direction: Near-RT RIC → E2 Node, or E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|----------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| Transaction ID | M | | 9.2.33 | | YES | reject |

9.1.2.18 E2 REMOVAL RESPONSE

This message is sent by either the E2 Node or the Near-RT RIC to acknowledge the initiation of removal of the E2 signalling connection and the related resources.

Direction: Near-RT RIC → E2 Node, or E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| Transaction ID | M | | 9.2.33 | . | YES | reject |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.2.19 E2 REMOVAL FAILURE

This message is sent by either the E2 Node or the Near-RT RIC to indicate that removing the E2 signalling connection and the related resources cannot be accepted.

Direction: Near-RT RIC → E2 Node, or E2 Node → Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| Transaction ID | M | | 9.2.33 | | YES | reject |
| Cause | M | | 9.2.1 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.2 Information Element definitions

9.2.0 General

When specifying information elements which are to be represented by bit strings, if not otherwise specifically stated in the semantics description of the concerned IE or elsewhere, the following principle applies with regards to the ordering of bits:

- The first bit (leftmost bit) contains the Most Significant Bit (MSB);
- The last bit (rightmost bit) contains the Least Significant Bit (LSB);
- When importing bit strings from other specifications, the first bit of the bit string contains the first bit of the concerned information.

9.2.1 Cause

The purpose of the *Cause* IE is to indicate the reason for a particular event for the E2AP protocol.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-------------------------|----------|-------|--|-----------------------|
| CHOICE Cause Group | M | | | |
| >RIC services | | | | |
| >>RIC Request | O | | ENUMERATED (RAN Function ID invalid, Action not supported, Excessive actions, Duplicate action, Duplicate Event Trigger, Function resource limit, RIC Request ID unknown, Inconsistent Action/subsequent Action sequence, Control message invalid, RIC Call process ID invalid, Control timer expired, Control failed to execute, System not ready, unspecified, ..., RIC Subscription End Time expired, RIC Subscription Time invalid, Duplicate RIC Request ID, Event Trigger not supported, Requested Information Unavailable, Invalid Information Request) | |
| >>RIC Service | O | | ENUMERATED RAN Function not supported, Excessive functions, RIC resource limit, ...) | |
| >>E2 Node | O | | ENUMERATED (E2 node component unknown, ...) | |
| >Transport Layer | | | | |
| >>Transport Layer Cause | M | | ENUMERATED (Unspecified, Transport Resource Unavailable, ...) | |
| >Protocol | | | | |
| >>Protocol Cause | M | | ENUMERATED (Transfer Syntax Error, Abstract Syntax Error (Reject), Abstract Syntax Error (Ignore and Notify), Message not Compatible with Receiver State, Semantic Error, Abstract Syntax Error (Falsely Constructed Message), Unspecified, ...) | |
| >Misc | | | | |
| >>Miscellaneous Cause | M | | ENUMERATED (Control Processing Overload, Hardware Failure, O&M Intervention, Unspecified, ...) | |

The meaning of the different cause values is described in the following table. In general, "not supported" cause values indicate that the related capability is missing. On the other hand, "not available" cause values indicate that the related capability is present, but insufficient resources are available to perform the requested action.

| RIC Request cause | Meaning |
|--|---|
| Unspecified | Sent for RIC service cause when none of the specified cause values applies. |
| RAN Function ID invalid | Requested function Id invalid or not known by E2 Node. |
| Action not supported | Requested Action not supported by RAN function. |
| Excessive actions | Excessive number of actions requested for RAN Function. |
| Duplicate action | Same action requested more than once in same subscription request. |
| Duplicate Event Trigger | Subscription request has same event trigger as previously accepted subscription request. |
| Function resource limit | RAN function has reached resource limit. |
| RIC Request ID unknown | RIC Request ID sent to Near-RT RIC is unknown. |
| Inconsistent Action/subsequent Action sequence | RAN Function has detected inconsistent sequence of requested Action and Subsequent Action. |
| Control message invalid | RAN Function has detected invalid RIC CONTROL REQUEST message. |
| RIC Call process ID invalid | RAN function has detected invalid RIC Call Process ID in RIC CONTROL REQUEST. |
| Control timer expired | RIC Control Request received by E2 Node after the associated RIC Time to Wait timer had expired. |
| Control failed to execute | Requested control procedure initiated by RIC Control Request failed to be executed in the E2 Node. |
| System not ready | RAN Function is not ready to receive RIC Subscription or RIC Control message. |
| RIC Subscription End Time expired | RIC SUBSCRIPTION DELETE REQUIRED is triggered to inform Near-RT RIC that end time has expired. |
| RIC Subscription Time invalid | E2 Node received RIC SUBSCRIPTION REQUEST containing an invalid RIC Subscription Start Time and/or RIC Subscription End Time. |
| Duplicate RIC Request ID | E2 node does not support handling of same RIC Request ID as previously accepted subscription request. |
| Event Trigger not supported | Requested event trigger definition or modification - not supported by RAN function. |
| Requested Information Unavailable | Information requested by Near-RT RIC is not available at E2 Node. |
| Invalid Information Request | Information requested by Near-RT RIC is invalid. |

| RIC Service cause | Meaning |
|----------------------------|--|
| RAN Function not supported | The RAN Function described by E2 Node is not supported by Near-RT RIC. |
| Excessive functions | RIC has reached a limit on the number of declared RAN functions. |
| RIC resource limit | RIC has reached a resource limit. |

| E2 Node configuration cause | Meaning |
|------------------------------------|--|
| E2 Node component unknown | The received message refers to an unknown E2 Node component. |

| Transport Layer cause | Meaning |
|--------------------------------|--|
| Unspecified | Sent when none of the cause values below applies but still the cause is Transport Network Layer related. |
| Transport Resource Unavailable | The required transport resources are not available. |

| Protocol cause | Meaning |
|---|--|
| Transfer Syntax Error | The received message included a transfer syntax error. |
| Abstract Syntax Error (Reject) | The received message included an abstract syntax error and the concerning criticality indicated "reject". |
| Abstract Syntax Error (Ignore And Notify) | The received message included an abstract syntax error and the concerning criticality indicated "ignore and notify". |
| Message Not Compatible With Receiver State | The received message was not compatible with the receiver state. |
| Semantic Error | The received message included a semantic error. |
| Abstract Syntax Error (Falsely Constructed Message) | The received message contained IEs or IE groups in wrong order or with too many occurrences. |
| Unspecified | Sent when none of the above cause values applies but still the cause is Protocol related. |

| Miscellaneous cause | Meaning |
|--|---|
| Control Processing Overload | Control processing overload. |
| Not Enough User Plane Processing Resources Available | Not enough resources are available related to user plane processing. |
| Hardware Failure | Action related to hardware failure. |
| O&M Intervention | The action is due to O&M intervention. |
| Unspecified Failure | Sent when none of the above cause values applies and the cause is not related to any of the categories Radio Network Layer, Transport Network Layer, NAS or Protocol. |

9.2.2 Criticality Diagnostics

The *Criticality Diagnostics* IE is sent by the E2 Node or the Near-RT RIC when parts of a received message have not been comprehended, or were missing, or if the message contained logical errors. When applicable, it contains information about which IEs were not comprehended or were missing.

For further details on how to use the *Criticality Diagnostics* IE see clause 10. The conditions for inclusion of the *Transaction ID* IE are described in clause 10.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|--|----------|------------------------------------|---|---|
| Procedure Code | O | | INTEGER (0..255) | Procedure Code is to be used if Criticality Diagnostics is part of Error Indication procedure, and not within the response message of the same procedure that caused the error. |
| Triggering Message | O | | ENUMERATED (initiating message, successful outcome, unsuccessful outcome) | The Triggering Message is used only if the Criticality Diagnostics is part of Error Indication procedure. |
| Procedure Criticality | O | | ENUMERATED (reject, ignore, notify) | This Procedure Criticality is used for reporting the Criticality of the Triggering message (Procedure). |
| RIC Request ID | O | | 9.2.7 | |
| Information Element Criticality Diagnostics | | <i>0 .. <maxnoof Errors></i> | | |
| >IE Criticality | M | | ENUMERATED (reject, ignore, notify) | The IE Criticality is used for reporting the criticality of the triggering IE. The value 'ignore' shall not be used. |
| >IE ID | M | | INTEGER (0..65535) | The IE ID of the not understood or missing IE. |
| >Type of Error | M | | ENUMERATED (not understood, missing, ...) | |

| Range bound | Explanation |
|---------------|--|
| maxnoofErrors | Maximum no. of IE errors allowed to be reported with a single message. The value for maxnoofErrors is 256. |

9.2.3 Message Type

The *Message Type* IE uniquely identifies the message being sent. It is mandatory for all messages.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|------------------|----------|-------|--|-----------------------|
| Message Type | | | | |
| >Procedure Code | M | | INTEGER (0..255) | |
| >Type of Message | M | | CHOICE (Initiating Message, Successful Outcome, Unsuccessful Outcome, ...) | |

9.2.4 Global RIC ID

This IE is used to globally identify the Near-RT RIC.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|----------------|----------|-------|-------------------------------------|-----------------------|
| PLMN Identity | M | | ETSI TS 138 423 [20] clause 9.2.2.4 | |
| Near-RT RIC ID | M | | BIT STRING (SIZE(20)) | |

9.2.5 Time to wait

This IE defines the minimum allowed waiting times.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------|----------|-------|--|-----------------------|
| Time to wait | M | | ENUMERATED (1s, 2s, 5s, 10s, 20s, 60s) | |

9.2.6 Global E2 Node ID

This IE is used to globally identify an E2 node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|--------------------|----------|-------|--------------------------------------|--|
| CHOICE | M | | | |
| >gNB | | | | To be used when E2 Node supports gNB mode or both gNB and en-gNB modes. |
| >>Global gNB ID | M | | ETSI TS 138 423 [20] clause 9.2.2.1 | |
| >>Global en-gNB ID | O | | ETSI TS 136 423 [25] clause 9.2.112 | Required when E2 node also supports NR with en-gNB mode. |
| >>gNB-CU-UP ID | O | | ETSI TS 137 483 [21] clause 9.3.1.15 | Required when E2 Node supports only gNB-CU-UP functionality. |
| >>gNB-DU ID | O | | ETSI TS 138 473 [22] clause 9.3.1.9 | Required when E2 Node supports only gNB-DU functionality. |
| >en-gNB | | | | To be used when E2 Node supports en-gNB mode only. |
| >>Global en-gNB ID | M | | ETSI TS 136 423 [25] clause 9.2.112 | |
| >>en-gNB-CU-UP ID | O | | ETSI TS 137 483 [21] clause 9.3.1.15 | Required when E2 Node supports only gNB-CU-UP functionality. |
| >>en-gNB-DU ID | O | | ETSI TS 138 473 [22] clause 9.3.1.9 | Required when E2 Node supports only gNB-DU functionality. |
| >ng-eNB | | | | To be used when E2 Node supports ng-eNB mode or both ng-eNB and eNB modes. |
| >>Global ng-eNB ID | M | | ETSI TS 138 423 [20] clause 9.2.2.2 | |
| >>Global eNB ID | O | | ETSI TS 136 423 [25] clause 9.2.22 | Required when E2 Node also supports E-UTRA with eNB mode. |
| >>ng-eNB-DU ID | O | | ETSI TS 137 473 [23] clause 9.3.1.9 | Required when E2 node supports only ng-eNB DU functionality. |
| >eNB | | | | To be used when E2 Node supports eNB mode only. |
| >>Global eNB ID | M | | ETSI TS 136 423 [25] clause 9.2.22 | |

9.2.7 RIC Request ID

This information element indicates the RIC Request ID, and shall be unique for a given E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|------------------|----------|-------|-----------------------|-----------------------|
| RIC Requestor ID | M | | INTEGER (0..65535) | |
| RIC Instance ID | M | | INTEGER (0..65535) | |

9.2.8 RAN Function ID

This information element indicates the RAN Function ID, and shall be unique within a given E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-----------------|----------|-------|-----------------------|--|
| RAN Function ID | M | | INTEGER (0..4095) | Value 0 reserved for Near-RT RIC internal usage. |

9.2.9 RIC Event Trigger Definition

This information element indicates the RIC event trigger description used by the RIC Subscription procedure.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|------------------------------|----------|-------|-----------------------|--|
| RIC Event Trigger Definition | M | | OCTET STRING | Defined in RAN Function specific E2 Service Model [3]. |

9.2.10 RIC Action ID

This information element indicates the Action ID number for a RIC Service Action, and shall be unique within the given RIC Request ID.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------|----------|-------|-----------------------|-----------------------|
| RIC Action ID | M | | INTEGER (0..255) | |

9.2.11 RIC Action Type

This IE defines the type of RIC Service Action to be executed.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-----------------|----------|-------|--|-----------------------|
| RIC Action Type | M | | ENUMERATED (Insert, Report, Policy, ...) | |

9.2.12 RIC Action Definition

This information element provides parameters to be used when executed a Report, Insert or Policy RIC Service Actions.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-----------------------|----------|-------|-----------------------|--|
| RIC Action Definition | M | | OCTET STRING | Defined in RAN Function specific E2 Service Model [3]. |

9.2.13 RIC Subsequent Action

This IE defines the subsequent action to be taken after completing a particular RIC Service Action and shall be present when RIC Action Type set to Insert.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|----------------------------|----------|-------|---|-----------------------|
| RIC Subsequent Action Type | M | | ENUMERATED (Continue, Halt, ...) | |
| RIC Time to Wait | M | | ENUMERATED (1ms, 2ms, 5ms, 10ms, 20ms, 30ms, 40ms, 50ms, 100ms, 200ms, 500ms, 1s, 2s, 5s, 10s, 20s, 60s, ...) | |

9.2.14 RIC Indication Sequence Number (SN)

This information element indicates the Indication Sequence Number (SN).

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-------------------|----------|-------|-----------------------|-----------------------|
| RIC Indication SN | M | | INTEGER (0..65535) | |

9.2.15 RIC Indication Type

This IE defines the Indication Type.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------------|----------|-------|----------------------------------|-----------------------|
| RIC Indication Type | M | | ENUMERATED (Insert, Report, ...) | |

9.2.16 RIC Indication message

This information element carries the RIC indication message used for Insert and Report RIC Service Actions.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|------------------------|----------|-------|-----------------------|--|
| RIC Indication message | M | | OCTET STRING | Defined in RAN Function specific E2 Service Model [3]. |

9.2.17 RIC Indication header

This information element carries the RIC indication header used for Insert and Report RIC Service Actions.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-----------------------|----------|-------|-----------------------|--|
| RIC Indication header | M | | OCTET STRING | Defined in RAN Function specific E2 Service Model [3]. |

9.2.18 RIC Call Process ID

This information element carries the RIC Call Process ID used for the Insert and Control RIC Service Actions. The RIC Call Process ID shall be unique within a given RAN Function on a given E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------------|----------|-------|-----------------------|--|
| RIC Call Process ID | M | | OCTET STRING | Defined in RAN Function specific E2 Service Model [3]. |

9.2.19 RIC Control message

This information element carries the RIC Control message.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------------|----------|-------|-----------------------|--|
| RIC Control Message | M | | OCTET STRING | Defined in RAN Function specific E2 Service Model [3]. |

9.2.20 RIC Control header

This information element carries the RIC Control Header.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|--------------------|----------|-------|-----------------------|--|
| RIC Control header | M | | OCTET STRING | Defined in RAN Function specific E2 Service Model [3]. |

9.2.21 RIC Control Ack Request

This IE defines whether and when the RIC CONTROL ACKNOWLEDGE message shall be sent by the E2 Node as described in the table below.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-------------------------|----------|-------|------------------------------|-----------------------|
| RIC Control Ack Request | M | | ENUMERATED (NoAck, Ack, ...) | |

The meaning of the different values is described in the following table.

| RIC Service cause | Meaning |
|-------------------|---|
| NoAck | Optional RIC Control Acknowledgement is not required. |
| Ack | Optional RIC Control Acknowledgement is required. |

9.2.22 Void

9.2.23 RAN Function Definition

This information element carries the RAN Function Definition.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-------------------------|----------|-------|-----------------------|--|
| RAN Function Definition | M | | OCTET STRING | Defined in RAN Function specific E2 Service Model [3]. |

9.2.24 RAN Function Revision

This information element carries the RAN Function Revision.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-----------------------|----------|-------|-----------------------|-----------------------|
| RAN Function Revision | M | | INTEGER (0..4095) | |

9.2.25 RIC Control Outcome

This information element carries the RIC Control Outcome.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------------|----------|-------|-----------------------|--|
| RIC Control Outcome | M | | OCTET STRING | Defined in RAN Function specific E2 Service Model [3]. |

9.2.26 E2 Node Component Interface Type

This IE is used to identify an E2 node component type.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|----------------------------------|----------|-------|--|-----------------------|
| E2 node component interface type | M | | ENUMERATED (ng, xn, e1, f1, w1, s1, x2, ...) | |

9.2.27 E2 Node Component Configuration

This IE is used to carry the E2 Node component configuration update information of a specific E2 Node component.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|----------------------------------|----------|-------|-----------------------|--|
| SEQUENCE | M | | | |
| >E2 Node Component Request Part | M | | OCTET STRING | Contents depend on component type and used to carry new or updated component configuration. See the table below. |
| >E2 Node Component Response Part | M | | OCTET STRING | Contents depend on component type and used to carry new or updated component configuration. See the table below. |

NOTE: E2 node may generate the content of this IE using information derived from prior messages sent or received over the corresponding 3GPP Interfaces. For the E2 SETUP REQUEST message, the E2 node may derive the content of this IE from the prior messages pertaining to the Request part and the Response part of the Component Addition list in the following table and/or the Request part and the Response part of the Component Update list in the following table.

In all cases the information is a data structure defined by the applicable 3GPP specification as specified in the following table.

| E2 Node component message content | Component Addition list | | Component Update list | |
|-----------------------------------|---|--|--|--|
| | Request part | Response part | Request part | Response part |
| gNB case | | | | |
| >NG (AMF Name) | NG SETUP REQUEST, ETSI TS 138 413 [19] clause 9.2.6.1 | NG SETUP RESPONSE, ETSI TS 138 413 [19] clause 9.2.6.2 | RAN CONFIGURATION UPDATE, ETSI TS 138 413 [19] clause 9.2.6.4 Or AMF CONFIGURATION UPDATE, ETSI TS 138 413 [19] clause 9.2.6.7 | RAN CONFIGURATION UPDATE ACKNOWLEDGE, ETSI TS 138 413 [19] clause 9.2.6.5 Or AMF CONFIGURATION UPDATE ACKNOWLEDGE, 3GPP TS 138 413 [19] clause 9.2.6.8 |

| E2 Node component message content | Component Addition list | | Component Update list | |
|--|--|--|--|--|
| | Request part | Response part | Request part | Response part |
| >Xn (Neighbour Global NG-RAN Node ID) | XN SETUP REQUEST, ETSI TS 138 423 [20] clause 9.1.3.1 | XN SETUP RESPONSE, ETSI TS 138 423 [20] clause 9.1.3.2 | NG-RAN NODE CONFIGURATION UPDATE, ETSI TS 138 423 [20] clause 9.1.3.4 | NG-RAN NODE CONFIGURATION UPDATE ACKNOWLEDGE, ETSI TS 138 423 [20] clause 9.1.3.5 |
| >E1 (gNB-CU-UP ID) | GNB-CU-UP E1 SETUP REQUEST, ETSI TS 137 483 [21] clause 9.2.1.4 Or GNB-CU-CP E1 SETUP REQUEST, ETSI TS 137 483 [21] clause 9.2.1.7 | GNB-CU-UP E1 SETUP RESPONSE, ETSI TS 137 483 [21] clause 9.2.1.5 Or GNB-CU-CP E1 SETUP RESPONSE, ETSI TS 137 483 [21] clause 9.2.1.8 | GNB-CU-UP CONFIGURATION UPDATE, ETSI TS 137 483 [21] clause 9.2.1.10 Or GNB-CU-CP CONFIGURATION UPDATE, ETSI TS 137 483 [21] clause 9.2.1.13 | GNB-CU-UP CONFIGURATION UPDATE ACKNOWLEDGE, ETSI TS 137 483 [21] clause 9.2.1.11 Or GNB-CU-CP CONFIGURATION UPDATE ACKNOWLEDGE, ETSI TS 137 483 [21] clause 9.2.1.14 |
| >F1 (gNB-DU ID) | F1 SETUP REQUEST, ETSI TS 138 473 [22] clause 9.2.1.4 | F1 SETUP RESPONSE, ETSI TS 138 473 [22] clause 9.2.1.5 | GNB-DU CONFIGURATION UPDATE, ETSI TS 138 473 [22] clause 9.2.1.7 Or GNB-CU CONFIGURATION UPDATE, 3GPP TS 138 473 [22] clause 9.2.1.10 | GNB-DU CONFIGURATION UPDATE ACKNOWLEDGE, ETSI TS 138 473 [22] clause 9.2.1.8 Or GNB-CU CONFIGURATION UPDATE ACKNOWLEDGE, 3GPP TS 138 473 [22] clause 9.2.1.11 |
| >X2 (Neighbour Global eNB ID) | EN-DC X2 SETUP REQUEST, ETSI TS 136 423 [25] clause 9.1.2.31 | EN-DC X2 SETUP RESPONSE, ETSI TS 136 423 [25] clause 9.1.2.32 | EN-DC CONFIGURATION UPDATE, ETSI TS 136 423 [25] clause 9.1.2.34 | EN-DC CONFIGURATION UPDATE ACKNOWLEDGE, ETSI TS 136 423 [25] clause 9.1.2.35 |
| eNB case | | | | |
| >NG (AMF Name) | NG SETUP REQUEST, ETSI TS 138 413 [19] clause 9.2.6.1 | NG SETUP RESPONSE, ETSI TS 138 413 [19] clause 9.2.6.2 | RAN CONFIGURATION UPDATE, ETSI TS 138 413 [19] clause 9.2.6.4 Or AMF CONFIGURATION UPDATE, 3GPP TS 138 413 [19] clause 9.2.6.7 | RAN CONFIGURATION UPDATE ACKNOWLEDGE, ETSI TS 138 413 [19] clause 9.2.6.5 Or AMF CONFIGURATION UPDATE ACKNOWLEDGE, 3GPP TS 138 413 [19] clause 9.2.6.8 |
| >Xn (Neighbour Global NG-RAN Node ID) | XN SETUP REQUEST, ETSI TS 138 423 [20] clause 9.1.3.1 | XN SETUP RESPONSE, ETSI TS 138 423 [20] clause 9.1.3.2 | NG-RAN NODE CONFIGURATION UPDATE, ETSI TS 138 423 [20] clause 9.1.3.4 | NG-RAN NODE CONFIGURATION UPDATE ACKNOWLEDGE, ETSI TS 138 423 [20] clause 9.1.3.5 |

| E2 Node component message content | Component Addition list | | Component Update list | |
|--|--|---|---|---|
| | Request part | Response part | Request part | Response part |
| >W1 (ng-eNB-DU ID) | W1 SETUP REQUEST, ETSI TS 137 473 [23] clause 9.2.1.4 | W1 SETUP RESPONSE, ETSI TS 137 473 [23] clause 9.2.1.5 | NG-ENB-DU CONFIGURATION UPDATE, ETSI TS 137 473 [23] clause 9.2.1.7 Or NG-ENB-CU CONFIGURATION UPDATE, ETSI TS 137 473 [23] clause 9.2.1.10 | NG-ENB-DU CONFIGURATION UPDATE ACKNOWLEDGE, ETSI TS 137 473 [23] clause 9.2.1.8 Or NG-ENB-CU CONFIGURATION UPDATE ACKNOWLEDGE, ETSI TS 137 473 [23] clause 9.2.1.11 |
| >S1 (MME Name) | S1 SETUP REQUEST, ETSI TS 136 413 [24] clause 9.1.8.4 | S1 SETUP RESPONSE, ETSI TS 136 413 [24] clause 9.1.8.5 | ENB CONFIGURATION UPDATE, ETSI TS 136 413 [24] clause 9.1.8.7 Or MME CONFIGURATION UPDATE, ETSI TS 136 413 [24] clause 9.1.8.10 | ENB CONFIGURATION UPDATE ACKNOWLEDGE, ETSI TS 136 413 [24] clause 9.1.8.8 Or MME CONFIGURATION UPDATE ACKNOWLEDGE, ETSI TS 136 413 [24] clause 9.1.8.11 |
| >X2 (when neighbour is eNB) (Neighbour Global eNB ID) | X2 SETUP REQUEST, ETSI TS 136 423 [25] clause 9.1.2.3 | X2 SETUP RESPONSE, ETSI TS 136 423 [25] clause 9.1.2.4 | ENB CONFIGURATION UPDATE, ETSI TS 136 423 [25] clause 9.1.2.8 | ENB CONFIGURATION UPDATE ACKNOWLEDGE, ETSI TS 136 423 [25] clause 9.1.2.9 |
| >X2 (when neighbour is en-gNB) (Neighbour Global eNB ID) | EN-DC X2 SETUP REQUEST, ETSI TS 136 423 [25] clause 9.1.2.31 | EN-DC X2 SETUP RESPONSE, ETSI TS 136 423 [25] clause 9.1.2.32 | EN-DC CONFIGURATION UPDATE, ETSI TS 136 423 [25] clause 9.1.2.34 | EN-DC CONFIGURATION UPDATE ACKNOWLEDGE, ETSI TS 136 423 [25] clause 9.1.2.35 |

9.2.28 E2 Node Component Configuration Acknowledge

This IE is used to carry the E2 Node component configuration update acknowledge of a specific E2 Node component.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------|----------|-------|------------------------------------|-----------------------|
| Outcome | M | | ENUMERATED (success, failure, ...) | |
| Cause | O | | 9.2.1 | Cause for failure. |

9.2.29 Transport Layer Information

This information element provides Near-RT RIC address and optionally port number to be used by an E2 Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-------------------------|----------|-------|--------------------------------|---|
| Transport Layer Address | M | | BIT STRING (SIZE(1..160, ...)) | To be passed to transport layer without interpretation. |
| Transport Layer Port | O | | BIT STRING (SIZE(16)) | To be passed to transport layer without interpretation. |

9.2.30 TNL Association Usage

This information element provides TNL association usage.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-----------------------|----------|-------|--|--|
| TNL Association Usage | M | | ENUMERATED (ric service, support functions, both, ...) | Indicates whether E2 connection to be used for RIC services only, or E2 support functions only, or both. |

9.2.31 RAN Function OID

This information element carries the RAN Function OID and shall uniquely refer to a specific E2 Service Model (E2SM).

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|--------------------------------|----------|-------|-------------------------------------|--|
| RAN Function Service Model OID | M | | PrintableString(SIZE(1..1000, ...)) | Object Identifier of the specific RAN Function definition. Formatted as per OID. |

9.2.32 E2 Node Component ID

This IE is used to locally identify an E2 node component.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|--|----------|-------|--------------------------------------|--------------------------|
| CHOICE <i>E2 node component interface type</i> | M | | | |
| >NG | | | | |
| >>AMF name | M | | ETSI TS 138 413 [19] clause 9.3.3.21 | Serving AMF. |
| >Xn | | | | |
| >>Global NG-RAN Node ID | M | | ETSI TS 138 423 [20] clause 9.2.2.3 | Neighbour gNB or ng-eNB. |
| >E1 | | | | |
| >>gNB-CU-UP ID | M | | ETSI TS 137 483 [21] clause 9.3.1.15 | |
| >F1 | | | | |
| >>gNB-DU ID | M | | ETSI TS 138 473 [22] clause 9.3.1.9 | |
| >W1 | | | | |
| >>ng-eNB-DU ID | M | | ETSI TS 137 473 [23] clause 9.3.1.9 | |
| >S1 | | | | |
| >>MME name | M | | ETSI TS 136 413 [24], clause 9.1.8.5 | Serving MME. |
| >X2 | | | | |
| >>Global eNB ID | O | | ETSI TS 136 423 [25] clause 9.2.22 | Neighbour eNB. |
| >>Global en-gNB ID | O | | ETSI TS 136 423 [25] clause 9.2.112 | Neighbour en-gNB. |

9.2.33 Transaction ID

The *Transaction ID* IE uniquely identifies a procedure among all ongoing parallel procedures of the same type initiated by the same protocol peer. Messages belonging to the same procedure shall use the same Transaction ID. The Transaction ID is determined by the initiating peer of a procedure.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|----------------|----------|-------|-----------------------|-----------------------|
| Transaction ID | M | | INTEGER (0..255, ...) | |

9.2.34 RIC Subscription Time

The *RIC Subscription Time* IE is used to set the start and end time of a RIC Subscription.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-----------------------|----------|-------|------------------------|---|
| RIC Subscription time | M | | OCTET STRING (SIZE(8)) | Encoded using the 64-bit timestamp format as defined in clause 6 of IETF RFC 5905 [26]. |

9.2.35 RIC Action Execution Order

This IE is used to modify the default RIC service action execution order.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|----------------------------|----------|-------|-----------------------|--|
| RIC Action Execution Order | M | | INTEGER (0..255, ...) | 0 used to indicate "Any-order" 1..255 Used to enforce a specific execution order. |

9.2.36 RIC Query Header

This information element carries the RIC Query Header.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|------------------|----------|-------|-----------------------|--|
| RIC Query Header | M | | OCTET STRING | Defined in RAN Function specific E2 Service Model [3]. |

9.2.37 RIC Query Definition

This information element carries the RIC Query Definition.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|----------------------|----------|-------|-----------------------|--|
| RIC Query Definition | M | | OCTET STRING | Defined in RAN Function specific E2 Service Model [3]. |

9.2.38 RIC Query Outcome

This information element carries the RIC Query Outcome.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-------------------|----------|-------|-----------------------|--|
| RIC Query Outcome | M | | OCTET STRING | Defined in RAN Function specific E2 Service Model [3]. |

9.3 Message and Information Element Abstract Syntax (with ASN.1)

9.3.1 General

E2AP ASN.1 definition conforms to Recommendation ITU-T X.691 [15], Recommendation ITU-T X.680 [16] and Recommendation ITU-T X.681 [17].

The ASN.1 definition specifies the structure and content of E2AP messages. E2AP messages can contain any IEs specified in the object set definitions for that message without the order or number of occurrences being restricted by ASN.1. However, for this version of the standard, a sending entity shall construct an E2AP message according to the PDU definitions module and with the following additional rules:

- IEs shall be ordered (in an IE container) in the order they appear in object set definitions.
- Object set definitions specify how many times IEs may appear. An IE shall appear exactly once if the presence field in an object has value "mandatory". An IE may appear at most once if the presence field in an object has value "optional" or "conditional". If in a tabular format there is multiplicity specified for an IE (i.e. an IE list) then in the corresponding ASN.1 definition the list definition is separated into two parts. The first part defines an IE container list where the list elements reside. The second part defines list elements. The IE container list appears as an IE of its own. For this version of the standard an IE container list may contain only one kind of list elements.

NOTE: In the above "IE" means an IE in the object set with an explicit ID. If one IE needs to appear more than once in one object set, then the different occurrences will have different IE IDs.

If an E2AP message that is not constructed as defined above is received, this shall be considered as Abstract Syntax Error, and the message shall be handled as defined for Abstract Syntax Error in clause 10.3.6.

9.3.2 Usage of private message mechanism for non-standard use

The private message mechanism for non-standard use is not supported with E2AP.

9.3.3 Elementary Procedure Definitions

```
-- ASN1START
-- *****
--
-- Elementary Procedure definitions
-- Derived from 3GPP 38.413 NGAP
-- *****

E2AP-PDU-Descriptions {
iso(1) identified-organization(3) dod(6) internet(1) private(4) enterprise(1) oran(53148) e2(1)
version2 (2) e2ap(1) e2ap-PDU-Descriptions (0) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- *****
--
-- IE parameter types from other modules.
--
-- *****

IMPORTS
    Criticality,
    ProcedureCode
FROM E2AP-CommonDataTypes

    E2connectionUpdate,
    E2connectionUpdateAcknowledge,
    E2connectionUpdateFailure,
    E2nodeConfigurationUpdate,
    E2nodeConfigurationUpdateAcknowledge,
    E2nodeConfigurationUpdateFailure,
    E2RemovalRequest,
    E2RemovalResponse,
    E2RemovalFailure,
    E2setupFailure,
    E2setupRequest,
    E2setupResponse,
    ErrorIndication,
    ResetRequest,
    ResetResponse,
    RICcontrolAcknowledge,
```

```

RICcontrolFailure,
RICcontrolRequest,
RICindication,
RICserviceQuery,
RICserviceUpdate,
RICserviceUpdateAcknowledge,
RICserviceUpdateFailure,
RICsubscriptionFailure,
RICsubscriptionRequest,
RICsubscriptionResponse,
RICsubscriptionDeleteFailure,
RICsubscriptionDeleteRequest,
RICsubscriptionDeleteResponse,
RICsubscriptionDeleteRequired,
RICsubscriptionModificationRequest,
RICsubscriptionModificationResponse,
RICsubscriptionModificationFailure,
RICsubscriptionModificationRequired,
RICsubscriptionModificationConfirm,
RICsubscriptionModificationRefuse,
RICqueryRequest,
RICqueryResponse,
RICqueryFailure
FROM E2AP-PDU-Contents

    id-E2connectionUpdate,
    id-E2nodeConfigurationUpdate,
    id-E2removal,
    id-E2setup,
    id-ErrorIndication,
    id-Reset,
    id-RICcontrol,
    id-RICindication,
    id-RICserviceQuery,
    id-RICserviceUpdate,
    id-RICsubscription,
    id-RICsubscriptionDelete,
    id-RICsubscriptionDeleteRequired,
    id-RICsubscriptionModification,
    id-RICsubscriptionModificationRequired,
    id-RICquery
FROM E2AP-Constants;

-- *****
--
-- Interface Elementary Procedure Class
--
-- *****

E2AP-ELEMENTARY-PROCEDURE ::= CLASS {
    &InitiatingMessage
    &SuccessfulOutcome                OPTIONAL
    &UnsuccessfulOutcome              OPTIONAL
    &procedureCode                    ProcedureCode UNIQUE
    &criticality                       Criticality DEFAULT ignore
}

WITH SYNTAX {
    INITIATING MESSAGE                &InitiatingMessage
    [SUCCESSFUL OUTCOME                &SuccessfulOutcome]
    [UNSUCCESSFUL OUTCOME              &UnsuccessfulOutcome]
    PROCEDURE CODE                     &procedureCode
    [CRITICALITY                       &criticality]
}

-- *****
--
-- Interface PDU Definition
--
-- *****

E2AP-PDU ::= CHOICE {
    initiatingMessage                  InitiatingMessage,
    successfulOutcome                  SuccessfulOutcome,
    unsuccessfulOutcome                UnsuccessfulOutcome,
    ...
}

```

```

InitiatingMessage ::= SEQUENCE {
    procedureCode E2AP-ELEMENTARY-PROCEDURE.&procedureCode      ({E2AP-ELEMENTARY-PROCEDURES}),
    criticality   E2AP-ELEMENTARY-PROCEDURE.&criticality        ({E2AP-ELEMENTARY-
PROCEDURES}@@procedureCode}),
    value        E2AP-ELEMENTARY-PROCEDURE.&InitiatingMessage  ({E2AP-ELEMENTARY-
PROCEDURES}@@procedureCode})
}

SuccessfulOutcome ::= SEQUENCE {
    procedureCode E2AP-ELEMENTARY-PROCEDURE.&procedureCode      ({E2AP-ELEMENTARY-PROCEDURES}),
    criticality   E2AP-ELEMENTARY-PROCEDURE.&criticality        ({E2AP-ELEMENTARY-
PROCEDURES}@@procedureCode}),
    value        E2AP-ELEMENTARY-PROCEDURE.&SuccessfulOutcome  ({E2AP-ELEMENTARY-
PROCEDURES}@@procedureCode})
}

UnsuccessfulOutcome ::= SEQUENCE {
    procedureCode E2AP-ELEMENTARY-PROCEDURE.&procedureCode      ({E2AP-ELEMENTARY-PROCEDURES}),
    criticality   E2AP-ELEMENTARY-PROCEDURE.&criticality        ({E2AP-ELEMENTARY-
PROCEDURES}@@procedureCode}),
    value        E2AP-ELEMENTARY-PROCEDURE.&UnsuccessfulOutcome ({E2AP-ELEMENTARY-
PROCEDURES}@@procedureCode})
}

-- *****
--
-- Interface Elementary Procedure List
--
-- *****

E2AP-ELEMENTARY-PROCEDURES E2AP-ELEMENTARY-PROCEDURE ::= {
    E2AP-ELEMENTARY-PROCEDURES-CLASS-1 |
    E2AP-ELEMENTARY-PROCEDURES-CLASS-2,
    ...
}

E2AP-ELEMENTARY-PROCEDURES-CLASS-1 E2AP-ELEMENTARY-PROCEDURE ::= {
    ricSubscription |
    ricSubscriptionDelete |
    ricSubscriptionModification |
    ricSubscriptionModificationRequired |
    ricQuery |
    ricServiceUpdate |
    ricControl |
    e2setup |
    e2nodeConfigurationUpdate |
    e2connectionUpdate |
    reset |
    e2removal,
    ...
}

E2AP-ELEMENTARY-PROCEDURES-CLASS-2 E2AP-ELEMENTARY-PROCEDURE ::= {
    ricIndication |
    ricServiceQuery |
    errorIndication |
    ricSubscriptionDeleteRequired,
    ...
}

-- *****
--
-- Interface Elementary Procedures
--
-- *****

-- New for v01.01
e2connectionUpdate E2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE E2connectionUpdate
    SUCCESSFUL OUTCOME E2connectionUpdateAcknowledge
    UNSUCCESSFUL OUTCOME E2connectionUpdateFailure
    PROCEDURE CODE id-E2connectionUpdate
    CRITICALITY reject
}

e2nodeConfigurationUpdate E2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE E2nodeConfigurationUpdate
    SUCCESSFUL OUTCOME E2nodeConfigurationUpdateAcknowledge
}

```



```

    UNSUCCESSFUL OUTCOME      E2nodeConfigurationUpdateFailure
    PROCEDURE CODE             id-E2nodeConfigurationUpdate
    CRITICALITY                 reject
}

-- New for v02.01
e2removal E2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        E2RemovalRequest
    SUCCESSFUL OUTCOME        E2RemovalResponse
    UNSUCCESSFUL OUTCOME     E2RemovalFailure
    PROCEDURE CODE            id-E2removal
    CRITICALITY               reject
}

e2setup E2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        E2setupRequest
    SUCCESSFUL OUTCOME        E2setupResponse
    UNSUCCESSFUL OUTCOME     E2setupFailure
    PROCEDURE CODE            id-E2setup
    CRITICALITY               reject
}

errorIndication E2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        ErrorIndication
    PROCEDURE CODE            id-ErrorIndication
    CRITICALITY               ignore
}

reset E2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        ResetRequest
    SUCCESSFUL OUTCOME        ResetResponse
    PROCEDURE CODE            id-Reset
    CRITICALITY               reject
}

ricControl E2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        RICcontrolRequest
    SUCCESSFUL OUTCOME        RICcontrolAcknowledge
    UNSUCCESSFUL OUTCOME     RICcontrolFailure
    PROCEDURE CODE            id-RICcontrol
    CRITICALITY               reject
}

ricIndication E2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        RICindication
    PROCEDURE CODE            id-RICindication
    CRITICALITY               ignore
}

ricServiceQuery E2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        RICserviceQuery
    PROCEDURE CODE            id-RICserviceQuery
    CRITICALITY               ignore
}

ricServiceUpdate E2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        RICserviceUpdate
    SUCCESSFUL OUTCOME        RICserviceUpdateAcknowledge
    UNSUCCESSFUL OUTCOME     RICserviceUpdateFailure
    PROCEDURE CODE            id-RICserviceUpdate
    CRITICALITY               reject
}

ricSubscription E2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        RICsubscriptionRequest
    SUCCESSFUL OUTCOME        RICsubscriptionResponse
    UNSUCCESSFUL OUTCOME     RICsubscriptionFailure
    PROCEDURE CODE            id-RICsubscription
    CRITICALITY               reject
}

ricSubscriptionDelete E2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        RICsubscriptionDeleteRequest
    SUCCESSFUL OUTCOME        RICsubscriptionDeleteResponse
    UNSUCCESSFUL OUTCOME     RICsubscriptionDeleteFailure
    PROCEDURE CODE            id-RICsubscriptionDelete
    CRITICALITY               reject
}

```

```

ricSubscriptionDeleteRequired E2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      RICsubscriptionDeleteRequired
  PROCEDURE CODE          id-RICsubscriptionDeleteRequired
  CRITICALITY             ignore
}

ricSubscriptionModification E2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      RICsubscriptionModificationRequest
  SUCCESSFUL OUTCOME      RICsubscriptionModificationResponse
  UNSUCCESSFUL OUTCOME   RICsubscriptionModificationFailure
  PROCEDURE CODE          id-RICsubscriptionModification
  CRITICALITY             reject
}

ricSubscriptionModificationRequired E2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      RICsubscriptionModificationRequired
  SUCCESSFUL OUTCOME      RICsubscriptionModificationConfirm
  UNSUCCESSFUL OUTCOME   RICsubscriptionModificationRefuse
  PROCEDURE CODE          id-RICsubscriptionModificationRequired
  CRITICALITY             reject
}

ricQuery E2AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      RICqueryRequest
  SUCCESSFUL OUTCOME      RICqueryResponse
  UNSUCCESSFUL OUTCOME   RICqueryFailure
  PROCEDURE CODE          id-RICquery
  CRITICALITY             reject
}

END
-- ASN1STOP

```

9.3.4 PDU definitions

```

-- ASN1START
-- *****
--
-- PDU definitions for E2AP
-- Derived from 3GPP 38.413 (NGAP)
--
-- *****

E2AP-PDU-Contents {
iso(1) identified-organization(3) dod(6) internet(1) private(4) enterprise(1) oran(53148) e2(1)
version2 (2) e2ap(1) e2ap-PDU-Contents (1) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- *****
--
-- IE parameter types from other modules.
--
-- *****

IMPORTS
  Cause,
  CriticalityDiagnostics,
  E2nodeComponentConfiguration,
  E2nodeComponentConfigurationAck,
  E2nodeComponentID,
  E2nodeComponentInterfaceType,
  GlobalE2node-ID,
  GlobalRIC-ID,
  RANfunctionDefinition,
  RANfunctionID,
  RANfunctionOID,
  RANfunctionRevision,
  RICactionDefinition,
  RICactionExecutionOrder,
  RICactionID,
  RICactionType,
  RICcallProcessID,
  RICcontrolAckRequest,

```

RICcontrolHeader,
 RICcontrolMessage,
 RICcontrolOutcome,
 RICeventTriggerDefinition,
 RICindicationHeader,
 RICindicationMessage,
 RICindicationSN,
 RICindicationType,
 RICrequestID,
 RICsubsequentAction,
 RICsubscriptionTime,
 RICqueryHeader,
 RICqueryDefinition,
 RICqueryOutcome,
 RICtimeToWait,
 TimeToWait,
 TNLinformation,
 TNLusage,
 TransactionID

FROM E2AP-IEs

ProtocolIE-Container{},
 ProtocolIE-ContainerList{},
 ProtocolIE-SingleContainer{},
 E2AP-PROTOCOL-IES,
 E2AP-PROTOCOL-IES-PAIR

FROM E2AP-Containers

id-Cause,
 id-CriticalityDiagnostics,
 id-E2connectionSetup,
 id-E2connectionSetupFailed,
 id-E2connectionSetupFailed-Item,
 id-E2connectionFailed-Item,
 id-E2connectionUpdate-Item,
 id-E2connectionUpdateAdd,
 id-E2connectionUpdateModify,
 id-E2connectionUpdateRemove,
 id-E2connectionUpdateRemove-Item,
 id-E2nodeComponentConfigAddition,
 id-E2nodeComponentConfigAddition-Item,
 id-E2nodeComponentConfigAdditionAck,
 id-E2nodeComponentConfigAdditionAck-Item,
 id-E2nodeComponentConfigRemoval,
 id-E2nodeComponentConfigRemoval-Item,
 id-E2nodeComponentConfigRemovalAck,
 id-E2nodeComponentConfigRemovalAck-Item,
 id-E2nodeComponentConfigUpdate,
 id-E2nodeComponentConfigUpdate-Item,
 id-E2nodeComponentConfigUpdateAck,
 id-E2nodeComponentConfigUpdateAck-Item,
 id-E2nodeTNLassociationRemoval,
 id-E2nodeTNLassociationRemoval-Item,
 id-GlobalE2node-ID,
 id-GlobalRIC-ID,
 id-RANfunctionID,
 id-RANfunctionID-Item,
 id-RANfunctionIEcause-Item,
 id-RANfunction-Item,
 id-RANfunctionsAccepted,
 id-RANfunctionsAdded,
 id-RANfunctionsDeleted,
 id-RANfunctionsModified,
 id-RANfunctionsRejected,
 id-RICaction-Admitted-Item,
 id-RICactionID,
 id-RICaction-NotAdmitted-Item,
 id-RICactions-Admitted,
 id-RICactions-NotAdmitted,
 id-RICaction-ToBeSetup-Item,
 id-RICactionsToBeRemovedForModification-List,
 id-RICaction-ToBeRemovedForModification-Item,
 id-RICactionsToBeModifiedForModification-List,
 id-RICaction-ToBeModifiedForModification-Item,
 id-RICactionsToBeAddedForModification-List,
 id-RICaction-ToBeAddedForModification-Item,
 id-RICactionsRemovedForModification-List,
 id-RICaction-RemovedForModification-Item,

```

id-RIActionsFailedToBeRemovedForModification-List,
id-RIAction-FailedToBeRemovedForModification-Item,
id-RIActionsModifiedForModification-List,
id-RIAction-ModifiedForModification-Item,
id-RIActionsFailedToBeModifiedForModification-List,
id-RIAction-FailedToBeModifiedForModification-Item,
id-RIActionsAddedForModification-List,
id-RIAction-AddedForModification-Item,
id-RIActionsFailedToBeAddedForModification-List,
id-RIAction-FailedToBeAddedForModification-Item,
id-RIActionsRequiredToBeModified-List,
id-RIAction-RequiredToBeModified-Item,
id-RIActionsRequiredToBeRemoved-List,
id-RIAction-RequiredToBeRemoved-Item,
id-RIActionsConfirmedForModification-List,
id-RIAction-ConfirmedForModification-Item,
id-RIActionsRefusedToBeModified-List,
id-RIAction-RefusedToBeModified-Item,
id-RIActionsConfirmedForRemoval-List,
id-RIAction-ConfirmedForRemoval-Item,
id-RIActionsRefusedToBeRemoved-List,
id-RIAction-RefusedToBeRemoved-Item,
id-RIcallProcessID,
id-RIcontrolAckRequest,
id-RIcontrolHeader,
id-RIcontrolMessage,
id-RIcontrolOutcome,
id-RIeventTriggerDefinitionToBeModified,
id-RIindicationHeader,
id-RIindicationMessage,
id-RIindicationSN,
id-RIindicationType,
id-RIcrequestID,
id-RIcserviceQuery,
id-RIcsubscriptionDetails,
id-RIcsubscriptionToBeRemoved,
id-RIcsubscription-withCause-Item,
id-RIcsubscriptionStartTime,
id-RIcsubscriptionEndTime,
id-RIcqueryHeader,
id-RIcqueryDefinition,
id-RIcqueryOutcome,
id-TimeToWait,
id-TNLinformation,
id-TransactionID,

maxofE2nodeComponents,
maxofRANfunctionID,
maxofRIActionID,
maxofRIcrequestID,
maxofTNLA
FROM E2AP-Constants;

-- *****
--
-- MESSAGES FOR RIC FUNCTIONAL PROCEDURES
--
-- *****

-- *****
--
-- RIC Subscription Elementary Procedure
--
-- *****
-- *****
--
-- RIC SUBSCRIPTION REQUEST
--
-- *****
RICsubscriptionRequest ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    {{RICsubscriptionRequest-IEs}},
    ...
}

RICsubscriptionRequest-IEs E2AP-PROTOCOL-IES ::= {
    { ID id-RIcrequestID          CRITICALITY reject  TYPE RICrequestID
      PRESENCE mandatory}|

```

```

    { ID id-RANfunctionID          CRITICALITY reject  TYPE RANfunctionID
    PRESENCE mandatory } |
    { ID id-RICsubscriptionDetails CRITICALITY reject  TYPE RICsubscriptionDetails
    PRESENCE mandatory },
    ...,
    { ID id-RICsubscriptionStartTime CRITICALITY reject  TYPE RICsubscriptionTime
    PRESENCE optional } |
    { ID id-RICsubscriptionEndTime   CRITICALITY reject  TYPE RICsubscriptionTime
    PRESENCE optional }
  }

RICsubscriptionDetails ::= SEQUENCE {
  ricEventTriggerDefinition  RICEventTriggerDefinition,
  ricAction-ToBeSetup-List   RICActions-ToBeSetup-List,
  ...
}

RICActions-ToBeSetup-List ::= SEQUENCE (SIZE(1..maxofRICActionID)) OF ProtocolIE-SingleContainer {
  {RICAction-ToBeSetup-ItemIEs} }

RICAction-ToBeSetup-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-RICAction-ToBeSetup-Item  CRITICALITY ignore  TYPE RICAction-ToBeSetup-Item  PRESENCE
  mandatory },
  ...
}

RICAction-ToBeSetup-Item ::= SEQUENCE {
  ricActionID                RICActionID,
  ricActionType              RICActionType,
  ricActionDefinition        RICActionDefinition  OPTIONAL,
  ricSubsequentAction        RICsubsequentAction  OPTIONAL,
  ...,
  ricActionExecutionOrder    RICActionExecutionOrder OPTIONAL  -- New in E2APv03.00
}

-- *****
--
-- RIC SUBSCRIPTION RESPONSE
--
-- *****
RICsubscriptionResponse ::= SEQUENCE {
  protocolIEs                ProtocolIE-Container{{RICsubscriptionResponse-IEs}},
  ...
}

RICsubscriptionResponse-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-RIcrequestID          CRITICALITY reject  TYPE RIcrequestID
  PRESENCE mandatory } |
  { ID id-RANfunctionID        CRITICALITY reject  TYPE RANfunctionID
  PRESENCE mandatory } |
  { ID id-RICActions-Admitted  CRITICALITY reject  TYPE RICAction-Admitted-List
  PRESENCE mandatory } |
  { ID id-RICActions-NotAdmitted CRITICALITY reject  TYPE RICAction-NotAdmitted-List
  PRESENCE optional },
  ...
}

RICAction-Admitted-List ::= SEQUENCE (SIZE(1..maxofRICActionID)) OF ProtocolIE-SingleContainer{{RICAction-Admitted-ItemIEs}}

RICAction-Admitted-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-RICAction-Admitted-Item  CRITICALITY ignore  TYPE RICAction-Admitted-Item
  PRESENCE mandatory },
  ...
}

RICAction-Admitted-Item ::= SEQUENCE {
  ricActionID                RICActionID,
  ...
}

RICAction-NotAdmitted-List ::= SEQUENCE (SIZE(0..maxofRICActionID)) OF ProtocolIE-SingleContainer {
  {RICAction-NotAdmitted-ItemIEs} }

```

```

RICAction-NotAdmitted-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-RIAction-NotAdmitted-Item CRITICALITY ignore TYPE RICAction-NotAdmitted-Item
    PRESENCE mandatory },
  ...
}

RICAction-NotAdmitted-Item ::= SEQUENCE {
  ricActionID          RICActionID,
  cause                Cause,
  ...
}

-- *****
--
-- RIC SUBSCRIPTION FAILURE
--
-- *****
RICsubscriptionFailure ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container   {{RICsubscriptionFailure-IEs}},
  ...
}

RICsubscriptionFailure-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-RIRequestID          CRITICALITY reject TYPE RICRequestID
    PRESENCE mandatory }|
  { ID id-RANfunctionID       CRITICALITY reject TYPE RANfunctionID
    PRESENCE mandatory }|
  { ID id-Cause                CRITICALITY reject TYPE Cause          PRESENCE mandatory }|
  { ID id-CriticalityDiagnostics CRITICALITY ignore TYPE CriticalityDiagnostics
    PRESENCE optional },
  ...
}

-- *****
--
-- RIC Subscription Delete Elementary Procedure
--
-- *****
--
-- RIC SUBSCRIPTION DELETE REQUEST
--
-- *****
RICsubscriptionDeleteRequest ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container   {{RICsubscriptionDeleteRequest-IEs}},
  ...
}

RICsubscriptionDeleteRequest-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-RIRequestID          CRITICALITY reject TYPE RICRequestID
    PRESENCE mandatory }|
  { ID id-RANfunctionID       CRITICALITY reject TYPE RANfunctionID
    PRESENCE mandatory },
  ...
}

-- *****
--
-- RIC SUBSCRIPTION DELETE RESPONSE
--
-- *****
RICsubscriptionDeleteResponse ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container   {{RICsubscriptionDeleteResponse-IEs}},
  ...
}

RICsubscriptionDeleteResponse-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-RIRequestID          CRITICALITY reject TYPE RICRequestID
    PRESENCE mandatory }|
  { ID id-RANfunctionID       CRITICALITY reject TYPE RANfunctionID
    PRESENCE mandatory },
  ...
}

-- *****
--
-- RIC SUBSCRIPTION DELETE FAILURE
--
-- *****

```

```

RICsubscriptionDeleteFailure ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    {{RICsubscriptionDeleteFailure-IEs}},
    ...
}

RICsubscriptionDeleteFailure-IEs E2AP-PROTOCOL-IES ::= {
    { ID id-RICrequestID          CRITICALITY reject  TYPE RICrequestID
      PRESENCE mandatory }|
    { ID id-RANfunctionID        CRITICALITY reject  TYPE RANfunctionID
      PRESENCE mandatory }|
    { ID id-Cause                 CRITICALITY ignore  TYPE Cause
      PRESENCE mandatory }|
    { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics
      PRESENCE optional  },
    ...
}

-- *****
--
-- RIC Subscription Delete Required Elementary Procedure
--
-- *****
-- *****
--
-- RIC SUBSCRIPTION DELETE REQUIRED
--
-- *****

RICsubscriptionDeleteRequired ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    {{RICsubscriptionDeleteRequired-IEs}},
    ...
}

RICsubscriptionDeleteRequired-IEs E2AP-PROTOCOL-IES ::= {
    { ID id-RICsubscriptionToBeRemoved CRITICALITY ignore  TYPE RICsubscription-List-withCause
      PRESENCE mandatory },
    ...
}

RICsubscription-List-withCause ::= SEQUENCE (SIZE(1..maxofRICrequestID)) OF ProtocolIE-
SingleContainer { {RICsubscription-withCause-ItemIEs} }

RICsubscription-withCause-ItemIEs E2AP-PROTOCOL-IES ::= {
    { ID id-RICsubscription-withCause-Item CRITICALITY ignore  TYPE RICsubscription-withCause-Item
      PRESENCE mandatory },
    ...
}

RICsubscription-withCause-Item ::= SEQUENCE {
    ricRequestID          RICrequestID,
    ranFunctionID         RANfunctionID,
    cause                 Cause,
    ...
}

-- *****
--
-- RIC Subscription Modification Elementary Procedure
--
-- *****
-- *****
--
-- RIC SUBSCRIPTION MODIFICATION REQUEST
--
-- *****

RICsubscriptionModificationRequest ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    {{RICsubscriptionModificationRequest-IEs}},
    ...
}

RICsubscriptionModificationRequest-IEs E2AP-PROTOCOL-IES ::= {
    { ID id-RICrequestID          CRITICALITY reject  TYPE RICrequestID
      PRESENCE mandatory }|
    { ID id-RANfunctionID        CRITICALITY reject  TYPE RANfunctionID
      PRESENCE mandatory }|
    { ID id-RICeventTriggerDefinitionToBeModified CRITICALITY ignore  TYPE
      RICeventTriggerDefinition PRESENCE optional }|
}

```

```

    { ID id-RIActionsToBeRemovedForModification-List CRITICALITY ignore TYPE RIActions-
ToBeRemovedForModification-List PRESENCE optional}|
    { ID id-RIActionsToBeModifiedForModification-List CRITICALITY ignore TYPE RIActions-
ToBeModifiedForModification-List PRESENCE optional}|
    { ID id-RIActionsToBeAddedForModification-List CRITICALITY ignore TYPE RIActions-
ToBeAddedForModification-List PRESENCE optional},
    ...
}

RIActions-ToBeRemovedForModification-List ::= SEQUENCE (SIZE(0..maxofRICActionID)) OF ProtocolIE-
SingleContainer {{RICAction-ToBeRemovedForModification-ItemIEs} }

RIAction-ToBeRemovedForModification-ItemIEs E2AP-PROTOCOL-IES ::= {
    { ID id-RIAction-ToBeRemovedForModification-Item CRITICALITY ignore TYPE RIAction-
ToBeRemovedForModification-Item PRESENCE mandatory },
    ...
}

RIAction-ToBeRemovedForModification-Item ::= SEQUENCE {
    ricActionID RICActionID,
    ...
}

RIActions-ToBeModifiedForModification-List ::= SEQUENCE (SIZE(0..maxofRICActionID)) OF ProtocolIE-
SingleContainer {{RICAction-ToBeModifiedForModification-ItemIEs} }

RIAction-ToBeModifiedForModification-ItemIEs E2AP-PROTOCOL-IES ::= {
    { ID id-RIAction-ToBeModifiedForModification-Item CRITICALITY ignore TYPE RIAction-
ToBeModifiedForModification-Item PRESENCE mandatory },
    ...
}

RIAction-ToBeModifiedForModification-Item ::= SEQUENCE {
    ricActionID RICActionID,
    ricActionDefinition RICActionDefinition OPTIONAL,
    ricActionExecutionOrder RICActionExecutionOrder OPTIONAL,
    ricSubsequentAction RICsubsequentAction OPTIONAL,
    ...
}

RIActions-ToBeAddedForModification-List ::= SEQUENCE (SIZE(0..maxofRICActionID)) OF ProtocolIE-
SingleContainer {{RICAction-ToBeAddedForModification-ItemIEs} }

RIAction-ToBeAddedForModification-ItemIEs E2AP-PROTOCOL-IES ::= {
    { ID id-RIAction-ToBeAddedForModification-Item CRITICALITY ignore TYPE RIAction-
ToBeAddedForModification-Item PRESENCE mandatory },
    ...
}

RIAction-ToBeAddedForModification-Item ::= SEQUENCE {
    ricActionID RICActionID,
    ricActionType RICActionType,
    ricActionDefinition RICActionDefinition,
    ricActionExecutionOrder RICActionExecutionOrder,
    ricSubsequentAction RICsubsequentAction OPTIONAL,
    ...
}
-- *****
--
-- RIC SUBSCRIPTION MODIFICATION RESPONSE
--
-- *****
RICsubscriptionModificationResponse ::= SEQUENCE {
    protocolIEs ProtocolIE-Container {{RICsubscriptionModificationResponse-IEs}},
    ...
}

RICsubscriptionModificationResponse-IEs E2AP-PROTOCOL-IES ::= {
    { ID id-RIRequestID CRITICALITY reject TYPE
RIRequestID PRESENCE mandatory}|
    { ID id-RANfunctionID CRITICALITY reject TYPE
RANfunctionID PRESENCE mandatory}|
    { ID id-RIActionsRemovedForModification-List CRITICALITY ignore TYPE RIActions-
RemovedForModification-List PRESENCE optional}|
    { ID id-RIActionsFailedToBeRemovedForModification-List CRITICALITY ignore TYPE RIActions-
FailedToBeRemovedForModification-List PRESENCE optional}}

```



```

    { ID id-RIActionsModifiedForModification-List
      ModifiedForModification-List PRESENCE optional}|
    { ID id-RIActionsFailedToBeModifiedForModification-List
      FailedToBeModifiedForModification-List PRESENCE optional}|
    { ID id-RIActionsAddedForModification-List
      AddedForModification-List PRESENCE optional}|
    { ID id-RIActionsFailedToBeAddedForModification-List
      FailedToBeAddedForModification-List PRESENCE optional},
    ...
  }

RIActions-RemovedForModification-List ::= SEQUENCE (SIZE(0..maxofRICActionID)) OF ProtocolIE-
SingleContainer {{RICAction-RemovedForModification-ItemIEs} }

RICAction-RemovedForModification-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-RIAction-RemovedForModification-Item CRITICALITY ignore TYPE RICAction-
  RemovedForModification-Item PRESENCE mandatory },
  ...
}

RICAction-RemovedForModification-Item ::= SEQUENCE {
  ricActionID RICActionID,
  ...
}

RIActions-FailedToBeRemovedForModification-List ::= SEQUENCE (SIZE(0..maxofRICActionID)) OF
ProtocolIE-SingleContainer {{RICAction-FailedToBeRemovedForModification-ItemIEs} }

RICAction-FailedToBeRemovedForModification-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-RIAction-FailedToBeRemovedForModification-Item CRITICALITY ignore TYPE RICAction-
  FailedToBeRemovedForModification-Item PRESENCE mandatory },
  ...
}

RICAction-FailedToBeRemovedForModification-Item ::= SEQUENCE {
  ricActionID RICActionID,
  cause Cause,
  ...
}

RIActions-ModifiedForModification-List ::= SEQUENCE (SIZE(0..maxofRICActionID)) OF ProtocolIE-
SingleContainer {{RICAction-ModifiedForModification-ItemIEs} }

RICAction-ModifiedForModification-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-RIAction-ModifiedForModification-Item CRITICALITY ignore TYPE RICAction-
  ModifiedForModification-Item PRESENCE mandatory },
  ...
}

RICAction-ModifiedForModification-Item ::= SEQUENCE {
  ricActionID RICActionID,
  ...
}

RIActions-FailedToBeModifiedForModification-List ::= SEQUENCE (SIZE(0..maxofRICActionID)) OF
ProtocolIE-SingleContainer {{RICAction-FailedToBeModifiedForModification-ItemIEs} }

RICAction-FailedToBeModifiedForModification-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-RIAction-FailedToBeModifiedForModification-Item CRITICALITY ignore TYPE RICAction-
  FailedToBeModifiedForModification-Item PRESENCE mandatory },
  ...
}

RICAction-FailedToBeModifiedForModification-Item ::= SEQUENCE {
  ricActionID RICActionID,
  cause Cause,
  ...
}

RIActions-AddedForModification-List ::= SEQUENCE (SIZE(0..maxofRICActionID)) OF ProtocolIE-
SingleContainer {{RICAction-AddedForModification-ItemIEs} }

RICAction-AddedForModification-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-RIAction-AddedForModification-Item CRITICALITY ignore TYPE RICAction-
  AddedForModification-Item PRESENCE mandatory },
  ...
}

RICAction-AddedForModification-Item ::= SEQUENCE {

```

```

    ricActionID          RICActionID,
  ...
}

RICActions-FailedToBeAddedForModification-List ::= SEQUENCE (SIZE(0..maxofRICActionID)) OF
ProtocolIE-SingleContainer {{RICAction-FailedToBeAddedForModification-ItemIEs} }

RICAction-FailedToBeAddedForModification-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-RICAction-FailedToBeAddedForModification-Item CRITICALITY ignore TYPE RICAction-
FailedToBeAddedForModification-Item PRESENCE mandatory },
  ...
}

RICAction-FailedToBeAddedForModification-Item ::= SEQUENCE {
  ricActionID          RICActionID,
  cause                Cause,
  ...
}

-- *****
--
-- RIC SUBSCRIPTION MODIFICATION FAILURE
--
-- *****
RICsubscriptionModificationFailure ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container  {{RICsubscriptionModificationFailure-IEs}},
  ...
}

RICsubscriptionModificationFailure-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-RICrequestID          CRITICALITY reject TYPE RICrequestID
  PRESENCE mandatory}|
  { ID id-RANfunctionID        CRITICALITY reject TYPE RANfunctionID
  PRESENCE mandatory}|
  { ID id-Cause                CRITICALITY reject TYPE Cause          PRESENCE mandatory}|
  { ID id-CriticalityDiagnostics CRITICALITY ignore TYPE CriticalityDiagnostics
  PRESENCE optional},
  ...
}

-- *****
--
-- RIC Subscription Modification Required Elementary Procedure
--
-- *****
--
-- RIC SUBSCRIPTION MODIFICATION REQUIRED
--
-- *****
RICsubscriptionModificationRequired ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container  {{RICsubscriptionModificationRequired-IEs}},
  ...
}

RICsubscriptionModificationRequired-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-RICrequestID          CRITICALITY reject TYPE RICrequestID
  PRESENCE mandatory}|
  { ID id-RANfunctionID        CRITICALITY reject TYPE RANfunctionID
  PRESENCE mandatory}|
  { ID id-RICactionsRequiredToBeModified-List CRITICALITY ignore TYPE RICactions-
RequiredToBeModified-List PRESENCE optional}|
  { ID id-RICactionsRequiredToBeRemoved-List CRITICALITY ignore TYPE RICactions-
RequiredToBeRemoved-List PRESENCE optional},
  ...
}

RICActions-RequiredToBeModified-List ::= SEQUENCE (SIZE(0..maxofRICActionID)) OF ProtocolIE-
SingleContainer {{RICAction-RequiredToBeModified-ItemIEs} }

RICAction-RequiredToBeModified-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-RICAction-RequiredToBeModified-Item CRITICALITY ignore TYPE RICAction-
RequiredToBeModified-Item PRESENCE mandatory },
  ...
}

RICAction-RequiredToBeModified-Item ::= SEQUENCE {
  ricActionID          RICActionID,

```

```

    ricTimeToWait          RICtimeToWait,
  ...
}

RICActions-RequiredToBeRemoved-List ::= SEQUENCE (SIZE(0..maxofRICActionID)) OF ProtocolIE-
SingleContainer {{RICAction-RequiredToBeRemoved-ItemIEs} }

RICAction-RequiredToBeRemoved-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-RICAction-RequiredToBeRemoved-Item CRITICALITY ignore TYPE RICAction-
RequiredToBeRemoved-Item PRESENCE mandatory },
  ...
}

RICAction-RequiredToBeRemoved-Item ::= SEQUENCE {
  ricActionID          RICActionID,
  cause                Cause,
  ...
}

-- *****
--
-- RIC SUBSCRIPTION MODIFICATION CONFIRM
--
-- *****
RICsubscriptionModificationConfirm ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container {{RICsubscriptionModificationConfirm-IEs}},
  ...
}

RICsubscriptionModificationConfirm-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-RIcrequestID CRITICALITY reject TYPE RIcrequestID
  PRESENCE mandatory}|
  { ID id-RANfunctionID CRITICALITY reject TYPE RANfunctionID
  PRESENCE mandatory}|
  { ID id-RICActionsConfirmedForModification-List CRITICALITY ignore TYPE RICActions-
ConfirmedForModification-List PRESENCE optional}|
  { ID id-RICActionsRefusedToBeModified-List CRITICALITY ignore TYPE RICActions-
RefusedToBeModified-List PRESENCE optional}|
  { ID id-RICActionsConfirmedForRemoval-List CRITICALITY ignore TYPE RICActions-
ConfirmedForRemoval-List PRESENCE optional}|
  { ID id-RICActionsRefusedToBeRemoved-List CRITICALITY ignore TYPE RICActions-
RefusedToBeRemoved-List PRESENCE optional},
  ...
}

RICActions-ConfirmedForModification-List ::= SEQUENCE (SIZE(0..maxofRICActionID)) OF ProtocolIE-
SingleContainer {{RICAction-ConfirmedForModification-ItemIEs} }

RICAction-ConfirmedForModification-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-RICAction-ConfirmedForModification-Item CRITICALITY ignore TYPE RICAction-
ConfirmedForModification-Item PRESENCE mandatory },
  ...
}

RICAction-ConfirmedForModification-Item ::= SEQUENCE {
  ricActionID          RICActionID,
  ...
}

RICActions-RefusedToBeModified-List ::= SEQUENCE (SIZE(0..maxofRICActionID)) OF ProtocolIE-
SingleContainer {{RICAction-RefusedToBeModified-ItemIEs} }

RICAction-RefusedToBeModified-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-RICAction-RefusedToBeModified-Item CRITICALITY ignore TYPE RICAction-
RefusedToBeModified-Item PRESENCE mandatory },
  ...
}

RICAction-RefusedToBeModified-Item ::= SEQUENCE {
  ricActionID          RICActionID,
  cause                Cause,
  ...
}

RICActions-ConfirmedForRemoval-List ::= SEQUENCE (SIZE(0..maxofRICActionID)) OF ProtocolIE-
SingleContainer {{RICAction-ConfirmedForRemoval-ItemIEs} }

RICAction-ConfirmedForRemoval-ItemIEs E2AP-PROTOCOL-IES ::= {

```

```

    { ID id-RIAction-ConfirmedForRemoval-Item          CRITICALITY ignore  TYPE RIAction-
ConfirmedForRemoval-Item      PRESENCE mandatory },
    ...
}

RIAction-ConfirmedForRemoval-Item ::= SEQUENCE {
    ricActionID          RICActionID,
    ...
}

RIActions-RefusedToBeRemoved-List ::= SEQUENCE (SIZE(0..maxofRICActionID)) OF ProtocolIE-
SingleContainer {{RIAction-RefusedToBeRemoved-ItemIEs} }

RIAction-RefusedToBeRemoved-ItemIEs  E2AP-PROTOCOL-IES ::= {
    { ID id-RIAction-RefusedToBeRemoved-Item          CRITICALITY ignore  TYPE RIAction-
RefusedToBeRemoved-Item      PRESENCE mandatory },
    ...
}

RIAction-RefusedToBeRemoved-Item ::= SEQUENCE {
    ricActionID          RICActionID,
    cause                Cause,
    ...
}

-- *****
--
-- RIC SUBSCRIPTION MODIFICATION REFUSE
--
-- *****
RICsubscriptionModificationRefuse ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    {{RICsubscriptionModificationRefuse-IEs}},
    ...
}

RICsubscriptionModificationRefuse-IEs E2AP-PROTOCOL-IES ::= {
    { ID id-RIcrequestID          CRITICALITY reject  TYPE RIcrequestID
    PRESENCE mandatory }|
    { ID id-RANfunctionID        CRITICALITY reject  TYPE RANfunctionID
    PRESENCE mandatory }|
    { ID id-Cause                CRITICALITY reject  TYPE Cause          PRESENCE mandatory }|
    { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics
    PRESENCE optional },
    ...
}

-- *****
--
-- RIC Indication Elementary Procedure
--
-- *****
--
-- RIC INDICATION
--
-- *****
RICindication ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    {{RICindication-IEs}},
    ...
}

RICindication-IEs E2AP-PROTOCOL-IES ::= {
    { ID id-RIcrequestID          CRITICALITY reject  TYPE RIcrequestID
    PRESENCE mandatory }|
    { ID id-RANfunctionID        CRITICALITY reject  TYPE RANfunctionID
    PRESENCE mandatory }|
    { ID id-RIcActionID          CRITICALITY reject  TYPE RIcActionID
    PRESENCE mandatory }|
    { ID id-RIcIndicationSN      CRITICALITY reject  TYPE RIcIndicationSN
    PRESENCE optional }|
    { ID id-RIcIndicationType    CRITICALITY reject  TYPE RIcIndicationType
    PRESENCE mandatory }|
    { ID id-RIcIndicationHeader  CRITICALITY reject  TYPE RIcIndicationHeader
    PRESENCE mandatory }|
    { ID id-RIcIndicationMessage CRITICALITY reject  TYPE RIcIndicationMessage
    PRESENCE mandatory }|

```

```

    { ID id-RICcallProcessID          CRITICALITY reject  TYPE RICcallProcessID
      PRESENCE optional  },
    ...
  }
}

-- *****
--
-- RIC Control Elementary Procedure
--
-- *****
-- *****
-- RIC CONTROL REQUEST
--
-- *****
RICcontrolRequest ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container    {{RICcontrolRequest-IEs}},
  ...
}

RICcontrolRequest-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-RICrequestID          CRITICALITY reject  TYPE RICrequestID
    PRESENCE mandatory  }|
  { ID id-RANfunctionID        CRITICALITY reject  TYPE RANfunctionID
    PRESENCE mandatory  }|
  { ID id-RICcallProcessID     CRITICALITY reject  TYPE RICcallProcessID
    PRESENCE optional   }|
  { ID id-RICcontrolHeader     CRITICALITY reject  TYPE RICcontrolHeader
    PRESENCE mandatory  }|
  { ID id-RICcontrolMessage    CRITICALITY reject  TYPE RICcontrolMessage
    PRESENCE mandatory  }|
  { ID id-RICcontrolAckRequest CRITICALITY reject  TYPE RICcontrolAckRequest
    PRESENCE optional   },
  ...
}

-- *****
--
-- RIC CONTROL ACKNOWLEDGE
--
-- *****
RICcontrolAcknowledge ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container    {{RICcontrolAcknowledge-IEs}},
  ...
}

RICcontrolAcknowledge-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-RICrequestID          CRITICALITY reject  TYPE RICrequestID
    PRESENCE mandatory  }|
  { ID id-RANfunctionID        CRITICALITY reject  TYPE RANfunctionID
    PRESENCE mandatory  }|
  { ID id-RICcallProcessID     CRITICALITY reject  TYPE RICcallProcessID
    PRESENCE optional   }|
  { ID id-RICcontrolOutcome    CRITICALITY reject  TYPE RICcontrolOutcome
    PRESENCE optional   },
  ...
}

-- *****
--
-- RIC CONTROL FAILURE
--
-- *****
RICcontrolFailure ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container    {{RICcontrolFailure-IEs}},
  ...
}

RICcontrolFailure-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-RICrequestID          CRITICALITY reject  TYPE RICrequestID
    PRESENCE mandatory  }|
  { ID id-RANfunctionID        CRITICALITY reject  TYPE RANfunctionID
    PRESENCE mandatory  }|
  { ID id-RICcallProcessID     CRITICALITY reject  TYPE RICcallProcessID
    PRESENCE optional   }|
  { ID id-Cause                CRITICALITY ignore  TYPE Cause
    PRESENCE mandatory  }|
  { ID id-RICcontrolOutcome    CRITICALITY reject  TYPE RICcontrolOutcome
    PRESENCE optional   },
  ...
}

```

```

    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics
      PRESENCE optional    }
  }
-- *****
--
-- RIC QUERY Elementary Procedure
--
-- *****
-- *****
--
-- RIC QUERY REQUEST
--
-- *****
RICqueryRequest ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container    {{RICqueryRequest-IEs}},
  ...
}

RICqueryRequest-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-RICrequestID      CRITICALITY reject  TYPE RICrequestID
    PRESENCE mandatory    }|
  { ID id-RANfunctionID    CRITICALITY reject  TYPE RANfunctionID
    PRESENCE mandatory    }|
  { ID id-RICqueryHeader   CRITICALITY reject  TYPE RICqueryHeader
    PRESENCE mandatory    }|
  { ID id-RICqueryDefinition CRITICALITY reject  TYPE RICqueryDefinition
    PRESENCE mandatory    },
  ...
}

-- *****
--
-- RIC QUERY RESPONSE
--
-- *****
RICqueryResponse ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container    {{RICqueryResponse-IEs}},
  ...
}

RICqueryResponse-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-RICrequestID      CRITICALITY reject  TYPE RICrequestID
    PRESENCE mandatory    }|
  { ID id-RANfunctionID    CRITICALITY reject  TYPE RANfunctionID
    PRESENCE mandatory    }|
  { ID id-RICqueryOutcome  CRITICALITY reject  TYPE RICqueryOutcome
    PRESENCE mandatory    },
  ...
}

-- *****
--
-- RIC QUERY FAILURE
--
-- *****
RICqueryFailure ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container    {{RICqueryFailure-IEs}},
  ...
}

RICqueryFailure-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-RICrequestID      CRITICALITY reject  TYPE RICrequestID
    PRESENCE mandatory    }|
  { ID id-RANfunctionID    CRITICALITY reject  TYPE RANfunctionID
    PRESENCE mandatory    }|
  { ID id-Cause            CRITICALITY ignore  TYPE Cause
    PRESENCE mandatory    }|
  { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics
    PRESENCE optional    },
  ...
}

-- *****
--
-- MESSAGES FOR GLOBAL PROCEDURES
--
-- *****

```

```

-- *****
--
-- Error Indication Elementary Procedure
--
-- *****
-- *****
--
-- ERROR INDICATION
--
-- *****
ErrorIndication ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    {{ErrorIndication-IEs}},
    ...
}

ErrorIndication-IEs E2AP-PROTOCOL-IES ::= {
    { ID id-TransactionID          CRITICALITY reject  TYPE TransactionID          PRESENCE
optional    }|
    { ID id-RICrequestID           CRITICALITY reject  TYPE RICrequestID            PRESENCE
optional    }|
    { ID id-RANfunctionID         CRITICALITY reject  TYPE RANfunctionID          PRESENCE
optional    }|
    { ID id-Cause                  CRITICALITY ignore  TYPE Cause                   PRESENCE
optional    }|
    { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE
optional    },
    ...
}

-- *****
--
-- E2 Setup Elementary Procedure
--
-- *****
-- *****
--
-- E2 SETUP REQUEST
--
-- *****

E2setupRequest ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    { {E2setupRequestIEs} },
    ...
}

E2setupRequestIEs E2AP-PROTOCOL-IES ::= {
    { ID id-TransactionID          CRITICALITY reject  TYPE TransactionID          PRESENCE mandatory }|
    { ID id-GlobalE2node-ID       CRITICALITY reject  TYPE GlobalE2node-ID        PRESENCE mandatory }|
    { ID id-RANfunctionsAdded     CRITICALITY reject  TYPE RANfunctions-List     PRESENCE mandatory }|
    { ID id-E2nodeComponentConfigAddition CRITICALITY reject  TYPE E2nodeComponentConfigAddition-
List    PRESENCE mandatory },
    ...
}

-- *****
--
-- E2 SETUP RESPONSE
--
-- *****

E2setupResponse ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    { {E2setupResponseIEs} },
    ...
}

E2setupResponseIEs E2AP-PROTOCOL-IES ::= {
    { ID id-TransactionID          CRITICALITY reject  TYPE TransactionID          PRESENCE mandatory }|
    { ID id-GlobalRIC-ID           CRITICALITY reject  TYPE GlobalRIC-ID           PRESENCE mandatory }|
    { ID id-RANfunctionsAccepted   CRITICALITY reject  TYPE RANfunctionsID-List   PRESENCE optional }|
    { ID id-RANfunctionsRejected   CRITICALITY reject  TYPE RANfunctionsIDcause-List PRESENCE optional }|
}

```

```

    { ID id-E2nodeComponentConfigAdditionAck    CRITICALITY reject  TYPE
E2nodeComponentConfigAdditionAck-List  PRESENCE mandatory },
  ...
}

-- *****
--
-- E2 SETUP FAILURE
--
-- *****

E2setupFailure ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container      { {E2setupFailureIEs} },
  ...
}

E2setupFailureIEs E2AP-PROTOCOL-IES ::= {
  { ID id-TransactionID      CRITICALITY reject  TYPE TransactionID      PRESENCE
mandatory }|
  { ID id-Cause              CRITICALITY ignore  TYPE Cause                PRESENCE
mandatory }|
  { ID id-TimeToWait         CRITICALITY ignore  TYPE TimeToWait           PRESENCE
optional }|
  { ID id-CriticalityDiagnostics  CRITICALITY ignore  TYPE CriticalityDiagnostics  PRESENCE
optional }|
  { ID id-TNLinformation     CRITICALITY ignore  TYPE TNLinformation        PRESENCE
optional },
  ...
}

-- *****
--
-- E2 Connection Update Elementary Procedure
--
-- *****
-- *****
--
-- E2 CONNECTION UPDATE
--
-- *****

E2connectionUpdate ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container      {{E2connectionUpdate-IEs}},
  ...
}

E2connectionUpdate-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-TransactionID      CRITICALITY reject  TYPE TransactionID      PRESENCE
mandatory }|
  { ID id-E2connectionUpdateAdd  CRITICALITY reject  TYPE E2connectionUpdate-List  PRESENCE
optional }|
  { ID id-E2connectionUpdateRemove  CRITICALITY reject  TYPE E2connectionUpdateRemove-List  PRESENCE
optional }|
  { ID id-E2connectionUpdateModify  CRITICALITY reject  TYPE E2connectionUpdate-List  PRESENCE
optional },
  ...
}

E2connectionUpdate-List ::= SEQUENCE (SIZE(1..maxofTNLA)) OF ProtocolIE-SingleContainer {
{E2connectionUpdate-ItemIEs} }

E2connectionUpdate-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-E2connectionUpdate-Item  CRITICALITY ignore  TYPE E2connectionUpdate-Item  PRESENCE
mandatory },
  ...
}

E2connectionUpdate-Item ::= SEQUENCE {
  tnlInformation      TNLinformation,
  tnlUsage            TNLusage,
  ...
}

E2connectionUpdateRemove-List ::= SEQUENCE (SIZE(1..maxofTNLA)) OF ProtocolIE-SingleContainer {
{E2connectionUpdateRemove-ItemIEs} }

E2connectionUpdateRemove-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-E2connectionUpdateRemove-Item  CRITICALITY ignore  TYPE E2connectionUpdateRemove-Item  PRESENCE
mandatory },

```



```

}
...
E2connectionUpdateRemove-Item ::= SEQUENCE {
    tnlInformation          TNLinformation,
    ...
}

-- *****
--
-- E2 CONNECTION UPDATE ACKNOWLEDGE
--
-- *****
E2connectionUpdateAcknowledge ::= SEQUENCE {
    protocolIEs            ProtocolIE-Container    {{E2connectionUpdateAck-IEs}},
    ...
}

E2connectionUpdateAck-IEs E2AP-PROTOCOL-IES ::= {
    { ID id-TransactionID          CRITICALITY reject  TYPE TransactionID
      PRESENCE mandatory  }|
    { ID id-E2connectionSetup      CRITICALITY reject  TYPE E2connectionUpdate-List
      PRESENCE optional    }|
    { ID id-E2connectionSetupFailed CRITICALITY reject  TYPE E2connectionSetupFailed-List
      PRESENCE optional    },
    ...
}

E2connectionSetupFailed-List ::= SEQUENCE (SIZE(1..maxofTNLA)) OF ProtocolIE-SingleContainer {
    {E2connectionSetupFailed-ItemIEs} }

E2connectionSetupFailed-ItemIEs E2AP-PROTOCOL-IES ::= {
    { ID id-E2connectionSetupFailed-Item          CRITICALITY ignore  TYPE
E2connectionSetupFailed-Item          PRESENCE mandatory  },
    ...
}

E2connectionSetupFailed-Item ::= SEQUENCE {
    tnlInformation          TNLinformation,
    cause                  Cause,
    ...
}

-- *****
--
-- E2 CONNECTION UPDATE FAILURE
--
-- *****
E2connectionUpdateFailure ::= SEQUENCE {
    protocolIEs            ProtocolIE-Container    {{E2connectionUpdateFailure-IEs}},
    ...
}

E2connectionUpdateFailure-IEs E2AP-PROTOCOL-IES ::= {
    { ID id-TransactionID          CRITICALITY reject  TYPE TransactionID
      PRESENCE mandatory  }|
    { ID id-Cause                  CRITICALITY reject  TYPE Cause
      PRESENCE optional    }|
    { ID id-TimeToWait            CRITICALITY ignore  TYPE TimeToWait
      PRESENCE optional    }|
    { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics
      PRESENCE optional    },
    ...
}

-- *****
--
-- E2 Node Configuration Update Elementary Procedure
--
-- *****
--
-- E2 NODE CONFIGURATION UPDATE
--
-- *****
E2nodeConfigurationUpdate ::= SEQUENCE {

```

```

    protocolIEs          ProtocolIE-Container    {{E2nodeConfigurationUpdate-IEs}},
  ...
}

E2nodeConfigurationUpdate-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-TransactionID          CRITICALITY reject  TYPE TransactionID
    PRESENCE mandatory  }|
  { ID id-GlobalE2node-ID        CRITICALITY reject  TYPE GlobalE2node-ID
    PRESENCE optional    }|
  List { ID id-E2nodeComponentConfigAddition  CRITICALITY reject  TYPE E2nodeComponentConfigAddition-
    PRESENCE optional  }|
  List { ID id-E2nodeComponentConfigUpdate    CRITICALITY reject  TYPE E2nodeComponentConfigUpdate-
    PRESENCE optional  }|
  List { ID id-E2nodeComponentConfigRemoval    CRITICALITY reject  TYPE E2nodeComponentConfigRemoval-
    PRESENCE optional  }|
  List { ID id-E2nodeTNLAssociationRemoval     CRITICALITY reject  TYPE E2nodeTNLAssociationRemoval-
    PRESENCE optional  },
  ...
}

E2nodeComponentConfigAddition-List ::= SEQUENCE (SIZE(1..maxofE2nodeComponents)) OF ProtocolIE-
SingleContainer { {E2nodeComponentConfigAddition-ItemIEs} }

E2nodeComponentConfigAddition-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-E2nodeComponentConfigAddition-Item  CRITICALITY reject  TYPE
E2nodeComponentConfigAddition-Item          PRESENCE mandatory  },
  ...
}

E2nodeComponentConfigAddition-Item ::= SEQUENCE {
  e2nodeComponentInterfaceType  E2nodeComponentInterfaceType,
  e2nodeComponentID             E2nodeComponentID,
  e2nodeComponentConfiguration  E2nodeComponentConfiguration,
  ...
}

E2nodeComponentConfigUpdate-List ::= SEQUENCE (SIZE(1..maxofE2nodeComponents)) OF ProtocolIE-
SingleContainer { {E2nodeComponentConfigUpdate-ItemIEs} }

E2nodeComponentConfigUpdate-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-E2nodeComponentConfigUpdate-Item    CRITICALITY reject  TYPE
E2nodeComponentConfigUpdate-Item            PRESENCE mandatory  },
  ...
}

E2nodeComponentConfigUpdate-Item ::= SEQUENCE {
  e2nodeComponentInterfaceType  E2nodeComponentInterfaceType,
  e2nodeComponentID             E2nodeComponentID,
  e2nodeComponentConfiguration  E2nodeComponentConfiguration,
  ...
}

E2nodeComponentConfigRemoval-List ::= SEQUENCE (SIZE(1..maxofE2nodeComponents)) OF ProtocolIE-
SingleContainer { {E2nodeComponentConfigRemoval-ItemIEs} }

E2nodeComponentConfigRemoval-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-E2nodeComponentConfigRemoval-Item    CRITICALITY reject  TYPE
E2nodeComponentConfigRemoval-Item            PRESENCE mandatory  },
  ...
}

E2nodeComponentConfigRemoval-Item ::= SEQUENCE {
  e2nodeComponentInterfaceType  E2nodeComponentInterfaceType,
  e2nodeComponentID             E2nodeComponentID,
  ...
}

E2nodeTNLAssociationRemoval-List ::= SEQUENCE (SIZE(1..maxofTNLA)) OF ProtocolIE-SingleContainer {
{E2nodeTNLAssociationRemoval-ItemIEs} }

E2nodeTNLAssociationRemoval-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-E2nodeTNLAssociationRemoval-Item     CRITICALITY reject  TYPE
E2nodeTNLAssociationRemoval-Item            PRESENCE mandatory  },
  ...
}

E2nodeTNLAssociationRemoval-Item ::= SEQUENCE {
  tnlInformation                TNLinformation,

```

```

    tnlInformationRIC          TNLInformation,
  }
  ...
-- *****
--
-- E2 NODE CONFIGURATION UPDATE ACKNOWLEDGE
--
-- *****
E2nodeConfigurationUpdateAcknowledge ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container    {{E2nodeConfigurationUpdateAcknowledge-
  IEs}},
  ...
}

E2nodeConfigurationUpdateAcknowledge-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-TransactionID          CRITICALITY reject  TYPE TransactionID
    PRESENCE mandatory  }|
  { ID id-E2nodeComponentConfigAdditionAck          CRITICALITY reject  TYPE
E2nodeComponentConfigAdditionAck-List          PRESENCE optional  }|
  { ID id-E2nodeComponentConfigUpdateAck          CRITICALITY reject  TYPE
E2nodeComponentConfigUpdateAck-List          PRESENCE optional  }|
  { ID id-E2nodeComponentConfigRemovalAck          CRITICALITY reject  TYPE
E2nodeComponentConfigRemovalAck-List          PRESENCE optional  },
  ...
}

E2nodeComponentConfigAdditionAck-List ::= SEQUENCE (SIZE(1..maxofE2nodeComponents)) OF ProtocolIE-
SingleContainer { {E2nodeComponentConfigAdditionAck-ItemIEs} }

E2nodeComponentConfigAdditionAck-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-E2nodeComponentConfigAdditionAck-Item          CRITICALITY reject  TYPE
E2nodeComponentConfigAdditionAck-Item          PRESENCE mandatory  },
  ...
}

E2nodeComponentConfigAdditionAck-Item ::= SEQUENCE {
  e2nodeComponentInterfaceType          E2nodeComponentInterfaceType,
  e2nodeComponentID                    E2nodeComponentID,
  e2nodeComponentConfigurationAck       E2nodeComponentConfigurationAck,
  ...
}

E2nodeComponentConfigUpdateAck-List ::= SEQUENCE (SIZE(1..maxofE2nodeComponents)) OF ProtocolIE-
SingleContainer { {E2nodeComponentConfigUpdateAck-ItemIEs} }

E2nodeComponentConfigUpdateAck-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-E2nodeComponentConfigUpdateAck-Item          CRITICALITY reject  TYPE
E2nodeComponentConfigUpdateAck-Item          PRESENCE mandatory  },
  ...
}

E2nodeComponentConfigUpdateAck-Item ::= SEQUENCE {
  e2nodeComponentInterfaceType          E2nodeComponentInterfaceType,
  e2nodeComponentID                    E2nodeComponentID,
  e2nodeComponentConfigurationAck       E2nodeComponentConfigurationAck,
  ...
}

E2nodeComponentConfigRemovalAck-List ::= SEQUENCE (SIZE(1..maxofE2nodeComponents)) OF ProtocolIE-
SingleContainer { {E2nodeComponentConfigRemovalAck-ItemIEs} }

E2nodeComponentConfigRemovalAck-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-E2nodeComponentConfigRemovalAck-Item          CRITICALITY reject  TYPE
E2nodeComponentConfigRemovalAck-Item          PRESENCE mandatory  },
  ...
}

E2nodeComponentConfigRemovalAck-Item ::= SEQUENCE {
  e2nodeComponentInterfaceType          E2nodeComponentInterfaceType,
  e2nodeComponentID                    E2nodeComponentID,
  e2nodeComponentConfigurationAck       E2nodeComponentConfigurationAck,
  ...
}

-- *****
--
-- E2 NODE CONFIGURATION UPDATE FAILURE

```

```

--
-- *****
E2nodeConfigurationUpdateFailure ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    {{E2nodeConfigurationUpdateFailure-IEs}},
    ...
}

E2nodeConfigurationUpdateFailure-IEs E2AP-PROTOCOL-IES ::= {
    { ID id-TransactionID          CRITICALITY reject  TYPE TransactionID
      PRESENCE mandatory }|
    { ID id-Cause                  CRITICALITY ignore  TYPE Cause
      PRESENCE mandatory }|
    { ID id-TimeToWait             CRITICALITY ignore  TYPE TimeToWait
      PRESENCE optional }|
    { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics
      PRESENCE optional },
    ...
}

-- *****
--
-- Reset Elementary Procedure
--
-- *****

-- *****
--
-- RESET REQUEST
--
-- *****

ResetRequest ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    { {ResetRequestIEs} },
    ...
}

ResetRequestIEs E2AP-PROTOCOL-IES ::= {
    { ID id-TransactionID          CRITICALITY reject  TYPE TransactionID          PRESENCE
      mandatory }|
    { ID id-Cause                  CRITICALITY ignore  TYPE Cause                  PRESENCE
      mandatory },
    ...
}

-- *****
--
-- RESET RESPONSE
--
-- *****

ResetResponse ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    { {ResetResponseIEs} },
    ...
}

ResetResponseIEs E2AP-PROTOCOL-IES ::= {
    { ID id-TransactionID          CRITICALITY reject  TYPE TransactionID          PRESENCE
      mandatory }|
    { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE
      optional },
    ...
}

-- *****
--
-- RIC Service Update Elementary Procedure
--
-- *****

-- *****
--
-- RIC SERVICE UPDATE
--
-- *****

RICServiceUpdate ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    {{RICServiceUpdate-IEs}},
    ...
}

```

```

RICserviceUpdate-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-TransactionID          CRITICALITY reject  TYPE TransactionID
    PRESENCE mandatory  }|
  { ID id-RANfunctionsAdded      CRITICALITY reject  TYPE RANfunctions-List
    PRESENCE optional    }|
  { ID id-RANfunctionsModified   CRITICALITY reject  TYPE RANfunctions-List
    PRESENCE optional    }|
  { ID id-RANfunctionsDeleted    CRITICALITY reject  TYPE RANfunctionsID-List
    PRESENCE optional    },
  ...
}

RANfunctions-List ::= SEQUENCE (SIZE(1..maxofRANfunctionID)) OF ProtocolIE-SingleContainer {
{RANfunction-ItemIEs} }

RANfunction-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-RANfunction-Item      CRITICALITY ignore  TYPE RANfunction-Item
    PRESENCE mandatory  },
  ...
}

RANfunction-Item ::= SEQUENCE {
  ranFunctionID          RANfunctionID,
  ranFunctionDefinition  RANfunctionDefinition,
  ranFunctionRevision    RANfunctionRevision,
  ranFunctionOID         RANfunctionOID,
  ...
}

RANfunctionsID-List ::= SEQUENCE (SIZE(1..maxofRANfunctionID)) OF ProtocolIE-
SingleContainer{{RANfunctionID-ItemIEs}}

RANfunctionID-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-RANfunctionID-Item    CRITICALITY ignore  TYPE RANfunctionID-Item
    PRESENCE mandatory  },
  ...
}

RANfunctionID-Item ::= SEQUENCE {
  ranFunctionID          RANfunctionID,
  ranFunctionRevision    RANfunctionRevision,
  ...
}

-- *****
--
-- RIC SERVICE UPDATE ACKNOWLEDGE
--
-- *****
RICserviceUpdateAcknowledge ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container  {{RICserviceUpdateAcknowledge-IEs}},
  ...
}

RICserviceUpdateAcknowledge-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-TransactionID          CRITICALITY reject  TYPE TransactionID
    PRESENCE mandatory  }|
  { ID id-RANfunctionsAccepted   CRITICALITY reject  TYPE RANfunctionsID-List
    PRESENCE optional    }|
  { ID id-RANfunctionsRejected   CRITICALITY reject  TYPE RANfunctionsIDcause-List
    PRESENCE optional    },
  ...
}

RANfunctionsIDcause-List ::= SEQUENCE (SIZE(1..maxofRANfunctionID)) OF ProtocolIE-SingleContainer {
{RANfunctionIDcause-ItemIEs} }

RANfunctionIDcause-ItemIEs E2AP-PROTOCOL-IES ::= {
  { ID id-RANfunctionIEcause-Item CRITICALITY ignore  TYPE RANfunctionIDcause-Item
    PRESENCE mandatory  },
  ...
}

RANfunctionIDcause-Item ::= SEQUENCE {
  ranFunctionID          RANfunctionID,
  cause                  Cause,
}

```

```

}
...
}

-- *****
--
-- RIC SERVICE UPDATE FAILURE
--
-- *****
RICserviceUpdateFailure ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container    {{RICserviceUpdateFailure-IEs}},
  ...
}

RICserviceUpdateFailure-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-TransactionID          CRITICALITY reject  TYPE TransactionID
    PRESENCE mandatory  }|
  { ID id-Cause                  CRITICALITY reject  TYPE Cause
    PRESENCE mandatory  }|
  { ID id-TimeToWait             CRITICALITY ignore  TYPE TimeToWait
    PRESENCE optional   }|
  { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics
    PRESENCE optional   },
  ...
}

-- *****
--
-- RIC Service Query Elementary Procedure
--
-- *****
--
-- RIC SERVICE QUERY
--
-- *****
RICserviceQuery ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container    {{RICserviceQuery-IEs}},
  ...
}

RICserviceQuery-IEs E2AP-PROTOCOL-IES ::= {
  { ID id-TransactionID          CRITICALITY reject  TYPE TransactionID
    PRESENCE mandatory  }|
  { ID id-RANfunctionsAccepted   CRITICALITY reject  TYPE RANfunctionsID-List
    PRESENCE optional   },
  ...
}

-- *****
--
-- E2 Removal Elementary Procedure
--
-- *****
--
-- E2 REMOVAL REQUEST
--
-- *****
E2RemovalRequest ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container    { {E2RemovalRequestIEs} },
  ...
}

E2RemovalRequestIEs E2AP-PROTOCOL-IES ::= {
  { ID id-TransactionID          CRITICALITY reject  TYPE TransactionID
    PRESENCE mandatory  },
  ...
}

-- *****
--
-- E2 REMOVAL RESPONSE
--
-- *****
E2RemovalResponse ::= SEQUENCE {

```

```

    protocolIEs          ProtocolIE-Container    { {E2RemovalResponseIEs} },
  ...
}

E2RemovalResponseIEs E2AP-PROTOCOL-IES ::= {
  { ID id-TransactionID          CRITICALITY reject  TYPE TransactionID
  PRESENCE mandatory }|
  { ID id-CriticalityDiagnostics CRITICALITY ignore TYPE CriticalityDiagnostics  PRESENCE
optional }},
  ...
}

-- *****
--
-- E2 REMOVAL FAILURE
--
-- *****

E2RemovalFailure ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container    { {E2RemovalFailureIEs} },
  ...
}

E2RemovalFailureIEs E2AP-PROTOCOL-IES ::= {
  { ID id-TransactionID          CRITICALITY reject  TYPE TransactionID          PRESENCE
mandatory }|
  { ID id-Cause                  CRITICALITY ignore  TYPE Cause                  PRESENCE
mandatory }|
  { ID id-CriticalityDiagnostics CRITICALITY ignore TYPE CriticalityDiagnostics  PRESENCE
optional }},
  ...
}

END
-- ASN1STOP

```

9.3.5 Information Element Definitions

```

-- ASN1START
-- *****
-- E2AP
-- Information Element Definitions
--
-- *****

E2AP-IEs {
iso(1) identified-organization(3) dod(6) internet(1) private(4) enterprise(1) oran(53148) e2(1)
version2 (2) e2ap(1) e2ap-IEs (2)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
  Criticality,
  Presence,
  ProcedureCode,
  ProtocolIE-ID,
  TriggeringMessage
FROM E2AP-CommonDataTypes

  maxnoofErrors,
  maxProtocolIEs
FROM E2AP-Constants;

-- A

-- *****
-- [New for E2AP v02.00] copied from 3GPP 38.413 (NGAP) IEs
-- *****
AMFName ::= PrintableString (SIZE(1..150, ...))

-- B
-- C
Cause ::= CHOICE {
  ricRequest          CauseRICrequest,
  ricService          CauseRICservice,

```

```

    e2Node          CauseE2node,
    transport       CauseTransport,
    protocol        CauseProtocol,
    misc            CauseMisc,
    ...
}

CauseE2node ::= ENUMERATED {
    e2node-component-unknown,
    ...
}

CauseMisc ::= ENUMERATED {
    control-processing-overload,
    hardware-failure,
    om-intervention,
    unspecified,
    ...
}

CauseProtocol ::= ENUMERATED {
    transfer-syntax-error,
    abstract-syntax-error-reject,
    abstract-syntax-error-ignore-and-notify,
    message-not-compatible-with-receiver-state,
    semantic-error,
    abstract-syntax-error-falsely-constructed-message,
    unspecified,
    ...
}

CauseRICrequest ::= ENUMERATED {
    ran-function-id-invalid,
    action-not-supported,
    excessive-actions,
    duplicate-action,
    duplicate-event-trigger,
    function-resource-limit,
    request-id-unknown,
    inconsistent-action-subsequent-action-sequence,
    control-message-invalid,
    ric-call-process-id-invalid,
    control-timer-expired,
    control-failed-to-execute,
    system-not-ready,
    unspecified,
    ... ,
    ric-subscription-end-time-expired,
    ric-subscription-end-time-invalid,
    duplicate-ric-request-id,
    eventTriggerNotSupported,
    requested-information-unavailable,
    invalid-information-request
}

CauseRICservice ::= ENUMERATED{
    ran-function-not-supported,
    excessive-functions,
    ric-resource-limit,
    ...
}

CauseTransport ::= ENUMERATED {
    unspecified,
    transport-resource-unavailable,
    ...
}

-- *****
-- copied from 3GPP 38.413 (NGAP) IEs
-- note: ie-Extensions removed
-- *****
CriticalityDiagnostics ::= SEQUENCE {
    procedureCode          ProcedureCode          OPTIONAL,
    triggeringMessage      TriggeringMessage      OPTIONAL,
    procedureCriticality   Criticality             OPTIONAL,
    ricRequestorID        RICrequestID           OPTIONAL,
    iEsCriticalityDiagnostics CriticalityDiagnostics-IE-List OPTIONAL,
    ...
}

```



```

}

CriticalityDiagnostics-IE-List ::= SEQUENCE (SIZE(1..maxnoofErrors)) OF CriticalityDiagnostics-IE-
Item

CriticalityDiagnostics-IE-Item ::= SEQUENCE {
    iECriticality      Criticality,
    iE-ID              ProtocolIE-ID,
    typeOfError        TypeOfError,
    ...
}

-- D
-- E

-- Following IE used to carry 3GPP defined SETUP and RAN Configuration messages defined in FlAP,
ElAP, XnAP, etc.
E2nodeComponentConfiguration ::= SEQUENCE{
    e2nodeComponentRequestPart    OCTET STRING,
    e2nodeComponentResponsePart    OCTET STRING,
    ...
}

E2nodeComponentConfigurationAck ::= SEQUENCE{
    updateOutcome      ENUMERATED {success, failure, ...},
    failureCause        Cause          OPTIONAL,
    ...
}

E2nodeComponentInterfaceType ::= ENUMERATED {ng, xn, e1, f1, w1, s1, x2, ...}

E2nodeComponentID ::= CHOICE{
    e2nodeComponentInterfaceTypeNG    E2nodeComponentInterfaceNG,
    e2nodeComponentInterfaceTypeXn    E2nodeComponentInterfaceXn,
    e2nodeComponentInterfaceTypeE1    E2nodeComponentInterfaceE1,
    e2nodeComponentInterfaceTypeF1    E2nodeComponentInterfaceF1,
    e2nodeComponentInterfaceTypeW1    E2nodeComponentInterfaceW1,
    e2nodeComponentInterfaceTypeS1    E2nodeComponentInterfaceS1,
    e2nodeComponentInterfaceTypeX2    E2nodeComponentInterfaceX2,
    ...
}

E2nodeComponentInterfaceE1 ::= SEQUENCE{
    gNB-CU-UP-ID          GNB-CU-UP-ID,
    ...
}

E2nodeComponentInterfaceF1 ::= SEQUENCE{
    gNB-DU-ID             GNB-DU-ID,
    ...
}

E2nodeComponentInterfaceNG ::= SEQUENCE{
    amf-name              AMFName,
    ...
}

E2nodeComponentInterfaceS1 ::= SEQUENCE{
    mme-name              MMename,
    ...
}

E2nodeComponentInterfaceX2 ::= SEQUENCE{
    global-eNB-ID          GlobalENB-ID    OPTIONAL,
    global-en-gNB-ID      GlobalenGNB-ID  OPTIONAL,
    ...
}

E2nodeComponentInterfaceXn ::= SEQUENCE{
    global-NG-RAN-Node-ID  GlobalNG-RANNode-ID,
    ...
}

E2nodeComponentInterfaceW1 ::= SEQUENCE{
    ng-eNB-DU-ID          NGENB-DU-ID,
    ...
}

```

```

-- *****
-- copied from 3GPP 36.423 (X2AP) IEs
-- note: ie-Extensions removed
-- *****
ENB-ID ::= CHOICE {
    macro-eNB-ID          BIT STRING (SIZE (20)),
    home-eNB-ID          BIT STRING (SIZE (28)),
    ... ,
    short-Macro-eNB-ID   BIT STRING (SIZE(18)),
    long-Macro-eNB-ID    BIT STRING (SIZE(21))
}
-- *****
-- copied from 3GPP 38.423 (XnAP) IEs
-- note: choice-extension removed
-- *****
ENB-ID-Choice ::= CHOICE {
    enb-ID-macro          BIT STRING (SIZE(20)),
    enb-ID-shortmacro    BIT STRING (SIZE(18)),
    enb-ID-longmacro     BIT STRING (SIZE(21)),
    ...
}
-- *****
-- copied from 3GPP 36.423 (X2AP) IEs
-- note: ie-Extensions removed
-- Note: to avoid duplicate names with XnAP, GNB-ID renamed ENGNB-ID, GlobalGNB-ID renamed
GlobalenGNB-ID
-- *****
ENGNB-ID ::= CHOICE {
    gNB-ID BIT STRING (SIZE (22..32)),
    ...
}
-- F
-- G
GlobaleE2node-ID ::= CHOICE{
    gNB          GlobaleE2node-gNB-ID,
    en-gNB       GlobaleE2node-en-gNB-ID,
    ng-eNB       GlobaleE2node-ng-eNB-ID,
    eNB          GlobaleE2node-eNB-ID,
    ...
}
GlobaleE2node-en-gNB-ID ::= SEQUENCE{
    global-en-gNB-ID   GlobalenGNB-ID,
    en-gNB-CU-UP-ID   GNB-CU-UP-ID   OPTIONAL,
    en-gNB-DU-ID      GNB-DU-ID      OPTIONAL,
    ...
}
GlobaleE2node-eNB-ID ::= SEQUENCE{
    global-eNB-ID      GlobalenNB-ID,
    ...
}
GlobaleE2node-gNB-ID ::= SEQUENCE{
    global-gNB-ID      GlobalgNB-ID,
    global-en-gNB-ID   GlobalenGNB-ID OPTIONAL,
    gNB-CU-UP-ID      GNB-CU-UP-ID   OPTIONAL,
    gNB-DU-ID         GNB-DU-ID      OPTIONAL,
    ...
}
GlobaleE2node-ng-eNB-ID ::= SEQUENCE{
    global-ng-eNB-ID   GlobalngeNB-ID,
    global-eNB-ID     GlobalenNB-ID   OPTIONAL,
    ngENB-DU-ID       NGENB-DU-ID     OPTIONAL,
    ...
}
-- *****
-- copied from 3GPP 36.423 (X2AP) IEs
-- note: ie-Extensions removed
-- *****
GlobalenNB-ID ::= SEQUENCE {
    pLMN-Identity      PLMN-Identity,
    eNB-ID             ENB-ID,
    ...
}
-- *****
-- copied from 3GPP 36.423 (X2AP) IEs

```

```

-- Note: to avoid duplicate names with XnAP, GNB-ID renamed ENGNB-ID, GlobalGNB-ID renamed
GlobalenGNB-ID
-- *****
GlobalenGNB-ID ::= SEQUENCE {
    plmn-identity      PLMN-Identity,
    gnb-id             ENGNB-ID,
    ...
}
-- *****
-- copied from 3GPP 38.423 (XnAP) IEs
-- note: choice-extension removed
-- *****
Globalgnb-ID ::= SEQUENCE {
    plmn-id           PLMN-Identity,
    gnb-id            GNB-ID-Choice,
    ...
}

-- *****
-- copied from 3GPP 38.423 (XnAP) IEs
-- note: choice-extension removed
-- *****
Globalngenb-ID ::= SEQUENCE {
    plmn-id           PLMN-Identity,
    enb-id            ENB-ID-Choice,
    ...
}

-- *****
-- [NEW for E2AP v02.00] copied from 3GPP 38.423 (XnAP) IEs
-- Note: extension field removed
-- *****

Globalng-RANNode-ID ::= CHOICE {
    gnb                Globalgnb-ID,
    ng-enb             Globalngenb-ID,
    ...
}

GlobalRIC-ID ::= SEQUENCE{
    plmn-identity      PLMN-Identity,
    ric-ID             BIT STRING (SIZE (20)),
    ...
}

-- *****
-- copied from 3GPP 37.483 (E1AP) IEs
-- *****
GNB-CU-UP-ID ::= INTEGER (0..68719476735)

-- *****
-- copied from 3GPP 38.473 (F1AP) IEs
-- *****
GNB-DU-ID ::= INTEGER (0..68719476735)

-- *****
-- copied from 3GPP 38.423 (XnAP) IEs
-- note: choice-extension removed
-- *****
GNB-ID-Choice ::= CHOICE {
    gnb-ID             BIT STRING (SIZE(22..32)),
    ...
}
-- H
-- I
-- J
-- K
-- L
-- M

-- *****
-- [New for E2AP v02.00] copied from 3GPP 36.413 (S1AP) IEs
-- *****
MMENAME ::= PrintableString (SIZE (1..150, ...))

-- N

```

```

-- *****
-- copied from 3GPP 37.473 (W1AP) IEs
-- *****
NGENB-DU-ID ::= INTEGER (0..68719476735)

-- O
-- P
-- *****
-- copied from 3GPP 36.423 (X2AP) IEs
-- *****
PLMN-Identity ::= OCTET STRING (SIZE(3))

-- Q
-- R
-- *****
-- Following IE defined in E2SM
-- *****
RANfunctionDefinition ::= OCTET STRING

RANfunctionID ::= INTEGER (0..4095)

RANfunctionOID ::= PrintableString(SIZE(1..1000, ...))

RANfunctionRevision ::= INTEGER (0..4095)

-- *****
-- Following IE defined in E2SM
-- *****
RICActionDefinition ::= OCTET STRING

-- new in E2AP-v03.00
RICActionExecutionOrder ::= INTEGER (0..255, ...)

RICActionID ::= INTEGER (0..255)

RICActionType ::= ENUMERATED{
    report,
    insert,
    policy,
    ...
}

-- *****
-- Following IE defined in E2SM
-- *****
RICcallProcessID ::= OCTET STRING

RICcontrolAckRequest ::= ENUMERATED{
    noAck,
    ack,
    ...
}

-- *****
-- Following IE defined in E2SM
-- *****
RICcontrolHeader ::= OCTET STRING

-- *****
-- Following IE defined in E2SM
-- *****
RICcontrolMessage ::= OCTET STRING

-- *****
-- Following IE defined in E2SM
-- *****
RICcontrolOutcome ::= OCTET STRING

-- *****
-- Following IE defined in E2SM
-- *****
RICeventTriggerDefinition ::= OCTET STRING

-- *****
-- Following IE defined in E2SM
-- *****
RICindicationHeader ::= OCTET STRING

```

```

-- *****
-- Following IE defined in E2SM
-- *****
RICindicationMessage ::= OCTET STRING

RICindicationSN ::= INTEGER (0..65535)

RICindicationType ::= ENUMERATED{
    report,
    insert,
    ...
}

RICrequestID ::= SEQUENCE {
    ricRequestorID          INTEGER (0..65535),
    ricInstanceID          INTEGER (0..65535),
    ...
}

RICsubscriptionTime ::= OCTET STRING (SIZE(8))

RICsubsequentAction ::=SEQUENCE{
    ricSubsequentActionType  RICsubsequentActionType,
    ricTimeToWait            RICtimeToWait,
    ...
}

RICsubsequentActionType ::= ENUMERATED{
    continue,
    wait,
    ...
}

-- *****
-- Following IE defined in E2SM
-- *****
RICqueryHeader ::= OCTET STRING

-- *****
-- Following IE defined in E2SM
-- *****
RICqueryDefinition ::= OCTET STRING

-- *****
-- Following IE defined in E2SM
-- *****
RICqueryOutcome ::= OCTET STRING

RICtimeToWait ::= ENUMERATED{
    w1ms,
    w2ms,
    w5ms,
    w10ms,
    w20ms,
    w30ms,
    w40ms,
    w50ms,
    w100ms,
    w200ms,
    w500ms,
    w1s,
    w2s,
    w5s,
    w10s,
    w20s,
    w60s,
    ...
}
-- S
-- T
-- *****
-- copied from 3GPP 38.413 (NGAP) IEs
-- *****
TimeToWait ::= ENUMERATED {v1s, v2s, v5s, v10s, v20s, v60s, ...}

```

```

TNLInformation ::= SEQUENCE{
    tnlAddress      BIT STRING (SIZE(1..160, ...)),
    tnlPort         BIT STRING (SIZE(16))  OPTIONAL,
    ...
}

TNLusage ::= ENUMERATED{ric-service, support-function, both, ...}

TransactionID ::= INTEGER (0..255, ...)

-- *****
-- copied from 3GPP 38.413 (NGAP) IEs
-- *****
TypeOfError ::= ENUMERATED {
    not-understood,
    missing,
    ...
}

-- U
-- V
-- W
-- X
-- Y
-- Z

END
-- ASN1STOP

```

9.3.6 Common definitions

```

-- ASN1START
-- *****
--
-- Common definitions
-- Derived from 3GPP 38.413 (NGAP)
--
-- *****

E2AP-CommonDataTypes {
iso(1) identified-organization(3) dod(6) internet(1) private(4) enterprise(1) oran(53148) e2(1)
version2 (2) e2ap(1) e2ap-CommonDataTypes (3) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

Criticality      ::= ENUMERATED { reject, ignore, notify }

Presence        ::= ENUMERATED { optional, conditional, mandatory }

ProcedureCode    ::= INTEGER (0..255)

ProtocolIE-ID    ::= INTEGER (0..65535)

TriggeringMessage ::= ENUMERATED { initiating-message, successful-outcome, unsuccessful-outcome }

END
-- ASN1STOP

```

9.3.7 Constant definitions

```

-- ASN1START
-- *****
--
-- Constant definitions
--
-- *****

E2AP-Constants {
iso(1) identified-organization(3) dod(6) internet(1) private(4) enterprise(1) oran(53148) e2(1)
version2 (2) e2ap(1) e2ap-Constants (4) }

DEFINITIONS AUTOMATIC TAGS ::=

```

```

BEGIN

IMPORTS
    ProcedureCode,
    ProtocolIE-ID
FROM E2AP-CommonDataTypes;

-- *****
--
-- Elementary Procedures
--
-- *****
id-E2setup                ProcedureCode ::= 1
id-ErrorIndication        ProcedureCode ::= 2
id-Reset                  ProcedureCode ::= 3
id-RICcontrol             ProcedureCode ::= 4
id-RICindication          ProcedureCode ::= 5
id-RICserviceQuery        ProcedureCode ::= 6
id-RICserviceUpdate       ProcedureCode ::= 7
id-RICsubscription        ProcedureCode ::= 8
id-RICsubscriptionDelete  ProcedureCode ::= 9
id-E2nodeConfigurationUpdate ProcedureCode ::= 10
id-E2connectionUpdate     ProcedureCode ::= 11
id-RICsubscriptionDeleteRequired ProcedureCode ::= 12
id-E2removal              ProcedureCode ::= 13
id-RICsubscriptionModification ProcedureCode ::= 14
id-RICsubscriptionModificationRequired ProcedureCode ::= 15
id-RICquery               ProcedureCode ::= 16

-- *****
--
-- Extension constants
--
-- *****

maxProtocolIEs                INTEGER ::= 65535

-- *****
--
-- Lists
--
-- *****
maxnoofErrors                INTEGER ::= 256
maxofE2nodeComponents        INTEGER ::= 1024
maxofRANfunctionID           INTEGER ::= 256
maxofRICactionID             INTEGER ::= 16
maxofTNLA                    INTEGER ::= 32
maxofRICrequestID            INTEGER ::= 1024

-- *****
--
-- IEs
--
-- *****
id-Cause                     ProtocolIE-ID ::= 1
id-CriticalityDiagnostics    ProtocolIE-ID ::= 2
id-GlobalE2node-ID           ProtocolIE-ID ::= 3
id-GlobalRIC-ID              ProtocolIE-ID ::= 4
id-RANfunctionID             ProtocolIE-ID ::= 5
id-RANfunctionID-Item        ProtocolIE-ID ::= 6
id-RANfunctionIEcause-Item   ProtocolIE-ID ::= 7
id-RANfunction-Item          ProtocolIE-ID ::= 8
id-RANfunctionsAccepted      ProtocolIE-ID ::= 9
id-RANfunctionsAdded         ProtocolIE-ID ::= 10
id-RANfunctionsDeleted       ProtocolIE-ID ::= 11
id-RANfunctionsModified      ProtocolIE-ID ::= 12
id-RANfunctionsRejected      ProtocolIE-ID ::= 13
id-RIcAction-Admitted-Item   ProtocolIE-ID ::= 14
id-RIcActionID               ProtocolIE-ID ::= 15
id-RIcAction-NotAdmitted-Item ProtocolIE-ID ::= 16
id-RIcActions-Admitted       ProtocolIE-ID ::= 17
id-RIcActions-NotAdmitted    ProtocolIE-ID ::= 18
id-RIcAction-ToBeSetup-Item  ProtocolIE-ID ::= 19
id-RIcCallProcessID          ProtocolIE-ID ::= 20
id-RIccontrolAckRequest      ProtocolIE-ID ::= 21
id-RIccontrolHeader          ProtocolIE-ID ::= 22

```

| | |
|---|----------------------|
| id-RICcontrolMessage | ProtocolIE-ID ::= 23 |
| id-RICcontrolStatus | ProtocolIE-ID ::= 24 |
| id-RICindicationHeader | ProtocolIE-ID ::= 25 |
| id-RICindicationMessage | ProtocolIE-ID ::= 26 |
| id-RICindicationSN | ProtocolIE-ID ::= 27 |
| id-RICindicationType | ProtocolIE-ID ::= 28 |
| id-RICrequestID | ProtocolIE-ID ::= 29 |
| id-RICsubscriptionDetails | ProtocolIE-ID ::= 30 |
| id-TimeToWait | ProtocolIE-ID ::= 31 |
| id-RICcontrolOutcome | ProtocolIE-ID ::= 32 |
| id-E2nodeComponentConfigUpdate | ProtocolIE-ID ::= 33 |
| id-E2nodeComponentConfigUpdate-Item | ProtocolIE-ID ::= 34 |
| id-E2nodeComponentConfigUpdateAck | ProtocolIE-ID ::= 35 |
| id-E2nodeComponentConfigUpdateAck-Item | ProtocolIE-ID ::= 36 |
| id-E2connectionSetup | ProtocolIE-ID ::= 39 |
| id-E2connectionSetupFailed | ProtocolIE-ID ::= 40 |
| id-E2connectionSetupFailed-Item | ProtocolIE-ID ::= 41 |
| id-E2connectionFailed-Item | ProtocolIE-ID ::= 42 |
| id-E2connectionUpdate-Item | ProtocolIE-ID ::= 43 |
| id-E2connectionUpdateAdd | ProtocolIE-ID ::= 44 |
| id-E2connectionUpdateModify | ProtocolIE-ID ::= 45 |
| id-E2connectionUpdateRemove | ProtocolIE-ID ::= 46 |
| id-E2connectionUpdateRemove-Item | ProtocolIE-ID ::= 47 |
| id-TNLinformation | ProtocolIE-ID ::= 48 |
| id-TransactionID | ProtocolIE-ID ::= 49 |
| id-E2nodeComponentConfigAddition | ProtocolIE-ID ::= 50 |
| id-E2nodeComponentConfigAddition-Item | ProtocolIE-ID ::= 51 |
| id-E2nodeComponentConfigAdditionAck | ProtocolIE-ID ::= 52 |
| id-E2nodeComponentConfigAdditionAck-Item | ProtocolIE-ID ::= 53 |
| id-E2nodeComponentConfigRemoval | ProtocolIE-ID ::= 54 |
| id-E2nodeComponentConfigRemoval-Item | ProtocolIE-ID ::= 55 |
| id-E2nodeComponentConfigRemovalAck | ProtocolIE-ID ::= 56 |
| id-E2nodeComponentConfigRemovalAck-Item | ProtocolIE-ID ::= 57 |
| id-E2nodeTNLassociationRemoval | ProtocolIE-ID ::= 58 |
| id-E2nodeTNLassociationRemoval-Item | ProtocolIE-ID ::= 59 |
| id-RICsubscriptionToBeRemoved | ProtocolIE-ID ::= 60 |
| id-RICsubscription-withCause-Item | ProtocolIE-ID ::= 61 |
| id-RICsubscriptionStartTime | ProtocolIE-ID ::= 62 |
| id-RICsubscriptionEndTime | ProtocolIE-ID ::= 63 |
| id-RICeventTriggerDefinitionToBeModified | ProtocolIE-ID ::= 64 |
| id-RICactionsToBeRemovedForModification-List | ProtocolIE-ID ::= 65 |
| id-RICaction-ToBeRemovedForModification-Item | ProtocolIE-ID ::= 66 |
| id-RICactionsToBeModifiedForModification-List | ProtocolIE-ID ::= 67 |
| id-RICaction-ToBeModifiedForModification-Item | ProtocolIE-ID ::= 68 |
| id-RICactionsToBeAddedForModification-List | ProtocolIE-ID ::= 69 |
| id-RICaction-ToBeAddedForModification-Item | ProtocolIE-ID ::= 70 |
| id-RICactionsRemovedForModification-List | ProtocolIE-ID ::= 71 |
| id-RICaction-RemovedForModification-Item | ProtocolIE-ID ::= 72 |
| id-RICactionsFailedToBeRemovedForModification-List | ProtocolIE-ID ::= 73 |
| id-RICaction-FailedToBeRemovedForModification-Item | ProtocolIE-ID ::= 74 |
| id-RICactionsModifiedForModification-List | ProtocolIE-ID ::= 75 |
| id-RICaction-ModifiedForModification-Item | ProtocolIE-ID ::= 76 |
| id-RICactionsFailedToBeModifiedForModification-List | ProtocolIE-ID ::= 77 |
| id-RICaction-FailedToBeModifiedForModification-Item | ProtocolIE-ID ::= 78 |
| id-RICactionsAddedForModification-List | ProtocolIE-ID ::= 79 |
| id-RICaction-AddedForModification-Item | ProtocolIE-ID ::= 80 |
| id-RICactionsFailedToBeAddedForModification-List | ProtocolIE-ID ::= 81 |
| id-RICaction-FailedToBeAddedForModification-Item | ProtocolIE-ID ::= 82 |
| id-RICactionsRequiredToBeModified-List | ProtocolIE-ID ::= 83 |
| id-RICaction-RequiredToBeModified-Item | ProtocolIE-ID ::= 84 |
| id-RICactionsRequiredToBeRemoved-List | ProtocolIE-ID ::= 85 |
| id-RICaction-RequiredToBeRemoved-Item | ProtocolIE-ID ::= 86 |
| id-RICactionsConfirmedForModification-List | ProtocolIE-ID ::= 87 |
| id-RICaction-ConfirmedForModification-Item | ProtocolIE-ID ::= 88 |
| id-RICactionsRefusedToBeModified-List | ProtocolIE-ID ::= 89 |
| id-RICaction-RefusedToBeModified-Item | ProtocolIE-ID ::= 90 |
| id-RICactionsConfirmedForRemoval-List | ProtocolIE-ID ::= 91 |
| id-RICaction-ConfirmedForRemoval-Item | ProtocolIE-ID ::= 92 |
| id-RICactionsRefusedToBeRemoved-List | ProtocolIE-ID ::= 93 |
| id-RICaction-RefusedToBeRemoved-Item | ProtocolIE-ID ::= 94 |
| id-RICqueryHeader | ProtocolIE-ID ::= 95 |
| id-RICqueryDefinition | ProtocolIE-ID ::= 96 |
| id-RICqueryOutcome | ProtocolIE-ID ::= 97 |
| END | |
| -- ASN1STOP | |

9.3.8 Container definitions

```

-- ASN1START
-- *****
--
-- Container definitions
--
-- derived from 3GPP 38.413 (NGAP)
-- *****

E2AP-Containers {
iso(1) identified-organization(3) dod(6) internet(1) private(4) enterprise(1) oran(53148) e2(1)
version2 (2) e2ap(1) e2ap-Containers (5) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- *****
--
-- IE parameter types from other modules.
--
-- *****

IMPORTS

    Criticality,
    Presence,
    ProtocolIE-ID
FROM E2AP-CommonDataTypes

    maxProtocolIEs
FROM E2AP-Constants;

-- *****
--
-- Class Definition for Protocol IEs
--
-- *****

E2AP-PROTOCOL-IES ::= CLASS {
    &id          ProtocolIE-ID          UNIQUE,
    &criticality Criticality,
    &Value,
    &presence    Presence
}
WITH SYNTAX {
    ID          &id
    CRITICALITY &criticality
    TYPE        &Value
    PRESENCE    &presence
}

-- *****
--
-- Class Definition for Protocol IEs
--
-- *****

E2AP-PROTOCOL-IES-PAIR ::= CLASS {
    &id          ProtocolIE-ID          UNIQUE,
    &firstCriticality Criticality,
    &FirstValue,
    &secondCriticality Criticality,
    &SecondValue,
    &presence    Presence
}
WITH SYNTAX {
    ID          &id
    FIRST CRITICALITY &firstCriticality
    FIRST TYPE      &FirstValue
    SECOND CRITICALITY &secondCriticality
    SECOND TYPE     &SecondValue
    PRESENCE       &presence
}

```

```

-- *****
--
-- Container for Protocol IEs
--
-- *****

ProtocolIE-Container {E2AP-PROTOCOL-IES : IEsSetParam} ::=
  SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-Field {{IEsSetParam}}

ProtocolIE-SingleContainer {E2AP-PROTOCOL-IES : IEsSetParam} ::=
  ProtocolIE-Field {{IEsSetParam}}

ProtocolIE-Field {E2AP-PROTOCOL-IES : IEsSetParam} ::= SEQUENCE {
  id                E2AP-PROTOCOL-IES.&id                ({{IEsSetParam}}),
  criticality       E2AP-PROTOCOL-IES.&criticality       ({{IEsSetParam}}{@id}),
  value            E2AP-PROTOCOL-IES.&Value            ({{IEsSetParam}}{@id})
}

-- *****
--
-- Container for Protocol IE Pairs
--
-- *****

ProtocolIE-ContainerPair {E2AP-PROTOCOL-IES-PAIR : IEsSetParam} ::=
  SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-FieldPair {{IEsSetParam}}

ProtocolIE-FieldPair {E2AP-PROTOCOL-IES-PAIR : IEsSetParam} ::= SEQUENCE {
  id                E2AP-PROTOCOL-IES-PAIR.&id                ({{IEsSetParam}}),
  firstCriticality  E2AP-PROTOCOL-IES-PAIR.&firstCriticality  ({{IEsSetParam}}{@id}),
  firstValue       E2AP-PROTOCOL-IES-PAIR.&FirstValue       ({{IEsSetParam}}{@id}),
  secondCriticality E2AP-PROTOCOL-IES-PAIR.&secondCriticality ({{IEsSetParam}}{@id}),
  secondValue      E2AP-PROTOCOL-IES-PAIR.&SecondValue      ({{IEsSetParam}}{@id})
}

-- *****
--
-- Container Lists for Protocol IE Containers
--
-- *****

ProtocolIE-ContainerList {INTEGER : lowerBound, INTEGER : upperBound, E2AP-PROTOCOL-IES :
IEsSetParam} ::=
  SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-SingleContainer {{IEsSetParam}}

ProtocolIE-ContainerPairList {INTEGER : lowerBound, INTEGER : upperBound, E2AP-PROTOCOL-IES-PAIR :
IEsSetParam} ::=
  SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-ContainerPair {{IEsSetParam}}

END
-- ASN1STOP

```

9.4 Message transfer syntax

E2AP shall use the ASN.1 Basic Packed Encoding Rules (BASIC-PER) Aligned Variant as transfer syntax, as specified in Recommendation ITU-T X.691 [15].

9.5 Timers

The following Timers are defined for use over the E2 interface in Near-RT RIC and E2 Node.

$T_{\text{RICEVENTcreate}}$

- Specifies the maximum time for the RIC Subscription procedure in the Near-RT RIC.

$T_{\text{RICEVENTdelete}}$

- Specifies the maximum time for the RIC Subscription Deletion procedure in the Near-RT RIC.

$T_{\text{RICEVENTmodify}}$

- Specifies the maximum time for the RIC Subscription Modification procedure in the Near-RT RIC.

$T_{\text{RICcontrol}}$

- Specifies the maximum time for the RIC Control procedure in the Near-RT RIC.

T_{RICquery}

- Specifies the maximum time for the RIC Query procedure in the Near-RT RIC.

10 Handling of Unknown, Unforeseen and Erroneous Protocol Data

Clause 10 of ETSI TS 136 413 [24] is applicable for the purposes of the present document.

Annex A (informative): Change history

| Date | Version | Information about changes |
|---------------|----------------|--|
| February 2020 | 01.00 | Initial version |
| October 2020 | 01.01 | Editorial and functional corrections |
| October 2021 | 02.00 | New features: RIC Subscription Delete, TNLA Removal. Corrections to all RIC service procedures. Change to ASN.1 version |
| March 2022 | 02.01 | New feature: E2 removal. Editorial and functional corrections |
| July 2022 | 02.02 | Clarification to RIC Service Update, RIC Control. Editorial and functional corrections |
| October 2022 | 02.03 | Editorial and functional corrections |
| March 2023 | 03.00 | New features: RIC Subscription Modification, RIC Query. Clarifications to RIC Subscription. Editorial and functional corrections |
| June 2023 | 03.01 | Alignment of O-RAN Drafting Rules (ODR) in preparation for ETSI PAS submission |
| October 2023 | 04.00 | Clarification on E2 Node components configuration. Editorial and functional corrections |

History

| Document history | | |
|-------------------------|--------------|-------------|
| V4.0.0 | October 2024 | Publication |
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