 ORAN-WG3.E2SM-KPM-v01.00.00

Technical Specification

O-RAN Working Group 3   
Near-Real-time RAN Intelligent Controller

E2 Service Model (E2SM)

KPM

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# Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| Date | Revision | Author | Description |
| 2019.11.25 | 00.00.0 | J. Song | Applied skeleton 00.01.04 to build KPM Monitor E2SM |
| 2019.12.01 | 00.00.1 | J. Song | Applied change from E2SM-NI-v000.01.05 |
| 2019.12.09 | 00.00.2 | J. Song | Removed Policy section, specifies detail list of container IE |
| 2019.12.11 | 00.00.3 | J. Song | Align with E2SM-NI as per comments from A. Urie |
| 2019.12.12 | 00.00.4 | J. Song | Add E2 Node ID, O-CU-CP/O-CU-UP container as per comments from WG3 |
| 2019.12.18 | 00.00.5 | J. Song | Updated Style Type and Format Type definition aligned with Nokia E2SM-NI v00.01.08 |
| 2019.01.14 | 00.00.6 | J. Song | Change name from KPIMON to KPMMON, additional alignment with Nokia E2SM-NI v00.01.08 and ASN.1 message addition |
| 2019.01.16 | 00.00.7 | J. Song | ASN.1 update |
| 2019.01.17 | 00.00.8 | J. Song | Add RIC Style Type in RIC Indication message IE with a corresponding change to the ASN.1 encoding |
| 2019.01.19 | 00.00.9 | J. Song | Change the name to E2SM-KPM, add Action Definition with RIC style list, made section 7.8 update for additional alignment with E2SM-NI, add Annex A. |
| 2019.01.20 | 00.00.10 | J. Song | Update Scope, rename Slice ID to S-NSSAI, add Action Definition to each style definition, remove EPC and 5GC style, add CU-CP EPC style, fix the use of 5QI and QCI for E2 indication header, and correctly reference 28.552 for 5GC IEs |
| 2019.01.20 | 00.00.11 | J. Song | Remove Report Period IE Test Condition and Report Period IE Value from trigger definition and ASN.1. Reference 28.552 for Active UE and PDCP DL/UL data volume |
| 2019.01.22 | 00.00.11a | J. Song | Removed eN-gNB definition |
| 2019.01.22 | 00.00.12 | J. Song | E2SM-KPM-IEs {  iso(1) identified-organization(3) dod(6) internet(1) private(4) enterprise(1) 53148 e2(1) version1 (1) e2sm(2) e2sm-KPM-IEs (2)} |
| 2019.01.22 | 00.00.13 | J. Song | Section 6.1 update, Change E2 Node ID to KPM Node ID |
| 2019.01.22 | 00.00.13a | J. Song | Change E2SM-NI-IndicationMessage to E2SM-KPM-IndicationMessage |
| 2019.01.29 | V01.00 | J. Song | Adopt Jio’s comments, change the number of NR DL/UL PRB from 100 to 273. |

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# 1 Introductory Material

## 1.1 Scope

This Technical Specification has been produced by the O-RAN Alliance.

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

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where:

x the first digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc. (the initial approved document will have x=01).

y the second digit is incremented when editorial only changes have been incorporated in the document.

z the third digit included only in working versions of the document indicating incremental changes during the editing process.

The present document specifies the E2 Service Model (E2SM) “Key Performance Measurement” (KPM) for the RAN function handling the performance measurements for 5G networks including network slicing defined in TS 28.552 [4] but also include the performance measurements for EPC networks including QoS.

# 2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document.

[1] 3GPP TR 21.905: “Vocabulary for 3GPP Specifications”.

[2] O-RAN Working Group 3, Near-Real-time RAN Intelligent Controller, Architecture & E2 General Aspects and Principles (E2GAP)

[3] ORAN WG3, O-RAN Working Group 3, Near-Real-time RAN Intelligent Controller, E2 Application Protocol (E2AP).

[4] 3GPP TS 28.552: "Management and orchestration 5G performance measurements".

[5] ITU-T Recommendation X.680 (2002-07): "Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation".

[6] ITU-T Recommendation X.681 (2002-07): "Information technology – Abstract Syntax Notation One (ASN.1): Information object specification".

[7] ITU-T Recommendation X.691 (2002-07): "Information technology - ASN.1 encoding rules - Specification of Packed Encoding Rules (PER)".

# 3 Definitions and Abbreviations

## 3.1 Definitions

**E2 node**: as defined in E2GAP [2].

**RAN Function**: as defined in E2GAP [2]

**E2 Service Model**: The description of the Services exposed by a specific RAN function within an E2 node over the E2 interface towards the Near-RT RIC.

**KPM Report**: The performance measurements for 4G LTE and 5G NR Network Functions.

## 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply.

O-CU O-RAN Central Unit

O-CU-CP O-RAN Central Unit – Control Plane

O-CU-UP O-RAN Central Unit – User Plane

O-DU O-RAN Distributed Unit

Near-RT RICNear-real-time RAN Intelligent Controller

Non-RT-RIC Non-real-time RAN Intelligent Controller

EN-DC E-UTRA-NR Dual Connectivity

MR-DC Multi-Radio Dual Connectivity

# 4 General

## 4.1 Forwards and Backwards Compatibility

The forwards and backwards compatibility of the protocol is assured by a 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.

## 4.2 Specification Notations

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

Service When referring to a Service in the specification the **SERVICE NAME** is written with upper case characters and in bold followed by the word "service", e.g. **REPORT** service.

Procedure When referring to an elementary procedure in the specification 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 specification 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 specification the *Information Element Name* 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. *E-RAB ID* IE.

Value of an IE When referring to the value of an information element (IE) in the specification the "Value" is written as it is specified in the specification enclosed by quotation marks, e.g. "Value".

## 4.3 Identifiers

For the purposes of the present document, the following identifiers are defined:

Style Type The identifier used to nominate a specific approach or Style used to exposing a given RIC Service (REPORT, INSERT, CONTROL and POLICY). The same E2SM may support more than one Style for each RIC Service.

Format Type The identifier used to nominate a specific formatting approach used to encode one of the E2AP IEs defined in this E2SM. The same E2SM may support more than one encoding Formats for each E2AP IE and each E2AP IE message encoding Format may be used by one or more RIC Service Styles.

# 5 E2SM services

As defined in E2 General Aspects and Principles [2], a given RAN Function offers a set of services to be exposed over the E2 (REPORT, INSERT, CONTROL and/or POLICY) using E2AP [3] defined procedures. Each of the E2AP Procedures listed in table 5-1 contains specific E2 Node RAN Function dependent Information Elements (IEs).

**Table 5-1: Relationship between E2SM services and E2AP Information elements**

|  |  |  |
| --- | --- | --- |
| RAN Function specific E2SM Information Elements | E2AP Information Element reference | Related E2AP Procedures |
| RIC Event Trigger Definition | E2AP [3] section 9.2.9 | RIC SUBSCRIPTION |
| RIC Action Definition | E2AP [3] section 9.2.12 | RIC SUBSCRIPTION |
| RIC Indication Header | E2AP [3] section 9.2.17 | RIC INDICATION |
| RIC Indication Message | E2AP [3] section 9.2.16 | RIC INDICATION |
| RIC Call Process ID | E2AP [3] section 9.2.18 | RIC INDICATION  RIC CONTROL |
| RIC Control Header | E2AP [3] section 9.2.20 | RIC CONTROL |
| RIC Control Message | E2AP [3] section 9.2.19 | RIC CONTROL |
| RAN Function Definition IE | E2AP [3] section 9.2.23 | E2 SETUP  RIC SERVICE UPDATE |

All of these RAN Function specific IEs are defined in E2AP [3] as “OCTET STRING”.

The purpose of this specification is to define the contents of these fields for the specific RAN Function “KPM Monitor”.

# 6 RAN Function Service Model Description

## 6.1 RAN Function Overview

E2 Service Model KPM (E2SM-KPM) supports O-CU-CP, O-CU-UP, O-DU as part of NG-RAN connected to 5GC or as part of E-UTRAN connected to EPC.

The E2 Node shall host the RAN function “KPM Monitor” which performs the following functionalities:

- Exposure of O-DU’s cell-related performance IEs through periodic KPM Report.

- Exposure of O-CU-CP’s UE related performance IEs through periodic KPM Report.

- Exposure of O-CU-UP’s bearer related performance IEs through periodic KPM Report

This E2SM specification provides a set of E2 Node Function exposure services described in clause 6.2 and has been prepared with the assumption that the same E2SM may be used to describe a RAN Function in O-DU, O-CU-CP, and O-CU-UP.

## 6.2 RAN Function exposure services

In this service model only below service is used;

### 6.2.1 REPORT service

The “KPM MONITOR” RAN Function provides selective support of the following **REPORT** services:

- The performance measurement report includes an KPM Node ID and can carry a container or a list of containers for the cell-related measurement IEs, Network Slice related measurement IEs, QoS related measurement IEs and bearer related measurement IEs.

These services may be initiated according to:

- Periodical event.

# 7 RAN Function Description

## 7.1 Description

The E2AP [3] procedures E2 SETUP and RIC SERVICE UPDATE is used to transport the RAN Function Description.

For the specific RAN Function, the *RAN Function Description* IE shall report the following information:

- RAN Function name along with associated information on E2SM definition

- Event trigger styles list along with the corresponding encoding type for each associated E2AP IE.

- RIC REPORT Service styles list along with the corresponding encoding type for each associated E2AP IE.

## 7.2 RAN Function name

RAN Function Short Name “ORAN-E2SM-KPM”

RAN Function name description “KPM monitor.”

RAN Function Instance, required when and if E2 Node exposes more than one instance of a RAN Function based on this E2SM.

## 7.3 Event trigger definition styles

## 7.3.1 RIC Event trigger definition IE style list

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RIC Style Type | Style Name | Supported RIC Service Style | | | Style Description |
| Report | Insert | Policy |
| 1 | Periodic report | 1~6 | - | - | *RIC Event trigger definition* IE based on the report period parameter |

## 7.3.2 RIC Event trigger definition IE style 1: Periodic Report Event

This *RIC Event Trigger Definition* IE style is used to set the KPM report period in E2 Node RAN Function. The measurement IEs in E2 Node Function is based on; Report Period IE, Report Period IE Test Condition and Report Period IE Value.

This *RIC Event Trigger Definition* IE style uses *RIC Event Trigger Definition* IE Format 1 (8.2.1.1.1)

## 7.4 Supported RIC REPORT Service styles

## 7.4.1 REPORT Service style type list

|  |  |  |
| --- | --- | --- |
| RIC Style Type | Style Name | Style Type Description |
| 1 | O-DU Measurement Container for the 5GC connected deployment | Used to send the measurement report for the target O-DU’s cell-related resource IE within the 5GC connected deployment. |
| 2 | O-DU Measurement Container for the EPC connected deployment | Used to send the measurement report for the target O-DU’s cell-related resource IE within the EPC connected deployment. |
| 3 | O-CU-CP Measurement Container for the 5GC connected deployment | Used to send the measurement report for the target O-CU-CP’s bearer-related resource IE within the 5GC connected deployment. |
| 4 | O-CU-CP Measurement Container for the EPC connected deployment | Used to send the measurement report for the target O-CU-CP’s bearer related resource IE within the EPC connected deployment. |
| 5 | O-CU-UP Measurement Container for the 5GC connected deployment | Used to send the measurement report for the target O-CU-UP’s per Interface IEs within the 5GC connected deployment |
| 6 | O-CU-UP Measurement Container for the EPC connected deployment | Used to send the measurement report for the target O-CU-UP’s per Interface IEs within the EPC connected deployment |

## 7.4.2 REPORT Service Style 1: O-DU Measurement for 5GC

#### 7.4.2.1 REPORT Service Style description

The REPORT Service style 1 provides the service status and resource usage information from the target O-DU within the NG-RAN for NR Connected to 5GC.

The collected performance measurement information can be carried in per service pre-defined container or as a transparent container with an associated header IEs providing optional KPM Node ID, Cell Global ID, PLMN ID, S-NSSAI, 5QI.

#### 7.4.2.2 REPORT Service *RIC Action Definition* IE contents

This REPOR**T** Service style type 1 uses the following RAN parameters with *RIC Action Definition* IE Format 1 (8.2.1.1.1) where RIC Style Type is used to request the list of 5GC deployment specific KPM containers in *RIC Indication header* IE:

|  |  |  |
| --- | --- | --- |
| RIC Style Type | Style Name | Style Type Description |
| 1 | O-DU Measurement Container for the 5GC connected deployment | Used to send the measurement report for the target O-DU’s cell-related resource IE within the 5GC connected deployment. |

#### 7.4.2.3 REPORT Service *RIC Indication header* IE contents

REPORT Service *RIC Indication Header* IE contains optional KPM Node ID, Cell Global ID, PLMN ID, S-NSSAI, 5QI.

This REPORT Service style uses *RIC Indication header* IE type 1 (8.2.1.3.1)

#### 7.4.2.4 REPORT Service RIC Indication message IE contents

REPORT Service RIC Indication message IE contains an optional performance measurement container or a transparent container. The performance measurement container can be used to carry the downlink total available PRBs, uplink total available PRBs, and an optional per PLMN DU measurement for the NG-RAN Standard-Alone deployment. The optional transparent container can be used to carry all other cell-related IEs.

This REPORT Service style uses *RIC Indication message* IE Format 1 (8.2.1.4.1)

## 7.4.3 REPORT Service Style 2: O-DU Measurement for EPC

#### 7.4.3.1 REPORT Service Style description

The REPORT Service style 2 provides the service status and performance measurement information from the target O-DU within the multi-connectivity operation using E-UTRA. The collected resource usage information can be carried in per service pre-defined container or as a transparent container with an associated header IEs providing optional KPM Node ID, Cell Global ID, PLMN ID, and QCI.

#### 7.4.3.2 REPORT Service *RIC Action Definition* IE contents

This REPORT Service style type 2 uses the following RAN parameters with *RIC Action Definition* IE Format 1 ([8.2.1.1.1](#_8.2.1.1.1_E2SM-KPM_Event)) where RIC Style Type is used to request the list of EPC deployment specific KPM containers in *RIC Indication header* IE

|  |  |  |
| --- | --- | --- |
| RIC Style Type | Style Name | Style Type Description |
| 2 | O-DU Measurement Container for the EPC connected deployment | Used to send the measurement report for the target O-DU’s cell-related resource IE within the EPC connected deployment. |

#### 7.4.3.3 REPORT Service *RIC Indication header* IE contents

REPORT Service *RIC Indication Header* IE contains optional KPM Node ID, Cell Global ID, PLMN ID, and QCI.

This REPORT Service style uses *RIC Indication header* IE Format 1 ([8.2.1.3.1](#_8.2.1.3.1_E2SM-KPM_Indication))

#### 7.4.3.4 REPORT Service RIC Indication message IE contents

REPORT Service RIC Indication message IE contains an optional performance measurement container or a transparent container. The performance measurement container can be used to carry the downlink total available PRBs, uplink total available PRBs, and an optional per PLMN DU measurement for the E-UTRA-NR Dual Connectivity EPC connected deployment. The optional transparent container can be used to carry all other cell-related IEs.

This REPORT Service style uses *RIC Indication message* IE Format 1 (8.2.1.4.1)

## 7.4.4 REPORT Service Style 3: O-CU-CP Measurement for 5GC

#### 7.4.4.1 REPORT Service Style description

The REPORT Service style 3 provides the service status and performance measurement information from O-CU-CP. The collected resource usage information is carried as a transparent container with an associated header IEs providing optional KPM Node ID, Cell Global ID, PLMN ID, S-NSSAI, and 5QI.

#### 7.4.4.2 REPORT Service *RIC Action Definition* IE contents

This REPORT Service style type 3 uses the following RAN parameters with *RIC Action Definition* IE Format 1 (8.2.1.1.1) where RIC Style Type is used to request the list of 5GC deployment specific KPM containers in *RIC Indication header* IE

|  |  |  |
| --- | --- | --- |
| RIC Style Type | Style Name | Style Type Description |
| 3 | O-CU-CP Measurement Container for the 5GC connected deployment | Used to send the measurement report for the target O-CU-CP’s UE related resource IE within the 5GC connected deployment. |

#### 7.4.4.3 REPORT Service *RIC Indication header* IE contents

REPORT Service *RIC Indication Header* IE contains optional KPM Node ID, Cell Global ID, PLMN ID, Slice ID, and 5QI.

This REPORT Service style 3 uses *RIC Indication header* IE format 1 (8.2.1.3.1)

#### 7.4.4.4 REPORT Service RIC Indication message IE contents

REPORT Service RIC Indication message IE contains an optional performance measurement container or a transparent container. The performance measurement container can be used to carry the number of active UEs. The optional transparent container can be used to carry all other bearer related IEs.

This REPORT Service style uses *RIC Indication message* IE format 1 (8.2.1.4.1)

## 7.4.5 REPORT Service Style 4: O-CU-CP Measurement for EPC

#### 7.4.5.1 REPORT Service Style description

The REPORT Service style 4 provides the service status and performance measurement information from O-CU-CP. The collected resource usage information is carried as a transparent container with an associated header IEs providing optional KPM Node ID, Cell Global ID, PLMN ID, and QCI.

#### 7.4.5.2 REPORT Service *RIC Action Definition* IE contents

This REPORT Service style type 4 uses the following RAN parameters with *RIC Action Definition* IE Format 1 (8.2.1.1.1) where RIC Style Type is used to request the list of EPC deployment specific KPM containers in *RIC Indication header* IE

|  |  |  |
| --- | --- | --- |
| RIC Style Type | Style Name | Style Type Description |
| 4 | O-CU-CP Measurement Container for the EPC connected deployment | Used to send the measurement report for the target O-CU-CP’s UE related resource IE within the EPC connected deployment. |

#### 7.4.5.3 REPORT Service *RIC Indication header* IE contents

REPORT Service *RIC Indication Header* IE contains optional KPM Node ID, Cell Global ID, PLMN ID, and QCI.

This REPORT Service style uses *RIC Indication header* IE format 1 (8.2.1.3.1)

#### 7.4.5.4 REPORT Service RIC Indication message IE contents

REPORT Service RIC Indication message IE contains an optional performance measurement container or a transparent container. The performance measurement container can be used to carry the number of active UEs. The optional transparent container can be used to carry all other bearer related IEs.

This REPORT Service style uses *RIC Indication message* IE format 1 (8.2.1.4.1)

## 7.4.6 REPORT Service Style 5: O-CU-UP Measurement for 5GC

#### 7.4.6.1 REPORT Service Style description

The REPORT Service style 5 provides the service status and performance measurement information from O-CU-UP within the NG-RAN for NR Connected to 5GC.

The collected resource usage information can be carried in per service deployment pre-defined container or as a transparent container with an associated header IEs providing optional KPM Node ID, Cell Global ID, PLMN ID, Slice ID, 5QI,.

#### 7.4.6.2 REPORT Service *RIC Action Definition* IE contents

This REPORT Service style type 5 uses the following RAN parameters with *RIC Action Definition* IE Format 1 (8.2.1.1.1) where RIC Style Type is used to request the list of 5GC deployment specific KPM containers in *RIC Indication header* IE

|  |  |  |
| --- | --- | --- |
| RIC Style Type | Style Name | Style Type Description |
| 5 | O-CU-UP Measurement Container for the 5GC connected deployment | Used to send the measurement report for the target O-CU-UP’s bearer related resource IE within the 5GC connected deployment. |

#### 7.4.6.3 REPORT Service *RIC Indication header* IE contents

REPORT Service *RIC Indication Header* IE contains optional KPM Node ID, Cell Global ID, PLMN ID, Slice ID, 5QI,.

This REPORT Service style uses *RIC Indication header* IE format 1 (8.2.1.3.1)

#### 7.4.6.4 REPORT Service RIC Indication message IE contents

REPORT Service RIC Indication message IE contains an optional performance measurement container or a transparent container. The performance measurement container can be used to carry the CU-UP name, the Interface type, an optional per PLMN O-CU-UP measurement for the NG-RAN 5GC connected deployment. The optional transparent container can be used to carry all other bearer plane related IEs,

This REPORT Service style uses *RIC Indication message* IE format 1 (8.2.1.4.1)

## 7.4.7 REPORT Service Style 6: O-CU-UP Measurement for EPC

#### 7.4.7.1 REPORT Service Style description

The REPORT Service style 6 provides the service status and performance measurement information from O-CU-UP within the multi-connectivity operation using E-UTRA.

The collected resource usage information can be carried in per service deployment pre-defined container or as a transparent container with an associated header IEs providing optional KPM Node ID, Cell Global ID, PLMN ID and QCI.

#### 7.4.7.2 REPORT Service *RIC Action Definition* IE contents

This REPORT Service style type 6 uses the following RAN parameters with *RIC Action Definition* IE Format 1 (8.2.1.1.1) where RIC Style Type is used to request the list of 5GC deployment specific KPM containers in *RIC Indication header* IE

|  |  |  |
| --- | --- | --- |
| 6 | O-CU-UP Measurement Container for the EPC connected deployment | Used to send the measurement report for the target O-CU-UP’s per Interface IEs within the EPC connected deployment |

#### 7.4.7.3 REPORT Service *RIC Indication header* IE contents

REPORT Service *RIC Indication Header* IE contains optional KPM Node ID, Cell Global ID, PLMN ID, and QCI.

This REPORT Service style uses *RIC Indication header* IE format 1 (8.2.1.3.1)

#### 7.4.7.4 REPORT Service RIC Indication message IE contents

REPORT Service RIC Indication message IE contains an optional performance measurement container or a transparent container. The performance measurement container can be used to carry the CU-UP name, the Interface type, an optional per PLMN O-CU-UP measurement for the E-UTRA-NR Dual Connectivity EPC connected deployment. The optional transparent container can be used to carry all other bearer plane related IEs.

This REPORT Service style uses *RIC Indication message* IE format 1 (8.2.1.4.1)

## 7.5 Supported RIC INSERT Service styles

Note: Not used in this service model

## 7.6 Supported RIC CONTROL Service styles

Note: Not used in this service model

## 7.7 Supported RIC POLICY Service styles

Note: Not used in this service model

## 7.8 Supported RIC Service Styles and E2SM IE Formats

Table 7.8-1 and 7.8-2 provide a summary of the E2SM IE Formats defined to support the set of RIC Event Triggers and RIC Service Styles defined in this E2SM specification.

Table 7.8-1: Summary of the E2SM IE encoding Formats defined to support the set of RIC Event Trigger styles

|  |  |
| --- | --- |
| RIC Service and Style | Event Trigger Definition Format |
| Event Trigger | |
| Style 1 | 1 |
|  |  |
|  |  |

Table 7.8-1: Summary of the E2SM IE encoding Formats defined to support the set of RIC Service Styles

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| RIC Service and Style | Action Definition Format | Indication header Format | Indication message Format | Call Process ID Format | Control header Format | Control message Format |
| REPORT | | | | | | |
| Style 1 | 1 | 1 | 1 |  |  |  |
| Style 2 | 1 | 1 | 1 |  |  |  |
| Style 3 | 1 | 1 | 1 |  |  |  |
| Style 4 | 1 | 1 | 1 |  |  |  |
| Style 5 | 1 | 1 | 1 |  |  |  |
| Style 6 | 1 | 1 | 1 |  |  |  |
| INSERT | | | | | | |
| Style 1 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| CONTROL | | | | | | |
| Style 1 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| POLICY | | | | | | |
| Style 1 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

# 8 Elements for E2SM Service Model

## 8.1 General

Sub-clause 8.2 describes the structure of the information elements as required for the E2SM-KPM MONITOR Service Model in tabular format. Sub-clause 8.3 presents individual information elements. Sub-clause 8.4 provides the corresponding ASN.1 definition of each information element.

The following attributes are used for the tabular description of the messages and information elements:

NOTE: The messages have been defined by the guidelines specified in 3GPP TR 25.921 [30].

## 8.2 Message Functional Definition and Content

### 8.2.1 Messages for RIC Functional procedures

#### 8.2.1.1 Near-RT RIC EVENT TRIGGER DEFINITION IE

This information element is part of the RIC SUBSCRIPTION REQUEST message sent by the RIC to an E2 Node and is required for event triggers used to initiate REPORT actions.

Direction: NEAR-RT RIC → E2 Node.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| CHOICE Format |  |  |  |  |
| > E2SM-KPM Event Trigger Definition Format 1 | M |  | 8.2.1.1.1 |  |

##### 8.2.1.1.1 E2SM-KPM Event Trigger Definition Format 1

This Near-RT RIC Event Trigger Definition style allows to select a specific target using:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| Sequence of Trigger Conditions |  | 0.. <maxof Message Protocol Test> |  |  |
| >Report Period IE | M |  | 8.3.28 |  |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxofMessageProtocolTest | Maximum no. of Message Protocol Test in event trigger definition supported by RAN Function. Value is <15>. |

#### 8.2.1.2 RIC ACTION DEFINITION IE

This information element is part of the RIC SUBSCRIPTION REQUEST message sent by the Near-RT RIC to an E2 Node. In this service model, this information element provides additional information for the nominated Action (Report).

Direction: NEAR-RT RIC → E2 Node.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| RIC Style Type | M |  | 8.3.3 |  |

#### 8.2.1.3 RIC INDICATION HEADER

This information element is part of the RIC INDICATION message sent by the E2 Node to the Near-RT RIC node and is required for REPORT action.

Direction: E2 Node → NEAR-RT RIC.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| CHOICE Format |  |  |  |  |
| >E2SM-KPM Indication Header Format 1 | M |  | 8.2.1.3.1 |  |

##### 8.2.1.3.1 E2SM-KPM Indication Header Format 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| KPM Node ID | O |  | 8.3.20 |  |
| Cell Global ID | O |  | 8.3.32 |  |
| PLMN ID | O |  | Served PLMN information [8.3.32] |  |
| Slice ID | O |  | S-NSSAI [8.3.31] |  |
| 5QI | O |  | INTEGER (0..255,...) | 5QI value |
| QCI | O |  | INTEGER (0..255,...) | QCI value |

#### 8.2.1.4 RIC INDICATION MESSAGE IE

This information element is part of the RIC INDICATION message sent by the E2 Node to the Near-RT RIC node and is required for REPORT action.

Direction: E2 Node → NEAR-RT RIC.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| RIC Style Type | M |  | 8.3.3 |  |
| CHOICE Format |  |  |  |  |
| >E2SM-KPM Indication Message Format 1 | M |  | 8.2.1.4.1 |  |

##### 8.2.1.4.1 E2SM-KPM Indication Message Format 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| Sequence of PM Containers |  | 1..<maxofContainers> |  |  |
| >Performance Measurement Container | O |  | 8.3.21 |  |
| >RAN Container | O |  | 8.3.27 |  |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxofContainers | Maximum no. of Performance Measurement Container. Value is 8. |

#### 8.2.1.5 RIC CALL PROCESS ID

Void

Note: Not used in this service model

#### 8.2.1.6 RIC CONTROL HEADER

Void

Note: Not used in this service model

### 8.2.2 Messages for RIC Global Procedures

#### 8.2.2.1 RAN Function Definition IE

This information element is part of the E2 SETUP REQUEST, and RIC SERVICE UPDATE message sent by the E2 Node to a Near-RT RIC node and is used to provide all required information for the Near-RT RIC to determine how a given E2 Node has been configured to support a given RAN Function specific E2SM.

Direction: E2 Node → NEAR-RT RIC.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| RAN Function Name | M |  | 8.3.2 |  |
| Sequence of Event trigger styles |  | 0.. <maxofRICStyles> |  |  |
| >RIC Event Trigger Style Type | M |  |  |  |
| >RIC Event Trigger Style Name | M |  | 8.3.5 |  |
| >RIC Event Trigger Format Type | M |  | 8.3.3 |  |
| Sequence of Report styles |  | 0.. <maxofRICStyles> |  |  |
| >RIC Report Style Type | M |  | 8.3.3 |  |
| >RIC Report Style Name | M |  | 8.3.4 |  |
| >RIC Indication Header Format Type | M |  | 8.3.5 | Indication header type used by Report style |
| >RIC Indication Message Format Type | M |  | 8.3.5 | Indication message type used by Report style |

Note: In this service model RIC Action definition service is not used.

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxofRICstyle | Maximum no. of Style of Report, Insert, Control or Policy actions supported by RAN Function. The value is 63. |

## 8.3 Information Element definitions

### 8.3.1 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.

### 8.3.2 RAN Function name

This IE defines the Name of a Style with a given Style ID.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| RAN Function Short Name | M |  | PrintableString(SIZE(1..150,...)) | KPM |

### 8.3.3 RIC Style Type

This IE defines the required Style ID.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| RIC Style Type | M |  | INTEGER |  |

### 8.3.4 RIC Style Name

This IE defines the Name of a Style with a given Style ID.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| RIC Style Name | M |  | PrintableString(SIZE(1..150,...)) |  |

### 8.3.5 RIC Format Type

This IE defines the Identifier of a given *RIC Type ID* IE.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| RIC Format Type | M |  | INTEGER (1..256) | . |

Note: 8.3.6 ~ 8.3.19 is reserved

### 8.3.20 KPM Node ID

This IE is used to globally identify an E2 node that provides KPM report.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| CHOICE *KPM node* | M |  |  |  |
| *>gNB* |  |  |  |  |
| >>Global gNB ID | M |  | 3GPP 38.423 clause 9.2.2.1 |  |
| >>gNB-CU-UP ID | O |  | 3GPP 38.463 clause 9.3.1.15 |  |
| >>gNB-DU ID | O |  | 3GPP 38.473 clause 9.3.1.9 |  |
| >en-gNB |  |  |  |  |
| >>Global en-gNB ID |  |  | 3GPP 36.423 clause 9.2.112 |  |
| >*ng-eNB* |  |  |  |  |
| >>Global ng-eNB ID | M |  | 3GPP 38.423 clause 9.2.2.2 |  |
| >eNB |  |  |  |  |
| >>Global eNB ID | M |  | 3GPP 36.423 clause 9.2.22 |  |

### 8.3.21 Performance Measurement Container

This IE indicates the RAN Container lists.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| CHOICE *RAN Container* | M |  |  |  |
| *>O-DU Performance Measurement Container* | O |  | 8.3.21a |  |
| > *O-CU-CP Performance Measurement Container* | O |  | 8.3.21b |  |
| > *O-CU-UP Performance Measurement Container* | O |  | 8.3.21c |  |

### 8.3.21a O-DU Performance Measurement Container

This IE defines per DU measurement Performance Measurement Container IE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| **CellResourceReportList** |  | *1* |  |  |
| **>CellResourceReportItem** |  | *1 .. <maxCellingNBDU>* |  |  |
| >>Cell Global ID | M |  | 8.3.32 | NR CGI |
| >>DL\_TotalofAvailablePRBs | O |  | INTEGER(0..273) | TS 28.552 (Section 5.1.1.2.6, DL total available PRB) during reported E2 period |
| >>UL\_TotalofAvailablePRBs | O |  | INTEGER(0..273) | TS 28.552 (Section 5.1.1.2.8 UL total available PRB) during reported E2 period |
| >>**ServedPlmnPerCellList** |  | *1* |  |  |
| >>>**ServedPlmnPerCellListItem** |  | *1 .. <maxnoofBPLMNs>* |  |  |
| >>>>PLMN Identity | M |  | 8.3.32 | Served PLMN information |
| *>>>>DUMeasurementFormatFor5GC* | O |  | 8.3.22 | Used for 5GC traffic |
| *>>>>DUMeasurementFormatForEPC* | O |  | 8.3.23 | Used for EPC traffic |

### 8.3.21b O-CU-CP Performance Measurement Container

This IE defines per O-CU-CP measurement Performance Measurement Container IE.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **IE/Group Name** | **Presence** |  | **Range** | **IE type and reference** | **Semantics descriptio7n** |
| CU-CP Name | O |  |  |  | CU-CP Name |
| **CU-CP Resource Status** |  |  | *1* |  |  |
| >Number of Active UEs - | O |  |  | INTEGER (1..65536,...) | TS 28.552 (Section 5.1.1.4.1) The mean number of RRC connections” during the monitoring period |

### 8.3.21c O-CU-UP Performance Measurement Container

This IE defines per O-CU-UP measurement Performance Measurement Container IE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **IE/Group Name** | **Presence** | **Range** | **IE type and reference** | **Semantics description** |
| CU-UP Name | O |  |  | CU-UP Name to distinguish CU-UP within a gNB |
| **Container List** |  | 1 |  |  |
| **>ContainerListItem** |  | 1..< maxnoofContainerListItems> |  |  |
| >>InterfaceType | M |  | ENUMERATED (F1U,Xn-U,X2-U…) |  |
| >>CUUPMeasurementContainer | M |  |  | 8.3.24 |

|  |  |
| --- | --- |
| **Range bound** | **Explanation** |
| maxnoofContainerListItems | Maximum no. Interface, the maximum value is 3. |

### 8.3.22 O-DU Measurement Container Format for 5GC

This IE defines per DU measurement Performance Measurement Container IE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| **SlicesPerPlmnPerCellList** |  | *1* |  |  |
| >**SlicesPerPlmnPerCellListItem** |  | *1..<maxnoofSliceItems>* |  |  |
| >>SliceID | M |  | 8.3.31 | S-NSSAI |
| >>**5QIPerSlicesPerPlmnPerCellList** |  | *1* |  |  |
| >>>**5QIPerSlicesPerPlmnPerCellListItem** |  | *1 .. <maxnoofQoSFlows>* |  | Bounded by Max QoSFlows in a PDU session |
| >>>>5QI | M |  | INTEGER (0..255,...) | 5QI value |
| >>>>DL\_PRBUsage | O |  | INTEGER(0..273) | TS 28.552 (Section 5.1.1.2.5, DL PRB used for data traffic) monitored for slice during E2 reporting period |
| >>>>UL\_PRBUsage | O |  | INTEGER(0..273) | TS 28.552 (Section 5.1.1.2.7 UL PRB used for data traffic) monitored for slice during E2 reporting period |

|  |  |
| --- | --- |
| **Range bound** | **Explanation** |
| maxnoofSliceItems | Maximum no. of signaled slice support items. The value is 1024. |

|  |  |
| --- | --- |
| **Range bound** | **Explanation** |
| maxnoofQoSFlows | Maximum no. of flows allowed to be mapped to one DRB, the maximum value is 64. |

### 8.3.23 O-DU Measurement Container Format for EPC

This IE defines per DU measurement Performance Measurement Container IE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| **PerQciReportList** |  | *1* |  |  |
| **>PerQciReportListItem** |  | *1 .. <maxnoofQCI >* |  |  |
| >>QCI | M |  | INTEGER (0..255,...) | QCI value |
| >>DL\_PRBUsage | O |  | INTEGER(0..100) | Used number of PRBs in an average of DL for the monitored slice during E2 reporting period |
| >>UL\_PRBUsage | O |  | INTEGER(0..100) | Used number of PRBs in an average of UL for the monitored slice during E2 reporting period |

|  |  |
| --- | --- |
| **Range bound** | **Explanation** |
| *maxnoofQCI* | Maximum no. of signaled QCI support items. The value is 256. |

### 8.3.24 O-CU-UP Measurement Container

This IE defines per O-CU-UP measurement Performance Measurement Container IE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **IE/Group Name** | **Presence** | **Range** | **IE type and reference** | **Semantics description** |
| **PlmnList** |  | *1* |  |  |
| **>PlmnListItem** |  | *1 .. <maxPLMN>* |  |  |
| >>PLMN Identity | M |  | 8.3.32 | Served PLMN information |
| *>>CUUPMeasurementFormatFor5GC* | O |  | 8.3.25 | Used for 5GC traffic (i.e., F1U or Xn) |
| *>>CUUPMeasurementFormatForEPC* | O |  | 8.3.26 | Used for EPC traffic (i.e., F1U or X2) |

|  |  |
| --- | --- |
| **Range bound** | **Explanation** |
| *maxnoofQCI* | Maximum number of PLMNs broadcast and reported by UE at the establishment, value 12. |

### 8.3.25 O-CU-UP measurement report format for 5GC

This IE defines per O-CU-UP measurement Performance Measurement Container IE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **IE/Group Name** | **Presence** | **Range** | **IE type and reference** | **Semantics description** |
| SlicesToReportList |  |  |  |  |
| >SlicesToReportListItem |  | *1 .. <maxnoofSliceList>* |  |  |
| >>SliceID | M |  | 8.3.31 | S-NSSAI |
| >>5QIPerSlicesPerPlmnList |  | *1* |  |  |
| >>>5QIPerSlicesPerPlmnListItem |  | *1 .. <maxnoofQoSFlows >* |  | Bounded by Max QoSFlows in a PDU session |
| >>>>5QI | M |  | INTEGER (0..255,...) | 5QI value |
| >>>>PDCPBytesDL | O |  | INTEGER (0..10,000,000,000,...) | total PDCP bytes transmitted DL during the reporting period (kbytes) |
| >>>>PDCPBytesUL | O |  | INTEGER (0..10,000,000,000,...) | total PDCP bytes transmitted UL during the report period (kbytes) |

### 8.3.26 O-CU-UP measurement report format for EPC

This IE defines per O-CU-UP measurement Performance Measurement Container IE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **IE/Group Name** | **Presence** | **Range** | **IE type and reference** | **Semantics description** |
| **PerQciReportList** |  | *1* |  |  |
| **>PerQciReportListItem** |  | *1 .. <maxnoofQCI >* |  |  |
| >>QCI | M |  | INTEGER (0..255,...) | QCI value |
| >>PDCPBytesDL | O |  | INTEGER (0..10,000,000,000,...) | DL PDCP SDU Data Volume (28.552 section 5.1.3.6.2.1) measured “above” PDCP (Mbits) |
| >>PDCPBytesUL | O |  | INTEGER (0..10,000,000,000,...) | UL PDCP SDU Data Volume (28.552 section 5.1.3.6.2.2) in the uplink delivered from PDCP layer to SDAP layer during the report period (Mbits) |

### 8.3.27 RAN Container

This IE defines the transparent RAN Container IE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| RAN Container | O |  | OCTET STRING |  |

### 8.3.28 Report Period IE

This IE defines the Report Period ID

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| Report Period IE | M |  | ENUMERATED (10ms, 20ms, 32ms, 40ms, 60ms, 70ms, 128ms,160ms, 256ms, 320ms, 512ms, 640ms, 1024ms, 1280ms, 2048ms, 2560ms, 5120ms, 10240ms, …) |  |

### 8.3.29 Report Period IE Test Condition

Void

Note: Not used in this service model

### 8.3.30 Report Period IE Value

Void

Note: Not used in this service model

### 8.3.31 S-NSSAI

This IE indicates the S-NSSAI.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **IE/Group Name** | **Presence** | **Range** | **IE type and reference** | **Semantics description** |
| SST | M |  | OCTET STRING (SIZE(1)) |  |
| SD | O |  | OCTET STRING (SIZE(3)) |  |

### 8.3.32 PLMN Identity

This information element indicates the PLMN Identity.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **IE/Group Name** | **Presence** | **Range** | **IE type and reference** | **Semantics description** |
| PLMN Identity | M |  | OCTET STRING (SIZE(3)) | - digits 0 to 9, encoded 0000 to 1001,  - 1111 used as filler digit,  two digits per octet,  - bits 4 to 1 of octet n encoding digit 2n-1  - bits 8 to 5 of octet n encoding digit 2n  -The PLMN identity consists of 3 digits from MCC followed by either  -a filler digit plus 2 digits from MNC (in case of 2 digit MNC) or  -3 digits from MNC (in case of a 3 digit MNC). |

### 8.3.32 NR CGI

This IE is used to globally identify an NR cell (see TS 38.300 [8]).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| PLMN Identity | M |  | 9.3.3.5 |  |
| NR Cell Identity | M |  | BIT STRING (SIZE(36)) | The leftmost bits of the *NR* *Cell Identity* IE correspond to the gNB ID (defined in subclause 9.3.1.6). |

## 8.4 Information Element Abstract Syntax (with ASN.1)

### 8.4.1 General

E2SM-KPM ASN.1 definition conforms to ITU-T Rec. X.680 [5] and ITU-T Rec. X.681 [6].

Sub clause 8.4.2 presents the Abstract Syntax of the E2SM information elements to be carried within the E2AP [3] protocol messages with ASN.1. In case there is contradiction between the ASN.1 definition in this sub clause and the tabular format in sub clause 8.2 and 8.3, the ASN.1 shall take precedence, except for the definition of conditions for the presence of conditional elements, in which the tabular format shall take precedence.

If an E2SM information element carried as an OCTET STRING in an E2AP [3] 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 9.

### 8.4.2 Information Element definitions

-- ASN1START

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- E2SM-KPM

-- Information Element Definitions

--

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

E2SM-KPM-IEs {

iso(1) identified-organization(3) dod(6) internet(1) private(4) enterprise(1) 53148 e2(1) version1 (1) e2sm(2) e2sm-KPMMON-IEs (2)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- IEs

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

GlobalKPMnode-ID ::= CHOICE{

gNB GlobalKPMnode-gNB-ID,

en-gNB GlobalKPMnode-en-gNB-ID,

ng-eNB GlobalKPMnode-ng-eNB-ID,

eNB GlobalKPMnode-eNB-ID,

...

}

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

GlobalKPMnode-gNB-ID ::= SEQUENCE{

global-gNB-ID GlobalgNB-ID,

gNB-CU-UP-ID GNB-CU-UP-ID OPTIONAL,

gNB-DU-ID GNB-DU-ID OPTIONAL,

...

}

GlobalgNB-ID ::= SEQUENCE {

plmn-id PLMN-Identity,

gnb-id GNB-ID-Choice,

...

}

GNB-CU-UP-ID ::= INTEGER (0..68719476735)

GNB-DU-ID ::= INTEGER (0..68719476735)

GNB-ID-Choice ::= CHOICE {

gnb-ID BIT STRING (SIZE(22..32)),

...

}

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

GlobalKPMnode-en-gNB-ID ::= SEQUENCE{

global-gNB-ID GlobalenGNB-ID,

...

}

GlobalenGNB-ID ::= SEQUENCE {

pLMN-Identity PLMN-Identity,

gNB-ID ENGNB-ID,

...

}

ENGNB-ID ::= CHOICE {

gNB-ID BIT STRING (SIZE (22..32)),

...

}

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

GlobalKPMnode-ng-eNB-ID ::= SEQUENCE{

global-ng-eNB-ID GlobalngeNB-ID,

...

}

GlobalngeNB-ID ::= SEQUENCE {

plmn-id PLMN-Identity,

enb-id ENB-ID-Choice,

...

}

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)),

...

}

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

GlobalKPMnode-eNB-ID ::= SEQUENCE{

global-eNB-ID GlobalENB-ID,

...

}

GlobalENB-ID ::= SEQUENCE {

pLMN-Identity PLMN-Identity,

eNB-ID ENB-ID,

...

}

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))

}

NRCGI ::= SEQUENCE {

pLMN-Identity PLMN-Identity,

nRCellIdentity NRCellIdentity

}

PLMN-Identity ::= OCTET STRING (SIZE(3))

NRCellIdentity ::= BIT STRING (SIZE(36))

SNSSAI ::= SEQUENCE {

sST OCTET STRING (SIZE(1)),

sD OCTET STRING (SIZE(3)) OPTIONAL

}

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

--

-- Lists

--

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

maxofMessageProtocolTests INTEGER ::= 15

maxofRICstyles INTEGER ::= 63

maxnoofQCI INTEGER ::= 256

maxnoofQoSFlows INTEGER ::= 64

maxnoofSliceItems INTEGER ::= 1024

maxnoofContainerListItems INTEGER ::= 3

maxCellingNBDU INTEGER ::= 512

maxofContainers INTEGER ::= 8

maxPLMN INTEGER ::= 12 -- Maximum number of PLMNs broadcast and reported by UE at establisghment

RIC-Style-Type ::= INTEGER

RIC-Style-Name ::= PrintableString(SIZE(1..150,...))

RIC-Format-Type ::= INTEGER

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- E2SM-KPM Service model IEs

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- Event Trigger Definition OCTET STRING contents

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- E2SM-KPM-EventTriggerDefinition IE

E2SM-KPM-EventTriggerDefinition ::= CHOICE{

eventDefinition-Format1 E2SM-KPM-EventTriggerDefinition-Format1,

...

}

-- E2SM-KPM-EventTriggerDefinition IE is used for Event Trigger Definition Format 1

E2SM-KPM-EventTriggerDefinition-Format1 ::= SEQUENCE{

policyTest-List SEQUENCE (SIZE(1..maxofMessageProtocolTests)) OF Trigger-ConditionIE-Item OPTIONAL,

...

}

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- Action Definition OCTET STRING contents

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- E2SM-KPM-ActionDefinition IE

E2SM-KPM-ActionDefinition ::= SEQUENCE{

ric-Style-Type RIC-Style-Type,

...

}

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- Indication Header OCTET STRING contents

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- E2SM-KPM-IndicationHeader IE

E2SM-KPM-IndicationHeader ::= CHOICE{

indicationHeader-Format1 E2SM-KPM-IndicationHeader-Format1,

...

}

-- E2SM-KPM-IndicationHeader Format 1

E2SM-KPM-IndicationHeader-Format1 ::= SEQUENCE{

id-GlobalKPMnode-ID GlobalKPMnode-ID OPTIONAL,

nRCGI NRCGI OPTIONAL,

pLMN-Identity PLMN-Identity OPTIONAL,

sliceID SNSSAI OPTIONAL,

fiveQI INTEGER (0..255) OPTIONAL,

qci INTEGER (0..255) OPTIONAL,

...

}

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- Indication Message OCTET STRING contents

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- E2SM-KPM-IndicationMessage IE

E2SM-KPM-IndicationMessage ::= CHOICE{

ric-Style-Type RIC-Style-Type,

indicationMessage-Format1 E2SM-KPM-IndicationMessage-Format1,

...

}

-- E2SM-KPM-IndicationMessage-Format 1 IE

E2SM-KPM-IndicationMessage-Format1 ::= SEQUENCE{

pm-Containers SEQUENCE (SIZE(1..maxCellingNBDU)) OF PM-Containers-List,

...

}

PM-Containers-List ::= SEQUENCE{

performanceContainer PF-Container OPTIONAL,

theRANContainer RAN-Container OPTIONAL,

...

}

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- RAN Function Description OCTET STRING contents

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- E2SM-KPM-RANfunction-Description

E2SM-KPM-RANfunction-Description ::= SEQUENCE{

ranFunction-Name RANfunction-Name,

e2SM-KPM-RANfunction-Item SEQUENCE{

ric-EventTriggerStyle-List SEQUENCE (SIZE(1..maxofRICstyles)) OF RIC-EventTriggerStyle-List OPTIONAL,

ric-ReportStyle-List SEQUENCE (SIZE(1..maxofRICstyles)) OF RIC-ReportStyle-List OPTIONAL,

...

},

...

}

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- commmon IEs

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

NI-Type ::= ENUMERATED{

x2-u,

xn-u,

f1-u,

...

}

RAN-Container ::= OCTET STRING

Trigger-ConditionIE-Item ::= SEQUENCE{

report-Period-IE RT-Period-IE,

...

}

RT-Period-IE ::= ENUMERATED{ ms10, ms20, ms32, ms40, ms60, ms64, ms70, ms80, ms128, ms160, ms256, ms320, ms512, ms640, ms1024, ms1280, ms2048, ms2560, ms5120, ms10240, ...}

RANcallProcess-ID-string ::= PrintableString(SIZE(1..150,...))

RANfunction-Name ::= SEQUENCE{

ranFunction-ShortName PrintableString(SIZE(1..150,...)),

ranFunction-E2SM-OID PrintableString(SIZE(1..1000,...)),

ranFunction-Description PrintableString(SIZE(1..150,...)),

ranFunction-Instance INTEGER OPTIONAL,

...

}

RIC-EventTriggerStyle-List ::= SEQUENCE{

ric-EventTriggerStyle-Type RIC-Style-Type,

ric-EventTriggerStyle-Name RIC-Style-Name,

ric-EventTriggerFormat-Type RIC-Format-Type,

...

}

RIC-ReportStyle-List ::= SEQUENCE{

ric-ReportStyle-Type RIC-Style-Type,

ric-ReportStyle-Name RIC-Style-Name,

ric-IndicationHeaderFormat-Type RIC-Format-Type,

ric-IndicationMessageFormat-Type RIC-Format-Type,

...

}

PF-Container ::= CHOICE {

oDU ODU-PF-Container,

oCU-CP OCUCP-PF-Container,

oCU-UP OCUUP-PF-Container

}

GNB-CU-CP-Name ::= PrintableString(SIZE(1..150,...))

GNB-DU-Name ::= PrintableString(SIZE(1..150,...))

GNB-CU-UP-Name ::= PrintableString(SIZE(1..150,...))

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- O-DU Container IEs

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

ODU-PF-Container ::= SEQUENCE{

cellResourceReportList SEQUENCE (SIZE(1..maxCellingNBDU)) OF CellResourceReportListItem,

...

}

CellResourceReportListItem ::= SEQUENCE{

nRCGI NRCGI,

dl-TotalofAvailablePRBs INTEGER (0..273) OPTIONAL,

ul-TotalofAvailablePRBs INTEGER (0..273) OPTIONAL,

servedPlmnPerCellList SEQUENCE (SIZE(1..maxPLMN)) OF ServedPlmnPerCellListItem,

...

}

ServedPlmnPerCellListItem ::= SEQUENCE{

pLMN-Identity PLMN-Identity,

du-PM-5GC FGC-DU-PM-Container OPTIONAL,

du-PM-EPC EPC-DU-PM-Container OPTIONAL,

...

}

FGC-DU-PM-Container ::= SEQUENCE{

slicePerPlmnPerCellList SEQUENCE (SIZE(1..maxnoofSliceItems)) OF SlicePerPlmnPerCellListItem,

...

}

SlicePerPlmnPerCellListItem ::= SEQUENCE{

sliceID SNSSAI,

fQIPERSlicesPerPlmnPerCellList SEQUENCE (SIZE(1..maxnoofQoSFlows)) OF FQIPERSlicesPerPlmnPerCellListItem,

...

}

FQIPERSlicesPerPlmnPerCellListItem ::= SEQUENCE{

fiveQI INTEGER (0..255),

dl-PRBUsage INTEGER (0..273) OPTIONAL,

ul-PRBUsage INTEGER (0..273) OPTIONAL,

...

}

EPC-DU-PM-Container ::= SEQUENCE{

perQCIReportList SEQUENCE (SIZE(1..maxnoofQCI)) OF PerQCIReportListItem,

...

}

PerQCIReportListItem ::= SEQUENCE{

qci INTEGER (0..255),

dl-PRBUsage INTEGER (0..100) OPTIONAL,

ul-PRBUsage INTEGER (0..100) OPTIONAL,

...

}

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- O-CUCP Container IEs

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

OCUCP-PF-Container ::= SEQUENCE{

gNB-CU-CP-Name GNB-CU-CP-Name OPTIONAL,

cu-CP-Resource-Status SEQUENCE {

numberOfActive-UEs INTEGER (1..65536, ...) OPTIONAL

}

}

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- O-CU-UP Container IEs

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

OCUUP-PF-Container ::= SEQUENCE{

gNB-CU-UP-Name GNB-CU-UP-Name OPTIONAL,

pf-ContainerList SEQUENCE (SIZE(1..maxnoofContainerListItems)) OF PF-ContainerListItem,

...

}

PF-ContainerListItem ::= SEQUENCE{

interface-type NI-Type,

o-CU-UP-PM-Container CUUPMeasurement-Container,

...

}

CUUPMeasurement-Container ::= SEQUENCE{

plmnList SEQUENCE (SIZE(1.. maxPLMN)) OF PlmnID-List,

...

}

PlmnID-List ::= SEQUENCE{

pLMN-Identity PLMN-Identity,

cu-UP-PM-5GC FGC-CUUP-PM-Format OPTIONAL,

cu-UP-PM-EPC EPC-CUUP-PM-Format OPTIONAL,

...

}

FGC-CUUP-PM-Format ::= SEQUENCE{

sliceToReportList SEQUENCE (SIZE(1..maxnoofSliceItems)) OF SliceToReportListItem,

...

}

SliceToReportListItem ::= SEQUENCE{

sliceID SNSSAI,

fQIPERSlicesPerPlmnList SEQUENCE (SIZE(1..maxnoofQoSFlows)) OF FQIPERSlicesPerPlmnListItem,

...

}

FQIPERSlicesPerPlmnListItem ::= SEQUENCE{

fiveQI INTEGER (0..255),

pDCPBytesDL INTEGER (0..10000000000,...) OPTIONAL,

pDCPBytesUL INTEGER (0..10000000000,...) OPTIONAL,

...

}

EPC-CUUP-PM-Format ::= SEQUENCE{

perQCIReportList SEQUENCE (SIZE(1..maxnoofQCI)) OF PerQCIReportListItemFormat,

...

}

PerQCIReportListItemFormat ::= SEQUENCE{

qci INTEGER (0..255),

pDCPBytesDL INTEGER (0..10000000000,...) OPTIONAL,

pDCPBytesUL INTEGER (0..10000000000,...) OPTIONAL,

...

}

END

-- ASN1STOP

# 9 Handling of Unknown, Unforeseen and Erroneous Protocol Data

Section 10 of TS 36.413 [4] is applicable for the purposes of the present document.

# Annex A Further information on RAN Function Network KPM Monitor

## A.1 Background Information

The RAN function “Key Performance Measurement” is used to provide RIC Service exposure of the performance measurement logical function of the E2 Nodes. Based on the O-RAN deployment architecture, the key performance measurement IEs could be different. Figure A.1-1 shows the target deployment architecture for E2SM-KPM.

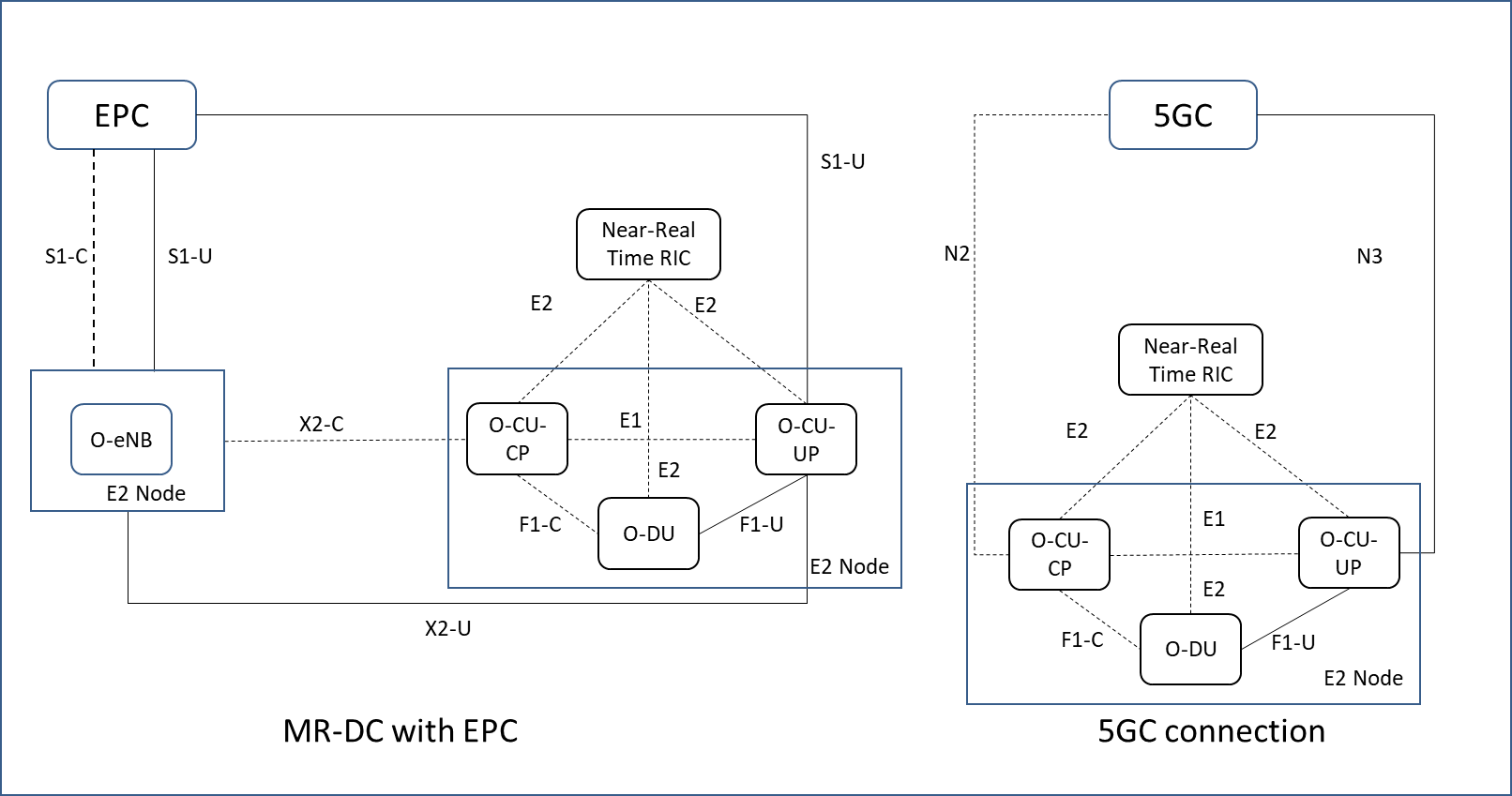


Figure A.1-1 E2SM-KPM Architecture

For each logical function the E2 Node shall use the RAN Function Description to declare the list of supported Network Interfaces and the corresponding set of supported RIC Services (**REPORT**) and for each supported RIC Service the list of supported Styles.

Each Performance Measurement Report is uniquely identified by:

- Implicitly by KPM Node ID and RAN Function ID or explicitly by RIC Style Type and Action Definition

Furthermore, it is assumed that a given E2 Node could support both EN-DC with EPC as well as 5GC connected deployment models. In that case E2 node may sends multiple containers that have the performance measurements from the EN-DC with EPC and 5GC connected deployment models.

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