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E2AP
接口设计方案

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修订记录

日期	作者	审核	修订说明	备注
2020.06.29	彭红燕		初稿	
2020.09.24	彭红燕		1. 新增了 2 种 RIC REPORT Service style：O-CU-UP UE Measurement、O-DU UE Measurement 2. 新增了 8 种 RIC Control Service style：O-CU-CP Report Cell Configuration、O-CU-UP Report Cell Configuration、O-DU Report Cell Configuration、O-CU-CP Configurated Cell Configuration、O-CU-UP Configurated Cell Configuration、O-DU Configurated Cell Configuration、O-CU-UP Report UE Measurement、O-DU Report UE Measurement 3. 新增了 3 种用于触发 UE 级事件的 Event Trigger Definition Format 4. 新增了 IE Definition，包括：Cell Measurement Related IEs、UE Measurement Related IEs、Cell Configuration Related IEs、Mobility Related IEs、RB Related IEs	
2021.01.27	彭红燕		新增 ASN.1 描述符章节	
2021.02.02	彭红燕		1. 添加 E2SM-TS 章节部分小节的描述，增强文档的可读性。 2. 修复 ASN.1 描述符的 Bug。	

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1.1 文档目的

1.2 参考文档

[1] ORAN-WG3.RICARCH-v01.00

[2] ORAN-WG3.E2GAP-v01.00

[3] ORAN-WG3.E2AP-v01.00

[4] ORAN-WG3.E2SM-v01.00

[5] ORAN-WG3.E2SM-KPM-v01.00

[6] O-RAN Near-RT RIC 原型基础版本技术规范书

1.3 术语与缩略语

术语或缩略语	解 释
CU	Central Unit
CU-CP	Central Unit – Control Plane
CU-UP	Central Unit – User Plane
DU	Distributed Unit
E2AP	E2 Application Protocol
E2SM	E2 Service Model
Near-RT RIC	Near-Real-Time RAN Intelligent Controller
TS	Traffic Steering
TS RANF	Traffic Steering RAN Function
NR CGI	NR Cell Global Identifier

1.4 说明

若无特殊说明，本文中提及的 RIC 指的是 Near-RT RIC。

2. 设计原则和设计依据

2.1 设计原则

2.1.1 可扩展性原则

为了便于后续扩展，设计过程中遵循系统网络架构的可扩展性原则，包括 CU/DU 分离、CU-CP/CU-UP 的分离。

2.1.2 遵循协议

E2 接口过程和消息的实现遵循 O-RAN-WG3.E2AP 规范。涉及 Traffic Steering 用例的 E2SM IE 采用自定义，定义格式参考协议 O-RAN-WG3.E2SM。

2.2 设计依据

中国移动通信有限公司研究院《O-RAN Near-RT RIC 原型基础版本技术规范书》。

3. 主要功能与性能指标要求

3.1 主要功能

本次设计的功能如下：

- E2AP 相关部分
  - SCTP 链路建立与维护
  - E2AP ASN.1 编解码
  - E2 建立/错误指示/重置
  - RIC 服务更新
  - RIC 订阅/删除订阅
  - RIC 指示
  - RIC 控制
- 用例相关部分
  - O-CUCP 小区负载状态信息上报
  - O-CUUP 小区负载状态信息上报
  - O-DU 小区负载状态信息上报
  - UE 测量报告上报
  - 执行 UE 迁移命令

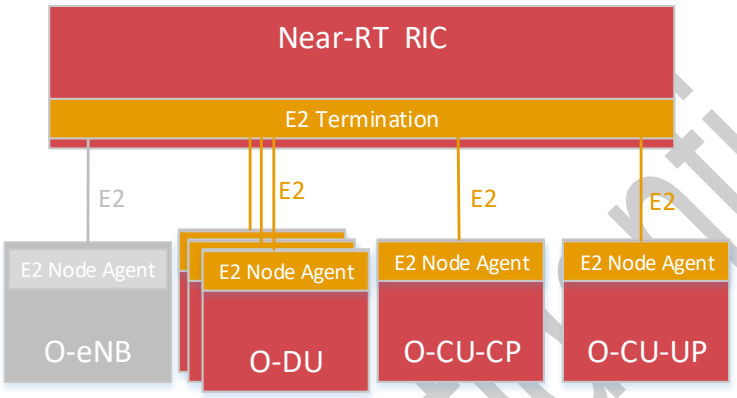
3.2 主要性能指标

//打通 O-RAN 与 Near-RT RIC 之间的环路。

3.3 使用要求

4. 系统架构设计

4.1 系统体系架构



4.2 系统体系架构概述

Near-RT RIC 与基站之间通过 E2 接口进行通信。

在 Near-RT RIC 侧，由 E2 Termination 模块负责 E2AP 的相关功能；在基站侧，由 E2 Node Agent 模块负责 E2AP 的相关功能。

为了兼容一体化、CU/DU 分离和 CU-CP/CU-UP/DU 全分离的基站架构模型，O-DU、O-CU-CP 和 O-CU-UP 分别与 Near-RT RIC 建立 E2 连接，Near-RT RIC 与 O-DU、O-CU-CP、O-CU-UP 之间的 E2 相关过程相互独立，互不影响。

为了满足可扩展性原则，本方案在设计 Traffic Steering 的 E2 Service Mode 时，基于 CU-CP/CU-UP/DU 全分离模型进行定义。

由于本方案的设计重点是定义 Traffic Steering 的 E2SM，因此接下来将首先介绍 Traffic Steering 的 E2SM 设计，然后再基站侧对 E2 过程消息的处理进行说明。最后一章，详细定义了 E2SM-TS 相关 IE，以供查阅。

在本文后续部分，若无特别说明，Near-RT RIC 仅包含 E2 Termination 模块的相关功能。

5. E2SM-TS

5.1 概述

Near-RT RIC 与 E2 Node 通信时，RIC 服务相关的消息封装成 E2SM Container，由 E2AP 过程中的消息携带到对端。其中，E2 Node 表示 O-CU-CP、O-CU-UP 或 O-DU。E2AP 消息与其携带的 E2SM-TS IE 的关系如表格 5-1 所示：

表 5-1 E2AP 消息与其携带的 E2SM Container 关系图

E2AP 消息	E2SM IE
E2 SETUP、RIC SERVICE UPDATE	RAN Function Definition
RIC SUBSCRIPTION	RIC Event Trigger Definition
RIC SUBSCRIPTION	RIC Action Definition
RIC INDICATION	RIC Indication Header
RIC INDICATION	RIC Indication Message
RIC CONTROL	RIC Control Header
RIC CONTROL	RIC Control Message

通过 E2AP 建立过程或 RIC 服务更新过程，E2 Node 将其所支持的 RAN 功能通过 RAN Function Definition IE 告诉 Near-RT RIC，后续 Near-RT RIC 根据该信息发起 RIC 订阅过程或 RIC 控制过程。

E2SM-TS 涉及的 RIC 服务包括：

1） Report Service

- TS RANF 的 Report 服务提供了上报小区负载状态信息和 UE 测量报告的服务。
- 该服务支持两种触发条件：周期性触发和事件性触发。

2） Control Service

- TS RANF 的 Control 服务提供了实时上报小区负载状态信息、UE 测量报告、执行 UE 迁移命令等服务。
- 该服务由 Near-RT RIC 触发。

3） Policy Service

第一阶段不支持。

在本章接下来的内容中，将定义 E2SM-TS 的 RAN Function Definition，RIC 事件触发样式，RIC 上报服务样式，RIC 控制服务样式。

5.2 RAN Function Definition

对于 TS RANF 而言，RAN Function Definition 包括以下信息：

1） RAN Function Name。

2） E2 Node 支持的 RIC 事件触发样式列表信息。

3） E2 Node 支持的 RIC 上报服务样式列表信息。

4） E2 Node 支持的 RIC 控制服务样式列表信息。

5.2.1 RAN Function Definition IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RAN Function Name	M		RAN Function Name 8.2.1	ORAN-E2SM-TrafficSteering
Sequence of Event trigger styles		0.. <maxofRICstyles>		
> RIC Event Trigger Style Type	M		RIC Style Type 8.2.2	ID of RIC Event trigger style
> RIC Event Trigger Style Name	M		RIC Style Name 8.2.3	Name of RIC Event trigger style
> RIC Event Trigger Format Type	M		RIC Format Type 8.2.4	RIC Event trigger format used by RIC Event Trigger Definition IE in RIC Event Subscription.
> **Sequence of RAN parameters for Format**		0..<maxofRANparameters>		基站通过该 IE 告知 Near-RT RIC 周期性上报的能力，如基站支持上报的最小周期，最大周期。 基站通过该 IE 告知 Near-RT RIC 上报量的能力，如每次上报小区负载状态信息的小区数，上报 UE 信息的 UE 数等。
>> RAN Parameter ID	M		RAN Parameter ID 8.2.6	
>> RAN Parameter Name	O		RAN Parameter Name 8.2.13	
>> RAN Parameter Value	M		Reserved	
Sequence of Report styles		0.. <maxofRICstyles>		
> RIC Report Style Type	M		RIC Style Type 8.2.2	ID of RIC Report style
> RIC Report Style Name	M		RIC Style Name 8.2.3	Name of RIC Report style
> RIC Report Action Format Type	M		RIC Format Type 8.2.4	RIC Report Action format used by RIC Action Definition IE in RIC Event Subscription.
> **Sequence of RAN parameters for Action**		0..<maxofRANparameters>		部分可选参数的上报能力
>> RAN Parameter ID	M		RAN Parameter ID 8.2.6	
>> RAN Parameter Name	O		RAN Parameter Name 8.2.13	
>> RAN Parameter Type	O		RAN Parameter Type 8.2.5	
> RIC Indication Header Format Type	M		RIC Format Type 8.2.4	Indication header format used by Report style
> RIC Indication Message Format Type	M		RIC Format Type 8.2.4	Indication message format used by Report style
Sequence of Control styles		0.. <maxofRICstyles>		

> RIC Control Style Type	M		RIC Style Type 8.2.2	ID of Control style
> RIC Control Style Name	M		RIC Style Name 8.2.3	Name of Control style
> RIC Control Header Format Type	M		RIC Format Type 8.2.4	Control header format used by control style
> RIC Control Message Format Type	M		RIC Format Type 8.2.4	Control message format used by control style
> RIC Control Outcome Format Type	M		RIC Format Type 8.2.4	Call Processs ID format used by control style
> **Sequence of RAN parameters for Control Outcome**		0.. <maxofRANparameters>		RAN parameters used by Control Outcome style
>> RAN Parameter ID	M		RAN Parameter ID 8.2.6	
>> RAN Parameter Name	O		RAN Parameter Name 8.2.8	
>> RAN Parameter Type	O		RAN Parameter Type 8.2.5	

Range bound	Value	Explanation
maxofRICstyles	63	Maximum no. of Style of Report, Insert, Control or Policy actions supported by RAN Function
maxofRANparameters	255	Maximum no. of RAN Parameter

5.3 Event trigger definition styles

事件触发样式定义了 RIC 事件触发样式类型、名字、以及格式。

在 E2 建立过程中或 RIC 服务更新过程中，E2 Node 将其支持的 RIC 服务（Report 或 Policy 服务）事件触发样式告诉 Near-RT RIC。在 RIC 订阅过程中，Near-RT RIC 根据该信息，填写 RIC Subscription Request 消息中携带的 RIC Event Trigger Definition IE，以告知 E2 Node 其所订阅事件的触发类型和触发条件等。

5.3.1 RIC event trigger definition IE style list

RIC Style Type 表示 RIC 事件触发样式类型，唯一标识一个 RIC 事件触发样式。

E2SM-TS 定义了两种 RIC 事件触发样式：周期性触发、事件性触发。

RIC 事件触发样式类型、名称，以及其所支持 RIC 服务类型的映射关系表格 5-3 所示：

表 5-3 RIC Style Type 与 RIC Service Style 的映射关系

RIC Style Type	Style Name	Supported RIC Service Style	
		Report	Policy
1	Periodic	1~6	--
2	Event	1~9	--

注：第一阶段的优先目标是打通 Near-RT RIC 和基站之间的环路，为了简化设计，本方案不考虑 RIC 策略服务。

RIC 事件触发样式与 RIC Event Trigger Definition IE 格式的映射关系如表格 5-4 所示：

表 5-4 RIC Style Type 与 RIC Event Trigger Definition Format 的映射关系

RIC Style Type	RIC Event Trigger Definition Format

1	1，2
2	3，4，5，6，7，8，9，10

E2SM-TS 定义了基站支持事件触发能力的相关字段，基站在 RAN Function Definition IE 的 Event Trigger Style 中携带相关信息。Near-RT RIC 通过该信息可知：基站最大支持上报的小区数、最大支持上报的 UE 数、最小上报周期等。

RAN Parameter ID	RAN Parameter Name	RAN Parameter Type	Parameter description
1	Max Number of Report Cells	INTEGER	基站最大支持上报的小区数
2	Max Number of Report UE per Cell	INTEGER	基站最大支持上报的 UE 数/小区
3	MinReportPeriod	Report Period	基站支持周期性上报的最小周期

5.3.2 RIC Event Trigger Definition IE

RIC Event Trigger Definition IE 包含了两个信息：

1） Near-RT RIC 订阅事件的触发类型，周期性触发还是事件性触发；

2） Near-RT RIC 订阅事件的触发条件，如周期性触发的周期长度，或事件性触发的参数阈值等。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RIC Style Type	M		RIC Style Type 8.2.2	
CHOICE RIC Event Trigger Format				
> Format 1			E2SM-TS-Event Trigger Definition Format 1 5.3.2.1	定义了 E2 Node 周期性上报小区级信息。
> Format 2			E2SM-TS-Event Trigger Definition Format 2 5.3.2.2	定义了 E2 Node 周期性上报 UE 级信息的时间间隔。
> Format 3			E2SM-TS-Event Trigger Definition Format 3 5.3.2.3	定义了事件性上报 O-CU-CP 统计的小区负载状态信息的触发条件。
> Format 4			E2SM-TS-Event Trigger Definition Format 4 5.3.2.4	定义了事件性上报 O-CU-CP 统计的 UE 测量报告的触发条件。触发条件为基于 SSB 的测量值。
> Format 5			E2SM-TS-Event Trigger Definition Format 5 5.3.2.5	定义了事件性上报 O-CU-CP 统计的 UE 测量报告的触发条件。触发条件为基于 CSI 的测量值。
> Format 6			E2SM-TS-Event Trigger Definition Format 6 5.3.2.6	定义了事件性上报 O-CU-UP 统计的小区负载状态信息的触发条件。
> Format 7			E2SM-TS-Event Trigger Definition Format 7 5.3.2.7	定义了事件性上报 O-CU-UP 统计的 UE 测量报告的触发条件。
> Format 8			E2SM-TS-Event Trigger Definition Format 8 5.3.2.8	定义了事件性上报 O-DU 统计的小区负载状态信息的触发条件。
> Format 9			E2SM-TS-Event Trigger Definition Format 9 5.3.2.9	定义了事件性上报 O-DU 统计的 UE 测量报告的触发条件。
> Format 10			E2SM-TS-Event Trigger Definition Format	定义了 E2 Node 事件性上报小区

			10 5.3.2.10	配置信息的触发条件。

5.3.2.1 E2SM-TS-Event Trigger Definition Format 1 IE

E2SM-TS-Event Trigger Definition IE Format 1 定义了 E2 Node 周期性上报小区级信息的时间间隔。其中小区级信息为小区负载状态信息、小区配置信息（来自 OAM）等。到底上报哪些信息，由 RIC Action Definition IE 中携带的 RIC Style Type 决定。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Cell Level Info Report Period	M		Report Period 8.2.7	

5.3.2.2 E2SM-TS-Event Trigger Definition Format 2 IE

E2SM-TS-Event Trigger Definition IE Format 2 定义了 E2 Node 周期性上报 UE 级信息的时间间隔。其中 UE 级信息为 UE 测量报告等。到底上报哪些信息，由 RIC Action Definition IE 中携带的 RIC Style Type 决定。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UE Level Report Period	M		Report Period 8.2.7	

5.3.2.3 E2SM-TS-Event Trigger Definition Format 3 IE

E2SM-TS-Event Trigger Definition IE Format 3 定义了事件性上报 O-CU-CP 统计的小区负载状态信息的触发条件，其中包括：Number of RRC Connections。

当检测到 O-CU-CP 统计的小区 RRC 连接数到达阈值 Number of RRC Connections，则向 RIC 上报 O-CU-CP 小区负载状态信息，RIC Indication Message Format 为 RIC Indication Message Format 1，其中携带了 O-CU-CP Cell Measurement Container IE。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Number of RRC Connections	M		INTEGER	

5.3.2.4 E2SM-TS-Event Trigger Definition Format 4 IE

E2SM-TS-Event Trigger Definition IE Format 4 定义了事件性上报 O-CU-CP 统计的 UE 测量报告的触发条件，即基于 SSB 的测量值，其中包括 RSRQ、RSRP 或者 SINR。

E2 Node 根据 E2SM-TS-Event Trigger Definition IE Format 4 中携带的 Measurement Trigger Quantity 向终端下发基于事件的测量配置。当 E2 Node 检测到 UE 相关的测量报告时，向 RIC 上报 UE 测量报告，RIC Indication Message Format 为 RIC Indication Message Format 4，其中携带了 O-CU-CP UE Measurement Container IE。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SSB-Based Measurement	M		Measurement Trigger Quantity 8.6.2.17	

5.3.2.5 E2SM-TS-Event Trigger Definition Format 5 IE

E2SM-TS-Event Trigger Definition IE Format 5 定义了事件性上报 O-CU-CP 统计的 UE 测量报

告的触发条件，即基于 CSI 的测量值，其中包括 RSRQ、RSRP 或者 SINR。

E2 Node 根据 E2SM-TS-Event Trigger Definition IE Format 4 中携带的 Measurement Trigger Quantity 向终端下发基于事件的测量配置。当 E2 Node 检测到 UE 相关的测量报告时，向 RIC 上报 UE 测量报告，RIC Indication Message Format 为 RIC Indication Message Format 4，其中携带了 O-CU-CP UE Measurement Container IE。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CSI-Based Measurement	M		Measurement Trigger Quantity 8.6.2.17	

5.3.2.6 E2SM-TS-Event Trigger Definition Format 6 IE

E2SM-TS-Event Trigger Definition IE Format 6 定义了事件性上报 O-CU-UP 统计的小区负载状态的触发条件。

当 O-CU-UP 检测到下行 PDCP SDU 丢包率达到达阈值 DL PDCP SDU Drop rate in gNB-CU-UP，则向 RIC 上报 O-CU-UP 负载状态信息，RIC Indication Message Format 为 RIC Indication Message Format 2，其中携带了 O-CU-UP Cell Measurement Container IE。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
DL PDCP SDU Drop rate in gNB-CU-UP		0..100	INTEGER	See 3GPP TS 28.552 session

5.3.2.7 E2SM-TS-Event Trigger Definition Format 7 IE

E2SM-TS-Event Trigger Definition IE Format 7 定义了事件性上报 O-CU-UP 统计的 UE 测量报告的触发条件。

当 O-CU-UP 检测到某个 UE 的测量报告达到阈值时，则向 RIC 上报 UE 测量报告，RIC Indication Message Format 为 RIC Indication Message Format 5，其中携带了 O-CU-UP UE Measurement Container IE。

以下参数至少填写一个。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
DL PDCP occupied buffer size	O		INTEGER	参考文献[6]
DL unused PDCP buffer size	O		INTEGER	参考文献[6]
Packet Delay	O		INTEGER	参考文献[6]

5.3.2.8 E2SM-TS-Event Trigger Definition Format 8 IE

E2SM-TS-Event Trigger Definition IE Format 8 定义了事件性上报 O-DU 统计的小区负载状态信息的触发条件。

当 O-DU 检测到小区的负载状态达到阈值时，则向 RIC 上报小区负载状态信息，RIC Indication Message Format 为 RIC Indication Message Format 3，其中携带了 O-DU Cell Measurement Container IE。

以下参数至少填写一个。

IE/Group Name	Presence	Range	IE type and reference	Semantics description

DL PRB Usage Ratio	O	0..100	INTEGER	参考文献[6]
UL PRB Usage Ratio	O	0..100	INTEGER	参考文献[6]

5.3.2.9 E2SM-TS-Event Trigger Definition Format 9 IE

E2SM-TS-Event Trigger Definition IE Format 9 定义了事件性上报 O-DU 统计的 UE 测量报告的触发条件。

当 O-DU 检测到某个 UE 的测量报告达到阈值时，则向 RIC 上报 UE 测量报告，RIC Indication Message Format 为 RIC Indication Message Format 6，其中携带了 O-DU UE Measurement Container IE。

以下参数至少填写一个。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UL UE PRB used for data traffic	O	0..273	INTEGER	参考文献[6]
DL UE PRB used for data traffic	O	0..273	INTEGER	参考文献[6]

5.3.2.10 E2SM-TS-Event Trigger Definition Format 10 IE

E2SM-TS-Event Trigger Definition IE Format 10 定义了 E2 Node 事件性上报小区配置的触发条件。

当 E2 Node 检测到小区配置发生变更时，则向 RIC 上报小区配置信息。到底上报哪些信息，由 RIC Action Definition IE 中携带的 RIC Style Type 决定。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Reserved			Reserved	

5.4 RIC REPORT Service styles

RIC 上报服务样式定义了 RIC 上报服务样式类型、名字、格式，以及 RIC 指示头格式、RIC 指示消息格式。

在 E2 建立过程中或 RIC 服务更新过程中，E2 Node 将其支持的 RIC 上报服务样式，以及相关的 RIC 指示头格式、消息格式告诉 Near-RT RIC。

在 RIC 订阅过程中，Near-RT RIC 根据 RIC 上报服务样式，填写 RIC Subscription Request 消息中携带的 RIC Action Definition IE，以告知 E2 Node 订阅的服务。

在 RIC 指示过程中，E2 Node 按照 RIC 指示头格式和消息格式组装 RIC Indication Header IE 和 RIC Indication Message IE，Near-RT RIC 按照 RIC 指示头格式和消息格式解析 RIC Indication Header IE 和 RIC Indication Message IE。

5.4.1 REPORT Service style type list

RIC Report Service Style Type 表示 RIC 上报服务样式类型，唯一标识一个 RIC 上报服务样式。

E2SM-TS 定义了 6 种 RIC 上报服务样式，详细情况如表格 5-5 所示。

表 5-5 RIC 上报服务样式

RIC Report Service Style Type	Style Name	描述
1	O-CU-CP Cell Load Information	上报 O-CU-CP 统计的小区负载状态信息。
2	O-CU-UP Cell Load Information	上报 O-CU-UP 统计的小区负载状态信息。
3	O-DU Cell Load Information	上报 O-DU 统计的小区负载状态信息。
4	O-CU-CP UE Measurement	上报 O-CU-CP 统计的 UE 测量报告。
5	O-CU-UP UE Measurement	上报 O-CU-UP 统计的 UE 测量报告。
6	O-DU UE Measurement	上报 O-DU 统计的 UE 测量报告。
7	O-CU-CP Cell Configuration	上报 O-CU-CP 相关的小区配置信息。
8	O-CU-UP Cell Configuration	上报 O-CU-UP 相关的小区配置信息。
9	O-DU Cell Configuration	上报 O-DU 相关的小区配置信息。

RIC 上报服务样式类型与 RIC Action Definition IE 格式的映射关系如表格 5-6 所示：

表 5-6 RIC 上报服务样式与 RIC Action Definition IE 格式的映射关系

RIC Report Service Style Type	Format
1	1
2	1
3	1
4	1
5	1
6	1
7	1
8	1
9	1

5.4.2 REPORT Service RIC Action Definition IE contents

在 E2 建立过程或 RIC 服务更新过程，E2 Node 将其支持的参数上报能力通过 RIC Report Action Format Type 和 Sequence of RAN parameters for Action IE 告诉 Near-RT RIC，其中 Sequence of RAN parameters for Action IE 表示可选参数的支持情况。若在 Sequence of RAN parameters for Action IE 中携带了某个参数，表明 E2 Node 支持该参数的上报。在 RIC 服务订阅过程中，Near-RT RIC 通过 RIC Action Definition IE 携带的消息指示 E2 Node 是否上报这些可选参数。

E2SM-TS 定义了如表格 5-7 所示的可选上报参数：

表 5-7 E2SM-TS 可选的上报参数

RAN Parameter ID	RAN Parameter Name	RAN Parameter Type	Parameter description
1	AddTimestamp	BOOLEAN	TRUE=Use optional Network Interface Timestamp in RIC Indication Header

5.4.3 REPORT Service RIC Action Definition IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RIC Style Type	M		RIC Style Type 8.2.2	RIC Report Service Style Type
CHOICE RIC Report Action Definition Format				

> Format 1			RIC Report Action Definition Format 1 5.4.3.1	

5.4.3.1 RIC Report Action Definition Format 1 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Sequence of Report Cells		0.. <maxofCells>		
> NR CGI	M		NR CGI 8.2.9	
Sequence of RAN Parameters		0.. <maxofActionParameters>		
> RAN Parameter ID	M		RAN Parameter ID 8.2.6	
> RAN Parameter Value	M		Reserved	

Range bound	Value	Explanation
maxofActionParameters	255	Maximum no. of action parameters supported by RAN Function
maxofCells	18	
maxofUEs	65535	

若 RIC Subscription Request 未携带 NR CGI 信息，则对于 RIC Style Type 1，2，3 而言，Near-RT RIC 订阅了 E2 Node 所有小区的小区状态信息上报服务；对于 RIC Style Type 4， 5，6 而言，Near-RT RIC 订阅了 E2 Node 所有小区所有 UE 的测量报告上报服务。

若 RIC Subscription Request 携带了 NR CGI 列表信息，则对于 RIC Style Type 1，2，3 而言，Near-RT RIC 订阅了 NR CGI 列表里小区的小区状态信息上报服务；对于 RIC Style Type 4，5，6 而言，Near-RT RIC 订阅了 NR CGI 列表里小区所有 UE 的测量报告上报服务。

5.4.4 REPORT Service RIC Indication Header IE

RIC Report Service Style Type 1~6 对应的 RIC Indication Header IE 格式为 RIC Indication Header IE Format 1。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RIC Style Type	O		RIC Style Type 8.2.2	
CHOICE RIC Indication Header Format	O			
> Format 1			RIC Indication Header Format 1 5.4.4.1	

5.4.4.1 RIC Indication Header Format 1 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Timestamp	O		INTEGER	

5.4.5 REPORT Service RIC Indication Message IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE RIC Indication Message Format				
> Format 1			RIC Indication Message Format 1 5.4.5.1.1	此格式携带了 O-CU-CP 统计的小区负载状态信息。
> Format 2			RIC Indication Message Format 2 5.4.5.2.1	此格式携带了 O-CU-UP 统计的小区负载状态信息。
> Format 3			RIC Indication Message Format 3 5.4.5.3.1	此格式携带了 O-DU 统计的小区负载状态信息。
> Format 4			RIC Indication Message Format 4 5.4.5.4.1	此格式携带了 O-CU-CP 统计的 UE 测量报告。
> Format 5			RIC Indication Message Format 5 5.4.5.5.1	此格式携带了 O-CU-UP 统计的 UE 测量报告。
> Format 6			RIC Indication Message Format 6 5.4.5.6.1	此格式携带了 O-DU 统计的 UE 测量报告。
> Format 7			RIC Indication Message Format 7 5.4.5.7.1	此格式携带了 O-CU-CP 相关的小区配置信息。
> Format 8			RIC Indication Message Format 8 5.4.5.8.1	此格式携带了 O-CU-UP 相关的小区配置信息。
> Format 9			RIC Indication Message Format 9 5.4.5.9.1	此格式携带了 O-DU 相关的小区配置信息。

5.4.5.1 RIC Report Service Style Type 1: O-CU-CP Cell Load Information

对于 RIC Report Service Style Type 1，基站侧的 E2 Node 向 Near-RT RIC 上报 O-CU-CP 统计的小区负载状态信息，包括 NR CGI、Mean number of RRC Connections、Max number of RRC Connections、Number of RRC Connections 等。

RIC Report Service Style Type 1 对应的 RIC Indication Message IE 格式为 RIC Indication Message Format 1。

5.4.5.1.1 RIC Indication Message Format 1 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-CU-CP Cell Load Info Container	M		O-CU-CP Cell Measurement Container 8.3.1	

5.4.5.2 RIC Report Service Style Type 2: O-CU-UP Cell Load Information

对于 RIC Report Service Style Type 2，基站侧的 E2 Node 向 Near-RT RIC 上报 O-CU-UP 统计的小区负载状态信息。

RIC Report Service Style Type 2 对应的 RIC Indication Message IE 格式为 RIC Indication Message Format 2。

5.4.5.2.1 RIC Indication Message Format 2 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-CU-UP Cell Load Info Container	M		O-CU-UP Cell Measurement Container 8.3.2	

5.4.5.3 RIC Report Service Style Type 3: O-DU Cell Load Information

对于 RIC Report Service Style Type 3，基站侧的 E2 Node 向 Near-RT RIC 上报 O-DU 统计的小区负载状态信息，包括。

RIC Report Service Style Type 3 对应的 RIC Indication Message IE 格式为 RIC Indication Message Format 3。

5.4.5.3.1 RIC Indication Message Format 3 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-DU Cell Load Info Container	M		O-DU Cell Measurement Container 8.3.3	

5.4.5.4 RIC Report Service Style Type 4: O-CU-CP UE Measurement

对于 RIC Report Service Style Type 4，基站侧的 E2 Node 向 Near-RT RIC 上报 O-CU-CP 统计的 UE 测量报告。

RIC Report Service Style Type 4 对应的 RIC Indication Message IE 格式为 RIC Indication Message Format 4。

5.4.5.4.1 RIC Indication Message Format 4 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-CU-CP UE Measurement Container	M		O-CU-CP UE Measurement Container 8.4.1	

5.4.5.5 RIC Report Service Style Type 5: O-CU-UP UE Measurement

对于 RIC Report Service Style Type 5，基站侧的 E2 Node 向 Near-RT RIC 上报 O-CU-UP 统计的 UE 测量报告。

RIC Report Service Style Type 5 对应的 RIC Indication Message IE 格式为 RIC Indication Message Format 5。

5.4.5.5.1 RIC Indication Message Format 5 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-CU-UP UE Measurement Container	M		O-CU-UP UE Measurement Container 8.4.2	

5.4.5.6 RIC Report Service Style Type 6: O-DU UE Measurement

对于 RIC Report Service Style Type 6，基站侧的 E2 Node 向 Near-RT RIC 上报 O-DU 统计的

UE 测量报告。

RIC Report Service Style Type 6 对应的 RIC Indication Message IE 格式为 RIC Indication Message Format 6。

5.4.5.6.1 RIC Indication Message Format 6 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-DU UE Measurement Container	M		O-DU UE Measurement Container 8.4.3	

5.4.5.7 RIC Report Service Style Type 7: O-CU-CP Cell Configuration

对于 RIC Report Service Style Type 7，基站侧的 E2 Node 向 Near-RT RIC 上报 O-CU-CP 相关的小区配置信息。

RIC Report Service Style Type 7 对应的 RIC Indication Message IE 格式为 RIC Indication Message Format 7。

5.4.5.7.1 RIC Indication Message Format 7 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-CU-CP Cell Configuration Container	M		O-CU-CP Cell Configuration Container 8.5.1	

5.4.5.8 RIC Report Service Style Type 8: O-CU-UP Cell Configuration

对于 RIC Report Service Style Type 8，基站侧的 E2 Node 向 Near-RT RIC 上报 O-CU-UP 相关的小区配置信息。

RIC Report Service Style Type 8 对应的 RIC Indication Message IE 格式为 RIC Indication Message Format 8。

5.4.5.8.1 RIC Indication Message Format 8 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-CU-UP Cell Configuration Container	M		O-CU-UP Cell Configuration Container 8.5.2	

5.4.5.9 RIC Report Service Style Type 9: O-DU Cell Configuration

对于 RIC Report Service Style Type 9，基站侧的 E2 Node 向 Near-RT RIC 上报 O-DU 相关的小区配置信息。

RIC Report Service Style Type 9 对应的 RIC Indication Message IE 格式为 RIC Indication Message Format 9。

5.4.5.9.1 RIC Indication Message Format 9 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-DU Cell Configuration Container	M		O-DU Cell Configuration Container 8.5.3	

5.5 RIC CONTROL Service styles

RIC 控制服务样式定义了 RIC 控制服务样式的类型、名字，RIC 控制头格式，RIC 控制消息格式，以及 RIC 控制结果格式。

在 E2 建立过程中或 RIC 服务更新过程中，E2 Node 将其支持的 RIC 控制服务样式，以及相关的 RIC 控制头格式、RIC 控制消息格式、RIC 控制结果格式告诉 Near-RT RIC。

在 RIC 控制过程中，Near-RT RIC 根据上报的 RIC 控制服务样式，填写 RIC Control Request 消息中携带的 RIC Control Header IE 和 RIC Control Message IE。

5.5.1 CONTROL Service style type list

E2SM-TS 定义了 13 种 RIC 控制服务样式类型，详细情况如表格 5-8 所示：

表 5-8 RIC 控制服务样式

RIC Control Service Style Type	Style Name	描述
1	O-CU-CP Cell Configuration Query	Near-RT RIC 查询 O-CU-CP 相关的小区配置信息。
2	O-CU-UP Cell Configuration Query	Near-RT RIC 查询 O-CU-UP 相关的小区配置信息。
3	O-DU Cell Configuration Query	Near-RT RIC 查询 O-DU 相关的小区配置信息。
4	O-CU-CP Cell Load Information Query	Near-RT RIC 查询 O-CU-CP 统计的小区负载状态信息。
5	O-CU-UP Cell Load Information Query	Near-RT RIC 查询 O-CU-UP 统计的小区负载状态信息。
6	O-DU Cell Load Information Query	Near-RT RIC 查询 O-DU 统计的小区负载状态信息。
7	O-CU-CP UE Measurement Query	Near-RT RIC 查询 O-CU-CP 统计的 UE 测量报告。
8	O-CU-UP UE Measurement Query	Near-RT RIC 查询 O-CU-UP 统计的 UE 测量报告。
9	O-DU UE Measurement Query	Near-RT RIC 查询 O-DU 统计的 UE 测量报告。
10	O-CU-CP Configurated Cell Configuration	Near-RT RIC 向 E2 Node 配置 O-CU-CP 相关的小区配置信息。
11	O-CU-UP Configurated Cell Configuration	Near-RT RIC 向 E2 Node 配置 O-CU-UP 相关的小区配置信息。
12	O-DU Configurated Cell Configuration	Near-RT RIC 向 E2 Node 配置 O-DU 相关的小区配置信息。
13	UE Transfer	Near-RT RIC 向基站测的 E2 节点请求执行 UE 迁移命令（切换、释放）。

RIC 控制服务样式与 RIC Control Header IE、RIC Control Message IE 和 RIC Control Outcome IE 格式的映射关系如表格 5-9 所示：

表 5-9 RIC 控制服务样式与 RIC Control Header、RIC Control Message、RIC Control Outcome 格式的映射关系

RIC Control Service Style Type	RIC Control Header IE Format	RIC Control Message IE Format	RIC Control Outcome IE Format
1	1	1	1
2	1	1	2
3	1	1	3
4	1	1	4
5	1	1	5
6	1	1	6
7	1	1, 2	7
8	1	1, 2	8
9	1	1, 2	9

10	1	3	NA
11	1	4	NA
12	1	5	NA
13	1	6	10

5.5.2 CONTROL Service RIC Control Header IE

在 RIC 控制过程中，Near-RT RIC 在 RIC Control Request 消息中携带 RIC Control Header IE ， E2 NODE 通过解析该 RIC Style Type IE 可以得知 Near-RT RIC 下发的控制命令。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RIC Style Type	M		RIC Style Type 8.2.2	
CHOICE RIC Control Header Format	O			
> Format 1			RIC Control Header Format 1 5.5.2.1	

5.5.2.1 RIC Control Header Format 1 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Reserved			Reserved	

5.5.3 CONTROL Service RIC Control Message IE

在 RIC 控制过程中，Near-RT RIC 在 RIC Control Request 消息中携带 RIC Control Message IE， E2 Node 通过解析该 IE 可以得知控制命令相关的参数。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE RIC Control Message Format				
> Format 1			RIC Control Message Format 1 5.5.3.1	此格式携带了哪些小区需要上报的信息。 具体上报的内容，由 RIC Control Header 的 RIC Style Type IE 决定。
> Format 2			RIC Control Message Format 2 5.5.3.2	此格式携带了哪些小区下的哪些 UE 需要上报 UE 测量报告的信息。 具体上报的内容，由 RIC Control Header 的 RIC Style Type IE 决定。
> Format 3			RIC Control Message Format 3 5.5.3.3	此格式携带了 RIC 配置给 E2 Node 的 O-CUCP 相关的小区配置信息。
> Format 4			RIC Control Message Format 4 5.5.3.4	此格式携带了 RIC 配置给 E2 Node 的 O-CUUP 相关的小区配置信息。
> Format 5			RIC Control Message Format 5 5.5.3.5	此格式携带了 RIC 配置给 E2 Node 的 O-DU 相关的小区配置信息。

> Format 6			RIC Control Message Format 6 5.5.3.6	此格式携带了 RIC 下发给 E2 Node UE 迁移的相关命令。

5.5.3.1 RIC Control Message Format 1 IE

若 RIC Control Header IE 中携带的 RIC Style Type 为 1~9，则 RIC Control Message IE 中可携带 RIC Control Message Format 1。

若 RIC Control Message 未携带 NR CGI 信息，则对于 RIC Style Type 1~6 而言，E2 Node 需要上报所有小区的相关信息；对于 RIC Style Type 7~9 而言，E2 Node 需要上报所有小区所有 UE 的测量报告。

若 RIC Control Message 携带了 NR CGI 列表信息，则对于 RIC Style Type 1~6 而言，E2 Node 需要上报 NR CGI 列表里小区的相关信息；对于 RIC Style Type 7~9 而言，E2 Node 需要上报 NR CGI 列表里小区所有 UE 的测量报告。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Sequence of Report Cells by Control		0 .. <maxofCells>		
> NR CGI	O		NR CGI 8.2.9	

5.5.3.2 RIC Control Message Format 2 IE

若 RIC Control Header IE 中携带的 RIC Style Type 为 7~9，则 RIC Control Message IE 中可携带 RIC Control Message Format 2。

当 E2 Node 收到为 Format 2 的 RIC Control Message，则向 RIC 上报 NR CGI 列表中指定 UE 的测量报告信息。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Sequence of Report Cell Containers by Control		1 .. <maxofCells>		
> NR CGI	M		NR CGI 8.2.9	
> Sequence of Report UEs by Control		1 .. < maxofUEs >		
>> UE ID	M		UE ID 8.2.11	

5.5.3.3 RIC Control Message Format 3 IE

若 RIC Control Header IE 中携带的 RIC Style Type 为 10，则 RIC Control Message IE 中可携带 RIC Control Message Format 3。

当 E2 Node 收到为 Format 3 的 RIC Control Message，则更新 E2 Node O-CU-CP 相关的配置信息。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-CU-CP Cell Configuration Container	M		O-CU-CP Cell Configuration Container 8.5.1	

5.5.3.4 RIC Control Message Format 4 IE

若 RIC Control Header IE 中携带的 RIC Style Type 为 11，则 RIC Control Message IE 中可携带 RIC Control Message Format 4。

当 E2 Node 收到为 Format 4 的 RIC Control Message，则更新 E2 Node O-CU-UP 相关的配置信息。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-CU-UP Cell Configuration Container	M		O-CU-UP Cell Configuration Container 8.5.2	

5.5.3.5 RIC Control Message Format 5 IE

若 RIC Control Header IE 中携带的 RIC Style Type 为 12，则 RIC Control Message IE 中可携带 RIC Control Message Format 5。

当 E2 Node 收到为 Format 5 的 RIC Control Message，则更新 E2 Node O-DU 相关的配置信息。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-DU Cell Configuration Container	M		O-DU Cell Configuration Container 8.5.3	

5.5.3.6 RIC Control Message Format 6 IE

若 RIC Control Header IE 中携带的 RIC Style Type 为 13，则 RIC Control Message IE 中可携带 RIC Control Message Format 6。

当 E2 Node 收到为 Format 6 的 RIC Control Message，则根据 UE Handover Container IE 携带的信息切换 UE 到目标小区，UE Release Container IE 携带的信息释放 UE，并将 UE 迁移结果通过 RIC Control Outcome IE 反馈给 RIC，其中格式为 format 10。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Sequence of UE Handover		0..<maxofUEs>		
> UE Handover Container			Handover Command 8.6.2.13	
Sequence of UE Release		0..<maxofUEs>		
> UE Release Container			Release Command 8.6.1.14	

5.5.4 CONTROL Service RIC Control Outcome IE

在 RIC 控制过程中，E2 Node 在 RIC Control Acknowledge 或 RIC Control Failure 消息中携带 RIC Control Outcome IE ， Near-RT RIC 通过解析该 IE 可以得知控制响应相关的参数。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE RIC Control Outcome Format				
> Format 1			RIC Control Outcome Format 1 5.5.4.1	此格式携带了 O-CU-CP 相关的小区配置信息。
> Format 2			RIC Control Outcome Format 2 5.5.4.2	此格式携带了 O-CU-UP 相关的小区配置信息。

> Format 3			RIC Control Outcome Format 3 5.5.4.3	此格式携带了 O-DU 相关的小区配置信息。
> Format 4			RIC Control Outcome Format 4 5.5.4.4	此格式携带了 O-CU-CP 相关的小区负载状态信息。
> Format 5			RIC Control Outcome Format 5 5.5.4.5	此格式携带了 O-CU-UP 相关的小区负载状态信息。
> Format 6			RIC Control Outcome Format 6 5.5.4.6	此格式携带了 O-DU 相关的小区负载状态信息。
> Format 7			RIC Control Outcome Format 7 5.5.4.7	此格式携带了 O-CU-CP 相关的 UE 测量报告信息。
> Format 8			RIC Control Outcome Format 8 5.5.4.8	此格式携带了 O-CU-UP 相关的 UE 测量报告信息。
> Format 9			RIC Control Outcome Format 9 5.5.4.9	此格式携带了 O-DU 相关的 UE 测量报告信息。
> Format 10			RIC Control Outcome Format 10 5.5.4.10	此格式携带了 UE 迁移结果。

5.5.4.1 RIC Control Outcome Format 1 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-CU-CP Cell Configuration Container	M		O-CU-CP Cell Configuration Container 8.5.1	

5.5.4.2 RIC Control Outcome Format 2 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-CU-UP Cell Configuration Container	M		O-CU-UP Cell Configuration Container 8.5.2	

5.5.4.3 RIC Control Outcome Format 3 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-DU Cell Configuration Container	M		O-DU Cell Configuration Container 8.5.3	

5.5.4.4 RIC Control Outcome Format 4 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-CU-CP Cell Load Information Container	M		O-CU-CP Cell Measurement Container 8.3.1	

5.5.4.5 RIC Control Outcome Format 5 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-CU-UP Cell Load Information Container	M		O-CU-UP Cell Measurement Container 8.3.2	

5.5.4.6 RIC Control Outcome Format 6 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-DU Cell Load Information Container	M		O-DU Cell Measurement Container 8.3.3	

5.5.4.7 RIC Control Outcome Format 7 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-CU-CP UE Measurement Container	M		O-CU-CP UE Measurement Container 8.4.1	

5.5.4.8 RIC Control Outcome Format 8 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-CU-UP UE Measurement Container	M		O-CU-UP UE Measurement Container 8.4.2	

5.5.4.9 RIC Control Outcome Format 9 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
O-DU UE Measurement Container	M		O-DU UE Measurement Container 8.4.3	

5.5.4.10 RIC Control Outcome Format 10 IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Sequence of UE Failed to Handover		0..<maxofUEs>		
> Source NR CGI			NR CGI 8.2.9	
> Target NR CGI			NR CGI 8.2.9	
> UE ID			UE ID	
> Cause		{unspecified, unknown target UE, handover target not allowed}	ENUMERATED	
Sequence of UE Failed to Release		0..<maxofUEs>		
> NR CGI			NR CGI 8.2.9	
> UE ID			UE ID	
> Cause		{unspecified, unknown target UE}	ENUMERATED	

5.6 E2 Node 与 RAN 功能映射表

	O-CU-CP	O-CU-UP	O-DU	O-BBU
Event Trigger				
RIC Event Trigger Style Type	1~2	1~2	1~2	1~2
RIC Event Trigger Definition Format	1,2,3,4	1,2,5,6	1,2,7,8	1,2,3,4,5,6,7,8
Report				
RIC Report Style Type	1,4	2,5	3,6	1,2,3,4,5,6
RIC Report Action Definition Format	1	1	1	1
RIC Indication Header Format	1	1	1	1

RIC Indication Message Format	1,4	2,5	3,6	1,2,3,4,5,6
Control				
RIC Control Style Type	1,4,7,10,13	2,5,8,11	3,6,9,12	1~13
RIC Control Header Format	1	1	1	1
RIC Control Message Format	1,2,3,6	1,2,4	1,2,5	1,2,3,4,5,6
RIC Control Outcome Format	1,4,7,10	2,5,8	3,6,9	1,2,3,4,5,6,7,8,9，10

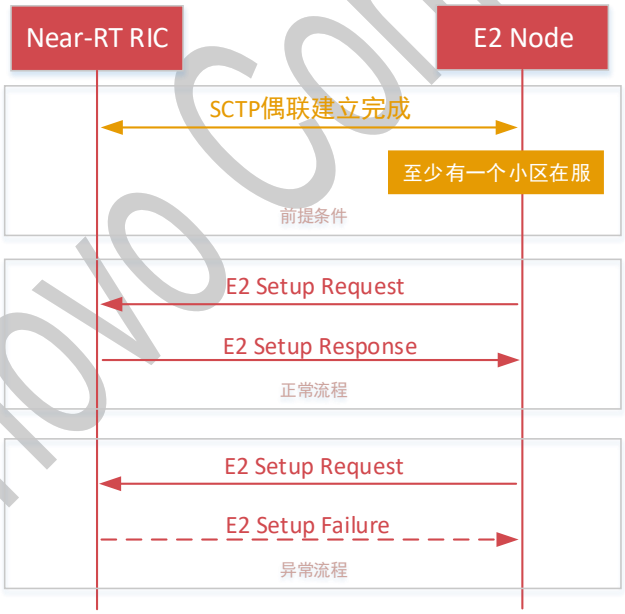
6. E2AP 过程

6.1 通用过程

通用流程表示不直接与某个特定应用程序关联的过程，主要包括：E2 建立过程、重置过程、错误指示、RIC 服务更新过程。

6.1.1 E2AP 建立过程

6.1.1.1 过程图



6.1.1.2 消息 IE

6.1.1.2.1 E2 Setup Request

字段	说明
Message Type	参考协议 O-RAN-WG3 E2AP 9.2.3
E2 Node ID	E2 节点标识，唯一标识一个 E2 节点，详细参考协议 O-RAN-WG3 E2AP 9.2.6.
List of RAN Functions Added	基站 E2 节点支持的 RAN 功能列表信息，详细参数协议 O-RAN-WG3 E2AP 9.1.2.2.

> RAN Function ID	RAN 功能标识，在一个 E2 Node 范围内唯一标识一个 RAN 功能。
> RAN Function Definition	E2SM IE
> RAN Function Revision	参考协议 O-RAN-WG3 E2AP 9.2.24.

6.1.1.2.2 E2 Setup Response

字段	说明
Message Type	参考协议 O-RAN-WG3 E2AP 9.2.3
Global RIC ID	Near-RT RIC 标识，唯一标识一个 Near-RT RIC，详细参考协议 O-RAN-WG3 E2AP 9.2.4.
List of RAN Functions Accepted	Near-RT RIC 接收的 RAN 功能列表信息。
> RAN Function ID	
List of RAN Functions Rejected	Near-RT RIC 拒绝的 RAN 功能。
> RAN Function ID	
> Case	Near-RT RIC 拒绝的原因。

6.1.1.2.3 E2 Setup Failure

字段	说明
Message Type	参考协议 O-RAN-WG3 E2AP 9.2.3
Case	E2 建立失败原因。
Time To Wait	
Criticality Diagnostics	

6.1.1.3 E2 建立过程说明

E2AP 建立过程由基站侧发起。

基站侧发起 E2AP 建立过程的前提条件有两个：1）SCTP 偶联建立已完成；2）至少存在一个小区在服。

当基站侧 E2 Node 满足以上两个条件时，发起 E2AP 建立过程，步骤如下：

1. E2 Node 向 Near-RT RIC 发送 E2 Setup Request 消息，携带 E2 Node ID 和一个或多个 RAN 功能信息列表。若 E2 Node 为 O-CU-CP，则 E2 Node ID IE 仅携带 Global gNB ID；若 E2 Node 为 O-DU，则 E2 Node ID IE 携带 Global gNB ID 和 gNB-DU ID；若 E2 Node 为 O-CU-UP，则 E2 Node ID IE 携带 Global gNB ID 和 gNB-CU-UP ID。其中，RAN 功能信息相关部分，见第 5 章。
2. E2 Node 启动一个定时器，等待 E2 Setup Response 消息。若在定时器超时前收到了来自 Near-RT RIC 的 E2 Setup Response，且 List of RAN Functions Accepted IE 携带的内容不为空，则认为 E2AP 连接建立成功；否则，则认为失败。

E2AP 建立异常情况的处理：

1. 若在定时器超时前收到了 E2 Setup Failure 消息，且携带了 wait to time IE，则在等待 wait to time 设置的时间后，再次发起 E2AP 建立过程。
2. 若在定时器超时前未收到任何 E2 消息，或者收到了非 E2 Setup Response 和 E2 Setup Failure，则立刻重新发起 E2AP 建立过程。

6.1.2 复位过程

6.1.2.1 基站侧发起的复位过程

6.1.2.1.1 过程图

6.1.2.1.2 消息 IE

6.1.2.1.2.1 Reset Request

字段	说明
Message Type	
Cause	Reset 原因。

6.1.2.1.2.2 Reset Response

字段	说明
Message Type	
Criticality Diagnostics	

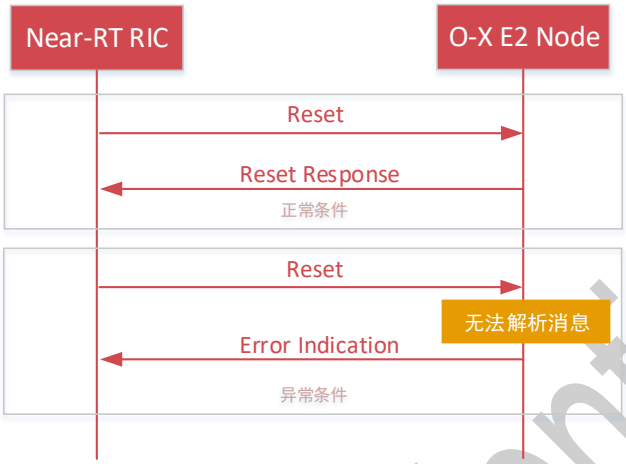
6.1.2.1.3 说明

当基站侧去使能 E2 功能，E2 Node 清空所有 Near-RT RIC 订阅消息，并停止所有正在进行的 RIC 服务过程，并向 Near-RT RIC 发送 Reset 消息，携带原因值为 O&M Intervention。

E2 Node 向 Near-RT RIC 发送 Reset 消息后，启动一个定时器，等待来自 Near-RT RIC 的 Reset Response 消息。当定时器超时，或在定时器超时前收到了 Reset Response 消息，E2 Node 断开与 Near-RT RIC 的 SCTP 连接，并关闭相关的 SCTP socket。

6.1.2.2 Near-RT RIC 发起的复位过程

6.1.2.2.1 过程图



6.1.2.2.2 消息 IE

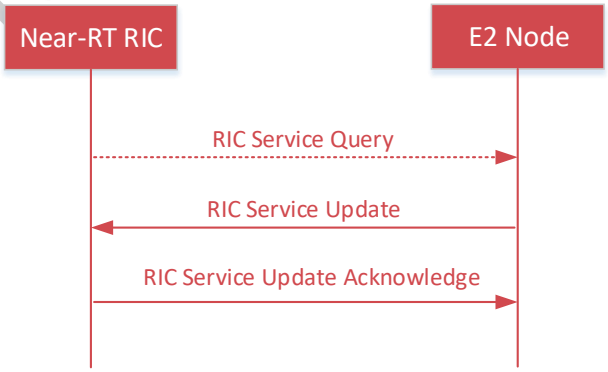
同 6.1.2.2.1。

6.1.2.2.3 说明

当 E2 Node 收到了来自 Near-RT RIC 的 Reset 消息，若能成功解析消息，则清空所有 Near-RT RIC 订阅消息，并停止所有正在进行的 RIC 服务过程，并向 Near-RT RIC 发送 Reset Response 消息；否则，向 Near-RT RIC 发送 Error Indication 消息，携带原因值为 Protocol Cause。

6.1.3 RIC 服务更新过程

6.1.3.1 过程图



6.1.3.2 消息 IE

6.1.3.2.1 RIC Service Query

字段	说明
Message Type	参考协议 O-RAN-WG3 E2AP 9.2.3
List of RAN Functions Accepted	Complete list of Functions previously accepted by Near-RT RIC。
> RAN Function ID	RAN 功能标识，在一个 E2 Node 范围内唯一标识一个 RAN 功能。
> RAN Function Revision	参考协议 O-RAN-WG3 E2AP 9.2.24.

6.1.3.2.2 RIC Service Update

字段	说明
Message Type	参考协议 O-RAN-WG3 E2AP 9.2.3
List of RAN Functions Added	基站 E2 节点支持的 RAN 功能列表信息，详细参数协议 O-RAN-WG3 E2AP 9.1.2.2.
> RAN Function ID	RAN 功能标识，在一个 E2 Node 范围内唯一标识一个 RAN 功能。
> RAN Function Definition	E2SM IE
> RAN Function Revision	参考协议 O-RAN-WG3 E2AP 9.2.24.
List of RAN Functions Modified	基站 E2 节点支持的 RAN 功能列表信息，详细参数协议 O-RAN-WG3 E2AP 9.1.2.2.
> RAN Function ID	RAN 功能标识，在一个 E2 Node 范围内唯一标识一个 RAN 功能。
> RAN Function Definition	E2SM IE
> RAN Function Revision	参考协议 O-RAN-WG3 E2AP 9.2.24.
List of RAN Functions Deleted	基站 E2 节点支持的 RAN 功能列表信息，详细参数协议 O-RAN-WG3 E2AP 9.1.2.2.
> RAN Function ID	RAN 功能标识，在一个 E2 Node 范围内唯一标识一个 RAN 功能。
> RAN Function Revision	参考协议 O-RAN-WG3 E2AP 9.2.24.

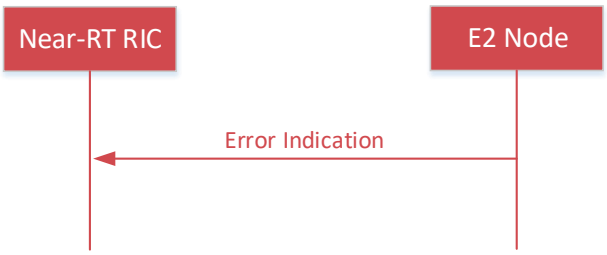
6.1.3.2.3 RIC Service Update Acknowledge

字段	说明
Message Type	参考协议 O-RAN-WG3 E2AP 9.2.3
List of RAN Functions Accepted	Near-RT RIC 接收的 RAN 功能列表信息。
> RAN Function ID	
> RAN Function Revision	
List of RAN Functions Rejected	Near-RT RIC 拒绝的 RAN 功能。
> RAN Function ID	
> Case	Near-RT RIC 拒绝的原因。

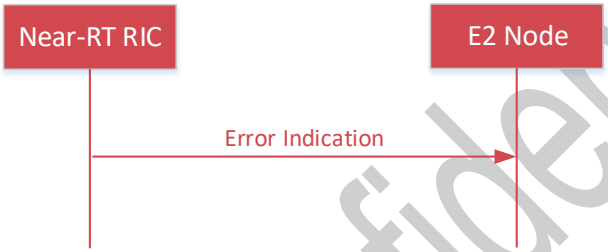
6.1.4 错误指示过程

当 Near-RT RIC 或 E2 Node 收到的 E2 消息无法解析，或者收到了不在预期范围内的消息时，则发起错误指示过程。

6.1.4.1 基站侧发起的错误指示过程



6.1.4.2 Near-RT RIC 发起的错误指示过程



6.1.4.3 消息 IE

字段	说明
Message Type	
RIC Request ID	
RAN Function ID	
Cause	
Criticality Diagnostics	

6.2 Near-RT RIC 功能相关过程

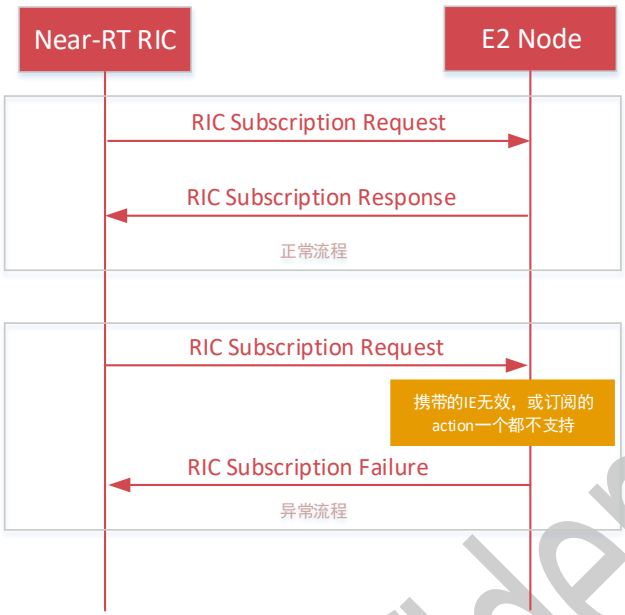
关于 RIC Request ID 的使用说明：（协议里没有说明）

1） RIC Request ID 的生命周期有两种，一种是开始于 RIC 订阅过程，结束于 RIC 删除订阅过程；一种是一个 RIC 控制过程。

2） 对于 RIC 订阅过程而言，唯一表示一个 RIC 订阅服务。两次 RIC 订阅不能携带相同的 RIC Request ID，除非前面一次订阅已执行过 RIC 删除订阅过程。

6.2.1 RIC 订阅过程

6.2.1.1 过程图



6.2.1.2 消息 IE

6.2.1.2.1 RIC Subscription Request

字段	说明
Message Type	E2 消息类型，包括过程码和消息类型。
RIC Request ID	
RAN Function ID	RAN 功能 ID，源于 E2 建立过程或 RIC 服务更新过程中携带的 RAN Function ID。
RIC Subscription Details	
> RIC Event Trigger Definition	E2SM IE
> Sequence of Actions	
>> RIC Action ID	
>> RIC Action Type	订阅的 RIC 服务，Report，Policy……
>> RIC Action Definition	E2SM IE
>> RIC Subsequent Action	

6.2.1.2.2 RIC Subscription Response

字段	说明
Message Type	E2 消息类型，包括过程码和消息类型。
RIC Request ID	源于 RIC Subscription Request 消息中携带的 RIC Request ID。
RAN Function ID	源于 RIC Subscription Request 消息中携带的 RAN Function ID。
RIC Actions Admitted List	
> RIC Action ID	E2 接收的订阅服务 ID。
RIC Actions Not Admitted List	
> RIC Action ID	E2 没有接收的订阅服务 ID。
> Cause	E2 没有接收订阅服务的原因。

6.2.1.2.3 RIC Subscription Failure

字段	说明
Message Type	E2 消息类型，包括过程码和消息类型。
RIC Request ID	源于 RIC Subscription Request 消息中携带的 RIC Request ID。
RAN Function ID	源于 RIC Subscription Request 消息中携带的 RAN Function ID。
RIC Actions Not Admitted List	
> RIC Action ID	E2 没有接收的订阅服务 ID。
> Cause	E2 没有接收订阅服务的原因。
Criticality Diagnostics	若 RIC Subscription Request 消息中存在无法解析的 IE 时，携带该字段。

6.2.1.3 RIC 订阅过程说明

RIC 订阅过程由 Near-RT RIC 侧发起。

当 E2 Node 收到来自 Near-RT RIC 的 RIC Subscription Request，其处理步骤如下：

1. 检查 RIC Subscription Request 携带的参数是否合理，包括：
   1） RIC Request ID、RAN Function ID 是否有效；
   2） RIC Event Trigger Definition IE 携带的消息是否与 E2 Node 上报的 RAN 功能相吻合；
   3） RIC Action ID、RIC Action Type 是否有效，RIC Action Definition IE 携带的消息是否与 E2 Node 上报的 RAN 功能相吻合。

   若是，执行 2；否则，向 Near-RT RIC 发送 RIC Subscription Failure，并携带相应的原因值。
2. 检查 RIC Subscription Request 消息中 RIC Action Definition 涉及的 Action 是否已订阅，若已订阅，则不接受该 Action，并携带原因为 Duplicate action；若未订阅，则接受该 Action。
3. 判断是否至少可以支持一个 Sequence of Actions IE 中携带的 Action，若是，则在 E2 Node 执行 4，并向 Near-RT RIC 发送 RIC Subscription Response，并携带接收的 Action 和拒绝的 Action（如果有）；否则，向 Near-RT RIC 发送 RIC Subscription Failure，并携带拒绝 Action 的原因。
4. 保存 RIC Subscription Request 消息携带的消息：RIC Request ID、RAN Function ID、RIC Action ID 等，并配置相关的订阅事件。

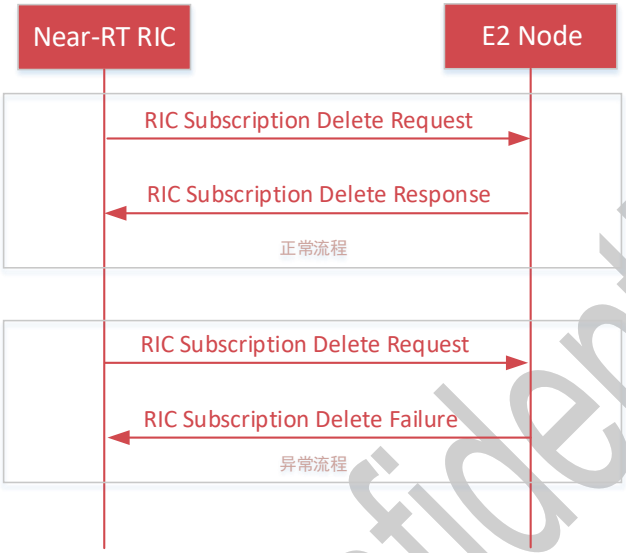
异常情况处理：

1. 当 E2 Node 收到两条除 RIC Request ID 外，其余 IE 完全相同的 RIC Subscription Request 时，则向 Near-RT RIC 发送 RIC Subscription Failure，并携带原因值。（协议规定）
2. 当 E2 Node 收到了两条 RIC Request ID 相同的订阅消息，而前面一次订阅未执行 RIC 订阅删除过程，则向 Near-RT RIC 发送 RIC Subscription Failure，并携带原因值 Duplicate RIC Request ID。（协议没说）
3. 当 E2 Node 正在处理 RIC Subscription Request 消息时收到了 RIC Subscription Delete

Request 时，则停止正在进行的 RIC 订阅过程，执行 RIC 取消订阅过程。

6.2.2 RIC 订阅删除过程

6.2.2.1 过程图



6.2.2.2 消息 IE

6.2.2.2.1 RIC Subscription Delete Request/ RIC Subscription Delete Response

字段	说明
Message Type	E2 消息类型，包括过程码和消息类型。
RIC Request ID	
RAN Function ID	

6.2.2.2.2 RIC Subscription Delete Failure

字段	说明
Message Type	E2 消息类型，包括过程码和消息类型。
RIC Request ID	
RAN Function ID	
Cause	
Criticality Diagnostics	

6.2.2.3 RIC 订阅删除过程说明

RIC 订阅删除过程由 Near-RT RIC 侧发起。

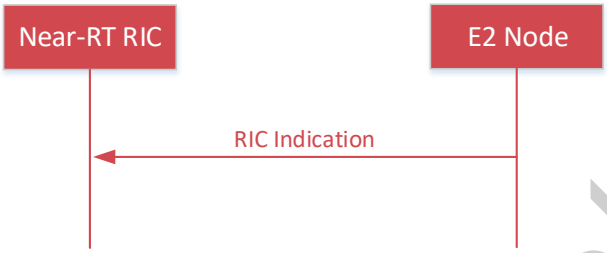
当 E2 Node 收到来自 Near-RT RIC 的 RIC Subscription Delete Request，其处理步骤如下：

1. 检查 RIC Subscription Delete Request 消息携带的 RIC Request ID 是否已订阅，若无，则向 Near-RT RIC 发送 RIC Subscription Delete Failure，并携带原因值为 Invalid RIC Request ID；否则，执行 2；

2. 停止所有 RIC Request ID 相关的订阅事件，清除所有已配置的资源（如果有），并向 Near-RT RIC 发送 RIC Subscription Delete Response。

6.2.3 RIC 指示过程

6.2.3.1 过程图



6.2.3.2 消息 IE

6.2.3.2.1 RIC Indication

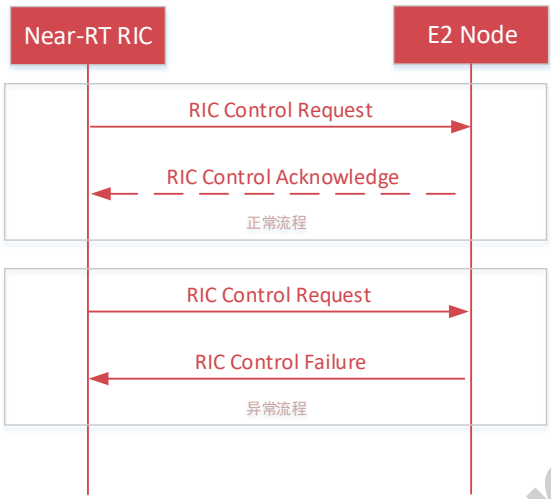
字段	说明
Message Type	E2 消息类型，包括过程码和消息类型。
RIC Request ID	源于 RIC 订阅过程。
RAN Function ID	
RIC Action ID	源于 RIC 订阅过程。
RIC Indication SN	这个参数为可选参数，协议里没有说明该参数的作用。因此，暂时不携带该参数。
RIC Indication Type	
RIC Indication Header	E2SM IE
RIC Indication Message	E2SM IE

6.2.3.3 RIC 指示过程说明

RIC 指示过程由 RIC 订阅事件触发。当满足事件触发条件时，向 Near-RT RIC 发送相应的报告。

6.2.4 RIC 控制过程

6.2.4.1 过程图



6.2.4.2 消息 IE

6.2.4.2.1 RIC Control Request

字段	类型	取值范围	说明
Message Type			E2 消息类型，包括过程码和消息类型。
RIC Request ID			
RAN Function ID			
RIC Control Header			E2SM IE
RIC Control Message			E2SM IE
RIC Control Ack Request（可选）		ENUMERATED (NoAck, Ack, NAck, …)	NoAck: 不需要给 Near-RT RIC 回复控制确认消息。 Ack: 需要给 Near-RT RIC 回复控制确认消息。 NAck: 只有当 E2 Node 处理 RIC 控制请求消息失败时，才发送 RIC 控制确认消息。

6.2.4.2.2 RIC Control Acknowledge

字段	类型	取值范围	说明
Message Type			E2 消息类型，包括过程码和消息类型。
RIC Request ID			
RAN Function ID			
RIC Control Status		ENUMERATED (Success, Rejected, Failed …)	RIC 控制请求的处理状态。
RIC Control Outcome（可选）			E2SM IE

6.2.4.2.3 RIC Control Failure

字段	类型	取值范围	说明
Message Type			E2 消息类型，包括过程码和消息类型。
RIC Request ID			
RAN Function ID			

Cause			
RIC Control Outcome（可选）			E2SM IE

6.2.4.3 RIC 控制过程说明

RIC 控制过程由 Near-RT RIC 发起。Near-RT RIC 可通过 RIC 控制过程向 E2 Node 请求立刻上报小区负载状态信息，UE 测量报告，或执行 UE 迁移命令等。

当 E2 Node 收到了来自 Near-RT RIC 的 RIC Control Request 消息，其处理步骤如下：

1. 检查 RIC Control Request 消息携带的 RAN Function ID 是否有效。若无效，则 E2 Node 向 Near-RT RIC 发送 Error Indication 消息（协议规定）；否则，执行 2。
2. 检查 RIC Control Request 消息携带的 RIC Control Header、RIC Control Message 是否有效，是否支持。若无效，或 E2 Node 不支持相应的 RIC 控制流程，则向 Near-RT RIC 发送 Error Indication 消息（协议规定）；否则，执行 3。
3. E2 Node 执行相应的控制流程。若执行失败，执行 4；否则，执行 5。
4. E2 Node 向 Near-RT RIC 发送 RIC Control Failure 消息。
5. RIC Control Request 消息中是否携带了 RIC Control Ack Request IE，若携带了该 IE，且为 Ack，则向 Near-RT RIC 发送 RIC Control Acknowledge 消息。（协议规定）

问题：根据目前的 E2AP 协议，第 4 步的处理其实不太明确。

当 RIC Control Request 消息中携带了 RIC Control Ack Request IE，且其值为 NAck 时，若 E2 Node 处理 RIC 控制请求消息失败，E2 Node 应该向 Near-RT RIC 发送什么消息？是 RIC Control Failure 呢，还是 RIC Control Acknowledge？

根据 E2AP 协议 8.2.4.3 章节， If the E2 Node fails to perform the requested RIC Control procedure action, then the E2 Node shall （必须）respond with the RIC CONTROL FAILURE message with an appropriate cause value。

根据 E2AP 协议 9.2.21 章节， NAck means that Optional RIC Control Acknowledgement is only required to report failure.

7. E2AP 控制面协议栈

E2AP 控制面协议栈如图 7-1 所示。传输网络层基于 IP 协议之上，为了增加信令消息传输的可靠性，在 IP 层之上添加了 SCTP。

IANA 给 SCTP 分配的用于 E2AP 的 Payload Protocol Identifier 为 70。

IANA 没有给 SCTP 分配用于 E2AP 的端口号，由 Near-RT RIC 与 E2 Node 自行配置。

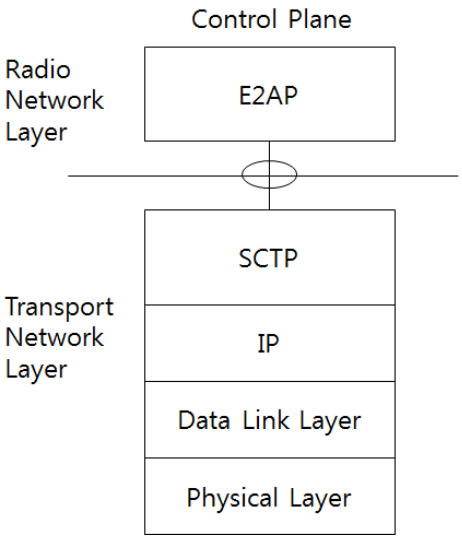


图 7-1 E2AP 控制面协议栈

7.1 数据库配置

新增数据库配置参数如下所示，这些参数用于建立 E2 的 SCTP 连接。

```
<E2AP>
    <Enable>true</Enable>
    <Transport>
        <RicIpAddress></RicIpAddress>
        <RicPort></RicPort>
        <LocalIpAddress></LocalIpAddress>
        <LocalPort></LocalPort>
        <Sctp>
            <RTOInitial>2</RTOInitial>
            <RTOMin>1</RTOMin>
            <RTOMax>23</RTOMax>
            <MaxInitRetransmits>2</MaxInitRetransmits>
            <HBInterval>30</HBInterval>
            <MaxPathRetransmits>6</MaxPathRetransmits>
            <MaxAssociationRetransmits>6</MaxAssociationRetransmits>
            <ValidCookieLife>8</ValidCookieLife>
        </Sctp>
    </Transport>
</E2AP>
```

7.2 SCTP 建链和断链

Near-RT RIC 侧为 SCTP 服务器，基站侧为 SCTP 客户端。

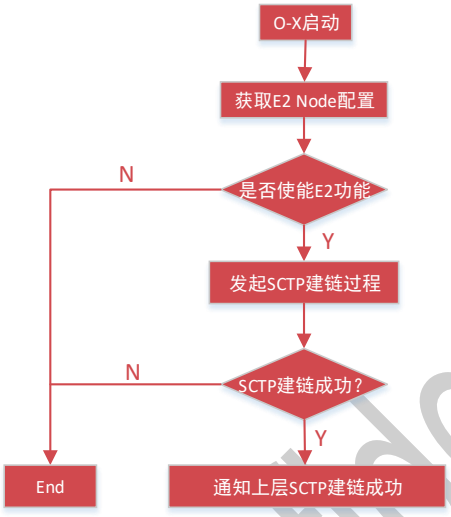
7.2.1 SCTP 建链

基站侧 SCTP 链路建立过程如下：

1. E2 Node 启动完成，其中 E2 Node 表示 DU，CU-CP，CU-UP。
2. 获取 E2 Node 相关配置，包括 SCTP 服务器 IP 地址和端口号、本地 IP 地址和端口

号、是否使能 E2 功能、SCTP 相关配置参数等。

3. 判断 E2 功能是否使能，若使能，则启动 SCTP socket，发起 SCTP 链路建立过程；否则，什么都不做。
4. 若 SCTP 链路建立成功，则通知上层（无线网络层），SCTP 偶联成功。



7.2.2 SCTP 断链

当 SCTP 链路发生故障，如 SCTP 心跳检测机制没有检测到心跳，则认为 SCTP 链路已经断开。

当 SCTP 断链，操作如下：

1. 通知上层 SCTP 断链；
2. 关闭 SCTP socket；
3. 重新启动 SCTP socket，发起 SCTP 链路建立过程。

SCTP 断链，E2AP 层的处理：

1. 停止所有正在执行的 RIC 过程（如果存在），并删除所有 Near-RT RIC 订阅的服务（如果存在）。

8. E2SM- TS IE Definition

8.1 Tabular Format Contents

8.1.1 Presence

缩写	含义
M	Mandatory，必须携带
O	Optional，可选，可以携带，也可以不携带。

C	Conditional，条件携带。若条件满足，则必须携带；否则，不携带。

8.1.2 CHOICE

CHOICE 下的选项，N 选一。

8.1.3 Sequence

表示可以携带多个 Sequence 下的实例配置。

8.2 E2SM Common IEs

8.2.1 RAN Function Name IE

This IE defines the Name of a given *RAN Function Name* IE as a structured data.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RAN Function Short Name	M		PrintableString(SIZE(1..150))	ORAN-WG3- TS

8.2.2 RIC Style Type IE

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

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

Note: Assignment of RIC Style Type values is described in section 5

8.2.3 RIC Style Name IE

This IE defines the *RIC Style Name* IE.

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

Note: Assignment of RIC Style Name values is described in section 5

8.2.4 RIC Format Type IE

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

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RIC Format Type	M		INTEGER	

Note: Assignment of RIC Format Type values is described in section 5

8.2.5 RAN Parameter Type IE

This IE defines the RAN function specific *RAN Parameter Type* IE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RAN Parameter Type	M	{integer, enumerated, boolean, bit string, octet string, printable string}	ENUMERATED	

8.2.6 RAN Parameter ID IE

This IE defines the RAN function specific *RAN parameter ID* IE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description

RAN Parameter ID	M	0..maxofRANparameters	INTEGER	

8.2.7 Report Period IE

This IE defines the Report Period IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Report Period	M	{ ms10, ms20, ms32, ms40, ms60, ms70, ms128, ms160, ms256, ms320, ms512, ms640, ms1024, ms2048, ms2560, ms5120, ms10240}	ENUMERATED	

8.2.8 PLMN Identity IE

This IE defines the RAN function specific PLMN Identity IE.

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 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 3 digit MNC).

8.2.9 NR CGI IE

This IE defines the NR CGI IE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		PLMN Identity 8.2.8	
NR Cell Identity	M		BIT STRING (SIZE(36))	The leftmost bits of the NR Cell Identity IE correspond to the gNB ID

8.2.10 E-UTRA CGI IE

This IE defines the E-UTRA CGI IE.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PLMN Identity	M		PLMN Identity 8.2.8	
E-UTRA Cell Identity	M		BIT STRING (SIZE(28))	The leftmost bits of the NR Cell Identity IE correspond to the gNB ID

8.2.11 UE ID IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RAN UE NGAP ID	O	(0.. 4294967295)	INTEGER	See 3GPP TS 38.413
AMF UE NGAP ID	O	(0.. 1099511627775)	INTEGER	See 3GPP TS 38.413
gNB-DU UE F1AP ID	C	(0.. 4294967295)	INTEGER	See 3GPP TS 38.473
gNB-CU UE F1AP ID	C	(0.. 4294967295)	INTEGER	See 3GPP TS 38.473
gNB-CU-CP UE E1AP ID	C	(0.. 4294967295)	INTEGER	See 3GPP TS 38.463
gNB-CU-UP UE E1AP ID	C	(0.. 4294967295)	INTEGER	See 3GPP TS 38.463
Source NG-RAN node UE XnAP ID	O	(0.. 4294967295)	INTEGER	See 3GPP TS 38.423
Target NG-RAN node UE XnAP ID	O	(0.. 4294967295)	INTEGER	See 3GPP TS 38.423
C-RNTI	C	(0..65535)	INTEGER	see 3GPP 38.331 section 6.3.2 RNTI-Value

8.2.12 RAN Parameter Name IE

This IE defines the *RAN Parameter Name* IE of a given RAN Parameter ID.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RAN Parameter Name	M		PrintableString(SIZE(1..150,...))	

8.2.13 Reserved IE

该 IE 的目的是为了填充暂时无法确定的 IE type 而设定的。

IE/Group Name	Presence	Range	IE type and reference	Semantics description
For Further Study	O		INTEGER	See 3GPP TS 38.413

8.3 Cell Measurement Related IEs

8.3.1 O-CU-CP Cell Measurement Container IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Sequence of O-CU-CP Cell Measurement		1.. <maxofCells>		
> NR CGI	M		NR CGI	See 3GPP TS 38.413 session 9.3.1.7
> Cell Status	M	(outOfService, inService)	ENUMERATED	
> Number of Supported RRC Connections	M		INTEGER	
> Mean number of RRC Connections	O		INTEGER	See 3GPP TS 28.552 session 5.1.1.4.1
> Max number of RRC Connections	M		INTEGER	See 3GPP TS 28.552 session 5.1.1.4.2
> Number of RRC Connections	M		INTEGER	

8.3.2 O-CU-UP Cell Measurement Container IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Sequence of O-CU-UP Cell Measurement		1.. <maxofCells>		
> NR CGI	M		NR CGI	See 3GPP TS 38.413 session 9.3.1.7
> DL Cell PDCP SDU Data Volume	O		INTEGER	See 3GPP TS 28.552 session 5.1.2.1.1.1
> DL PDCP SDU Drop rate in gNB-CU-UP	O		INTEGER	See 3GPP TS 28.552 session 5.1.3.2.1
> Packet Delay	O		INTEGER	See 3GPP TS 28.552 session

8.3.3 O-DU Cell Measurement Container IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Sequence of O-DU Cell Measurement		1.. <maxofCells>		
> NR CGI	M		NR CGI	See 3GPP TS 38.413 session 9.3.1.7
> Cell Status	M	(outOfService, inService)	ENUMERATED	
> DL PRB Usage Ratio	O	(0..100)	INTEGER	
> UL PRB Usage Ratio	O	(0..100)	INTEGER	
> DL Total Available PRBs	O		INTEGER	See 3GPP TS 28.552 session 5.1.1.2.6
> UL Total Available PRBs	O		INTEGER	
> DL Total PRB Usage	O		INTEGER	See 3GPP TS 28.552 session 5.1.1.2.1
> UL Total PRB Usage	O		INTEGER	
> DL PRB Used For Data Traffic	O		INTEGER	See 3GPP TS 28.552 session 5.1.1.2.5
> Total Number Of DL TBs	O		INTEGER	See 3GPP TS 28.552 session 5.1.1.7.3
> Cell MAC Rate	O		INTEGER	This measurement provides a cell bitrate of MAC. Only the successfully transmitted TBs will be calculated. Retransmitted TBs is not considered
> Distribution Of DL Total PRB Usage	O		INTEGER	See 3GPP TS 28.552 session 5.1.1.2.3
> Total Error Number Of DL TBs	O		INTEGER	See 3GPP TS 28.552 session 5.1.1.7.4
> MCS Distribution in PDSCH	O		INTEGER	See 3GPP TS 28.552 session 5.1.1.12.1
> Mean Number of Active UEs in the DL per Mapped 5QI Per Cell	O		INTEGER	See 3GPP TS 38.314 session 4.1.1.3.1

> Max number of Active UEs in the DL per mapped 5QI per cell	O		INTEGER	See 3GPP TS 38.314 session 4.1.1.3.2
> DL Packet Drop Rate in gNB-DU	O		INTEGER	See 3GPP TS 28.552 session 5.1.3.2.2

8.4 UE Measurement Related IEs

8.4.1 O-CU-CP UE Measurement Container IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Sequence of O-CU-CP UE Measurement		1.. <maxofUEs>		
> UE ID	M		UE ID 8.2.11	
> NR CGI	M		NR CGI	See 3GPP TS 38.413 section 9.3.1.7
> Measurement Result			Measurement Result	参考 8.6.2.10。

8.4.2 O-CU-UP UE Measurement Container IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Sequence of O-CU-UP UE Measurement		1.. <maxofUEs>		
> UE ID	M		UE ID 8.2.11	
> NR CGI	M		NR CGI	参考 8.2.9
> DL PDCP occupied buffer size	O	65535	INTEGER	This measurement is optionally split into subcounters per UE level. And it is an average value for a period of time. The unit is kbit
> DL unused PDCP buffer si	O		INTEGER	This measurement is optionally split into subcounters per UE level. And it is an average value for a period of time. The unit is kbit
> Packet Dela	O		INTEGER	see 3GPP 36.314 section 4.1.4.1
> PDCP data volume	O		INTEGER	see 3GPP 36.314 section 4.1.8.1

8.4.3 O-DU UE Measurement Container IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Sequence of O-DU UE Measurement		1.. <maxofUEs>		
> UE ID	M		UE ID 8.2.11	
> NR CGI	M		NR CGI	参考 8.2.9
> UL UE PRB used for data traffic	O		INTEGER	参考文献[6]
> DL UE PRB used for data traffic	O		INTEGER	参考文献[6]
> Average DL UE Throughput in gNB	O		INTEGER	See 3GPP TS 28.552

				session 5.1.1.3.1
> Distribution of DL UE Throughput in gNB	O		INTEGER	See 3GPP TS 28.552 session 5.1.1.3.2
> UE MAC Rate	O		INTEGER	This measurement provides a UE bitrate of MAC. Only the successfully transmitted TBs will be calculated. Retransmitted TBs is not considered
> Wideband CQI distribution	O		INTEGER	See 3GPP TS 28.552 session 5.1.1.11.1
> Average MCS	O	0..28	INTEGER	This measurement provides the MCS scheduled for PDSCH RB by NG-RAN per UE. It is an average value for a period of time
> TA	O		INTEGER	See 3GPP TS 38.213 session 4.2

8.5 Cell Configuration Related IEs

8.5.1 O-CU-CP Cell Configuration Container IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Sequence of O-CU-CP Cell Configuration		1.. <maxofCells>		
> NR CGI	M		NR CGI 8.2.9	
> NR PCI	M		INTEGER	
> TAC	M		OCTET STRING (SIZE(3))	
> Measurement Report Event Trigger Configuration	O		Measurement Report Event Trigger Configuration 8.6.2.9	
> Neighbor Cell Information	O		Neighbor Cell Information	详细见 8.6.1
> Common Cell Reselection Configuration	O		Common Cell Reselection Configuration	详细见 8.6.3.1
> Intra-frequency Cell Reselection Configuration	O		Intra-frequency Cell Reselection Configuration	详细见 8.6.3.2
> Inter-frequency Cell Reselection Configuration	O		Inter-frequency Cell Reselection Configuration	详细见 8.6.3.3
> Inter-RAT Cell Reselection Configuration	O		Inter-RAT Cell Reselection Configuration	详细见 8.6.3.4
> Logical Channel Configuration	O		Logical Channel	详细见 8.7.1

			Configuration	
> DRX Configuration	O		DRX Configuration	详细见 8.7.2
> Scheduling Request Configuration	O		Scheduling Request Configuration	8.7.3
> Non-dynamic Scheduling Configuration	O		Non-dynamic Scheduling Configuration	8.7.4

8.5.2 O-CU-UP Cell Configuration Container IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Sequence of O-CU-UP Cell Configuration		1.. <maxofCells>		
> NR CGI	M		NR CGI	详细见 8.2.9

8.5.3 O-DU Cell Configuration Container IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Sequence of O-DU Cell Configuration		1.. <maxofCells>		
> NR CGI	M		NR CGI	详细见 8.2.9

8.6 Mobility Related IEs

8.6.1 Neighbor Cell Information IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Sequence of NR Cell Containers		1.. 8		
> NR CGI	M		NR CGI	详细见 8.2.9
> NR PCI	M	(0, 1007)	INTEGER	
> TAC	M		OCTET STRING (SIZE(3))	
> NR Carrier ARFCN	M	(0, 3279165)	INTEGER	
> SSB Frequency	M	(0, 3279165)	INTEGER	
> SSB Subcarrier Spacing	M	{kHz15, kHz30, kHz60, kHz120, kHz240, spare3, spare2, spare1}	ENUMERATED	
> Q_{Offset}	M	{dB-24, dB-22, dB-20, dB-18, dB-16, dB-14, dB-12, dB-10, dB-8, dB-6, dB-5, dB-4, dB-3, dB-2, dB-1, dB0, dB1, dB2, dB3, dB4, dB5, dB6, dB8, dB10, dB12, dB14, dB16, dB18, dB20, dB22, dB24}	ENUMERATED	
> $Q_{RxLevMinOffsetCell}$	M	(1, 8)	INTEGER	
> $Q_{QualLevMinOffsetCell}$	M	(1, 8)	INTEGER	
> is Black Cell	O	(True, False)	BOOLEAN	
Sequence of EUTRA Cell Containers		1.. 8		
> ECGI	O		E-UTRA CGI	详细见 8.2.10。
> PCI	O	(0, 503)	INTEGER	
> TAC	O		OCTET STRING	

			(SIZE(3))	
> EUTRA Carrier ARFCN	O	(0, 262143)	INTEGER	
> Q_{Offset}	O	{dB-24, dB-22, dB-20, dB-18, dB-16, dB-14, dB-12, dB-10, dB-8, dB-6, dB-5, dB-4, dB-3, dB-2, dB-1, dB0, dB1, dB2, dB3, dB4, dB5, dB6, dB8, dB10, dB12, dB14, dB16, dB18, dB20, dB22, dB24}	ENUMERATED	
> $Q_{RxLevMinOffsetCell}$	O	(1, 8)	INTEGER	
> $Q_{QualLevMinOffsetCell}$	O	(1, 8)	INTEGER	
> is Black Cell	O	(True, False)	BOOLEAN	

8.6.2 Connected Mode Related IEs

8.6.2.1 A1 Event Trigger Configuration IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Enable	M		BOOLEAN	
index	M	(1, 127)	INTEGER	
A1 Threshold	M		Measurement Trigger Quantity	
Report On Leave	M		BOOLEAN	
Hysteresis	M	(0..30)	INTEGER	
Time To Trigger	M	{ms0, ms40, ms64, ms80, ms100, ms128, ms160, ms256, ms320, ms480, ms512, ms640, ms1024, ms1280, ms2560, ms5120}	ENUMERATED	
Reference Signal Type	M	{ssb, csi-rs}	ENUMERATED	
Report Interval	M	{ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, ms20480, ms40960, min1,min6, min12, min30 }	ENUMERATED	
Report Amount	M	{r1, r2, r4, r8, r16, r32, r64, infinity}	ENUMERATED	
Report Quantity Cell	M		Measurement Trigger Quantity	
Max Report Cells	M	(1,8)	INTEGER	
Report Quantity RS Index	O		Measurement Trigger Quantity	
Include Beam Measurements	M	(True, False)	BOOLEAN	
Max Nr of RS Indexes To Report	O	(0,32)	INTEGER	

8.6.2.2 A2 Event Trigger Configuration IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Enable	M	(True, False)	BOOLEAN	
index	M	(1, 127)	INTEGER	
A2 Threshold	M		Measurement Trigger Quantity	See 3GPP TS 38.331 section 6.3.2
Report On Leave	M	(True, False)	BOOLEAN	See 3GPP TS 38.331

				section 6.3.2
Hysteresis	M	(0..30)	INTEGER	See 3GPP TS 38.331 section 6.3.2
Time To Trigger	M	{ms0, ms40, ms64, ms80, ms100, ms128, ms160, ms256, ms320, ms480, ms512, ms640, ms1024, ms1280, ms2560, ms5120}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Reference Signal Type	M	{ssb, csi-rs}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Interval	M	{ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, ms20480, ms40960, min1,min6, min12, min30 }	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Amount	M	{r1, r2, r4, r8, r16, r32, r64, infinity}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Quantity Cell	M		Measurement Trigger Quantity	See 3GPP TS 38.331 section 6.3.2
Max Report Cells	M	(1,8)	INTEGER	See 3GPP TS 38.331 section 6.3.2
Report Quantity RS Index	O		Measurement Trigger Quantity	
Include Beam Measurements	M	(True, False)	BOOLEAN	See 3GPP TS 38.331 section 6.3.2
Max Nr of RS Indexes To Report	O	(0,32)	INTEGER	See 3GPP TS 38.331 section 6.3.2

8.6.2.3 A3 Event Trigger Configuration IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Enable	M	(True, False)	BOOLEAN	
index	M	(1, 127)	INTEGER	
A3 Offset			Measurement Trigger Quantity Offset	See 3GPP TS 38.331 section 6.3.2
Report On Leave	M	(True, False)	BOOLEAN	See 3GPP TS 38.331 section 6.3.2
Hysteresis	M	(0..30)	INTEGER	See 3GPP TS 38.331 section 6.3.2
Time To Trigger	M	{ms0, ms40, ms64, ms80, ms100, ms128, ms160, ms256, ms320, ms480, ms512, ms640, ms1024, ms1280, ms2560, ms5120}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Use White Cell List	M	(True, False)	BOOLEAN	See 3GPP TS 38.331 section 6.3.2
Reference Signal Type	M	{ssb, csi-rs}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Interval	M	{ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, ms20480, ms40960, min1,	ENUMERATED	See 3GPP TS 38.331 section 6.3.2

		min6, min12, min30 }		
Report Amount	M	{r1, r2, r4, r8, r16, r32, r64, infinity}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Quantity Cell	M		Measurement Trigger Quantity	
Max Report Cells	M	(1, 8)	INTEGER	See 3GPP TS 38.331 section 6.3.2
Report Quantity RS Index	O		Measurement Trigger Quantity	
Include Beam Measurements	M	(True, False)	BOOLEAN	See 3GPP TS 38.331 section 6.3.2
Max Nr of RS Indexes To Report	O	(0, 32)	INTEGER	See 3GPP TS 38.331 section 6.3.2

8.6.2.4 A4 Event Trigger Configuration IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Enable	M	(True, False)	BOOLEAN	
index	M	(1, 127)	INTEGER	
A4 Threshold	M		Measurement Trigger Quantity	
Report On Leave	M	(True, False)	BOOLEAN	See 3GPP TS 38.331 section 6.3.2
Hysteresis	M	(0..30)	INTEGER	See 3GPP TS 38.331 section 6.3.2
Time To Trigger	M	{ms0, ms40, ms64, ms80, ms100, ms128, ms160, ms256, ms320, ms480, ms512, ms640, ms1024, ms1280, ms2560, ms5120}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Use White Cell List		(True, False)	BOOLEAN	See 3GPP TS 38.331 section 6.3.2
Reference Signal Type	M	{ssb, csi-rs}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Interval	M	{ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, ms20480, ms40960, min1,min6, min12, min30 }	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Amount	M	{r1, r2, r4, r8, r16, r32, r64, infinity}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Quantity Cell	M		Measurement Trigger Quantity	
Max Report Cells	M	(1,8)	INTEGER	See 3GPP TS 38.331 section 6.3.2
Report Quantity RS Index	O		Measurement Trigger Quantity	
Include Beam Measurements	M	(True, False)	BOOLEAN	See 3GPP TS 38.331 section 6.3.2
Max Nr of RS Indexes To Report	O	(0,32)	INTEGER	See 3GPP TS 38.331 section 6.3.2

8.6.2.5 A5 Event Trigger Configuration IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Enable	M	(True, False)	BOOLEAN	
index	M	(1, 127)	INTEGER	
A5 Threshold1	M		Measurement Trigger Quantity	
A5 Threshold2	M		Measurement Trigger Quantity	
Hysteresis	M	(0..30)	INTEGER	See 3GPP TS 38.331 section 6.3.2
Time To Trigger	M	{ms0, ms40, ms64, ms80, ms100, ms128, ms160, ms256, ms320, ms480, ms512, ms640, ms1024, ms1280, ms2560, ms5120}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Use White Cell List		(True, False)	BOOLEAN	See 3GPP TS 38.331 section 6.3.2
Reference Signal Type	M	{ssb, csi-rs}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Interval	M	{ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, ms20480, ms40960, min1,min6, min12, min30 }	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Amount	M	{r1, r2, r4, r8, r16, r32, r64, infinity}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Quantity Cell	M		Measurement Trigger Quantity	
Max Report Cells	M	(1,8)	INTEGER	See 3GPP TS 38.331 section 6.3.2
Report Quantity RS Index	O		Measurement Trigger Quantity	
Include Beam Measurements	M	(True, False)	BOOLEAN	See 3GPP TS 38.331 section 6.3.2
Max Nr of RS Indexes To Report	O	(0,32)	INTEGER	See 3GPP TS 38.331 section 6.3.2

8.6.2.6 A6 Event Trigger Configuration IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Enable	M	(True, False)	BOOLEAN	
index	M	(1, 127)	INTEGER	
A6 Offset			Measurement Trigger Quantity Offset	
Hysteresis	M	(0..30)	INTEGER	See 3GPP TS 38.331 section 6.3.2
Time To Trigger	M	{ms0, ms40, ms64, ms80, ms100, ms128, ms160, ms256, ms320, ms480, ms512, ms640, ms1024, ms1280, ms2560, ms5120}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Use White Cell List		(True, False)	BOOLEAN	See 3GPP TS 38.331

				section 6.3.2
Reference Signal Type	M	{ssb, csi-rs}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Interval	M	{ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, ms20480, ms40960, min1,min6, min12, min30 }	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Amount	M	{r1, r2, r4, r8, r16, r32, r64, infinity}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Quantity Cell	M		Measurement Trigger Quantity	
Max Report Cells	M	(1,8)	INTEGER	See 3GPP TS 38.331 section 6.3.2
Report Quantity RS Index	O		Measurement Trigger Quantity	
Include Beam Measurements	M	(True, False)	BOOLEAN	See 3GPP TS 38.331 section 6.3.2
Max Nr of RS Indexes To Report	O	(0,32)	INTEGER	See 3GPP TS 38.331 section 6.3.2

8.6.2.7 B1 Event Trigger Configuration IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Enable	M	(True, False)	BOOLEAN	
index	M	(1, 127)	INTEGER	
B1 Threshold EUTRA			Measurement Trigger Quantity EUTRA	
Report On Leave	M	(True, False)	BOOLEAN	See 3GPP TS 38.331 section 6.3.2
Hysteresis	M	(0..30)	INTEGER	See 3GPP TS 38.331 section 6.3.2
Time To Trigger	M	{ms0, ms40, ms64, ms80, ms100, ms128, ms160, ms256, ms320, ms480, ms512, ms640, ms1024, ms1280, ms2560, ms5120}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Reference Signal Type	M	{ssb, csi-rs}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Interval	M	{ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, ms20480, ms40960, min1,min6, min12, min30 }	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Amount	M	{r1, r2, r4, r8, r16, r32, r64, infinity}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Quantity Cell	M		Measurement Trigger Quantity	
Max Report Cells	M	(1,8)	INTEGER	See 3GPP TS 38.331 section 6.3.2
Include Beam Measurements	M	(True, False)	BOOLEAN	See 3GPP TS 38.331 section 6.3.2
Max Nr of RS Indexes To Report	O	(0,32)	INTEGER	See 3GPP TS 38.331

				section 6.3.2

8.6.2.8 B2 Event Trigger Configuration IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Enable	M	(True, False)	BOOLEAN	
index	M	(1, 127)	INTEGER	
B2 Threshold1	M		Measurement Trigger Quantity	
B2 Threshold2 EUTRA	M		Measurement Trigger Quantity EUTRA	
Report On Leave	M	(True, False)	BOOLEAN	See 3GPP TS 38.331 section 6.3.2
Hysteresis	M	(0..30)	INTEGER	See 3GPP TS 38.331 section 6.3.2
Time To Trigger	M	{ms0, ms40, ms64, ms80, ms100, ms128, ms160, ms256, ms320, ms480, ms512, ms640, ms1024, ms1280, ms2560, ms5120}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Reference Signal Type	M	{ssb, csi-rs}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Interval	M	{ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, ms20480, ms40960, min1,min6, min12, min30 }	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Amount	M	{r1, r2, r4, r8, r16, r32, r64, infinity}	ENUMERATED	See 3GPP TS 38.331 section 6.3.2
Report Quantity Cell	M		Measurement Trigger Quantity	
Max Report Cells	M	(1,8)	INTEGER	See 3GPP TS 38.331 section 6.3.2
Include Beam Measurements	M	(True, False)	BOOLEAN	See 3GPP TS 38.331 section 6.3.2
Max Nr of RS Indexes To Report	O	(0,32)	INTEGER	See 3GPP TS 38.331 section 6.3.2

8.6.2.9 Measurement Report Event Trigger Configuration IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Sequence of A1 Report Configuration		0.. maxofReports		
> A1 Event Trigger Configuration			A1 Event Trigger Configuration	
Sequence of A2 Report Configuration		0.. maxofReports		
> A2 Event Trigger Configuration			A2 Event Trigger Configuration	
Sequence of A3 Report Configuration		0.. maxofReports		
> A3 Event Trigger Configuration			A3 Event Trigger Configuration	
Sequence of A4 Report Configuration		0.. maxofReports		
> A4 Event Trigger Configuration			A4 Event Trigger Configuration	
Sequence of A5 Report Configuration		0.. maxofReports		

> A5 Event Trigger Configuration			A5 Event Trigger Configuration	
Sequence of A6 Report Configuration		0.. maxofReports		
> A6 Event Trigger Configuration			A6 Event Trigger Configuration	
Sequence of B1 Report Configuration		0.. maxofReports		
> B1 Event Trigger Configuration			B1 Event Trigger Configuration	
Sequence of B2 Report Configuration		0.. maxofReports		
> B2 Event Trigger Configuration			B2 Event Trigger Configuration	

8.6.2.10 Measurement Result IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Measurement Result Serving Cell	M		Measurement Result NR	
CHOICE Measurement Result Neigh Cells				
> **Sequence of Measurement Result NR**		(1, 8)		
>> Measurement Result NR			Measurement Result NR	
> **Sequence of Measurement Result EUTRA**		(1, 8)		
>> Measurement Result EUTRA			Measurement Result EUTRA	

8.6.2.11 Measurement Result NR IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PCI	M		INTEGER	
Based-SSB	O		Measurement Quantity Result	
Based-CSI-RS	O		Measurement Quantity Result	

8.6.2.12 Measurement Result EUTRA IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PCI	M	(0, 503)	INTEGER	
Measurement Quantity Result	M		Measurement Quantity Result EUTRA	

8.6.2.13 Handover Command IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Source Cell ID	M		NR CGI	
Target Cell ID	M		NR CGI	
Target Cell Carrier Frequency	O		INTEGER	
UE ID	M		UE ID	
Cause	O	{unspecified, ricHandoverTriggered }	ENUMERATED	

8.6.2.14 Release Command IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Source Cell ID	M		NR CGI	
UE ID	M		UE ID	
Sequence of cell reselection priority		0..8		

> carrier frequency	M		INTEGER	
> cell reselection priority	M		INTEGER	
t320	O	{min5, min10, min20, min30, min60, min120, min180, spare1}	ENUMERATED	

8.6.2.15 Measurement Quantity Result IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RSRP		(0, 127)	INTEGER	
RSRQ		(0, 127)	INTEGER	
SINR		(0, 127)	INTEGER	

8.6.2.16 Measurement Quantity Result EUTRA IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RSRP		(0, 97)	INTEGER	
RSRQ		(0, 34)	INTEGER	
SINR		(0, 127)	INTEGER	

8.6.2.17 Measurement Trigger Quantity IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE Quantity				
> RSRP		(0, 127)	INTEGER	
> RSRQ		(0, 127)	INTEGER	
> SINR		(0, 127)	INTEGER	

8.6.2.18 Measurement Trigger Quantity EUTRA IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE Quantity				
> RSRP		(0, 97)	INTEGER	
> RSRQ		(0, 34)	INTEGER	
> SINR		(0, 127)	INTEGER	

8.6.2.19 Measurement Trigger Quantity Offset IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE Quantity Offset				
> RSRP		(-30, 30)	INTEGER	
> RSRQ		(-30, 30)	INTEGER	
> SINR		(-30, 30)	INTEGER	

Range bound	Value	Explanation
maxofReports	64	

8.6.3 Idle Mode Related IEs

8.6.3.1 Common Cell Reselection Configuration IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Nrof SS-Blocks To Average	O	(2, 16)	INTEGER	
Abs Thresh SS-Blocks Consolidation			Threshold NR	

Range To Best Cell	O	{dB-24, dB-22, dB-20, dB-18, dB-16, dB-14, dB-12, dB-10, dB-8, dB-6, dB-5, dB-4, dB-3, dB-2, dB-1, dB0, dB1, dB2, dB3, dB4, dB5, dB6, dB8, dB10, dB12, dB14, dB16, dB18, dB20, dB22, dB24}	ENUMERATED	
Q_{hyst}	M	{dB0, dB1, dB2, dB3, dB4, dB5, dB6, dB8, dB10, dB12, dB14, dB16, dB18, dB20, dB22, dB24}	ENUMERATED	
Speed State Reselection Pars	O			
> **Mobility State Parameters**	O			
>> t-Evaluation	O	{s30, s60, s120, s180, s240, spare3, spare2, spare1}	ENUMERATED	
>> t-HystNormal	O	{s30, s60, s120, s180, s240, spare3, spare2, spare1}	ENUMERATED	
>> n-CellChangeMedium	O	(1, 16)	INTEGER	
>> n-CellChangeHigh	O	(1, 16)	INTEGER	
> **q-HystSF**				
>> sf-Medium	O	{dB-6, dB-4, dB-2, dB0}	ENUMERATED	
>> sf-High	O	{dB-6, dB-4, dB-2, dB0}	ENUMERATED	

8.6.3.2 Intra-frequency Cell Reselection Configuration IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Serving Frequency Information				
> s-NonIntraSearchP		(0, 31)	INTEGER	
> s-NonIntraSearchQ		(0, 31)	INTEGER	
> Thresh Serving Low P	M	(0, 31)	INTEGER	
> Thresh Serving Low Q		(0, 31)	INTEGER	
> Cell Reselection Priority	M	(0, 7)	INTEGER	
> Cell Reselection SubPriority		{0.2, 0.4, 0.6, 0.8}	ENUMERATED	
$Q_{RxLevMin}$	M	(-70, -22)	INTEGER	
$Q_{QualMin}$	O	(-43, -12)	INTEGER	
s-IntraSearchP	M	(0, 31)	INTEGER	
s-IntraSearchQ	O	(0, 31)	INTEGER	
t-Reselection NR	M	(0, 7)	INTEGER	
p-Max	O	(-30..33)	INTEGER	
Derive SSB-Index From Cell	O	(True, False)	BOOLEAN	
t-Reselection NR-SF				
> sf-Medium	O	{0.25, 0.5, 0.75, 1.0}	ENUMERATED	
> sf-High	O	{0.25, 0.5, 0.75, 1.0}	ENUMERATED	

8.6.3.3 Inter-frequency Cell Reselection Configuration IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Dl Carrier Frequency	M		INTEGER	
Sequence of NR-Multi Band Info		(1,8)		
> Frequency Band Indicator NR	O	(1, 1024)	INTEGER	
> **Sequence of NR-NS-Pmax**	O	(1,8)	INTEGER	

>> additional P-max	O	(-30..33)	INTEGER	
>> additional Spectrum Emission	O	(0, 7)	INTEGER	
Nrof SS-Blocks To Average	O	(2, 16)	INTEGER	
Abs Thresh SS-Blocks Consolidation	M		Threshold NR	
Ssb Subcarrier Spacing	M	{kHz15, kHz30, kHz60, kHz120, kHz240, spare3, spare2, spare1}	ENUMERATED	
Derive SSB-Index From Cell	O	(True, False)	BOOLEAN	
$Q_{RxLevMin}$	M	(-70, -22)	INTEGER	
$Q_{QualMin}$	O	(-43, -12)	INTEGER	
p-Max	O	(-30..33)	INTEGER	
t-Reselection NR	M	(0, 7)	INTEGER	
t-Reselection NR-SF				
> sf-Medium	O	{0.25, 0.5, 0.75, 1.0}	ENUMERATED	
> sf-High	O	{0.25, 0.5, 0.75, 1.0}	ENUMERATED	
threshX-HighP	M	(0, 31)	INTEGER	
threshX-LowP	M	(0, 31)	INTEGER	
threshX-HighQ	O	(0, 31)	INTEGER	
threshX-LowQ	O	(0, 31)	INTEGER	
Cell Reselection Priority	M	(0, 7)	INTEGER	
Cell Reselection SubPriority	O	{0.2, 0.4, 0.6, 0.8}	ENUMERATED	
q-OffsetFreq	M	{dB-24, dB-22, dB-20, dB-18, dB-16, dB-14, dB-12, dB-10, dB-8, dB-6, dB-5, dB-4, dB-3, dB-2, dB-1, dB0, dB1, dB2, dB3, dB4, dB5, dB6, dB8, dB10, dB12, dB14, dB16, dB18, dB20, dB22, dB24}	ENUMERATED	

8.6.3.4 Inter-RAT Cell Reselection Configuration IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Dl Carrier Frequency	M		INTEGER	
Allowed Measurement Bandwidth	M	{mbw6, mbw15, mbw25, mbw50, mbw75, mbw100}	ENUMERATED	
Presence Antenna Port1	M	(True, False)	BOOLEAN	
Cell Reselection Priority	M	(0, 7)	INTEGER	
Cell Reselection SubPriority	O	{0.2, 0.4, 0.6, 0.8}	ENUMERATED	
threshX-HighP	M	(0, 31)	INTEGER	
threshX-LowP	M	(0, 31)	INTEGER	
threshX-HighQ	O	(0, 31)	INTEGER	
threshX-LowQ	O	(0, 31)	INTEGER	
$Q_{RxLevMin}$	M	(-70, -22)	INTEGER	
$Q_{QualMin}$	O	(-43, -12)	INTEGER	
p-Max	O	(-30..33)	INTEGER	

8.6.3.5 Threshold NR IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RSRP		(0, 127)	INTEGER	

RSRQ		(0, 127)	INTEGER	
SINR		(0, 127)	INTEGER	

8.7 RB Related IEs (TS 不支持)

8.7.1 Logical Channel Configuration IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Logical Channel Group	M		INTEGER	
Priority	M	(1..16)	INTEGER	This IE is defined in TS 38.321
Prioritised Bit Rate	M	{kBps0, kBps8, kBps16, kBps32, kBps64, kBps128, kBps256, kBps512, kBps1024, kBps2048, kBps4096, kBps8192, kBps16384, kBps32768, kBps65536, infinity}	ENUMERATED	This IE is defined in TS 38.331
Bucket Size Duration	M	{ms5, ms10, ms20, ms50, ms100, ms150, ms300, ms500, ms1000, spare7, spare6, spare5, spare4, spare3,spare2, spare1}	ENUMERATED	This IE is defined in TS 38.331

8.7.2 DRX Configuration IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Long DRX Cycle Length	M	(ms10, ms20, ms32, ms40, ms60, ms64, ms70, ms80, ms128, ms160, ms256, ms320, ms512, ms640, ms1024, ms1280, ms2048, ms2560, ms5120, ms10240.)	ENUMERATED	This IE is defined in TS 38.331
Short DRX Cycle Length	M	(ms2, ms3, ms4, ms5, ms6, ms7, ms8, ms10, ms14, ms16, ms20, ms30, ms32, ms35, ms40, ms64, ms80, ms128, ms160, ms256, ms320, ms512, ms640)	ENUMERATED	This IE is defined in TS 38.331
Short DRX Cycle Timer	M	(1,16)	INTEGER	This IE is defined in TS 38.331

8.7.3 Scheduling Request Configuration IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
sr-ProhibitTimer	O	{ms1, ms2, ms4, ms8, ms16, ms32, ms64, ms128}	ENUMERATED	Timer for SR transmission on PUCCH in TS 38.321. Value is in ms. When the field is absent, the UE applies the value 0. This IE is defined in TS 38.331

sr-TransMax	M	{ n4, n8, n16, n32, n64, spare3, spare2, spare1}	ENUMERATED	Maximum number of SR transmissions as described in TS 38.321. Value n4 corresponds to 4, value n8 corresponds to 8, and so on. This IE is defined in TS 38.331

8.7.4 Non-dynamic Scheduling Configuration IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
SPS-Config				The IE is used to configure downlink semi-persistent transmission
> periodicity	M	{ms10, ms20, ms32, ms40, ms64, ms80, ms128, ms160, ms320, ms640, spare6, spare5, spare4, spare3, spare2, spare1}	ENUMERATED	Periodicity for DL SPS (see TS 38.214 and TS 38.321)
Configured Grant Config				
> periodicity	O	{sym2, sym7, sym1x14, sym2x14, sym4x14, sym5x14, sym8x14, sym10x14, sym16x14, sym20x14, sym32x14, sym40x14, sym64x14, sym80x14, sym128x14, sym160x14, sym256x14, sym320x14, sym512x14, sym640x14, sym1024x14, sym1280x14, sym2560x14, sym5120x14, sym6, sym1x12, sym2x12, sym4x12, sym5x12, sym8x12, sym10x12, sym16x12, sym20x12, sym32x12, sym40x12, sym64x12, sym80x12, sym128x12, sym160x12, sym256x12, sym320x12, sym512x12, sym640x12, sym1280x12, sym2560x12}	ENUMERATED	Periodicity for UL transmission without UL grant for type 1 and type 2 (see TS 38.321)
> configured Grant Timer	O	(1..64)	INTEGER	Indicates the initial value of the configured grant timer (see TS 38.321) in multiples of periodicity.

8.7.5 DRB QoS Configuration IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description

Sequence of DRB to Be Setup		0 ..<maxofDRBs>		Periodicity for DL SPS (see TS 38.214 and TS 38.321)
> DRB ID		1 ..<maxofDRBs>	INTEGER	
> **CHOICE QoS Information**				
>> E-UTRAN QoS			E-UTRAN QoS	Shall be used for EN-DC case to convey E-RAB Level QoS Parameters
>> DRB Information			DRB QoS	Shall be used for NG-RAN cases

8.7.6 DRB QoS IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
CHOICE QoS Characteristics				
> **Non-dynamic 5QI**			Non Dynamic 5QI Descriptor	
> **Dynamic 5QI**			Dynamic 5QI Descriptor	
NG-RAN Allocation and Retention Priority	O		INTEGER	
GBR QoS Flow Information	O		GBR QoS Flow Information	
Reflective QoS Attribute	O	(subject to)	ENUMERATED	
PDU Session ID	O	(0..255)	INTEGER	
UL PDU Session Aggregate Maximum Bit Rate	O		INTEGER	

8.7.7 Non Dynamic 5QI Descriptor IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
fiveQI	M	(0..255)	INTEGER	
Priority Level	O	(0..127)	INTEGER	
Averaging Window	O	(0..4095)	INTEGER	

8.7.8 Dynamic 5QI Descriptor IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
QoS Priority Level	M	(1, 127)	INTEGER	
Packet error rate	M		INTEGER	
fiveQI		(0, 255)	INTEGER	
Packet Delay Budget		(0, 1023)	INTEGER	
Averaging Window	C	(0, 4095)	INTEGER	

8.7.9 GBR QoS Flow Information IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Maximum Flow Bit Rate Downlink	M		INTEGER	Maximum Bit Rate in DL. Details in TS 23.501
Maximum Flow Bit Rate Uplink	M		INTEGER	
Guaranteed Flow Bit Rate Downlink	M		INTEGER	

Guaranteed Flow Bit Rate Uplink	M		INTEGER	
Maximum Packet Loss Rate Downlink	O		INTEGER	
Maximum Packet Loss Rate Uplink	O		INTEGER	

8.7.10 E-UTRAN QoS IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
QCI	M	(0..255)	INTEGER	QoS Class Identifier defined in TS 23.401 [10]. Logical range and coding specified in TS 23.203 [11].
Allocation and Retention Priority	M		Allocation and Retention Priority	
GBR QoS Information	O		GBR QoS Flow Information	This IE applies to GBR bearers only and shall be ignored otherwise.

8.7.11 Allocation and Retention Priority IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Priority Level	M	(0..15)	INTEGER	参考 38.473
Pre-emption Capability	M	(shall not trigger pre-emption, may trigger pre-emption)	ENUMERATED	参考 38.473
Pre-emption Vulnerability	M	(not pre-emptable, pre-emptable)	ENUMERATED	参考 38.473

8.7.12 GBR QoS Information IE

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Maximum Flow Bit Rate Downlink	M		INTEGER	Maximum Bit Rate in DL. Details in TS 23.501
Maximum Flow Bit Rate Uplink	M		INTEGER	
Guaranteed Flow Bit Rate Downlink	M		INTEGER	
Guaranteed Flow Bit Rate Uplink	M		INTEGER	

Range bound	Value	Explanation
maxofDRBs	29	Maximum number of DRBs (that can be added in DRB-ToAddModLIst)

9. IE Abstract Syntax (with ASN.1)

```
-- ASN1START

-- **************************************************************
-- E2SM-TS Information Element Definitions
-- **************************************************************

E2SM-TS-IEs {
iso(1) identified-organization(3) dod(6) internet(1) private(4) enterprise(1) oran(53148) e2(1) version(2) e2sm(2) e2sm-TS-IEs(2)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- **************************************************************
-- E2SM-TS Service Model IEs
-- **************************************************************


-- **************************************************************
-- RAN Function Definition OCTET STRING contents
-- **************************************************************

RANFunctionDefinition ::= SEQUENCE{
    rANFunctionName                             RANFunctionName,
    eventTriggerStyles-List                     SEQUENCE (SIZE(0..maxofRICstyles)) OF EventTriggerStyles,
    reportStyles-List                           SEQUENCE (SIZE(0..maxofRICstyles)) OF ReportStyles,
    controlStyles-List                          SEQUENCE (SIZE(0..maxofRICstyles)) OF ControlStyles,
    ...
}


-- **************************************************************
-- RIC Event Trigger Definition OCTET STRING contents
-- **************************************************************

RICEventTriggerDefinition ::= SEQUENCE{
    rICStyleType                                RICStyleType,
    rICEventTriggerFormat                       RicEventTriggerFormat-Choice,
    ...
}


-- **************************************************************
-- REPORT Service RIC Action Definition OCTET STRING contents
-- **************************************************************

REPORTServiceRICActionDefinition ::= SEQUENCE{
    rICStyleType                                RICStyleType,
    rICReportActionDefinitionFormat             RicReportActionDefinitionFormat-Choice,
    ...
}


-- **************************************************************
-- REPORT Service RIC Indication Header OCTET STRING contents
-- **************************************************************

REPORTServiceRICIndicationHeader ::= SEQUENCE{
    rICStyleType                                RICStyleType                                OPTIONAL,
    rICIndicationHeaderFormat                   RicIndicationHeaderFormat-Choice            OPTIONAL,
    ...
}


-- **************************************************************
-- REPORT Service RIC Indication Message OCTET STRING contents
-- **************************************************************

REPORTServiceRICIndicationMessage ::= SEQUENCE{
    rICIndicationMessageFormat                  RicIndicationMessageFormat-Choice,
    ...
}


-- **************************************************************
-- CONTROL Service RIC Control Header OCTET STRING contents
-- **************************************************************
```

```
CONTROLServiceRICControlHeader ::= SEQUENCE{
    rICStyleType                                RICStyleType,
    rICControlHeaderFormat                      RicControlHeaderFormat-Choice                   OPTIONAL,
    ...
}


-- **************************************************************
-- CONTROL Service RIC Control Message OCTET STRING contents
-- **************************************************************

CONTROLServiceRICControlMessage ::= SEQUENCE{
    rICControlMessageFormat                     RicControlMessageFormat-Choice,
    ...
}


-- **************************************************************
-- CONTROL Service RIC Control Outcome OCTET STRING contents
-- **************************************************************

CONTROLServiceRICControlOutcome ::= SEQUENCE{
    rICControlOutcomeFormat                     RicControlOutcomeFormat-Choice,
    ...
}

-- **************************************************************
-- Constant Definition
-- **************************************************************

-- **************************************************************
-- Lists
-- **************************************************************

maxofRICstyles                              INTEGER ::= 63   --Maximum no. of Style of Report, Insert, Control or Policy actions
supported by RAN Function
maxofRANparameters                          INTEGER ::= 255  --Maximum no. of RAN Parameter
maxofActionParameters                       INTEGER ::= 255  --Maximum no. of action parameters supported by RAN Function
maxofCells                                  INTEGER ::= 18
maxofUEs                                    INTEGER ::= 65535
maxofReports                                INTEGER ::= 64
maxofDRBs                                   INTEGER ::= 29   --Maximum number of DRBs (that can be added in DRB-ToAddModLIst)

-- **************************************************************
-- IEs
-- **************************************************************

EventTriggerStyles ::= SEQUENCE{
    rICEventTriggerStyleType                    RICStyleType,
    rICEventTriggerStyleName                    RICStyleName,
    rICEventTriggerFormatType                   RICFormatType,
    rANParametersForFormat-List                 SEQUENCE (SIZE(0..maxofRANparameters)) OF RanParametersForFormat,
    ...
}

RanParametersForFormat ::= SEQUENCE{
    rANParameterId                              RANParameterID,
    rANParameterName                            RANParameterName                                OPTIONAL,
    rANParameterValue                           Reserved,
    ...
}

ReportStyles ::= SEQUENCE{
    rICReportStyleType                          RICStyleType,
    rICReportStyleName                          RICStyleName,
    rICReportActionFormatType                   RICFormatType,
    rANParametersForAction-List                 SEQUENCE (SIZE(0..maxofRANparameters)) OF RanParametersForAction,
    rICIndicationHeaderFormatType               RICFormatType,
    rICIndicationMessageFormatType              RICFormatType,
    ...
}

RanParametersForAction ::= SEQUENCE{
    rANParameterId                              RANParameterID,
    rANParameterName                            RANParameterName                                OPTIONAL,
    rANParameterType                            RANParameterType                                OPTIONAL,
    ...
}

ControlStyles ::= SEQUENCE{
    rICControlStyleType                         RICStyleType,
```

```
    rICControlStyleName                         RICStyleName,
    rICControlHeaderFormatType                  RICFormatType,
    rICControlMessageFormatType                 RICFormatType,
    rICControlOutcomeFormatType                 RICFormatType,
    rANParametersForControlOutcome-List         SEQUENCE (SIZE(0..maxofRANparameters)) OF RanParametersForControlOutcome,
    ...
}

RanParametersForControlOutcome ::= SEQUENCE{
    rANParameterId                              RANParameterID,
    rANParameterName                            RANParameterName                        OPTIONAL,
    rANParameterType                            RANParameterType                        OPTIONAL,
    ...
}

RicEventTriggerFormat-Choice ::= CHOICE{
    format1                                     E2SM-TS-EventTriggerDefinitionFormat1,
    format2                                     E2SM-TS-EventTriggerDefinitionFormat2,
    format3                                     E2SM-TS-EventTriggerDefinitionFormat3,
    format4                                     E2SM-TS-EventTriggerDefinitionFormat4,
    format5                                     E2SM-TS-EventTriggerDefinitionFormat5,
    format6                                     E2SM-TS-EventTriggerDefinitionFormat6,
    format7                                     E2SM-TS-EventTriggerDefinitionFormat7,
    format8                                     E2SM-TS-EventTriggerDefinitionFormat8,
    format9                                     E2SM-TS-EventTriggerDefinitionFormat9,
    format10                                    E2SM-TS-EventTriggerDefinitionFormat10,
    ...
}

E2SM-TS-EventTriggerDefinitionFormat1 ::= SEQUENCE{
    cellLevelInfoReportPeriod                   ReportPeriod,
    ...
}

E2SM-TS-EventTriggerDefinitionFormat2 ::= SEQUENCE{
    uELevelReportPeriod                         ReportPeriod,
    ...
}

E2SM-TS-EventTriggerDefinitionFormat3 ::= SEQUENCE{
    numberOfRrcConnections                      INTEGER,
    ...
}

E2SM-TS-EventTriggerDefinitionFormat4 ::= SEQUENCE{
    sSB-BasedMeasurement                        MeasurementTriggerQuantity,
    ...
}

E2SM-TS-EventTriggerDefinitionFormat5 ::= SEQUENCE{
    cSI-BasedMeasurement                        MeasurementTriggerQuantity,
    ...
}

E2SM-TS-EventTriggerDefinitionFormat6 ::= SEQUENCE{
    dLPdcpSduDropRateInGnb-Cu-Up                INTEGER (0..100),
    ...
}

E2SM-TS-EventTriggerDefinitionFormat7 ::= SEQUENCE{
    dLPdcpOccupiedBufferSize                    INTEGER                                 OPTIONAL,
    dLUnusedPdcpBufferSize                      INTEGER                                 OPTIONAL,
    packetDelay                                 INTEGER                                 OPTIONAL,
    ...
}

E2SM-TS-EventTriggerDefinitionFormat8 ::= SEQUENCE{
    dLPrbUsageRatio                             INTEGER (0..100)                        OPTIONAL,
    uLPrbUsageRatio                             INTEGER (0..100)                        OPTIONAL,
    ...
}

E2SM-TS-EventTriggerDefinitionFormat9 ::= SEQUENCE{
    uLUePrbUsedForDataTraffic                   INTEGER (0..273)                        OPTIONAL,
    dLUePrbUsedForDataTraffic                   INTEGER (0..273)                        OPTIONAL,
    ...
}

E2SM-TS-EventTriggerDefinitionFormat10 ::= SEQUENCE{
    reserved                                    Reserved,
    ...
}
```

```
RicReportActionDefinitionFormat-Choice ::= CHOICE{
    format1                                     RICReportActionDefinitionFormat1,
    ...
}

RICReportActionDefinitionFormat1 ::= SEQUENCE{
    reportCells-List                            SEQUENCE (SIZE(0..maxofCells)) OF ReportCells,
    rANParameters-List                          SEQUENCE (SIZE(0..maxofActionParameters)) OF RanParameters,
    ...
}

ReportCells ::= SEQUENCE{
    nRCgi                                       NRCGI,
    ...
}

RanParameters ::= SEQUENCE{
    rANParameterId                              RANParameterID,
    rANParameterValue                           Reserved,
    ...
}

RicIndicationHeaderFormat-Choice ::= CHOICE{
    format1                                     RICIndicationHeaderFormat1,
    ...
}

RICIndicationHeaderFormat1 ::= SEQUENCE{
    timestamp                                   INTEGER                                 OPTIONAL,
    ...
}

RicIndicationMessageFormat-Choice ::= CHOICE{
    format1                                     RICIndicationMessageFormat1,
    format2                                     RICIndicationMessageFormat2,
    format3                                     RICIndicationMessageFormat3,
    format4                                     RICIndicationMessageFormat4,
    format5                                     RICIndicationMessageFormat5,
    format6                                     RICIndicationMessageFormat6,
    format7                                     RICIndicationMessageFormat7,
    format8                                     RICIndicationMessageFormat8,
    format9                                     RICIndicationMessageFormat9,
    ...
}

RICIndicationMessageFormat1 ::= SEQUENCE{
    o-CU-CPCellLoadInfoContainer                O-CU-CPCellMeasurementContainer,
    ...
}

RICIndicationMessageFormat2 ::= SEQUENCE{
    o-CU-UPCellLoadInfoContainer                O-CU-UPCellMeasurementContainer,
    ...
}

RICIndicationMessageFormat3 ::= SEQUENCE{
    o-DUCellLoadInfoContainer                   O-DUCellMeasurementContainer,
    ...
}

RICIndicationMessageFormat4 ::= SEQUENCE{
    o-CU-CPUeMeasurementContainer               O-CU-CPUEMeasurementContainer,
    ...
}

RICIndicationMessageFormat5 ::= SEQUENCE{
    o-CU-UPUeMeasurementContainer               O-CU-UPUEMeasurementContainer,
    ...
}

RICIndicationMessageFormat6 ::= SEQUENCE{
    o-DUUeMeasurementContainer                  O-DUUEMeasurementContainer,
    ...
}

RICIndicationMessageFormat7 ::= SEQUENCE{
    o-CU-CPCellConfigurationContainer           O-CU-CPCellConfigurationContainer,
    ...
}

RICIndicationMessageFormat8 ::= SEQUENCE{
```

```
    o-CU-UPCellConfigurationContainer               O-CU-UPCellConfigurationContainer,
    ...
}

RICIndicationMessageFormat9 ::= SEQUENCE{
    o-DUCellConfigurationContainer                  O-DUCellConfigurationContainer,
    ...
}

RicControlHeaderFormat-Choice ::= CHOICE{
    format1                                         RICControlHeaderFormat1,
    ...
}

RICControlHeaderFormat1 ::= SEQUENCE{
    reserved                                        Reserved,
    ...
}

RicControlMessageFormat-Choice ::= CHOICE{
    format1                                         RICControlMessageFormat1,
    format2                                         RICControlMessageFormat2,
    format3                                         RICControlMessageFormat3,
    format4                                         RICControlMessageFormat4,
    format5                                         RICControlMessageFormat5,
    format6                                         RICControlMessageFormat6,
    ...
}

RICControlMessageFormat1 ::= SEQUENCE{
    reportCellsByControl-List                       SEQUENCE (SIZE(0..maxofCells)) OF ReportCellsByControl,
    ...
}

ReportCellsByControl ::= SEQUENCE{
    nRCgi                                           NRCGI                                           OPTIONAL,
    ...
}

RICControlMessageFormat2 ::= SEQUENCE{
    reportCellContainersByControl-List              SEQUENCE (SIZE(1..maxofCells)) OF ReportCellContainersByControl,
    ...
}

ReportCellContainersByControl ::= SEQUENCE{
    nRCgi                                           NRCGI,
    reportUesByControl-List                         SEQUENCE (SIZE(1..maxofUEs)) OF ReportUesByControl,
    ...
}

ReportUesByControl ::= SEQUENCE{
    uEId                                            UEID,
    ...
}

RICControlMessageFormat3 ::= SEQUENCE{
    o-CU-CPCellConfigurationContainer               O-CU-CPCellConfigurationContainer,
    ...
}

RICControlMessageFormat4 ::= SEQUENCE{
    o-CU-UPCellConfigurationContainer               O-CU-UPCellConfigurationContainer,
    ...
}

RICControlMessageFormat5 ::= SEQUENCE{
    o-DUCellConfigurationContainer                  O-DUCellConfigurationContainer,
    ...
}

RICControlMessageFormat6 ::= SEQUENCE{
    uEHandover-List                                 SEQUENCE (SIZE(0..maxofUEs)) OF UeHandover,
    uERelease-List                                  SEQUENCE (SIZE(0..maxofUEs)) OF UeRelease,
    ...
}

UeHandover ::= SEQUENCE{
    uEHandoverContainer                             HandoverCommand,
    ...
}

UeRelease ::= SEQUENCE{
```

```
    uEReleaseContainer                          ReleaseCommand,
    ...
}

RicControlOutcomeFormat-Choice ::= CHOICE{
    format1                                     RICControlOutcomeFormat1,
    format2                                     RICControlOutcomeFormat2,
    format3                                     RICControlOutcomeFormat3,
    format4                                     RICControlOutcomeFormat4,
    format5                                     RICControlOutcomeFormat5,
    format6                                     RICControlOutcomeFormat6,
    format7                                     RICControlOutcomeFormat7,
    format8                                     RICControlOutcomeFormat8,
    format9                                     RICControlOutcomeFormat9,
    format10                                    RICControlOutcomeFormat10,
    ...
}

RICControlOutcomeFormat1 ::= SEQUENCE{
    o-CU-CPCellConfigurationContainer           O-CU-CPCellConfigurationContainer,
    ...
}

RICControlOutcomeFormat2 ::= SEQUENCE{
    o-CU-UPCellConfigurationContainer           O-CU-UPCellConfigurationContainer,
    ...
}

RICControlOutcomeFormat3 ::= SEQUENCE{
    o-DUCellConfigurationContainer              O-DUCellConfigurationContainer,
    ...
}

RICControlOutcomeFormat4 ::= SEQUENCE{
    o-CU-CPCellLoadInformationContainer         O-CU-CPCellMeasurementContainer,
    ...
}

RICControlOutcomeFormat5 ::= SEQUENCE{
    o-CU-UPCellLoadInformationContainer         O-CU-UPCellMeasurementContainer,
    ...
}

RICControlOutcomeFormat6 ::= SEQUENCE{
    o-DUCellLoadInformationContainer            O-DUCellMeasurementContainer,
    ...
}

RICControlOutcomeFormat7 ::= SEQUENCE{
    o-CU-CPUeMeasurementContainer               O-CU-CPUEMeasurementContainer,
    ...
}

RICControlOutcomeFormat8 ::= SEQUENCE{
    o-CU-UPUeMeasurementContainer               O-CU-UPUEMeasurementContainer,
    ...
}

RICControlOutcomeFormat9 ::= SEQUENCE{
    o-DUUeMeasurementContainer                  O-DUUEMeasurementContainer,
    ...
}

RICControlOutcomeFormat10 ::= SEQUENCE{
    uEFailedToHandover-List                     SEQUENCE (SIZE(0..maxofUEs)) OF UeFailedToHandover,
    uEFailedToRelease-List                      SEQUENCE (SIZE(0..maxofUEs)) OF UeFailedToRelease,
    ...
}

UeFailedToHandover ::= SEQUENCE{
    sourceNrCgi                                 NRCGI,
    targetNrCgi                                 NRCGI,
    uEId                                        UEID,
    cause                                       ENUMERATED {unspecified,unknowntargetUE,handovertargetnotallowed},
    ...
}

UeFailedToRelease ::= SEQUENCE{
    nRCgi                                       NRCGI,
    uEId                                        UEID,
    cause                                       ENUMERATED {unspecified,unknowntargetUE},
    ...
```

```
}

RANFunctionName ::= SEQUENCE{
    rANFunctionShortName                    PrintableString(SIZE(1..150)),
    ...
}

RICStyleType ::= SEQUENCE{
    rICStyleType                            INTEGER,
    ...
}

RICStyleName ::= SEQUENCE{
    rICStyleName                            PrintableString(SIZE(1..150)),
    ...
}

RICFormatType ::= SEQUENCE{
    rICFormatType                           INTEGER,
    ...
}

RANParameterType ::= SEQUENCE{
    rANParameterType                        ENUMERATED {integer,enumerated,boolean,bitstring,octetstring,printablestring},
    ...
}

RANParameterID ::= SEQUENCE{
    rANParameterId                          INTEGER (0..maxofRANparameters),
    ...
}

ReportPeriod ::= SEQUENCE{
    reportPeriod                            ENUMERATED
{ms10,ms20,ms32,ms40,ms60,ms70,ms128,ms160,ms256,ms320,ms512,ms640,ms1024,ms2048,ms2560,ms5120,ms10240},
    ...
}

PLMNIdentity ::= SEQUENCE{
    pLMNIdentity                            OCTET STRING (SIZE(3)),
    ...
}

NRCGI ::= SEQUENCE{
    pLMNIdentity                            PLMNIdentity,
    nRCellIdentity                          BIT STRING (SIZE(36)),
    ...
}

E-UTRACGI ::= SEQUENCE{
    pLMNIdentity                            PLMNIdentity,
    e-UTRACellIdentity                      BIT STRING (SIZE(28)),
    ...
}

UEID ::= SEQUENCE{
    rANUeNgapId                             INTEGER (0..4294967295)                 OPTIONAL,
    aMFUeNgapId                             INTEGER (0..1099511627775)              OPTIONAL,
    gNB-DUUeF1ApId                          INTEGER (0..4294967295)                 OPTIONAL,       --Cond ,
    gNB-CUUeF1ApId                          INTEGER (0..4294967295)                 OPTIONAL,       --Cond ,
    gNB-CU-CPUeE1ApId                       INTEGER (0..4294967295)                 OPTIONAL,       --Cond ,
    gNB-CU-UPUeE1ApId                       INTEGER (0..4294967295)                 OPTIONAL,       --Cond ,
    sourceNg-RanNodeUeXnapId                INTEGER (0..4294967295)                 OPTIONAL,
    targetNg-RanNodeUeXnapId                INTEGER (0..4294967295)                 OPTIONAL,
    c-RNTI                                  INTEGER (0..65535)                      OPTIONAL,       --Cond ,
    ...
}

RANParameterName ::= SEQUENCE{
    rANParameterName                        PrintableString(SIZE(1..150,...)),
    ...
}

Reserved ::= SEQUENCE{
    forFurtherStudy                         INTEGER                                 OPTIONAL,
    ...
}

O-CU-CPCellMeasurementContainer ::= SEQUENCE{
    o-CU-CPCellMeasurement-List             SEQUENCE (SIZE(1..maxofCells)) OF O-Cu-CpCellMeasurement,
    ...
}
```

```
O-Cu-CpCellMeasurement ::= SEQUENCE{
    nRCgi                                       NRCGI,
    cellStatus                                  ENUMERATED {outOfService,inService},
    numberOfSupportedRrcConnections             INTEGER,
    meanNumberOfRrcConnections                  INTEGER                                     OPTIONAL,
    maxNumberOfRrcConnections                   INTEGER,
    numberOfRrcConnections                      INTEGER,
    ...
}

O-CU-UPCellMeasurementContainer ::= SEQUENCE{
    o-CU-UPCellMeasurement-List                 SEQUENCE (SIZE(1..maxofCells)) OF O-Cu-UpCellMeasurement,
    ...
}

O-Cu-UpCellMeasurement ::= SEQUENCE{
    nRCgi                                       NRCGI,
    dLCellPdcpSduDataVolume                     INTEGER                                     OPTIONAL,
    dLPdcpSduDropRateInGnb-Cu-Up                INTEGER                                     OPTIONAL,
    packetDelay                                 INTEGER                                     OPTIONAL,
    ...
}

O-DUCellMeasurementContainer ::= SEQUENCE{
    o-DUCellMeasurement-List                    SEQUENCE (SIZE(1..maxofCells)) OF O-DuCellMeasurement,
    ...
}

O-DuCellMeasurement ::= SEQUENCE{
    nRCgi                                       NRCGI,
    cellStatus                                  ENUMERATED {outOfService,inService},
    dLPrbUsageRatio                             INTEGER (0..100)                            OPTIONAL,
    uLPrbUsageRatio                             INTEGER (0..100)                            OPTIONAL,
    dLTotalAvailablePrbs                        INTEGER                                     OPTIONAL,
    uLTotalAvailablePrbs                        INTEGER                                     OPTIONAL,
    dLTotalPrbUsage                             INTEGER                                     OPTIONAL,
    uLTotalPrbUsage                             INTEGER                                     OPTIONAL,
    dLPrbUsedForDataTraffic                     INTEGER                                     OPTIONAL,
    totalNumberOfDlTbs                          INTEGER                                     OPTIONAL,
    cellMacRate                                 INTEGER                                     OPTIONAL,
    distributionOfDlTotalPrbUsage               INTEGER                                     OPTIONAL,
    totalErrorNumberOfDlTbs                     INTEGER                                     OPTIONAL,
    mCSDistributionInPdsch                      INTEGER                                     OPTIONAL,
    meanNumberOfActiveUesInTheDlPerMapped5QiPerCell  INTEGER                                OPTIONAL,
    maxNumberOfActiveUesInTheDlPerMapped5QiPerCell   INTEGER                                OPTIONAL,
    dLPacketDropRateInGnb-Du                    INTEGER                                     OPTIONAL,
    ...
}

O-CU-CPUEMeasurementContainer ::= SEQUENCE{
    o-CU-CPUeMeasurement-List                   SEQUENCE (SIZE(1..maxofUEs)) OF O-Cu-CpUeMeasurement,
    ...
}

O-Cu-CpUeMeasurement ::= SEQUENCE{
    uEId                                        UEID,
    nRCgi                                       NRCGI,
    measurementResult                           MeasurementResult,
    ...
}

O-CU-UPUEMeasurementContainer ::= SEQUENCE{
    o-CU-UPUeMeasurement-List                   SEQUENCE (SIZE(1..maxofUEs)) OF O-Cu-UpUeMeasurement,
    ...
}

O-Cu-UpUeMeasurement ::= SEQUENCE{
    uEId                                        UEID,
    nRCgi                                       NRCGI,
    dLPdcpOccupiedBufferSize                    INTEGER (0..65535)                          OPTIONAL,
    dLUnusedPdcpBufferSize                      INTEGER                                     OPTIONAL,
    packetDelay                                 INTEGER                                     OPTIONAL,
    pDCPDataVolume                              INTEGER                                     OPTIONAL,
    ...
}

O-DUUEMeasurementContainer ::= SEQUENCE{
    o-DUUeMeasurement-List                      SEQUENCE (SIZE(1..maxofUEs)) OF O-DuUeMeasurement,
    ...
}
```

```
O-DuUeMeasurement ::= SEQUENCE{
    uEId                                    UEID,
    nRCgi                                   NRCGI,
    uLUePrbUsedForDataTraffic               INTEGER                                         OPTIONAL,
    dLUePrbUsedForDataTraffic               INTEGER                                         OPTIONAL,
    averageDlUeThroughputInGnb              INTEGER                                         OPTIONAL,
    distributionOfDlUeThroughputInGnb       INTEGER                                         OPTIONAL,
    uEMacRate                               INTEGER                                         OPTIONAL,
    widebandCqiDistribution                 INTEGER                                         OPTIONAL,
    averageMcs                              INTEGER (0..28)                                 OPTIONAL,
    tA                                      INTEGER                                         OPTIONAL,
    ...
}

O-CU-CPCellConfigurationContainer ::= SEQUENCE{
    o-CU-CPCellConfiguration-List           SEQUENCE (SIZE(1..maxofCells)) OF O-Cu-CpCellConfiguration,
    ...
}

O-Cu-CpCellConfiguration ::= SEQUENCE{
    nRCgi                                   NRCGI,
    nRPci                                   INTEGER,
    tAC                                     OCTET STRING (SIZE(3)),
    measurementReportEventTriggerConfiguration  MeasurementReportEventTriggerConfiguration  OPTIONAL,
    neighborCellInformation                 NeighborCellInformation                         OPTIONAL,
    commonCellReselectionConfiguration      CommonCellReselectionConfiguration              OPTIONAL,
    intra-frequencyCellReselectionConfiguration  Intra-frequencyCellReselectionConfiguration  OPTIONAL,
    inter-frequencyCellReselectionConfiguration  Inter-frequencyCellReselectionConfiguration  OPTIONAL,
    inter-RATCellReselectionConfiguration   Inter-RATCellReselectionConfiguration           OPTIONAL,
    logicalChannelConfiguration             LogicalChannelConfiguration                     OPTIONAL,
    dRXConfiguration                        DRXConfiguration                                OPTIONAL,
    schedulingRequestConfiguration          SchedulingRequestConfiguration                  OPTIONAL,
    non-dynamicSchedulingConfiguration      Non-dynamicSchedulingConfiguration              OPTIONAL,
    ...
}

O-CU-UPCellConfigurationContainer ::= SEQUENCE{
    o-CU-UPCellConfiguration-List           SEQUENCE (SIZE(1..maxofCells)) OF O-Cu-UpCellConfiguration,
    ...
}

O-Cu-UpCellConfiguration ::= SEQUENCE{
    nRCgi                                   NRCGI,
    ...
}

O-DUCellConfigurationContainer ::= SEQUENCE{
    o-DUCellConfiguration-List              SEQUENCE (SIZE(1..maxofCells)) OF O-DuCellConfiguration,
    ...
}

O-DuCellConfiguration ::= SEQUENCE{
    nRCgi                                   NRCGI,
    ...
}

NeighborCellInformation ::= SEQUENCE{
    nRCellContainers-List                   SEQUENCE (SIZE(1..8)) OF NrCellContainers,
    eUTRACellContainers-List                SEQUENCE (SIZE(1..8)) OF EutraCellContainers,
    ...
}

NrCellContainers ::= SEQUENCE{
    nRCgi                                   NRCGI,
    nRPci                                   INTEGER (0..1007),
    tAC                                     OCTET STRING (SIZE(3)),
    nRCarrierArfcn                          INTEGER (0..3279165),
    sSBFrequency                            INTEGER (0..3279165),
    sSBSubcarrierSpacing                    ENUMERATED {kHz15,kHz30,kHz60,kHz120,kHz240,spare3,spare2,spare1},
    qOffset                                 ENUMERATED {dB-24,dB-22,dB-20,dB-18,dB-16,dB-14,dB-12,dB-10,dB-8,dB-6,dB-5,dB-4,dB-
3,dB-2,dB-1,dB0,dB1,dB2,dB3,dB4,dB5,dB6,dB8,dB10,dB12,dB14,dB16,dB18,dB20,dB22,dB24},
    qRxLevMinOffsetCell                     INTEGER (1..8),
    qQualLevMinOffsetCell                   INTEGER (1..8),
    isBlackCell                             BOOLEAN                                         OPTIONAL,
    ...
}

EutraCellContainers ::= SEQUENCE{
    eCGI                                    E-UTRACGI                                       OPTIONAL,
    pCI                                     INTEGER (0..503)                                OPTIONAL,
    tAC                                     OCTET STRING (SIZE(3))                          OPTIONAL,
    eUTRACarrierArfcn                       INTEGER (0..262143)                             OPTIONAL,
```

```
    qOffset                                 ENUMERATED {dB-24, dB-22, dB-20, dB-18, dB-16, dB-14, dB-12, dB-10, dB-8, dB-6, dB-5, dB-4, dB-
3, dB-2, dB-1, dB0, dB1, dB2, dB3, dB4, dB5, dB6, dB8, dB10, dB12, dB14, dB16, dB18, dB20, dB22, dB24}OPTIONAL,
    qRxLevMinOffsetCell                     INTEGER (1..8)                                  OPTIONAL,
    qQualLevMinOffsetCell                   INTEGER (1..8)                                  OPTIONAL,
    isBlackCell                             BOOLEAN                                         OPTIONAL,
    ...
}

A1EventTriggerConfiguration ::= SEQUENCE{
    enable                                  BOOLEAN,
    index                                   INTEGER (1..127),
    a1Threshold                             MeasurementTriggerQuantity,
    reportOnLeave                           BOOLEAN,
    hysteresis                              INTEGER (0..30),
    timeToTrigger                           ENUMERATED
{ms0, ms40, ms64, ms80, ms100, ms128, ms160, ms256, ms320, ms480, ms512, ms640, ms1024, ms1280, ms2560, ms5120},
    referenceSignalType                     ENUMERATED {ssb, csi-rs},
    reportInterval                          ENUMERATED
{ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, ms20480, ms40960, min1, min6, min12, min30},
    reportAmount                            ENUMERATED {r1, r2, r4, r8, r16, r32, r64, infinity},
    reportQuantityCell                      MeasurementTriggerQuantity,
    maxReportCells                          INTEGER (1..8),
    reportQuantityRsIndex                   MeasurementTriggerQuantity                      OPTIONAL,
    includeBeamMeasurements                 BOOLEAN,
    maxNrOfRsIndexesToReport                INTEGER (0..32)                                 OPTIONAL,
    ...
}

A2EventTriggerConfiguration ::= SEQUENCE{
    enable                                  BOOLEAN,
    index                                   INTEGER (1..127),
    a2Threshold                             MeasurementTriggerQuantity,
    reportOnLeave                           BOOLEAN,
    hysteresis                              INTEGER (0..30),
    timeToTrigger                           ENUMERATED
{ms0, ms40, ms64, ms80, ms100, ms128, ms160, ms256, ms320, ms480, ms512, ms640, ms1024, ms1280, ms2560, ms5120},
    referenceSignalType                     ENUMERATED {ssb, csi-rs},
    reportInterval                          ENUMERATED
{ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, ms20480, ms40960, min1, min6, min12, min30},
    reportAmount                            ENUMERATED {r1, r2, r4, r8, r16, r32, r64, infinity},
    reportQuantityCell                      MeasurementTriggerQuantity,
    maxReportCells                          INTEGER (1..8),
    reportQuantityRsIndex                   MeasurementTriggerQuantity                      OPTIONAL,
    includeBeamMeasurements                 BOOLEAN,
    maxNrOfRsIndexesToReport                INTEGER (0..32)                                 OPTIONAL,
    ...
}

A3EventTriggerConfiguration ::= SEQUENCE{
    enable                                  BOOLEAN,
    index                                   INTEGER (1..127),
    a3Offset                                MeasurementTriggerQuantityOffset,
    reportOnLeave                           BOOLEAN,
    hysteresis                              INTEGER (0..30),
    timeToTrigger                           ENUMERATED
{ms0, ms40, ms64, ms80, ms100, ms128, ms160, ms256, ms320, ms480, ms512, ms640, ms1024, ms1280, ms2560, ms5120},
    useWhiteCellList                        BOOLEAN,
    referenceSignalType                     ENUMERATED {ssb, csi-rs},
    reportInterval                          ENUMERATED
{ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, ms20480, ms40960, min1, min6, min12, min30},
    reportAmount                            ENUMERATED {r1, r2, r4, r8, r16, r32, r64, infinity},
    reportQuantityCell                      MeasurementTriggerQuantity,
    maxReportCells                          INTEGER (1..8),
    reportQuantityRsIndex                   MeasurementTriggerQuantity                      OPTIONAL,
    includeBeamMeasurements                 BOOLEAN,
    maxNrOfRsIndexesToReport                INTEGER (0..32)                                 OPTIONAL,
    ...
}

A4EventTriggerConfiguration ::= SEQUENCE{
    enable                                  BOOLEAN,
    index                                   INTEGER (1..127),
    a4Threshold                             MeasurementTriggerQuantity,
    reportOnLeave                           BOOLEAN,
    hysteresis                              INTEGER (0..30),
    timeToTrigger                           ENUMERATED
{ms0, ms40, ms64, ms80, ms100, ms128, ms160, ms256, ms320, ms480, ms512, ms640, ms1024, ms1280, ms2560, ms5120},
    useWhiteCellList                        BOOLEAN,
    referenceSignalType                     ENUMERATED {ssb, csi-rs},
    reportInterval                          ENUMERATED
{ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, ms20480, ms40960, min1, min6, min12, min30},
    reportAmount                            ENUMERATED {r1, r2, r4, r8, r16, r32, r64, infinity},
```

```
    reportQuantityCell                          MeasurementTriggerQuantity,
    maxReportCells                              INTEGER (1..8),
    reportQuantityRsIndex                       MeasurementTriggerQuantity                  OPTIONAL,
    includeBeamMeasurements                     BOOLEAN,
    maxNrOfRsIndexesToReport                    INTEGER (0..32)                             OPTIONAL,
    ...
}

A5EventTriggerConfiguration ::= SEQUENCE{
    enable                                      BOOLEAN,
    index                                       INTEGER (1..127),
    a5Threshold1                                MeasurementTriggerQuantity,
    a5Threshold2                                MeasurementTriggerQuantity,
    hysteresis                                  INTEGER (0..30),
    timeToTrigger                               ENUMERATED
{ms0,ms40,ms64,ms80,ms100,ms128,ms160,ms256,ms320,ms480,ms512,ms640,ms1024,ms1280,ms2560,ms5120},
    useWhiteCellList                            BOOLEAN,
    referenceSignalType                         ENUMERATED {ssb,csi-rs},
    reportInterval                              ENUMERATED
{ms120,ms240,ms480,ms640,ms1024,ms2048,ms5120,ms10240,ms20480,ms40960,min1,min6,min12,min30},
    reportAmount                                ENUMERATED {r1,r2,r4,r8,r16,r32,r64,infinity},
    reportQuantityCell                          MeasurementTriggerQuantity,
    maxReportCells                              INTEGER (1..8),
    reportQuantityRsIndex                       MeasurementTriggerQuantity                  OPTIONAL,
    includeBeamMeasurements                     BOOLEAN,
    maxNrOfRsIndexesToReport                    INTEGER (0..32)                             OPTIONAL,
    ...
}

A6EventTriggerConfiguration ::= SEQUENCE{
    enable                                      BOOLEAN,
    index                                       INTEGER (1..127),
    a6Offset                                    MeasurementTriggerQuantityOffset,
    hysteresis                                  INTEGER (0..30),
    timeToTrigger                               ENUMERATED
{ms0,ms40,ms64,ms80,ms100,ms128,ms160,ms256,ms320,ms480,ms512,ms640,ms1024,ms1280,ms2560,ms5120},
    useWhiteCellList                            BOOLEAN,
    referenceSignalType                         ENUMERATED {ssb,csi-rs},
    reportInterval                              ENUMERATED
{ms120,ms240,ms480,ms640,ms1024,ms2048,ms5120,ms10240,ms20480,ms40960,min1,min6,min12,min30},
    reportAmount                                ENUMERATED {r1,r2,r4,r8,r16,r32,r64,infinity},
    reportQuantityCell                          MeasurementTriggerQuantity,
    maxReportCells                              INTEGER (1..8),
    reportQuantityRsIndex                       MeasurementTriggerQuantity                  OPTIONAL,
    includeBeamMeasurements                     BOOLEAN,
    maxNrOfRsIndexesToReport                    INTEGER (0..32)                             OPTIONAL,
    ...
}

B1EventTriggerConfiguration ::= SEQUENCE{
    enable                                      BOOLEAN,
    index                                       INTEGER (1..127),
    b1ThresholdEutra                            MeasurementTriggerQuantityEUTRA,
    reportOnLeave                               BOOLEAN,
    hysteresis                                  INTEGER (0..30),
    timeToTrigger                               ENUMERATED
{ms0,ms40,ms64,ms80,ms100,ms128,ms160,ms256,ms320,ms480,ms512,ms640,ms1024,ms1280,ms2560,ms5120},
    referenceSignalType                         ENUMERATED {ssb,csi-rs},
    reportInterval                              ENUMERATED
{ms120,ms240,ms480,ms640,ms1024,ms2048,ms5120,ms10240,ms20480,ms40960,min1,min6,min12,min30},
    reportAmount                                ENUMERATED {r1,r2,r4,r8,r16,r32,r64,infinity},
    reportQuantityCell                          MeasurementTriggerQuantity,
    maxReportCells                              INTEGER (1..8),
    includeBeamMeasurements                     BOOLEAN,
    maxNrOfRsIndexesToReport                    INTEGER (0..32)                             OPTIONAL,
    ...
}

B2EventTriggerConfiguration ::= SEQUENCE{
    enable                                      BOOLEAN,
    index                                       INTEGER (1..127),
    b2Threshold1                                MeasurementTriggerQuantity,
    b2Threshold2Eutra                           MeasurementTriggerQuantityEUTRA,
    reportOnLeave                               BOOLEAN,
    hysteresis                                  INTEGER (0..30),
    timeToTrigger                               ENUMERATED
{ms0,ms40,ms64,ms80,ms100,ms128,ms160,ms256,ms320,ms480,ms512,ms640,ms1024,ms1280,ms2560,ms5120},
    referenceSignalType                         ENUMERATED {ssb,csi-rs},
    reportInterval                              ENUMERATED
{ms120,ms240,ms480,ms640,ms1024,ms2048,ms5120,ms10240,ms20480,ms40960,min1,min6,min12,min30},
    reportAmount                                ENUMERATED {r1,r2,r4,r8,r16,r32,r64,infinity},
    reportQuantityCell                          MeasurementTriggerQuantity,
```

```
    maxReportCells                                  INTEGER (1..8),
    includeBeamMeasurements                         BOOLEAN,
    maxNrOfRsIndexesToReport                        INTEGER (0..32)                                 OPTIONAL,
    ...
}

MeasurementReportEventTriggerConfiguration ::= SEQUENCE{
    a1ReportConfiguration-List                      SEQUENCE (SIZE(0..maxofReports)) OF A1ReportConfiguration,
    a2ReportConfiguration-List                      SEQUENCE (SIZE(0..maxofReports)) OF A2ReportConfiguration,
    a3ReportConfiguration-List                      SEQUENCE (SIZE(0..maxofReports)) OF A3ReportConfiguration,
    a4ReportConfiguration-List                      SEQUENCE (SIZE(0..maxofReports)) OF A4ReportConfiguration,
    a5ReportConfiguration-List                      SEQUENCE (SIZE(0..maxofReports)) OF A5ReportConfiguration,
    a6ReportConfiguration-List                      SEQUENCE (SIZE(0..maxofReports)) OF A6ReportConfiguration,
    b1ReportConfiguration-List                      SEQUENCE (SIZE(0..maxofReports)) OF B1ReportConfiguration,
    b2ReportConfiguration-List                      SEQUENCE (SIZE(0..maxofReports)) OF B2ReportConfiguration,
    ...
}

A1ReportConfiguration ::= SEQUENCE{
    a1EventTriggerConfiguration                     A1EventTriggerConfiguration,
    ...
}

A2ReportConfiguration ::= SEQUENCE{
    a2EventTriggerConfiguration                     A2EventTriggerConfiguration,
    ...
}

A3ReportConfiguration ::= SEQUENCE{
    a3EventTriggerConfiguration                     A3EventTriggerConfiguration,
    ...
}

A4ReportConfiguration ::= SEQUENCE{
    a4EventTriggerConfiguration                     A4EventTriggerConfiguration,
    ...
}

A5ReportConfiguration ::= SEQUENCE{
    a5EventTriggerConfiguration                     A5EventTriggerConfiguration,
    ...
}

A6ReportConfiguration ::= SEQUENCE{
    a6EventTriggerConfiguration                     A6EventTriggerConfiguration,
    ...
}

B1ReportConfiguration ::= SEQUENCE{
    b1EventTriggerConfiguration                     B1EventTriggerConfiguration,
    ...
}

B2ReportConfiguration ::= SEQUENCE{
    b2EventTriggerConfiguration                     B2EventTriggerConfiguration,
    ...
}

MeasurementResult ::= SEQUENCE{
    measurementResultServingCell                    MeasurementResultNR,
    measurementResultNeighCells                     MeasurementResultNeighCells-Choice,
    ...
}

MeasurementResultNeighCells-Choice ::= CHOICE{
    measurementResultNr-List                        SEQUENCE (SIZE(1..8)) OF MeasurementResultNr,
    measurementResultEutra-List                     SEQUENCE (SIZE(1..8)) OF MeasurementResultEutra,
    ...
}

MeasurementResultNr ::= SEQUENCE{
    measurementResultNr                             MeasurementResultNR,
    ...
}

MeasurementResultEutra ::= SEQUENCE{
    measurementResultEutra                          MeasurementResultEUTRA,
    ...
}

MeasurementResultNR ::= SEQUENCE{
    pCI                                             INTEGER,
```

```
    based-SSB                                   MeasurementQuantityResult                   OPTIONAL,
    based-CSI-RS                                MeasurementQuantityResult                   OPTIONAL,
    ...
}

MeasurementResultEUTRA ::= SEQUENCE{
    pCI                                         INTEGER (0..503),
    measurementQuantityResult                   MeasurementQuantityResultEUTRA,
    ...
}

HandoverCommand ::= SEQUENCE{
    sourceCellId                                NRCGI,
    targetCellId                                NRCGI,
    targetCellCarrierFrequency                  INTEGER                                     OPTIONAL,
    uEId                                        UEID,
    cause                                       ENUMERATED {unspecified,ricHandoverTriggered}   OPTIONAL,
    ...
}

ReleaseCommand ::= SEQUENCE{
    sourceCellId                                NRCGI,
    uEId                                        UEID,
    cellReselectionPriority-List                SEQUENCE (SIZE(0..8)) OF CellReselectionPriority,
    t320                                        ENUMERATED {min5,min10,min20,min30,min60,min120,min180,spare1}OPTIONAL,
    ...
}

CellReselectionPriority ::= SEQUENCE{
    carrierFrequency                            INTEGER,
    cellReselectionPriority                     INTEGER,
    ...
}

MeasurementQuantityResult ::= SEQUENCE{
    rSRP                                        INTEGER (0..127),
    rSRQ                                        INTEGER (0..127),
    sINR                                        INTEGER (0..127),
    ...
}

MeasurementQuantityResultEUTRA ::= SEQUENCE{
    rSRP                                        INTEGER (0..97),
    rSRQ                                        INTEGER (0..34),
    sINR                                        INTEGER (0..127),
    ...
}

MeasurementTriggerQuantity ::= SEQUENCE{
    quantity                                    Quantity-Choice,
    ...
}

Quantity-Choice ::= CHOICE{
    rSRP                                        INTEGER (0..97),
    rSRQ                                        INTEGER (0..34),
    sINR                                        INTEGER (0..127),
    ...
}

MeasurementTriggerQuantityEUTRA ::= SEQUENCE{
    quantity                                    Quantity-Choice,
    ...
}

MeasurementTriggerQuantityOffset ::= SEQUENCE{
    quantityOffset                              QuantityOffset-Choice,
    ...
}

QuantityOffset-Choice ::= CHOICE{
    rSRP                                        INTEGER (-30..30),
    rSRQ                                        INTEGER (-30..30),
    sINR                                        INTEGER (-30..30),
    ...
}

CommonCellReselectionConfiguration ::= SEQUENCE{
    nrofSs-BlocksToAverage                      INTEGER (2..16)                             OPTIONAL,
    absThreshSs-BlocksConsolidation             ThresholdNR,
    rangeToBestCell                             ENUMERATED {dB-24,dB-22,dB-20,dB-18,dB-16,dB-14,dB-12,dB-10,dB-8,dB-6,dB-5,dB-4,dB-
3,dB-2,dB-1,dB0,dB1,dB2,dB3,dB4,dB5,dB6,dB8,dB10,dB12,dB14,dB16,dB18,dB20,dB22,dB24}OPTIONAL,
```

```
    qhyst                                   ENUMERATED
{dB0, dB1, dB2, dB3, dB4, dB5, dB6, dB8, dB10, dB12, dB14, dB16, dB18, dB20, dB22, dB24},
    speedStateReselectionPars               SpeedStateReselectionPars               OPTIONAL,
    ...
}

SpeedStateReselectionPars ::= SEQUENCE{
    mobilityStateParameters                 MobilityStateParameters                 OPTIONAL,
    q-HystSF                                Q-Hystsf,
    ...
}

MobilityStateParameters ::= SEQUENCE{
    t-Evaluation                            ENUMERATED {s30, s60, s120, s180, s240, spare3, spare2, spare1}OPTIONAL,
    t-HystNormal                            ENUMERATED {s30, s60, s120, s180, s240, spare3, spare2, spare1}OPTIONAL,
    n-CellChangeMedium                      INTEGER (1..16)                         OPTIONAL,
    n-CellChangeHigh                        INTEGER (1..16)                         OPTIONAL,
    ...
}

Q-Hystsf ::= SEQUENCE{
    sf-Medium                               ENUMERATED {dB-6, dB-4, dB-2, dB0}      OPTIONAL,
    sf-High                                 ENUMERATED {dB-6, dB-4, dB-2, dB0}      OPTIONAL,
    ...
}

Intra-frequencyCellReselectionConfiguration ::= SEQUENCE{
    servingFrequencyInformation             ServingFrequencyInformation,
    qRxLevMin                               INTEGER (-70..-22),
    qQualMin                                INTEGER (-43..-12)                      OPTIONAL,
    s-IntraSearchP                          INTEGER (0..31),
    s-IntraSearchQ                          INTEGER (0..31)                         OPTIONAL,
    t-ReselectionNr                         INTEGER (0..7),
    p-Max                                   INTEGER (-30..33)                       OPTIONAL,
    deriveSsb-IndexFromCell                 BOOLEAN                                 OPTIONAL,
    t-ReselectionNr-Sf                      T-ReselectionNr-Sf,
    ...
}

ServingFrequencyInformation ::= SEQUENCE{
    s-NonIntraSearchP                       INTEGER (0..31),
    s-NonIntraSearchQ                       INTEGER (0..31),
    threshServingLowP                       INTEGER (0..31),
    threshServingLowQ                       INTEGER (0..31),
    cellReselectionPriority                 INTEGER (0..7),
    cellReselectionSubpriority              ENUMERATED {odot2, odot4, odot6, odot8},
    ...
}

T-ReselectionNr-Sf ::= SEQUENCE{
    sf-Medium                               ENUMERATED {odot25, odot5, odot75, n1dot0}  OPTIONAL,
    sf-High                                 ENUMERATED {odot25, odot5, odot75, n1dot0}  OPTIONAL,
    ...
}

Inter-frequencyCellReselectionConfiguration ::= SEQUENCE{
    dlCarrierFrequency                      INTEGER,
    nR-MultiBandInfo-List                   SEQUENCE (SIZE(1..8)) OF Nr-MultiBandInfo,
    nrofSs-BlocksToAverage                  INTEGER (2..16)                         OPTIONAL,
    absThreshSs-BlocksConsolidation         ThresholdNR,
    ssbSubcarrierSpacing                    ENUMERATED {kHz15, kHz30, kHz60, kHz120, kHz240, spare3, spare2, spare1},
    deriveSsb-IndexFromCell                 BOOLEAN                                 OPTIONAL,
    qRxLevMin                               INTEGER (-70..-22),
    qQualMin                                INTEGER (-43..-12)                      OPTIONAL,
    p-Max                                   INTEGER (-30..33)                       OPTIONAL,
    t-ReselectionNr                         INTEGER (0..7),
    t-ReselectionNr-Sf                      T-ReselectionNr-Sf,
    threshX-HighP                           INTEGER (0..31),
    threshX-LowP                            INTEGER (0..31),
    threshX-HighQ                           INTEGER (0..31)                         OPTIONAL,
    threshX-LowQ                            INTEGER (0..31)                         OPTIONAL,
    cellReselectionPriority                 INTEGER (0..7),
    cellReselectionSubpriority              ENUMERATED {odot2, odot4, odot6, odot8}     OPTIONAL,
    q-OffsetFreq                            ENUMERATED {dB-24, dB-22, dB-20, dB-18, dB-16, dB-14, dB-12, dB-10, dB-8, dB-6, dB-5, dB-4, dB-
3, dB-2, dB-1, dB0, dB1, dB2, dB3, dB4, dB5, dB6, dB8, dB10, dB12, dB14, dB16, dB18, dB20, dB22, dB24},
    ...
}

Nr-MultiBandInfo ::= SEQUENCE{
    frequencyBandIndicatorNr                INTEGER (1..1024)                       OPTIONAL,
    nR-NS-Pmax-List                         SEQUENCE (SIZE(1..8)) OF Nr-Ns-Pmax     OPTIONAL,
    ...
```

```
}

Nr-Ns-Pmax ::= SEQUENCE{
    additionalP-Max                                 INTEGER (-30..33)                               OPTIONAL,
    additionalSpectrumEmission                      INTEGER (0..7)                                  OPTIONAL,
    ...
}

Inter-RATCellReselectionConfiguration ::= SEQUENCE{
    dlCarrierFrequency                              INTEGER,
    allowedMeasurementBandwidth                     ENUMERATED {mbw6,mbw15,mbw25,mbw50,mbw75,mbw100},
    presenceAntennaPort1                            BOOLEAN,
    cellReselectionPriority                         INTEGER (0..7),
    cellReselectionSubpriority                      ENUMERATED {odot2,odot4,odot6,odot8}            OPTIONAL,
    threshX-HighP                                   INTEGER (0..31),
    threshX-LowP                                    INTEGER (0..31),
    threshX-HighQ                                   INTEGER (0..31)                                 OPTIONAL,
    threshX-LowQ                                    INTEGER (0..31)                                 OPTIONAL,
    qRxLevMin                                       INTEGER (-70..-22),
    qQualMin                                        INTEGER (-43..-12)                              OPTIONAL,
    p-Max                                           INTEGER (-30..33)                               OPTIONAL,
    ...
}

ThresholdNR ::= SEQUENCE{
    rSRP                                            INTEGER (0..127),
    rSRQ                                            INTEGER (0..127),
    sINR                                            INTEGER (0..127),
    ...
}

LogicalChannelConfiguration ::= SEQUENCE{
    logicalChannelGroup                             INTEGER,
    priority                                        INTEGER (1..16),
    prioritisedBitRate                              ENUMERATED
{kBps0,kBps8,kBps16,kBps32,kBps64,kBps128,kBps256,kBps512,kBps1024,kBps2048,kBps4096,kBps8192,kBps16384,kBps32768,kBps65536,infinity},
    bucketSizeDuration                              ENUMERATED
{ms5,ms10,ms20,ms50,ms100,ms150,ms300,ms500,ms1000,spare7,spare6,spare5,spare4,spare3,spare2,spare1},
    ...
}

DRXConfiguration ::= SEQUENCE{
    longDrxCycleLength                              ENUMERATED
{ms10,ms20,ms32,ms40,ms60,ms64,ms70,ms80,ms128,ms160,ms256,ms320,ms512,ms640,ms1024,ms1280,ms2048,ms2560,ms5120,ms1024odot},
    shortDrxCycleLength                             ENUMERATED
{ms2,ms3,ms4,ms5,ms6,ms7,ms8,ms10,ms14,ms16,ms20,ms30,ms32,ms35,ms40,ms64,ms80,ms128,ms160,ms256,ms320,ms512,ms640},
    shortDrxCycleTimer                              INTEGER (1..16),
    ...
}

SchedulingRequestConfiguration ::= SEQUENCE{
    sr-ProhibitTimer                                ENUMERATED {ms1,ms2,ms4,ms8,ms16,ms32,ms64,ms128} OPTIONAL,
    sr-TransMax                                     ENUMERATED {n4,n8,n16,n32,n64,spare3,spare2,spare1},
    ...
}

Non-dynamicSchedulingConfiguration ::= SEQUENCE{
    sPS-Config                                      Sps-Config,
    configuredGrantConfig                           ConfiguredGrantConfig,
    ...
}

Sps-Config ::= SEQUENCE{
    periodicity                                     ENUMERATED
{ms10,ms20,ms32,ms40,ms64,ms80,ms128,ms160,ms320,ms640,spare6,spare5,spare4,spare3,spare2,spare1},
    ...
}

ConfiguredGrantConfig ::= SEQUENCE{
    periodicity                                     ENUMERATED
{sym2,sym7,sym1x14,sym2x14,sym4x14,sym5x14,sym8x14,sym10x14,sym16x14,sym20x14,sym32x14,sym40x14,sym64x14,sym80x14,sym128x14,sym160x14,sym
256x14,sym320x14,sym512x14,sym640x14,sym1024x14,sym1280x14,sym2560x14,sym5120x14,sym6,sym1x12,sym2x12,sym4x12,sym5x12,sym8x12,sym10x12,sy
m16x12,sym20x12,sym32x12,sym40x12,sym64x12,sym80x12,sym128x12,sym160x12,sym256x12,sym320x12,sym512x12,sym640x12,sym1280x12,sym2560x12}OPT
IONAL,
    configuredGrantTimer                            INTEGER (1..64)                                 OPTIONAL,
    ...
}

DRBQoSConfiguration ::= SEQUENCE{
    dRBToBeSetup-List                               SEQUENCE (SIZE(0..maxofDRBs)) OF DrbToBeSetup,
    ...
}
```

```
DrbToBeSetup ::= SEQUENCE{
    dRBId                                   INTEGER (1..maxofDRBs),
    qoSInformation                          QosInformation-Choice,
    ...
}

QosInformation-Choice ::= CHOICE{
    e-UTRANQos                              E-UTRANQoS,
    dRBInformation                          DRBQoS,
    ...
}

DRBQoS ::= SEQUENCE{
    qoSCharacteristics                      QosCharacteristics-Choice,
    nG-RANAllocationAndRetentionPriority    INTEGER                                 OPTIONAL,
    gBRQosFlowInformation                   GBRQoSFlowInformation                   OPTIONAL,
    reflectiveQosAttribute                  ENUMERATED {subjectto}                  OPTIONAL,
    pDUSessionId                            INTEGER (0..255)                        OPTIONAL,
    uLPduSessionAggregateMaximumBitRate     INTEGER                                 OPTIONAL,
    ...
}

QosCharacteristics-Choice ::= CHOICE{
    non-dynamic5Qi                          NonDynamic5QIDescriptor,
    dynamic5Qi                              Dynamic5QIDescriptor,
    ...
}

NonDynamic5QIDescriptor ::= SEQUENCE{
    fiveQI                                  INTEGER (0..255),
    priorityLevel                           INTEGER (0..127)                        OPTIONAL,
    averagingWindow                         INTEGER (0..4095)                       OPTIONAL,
    ...
}

Dynamic5QIDescriptor ::= SEQUENCE{
    qoSPriorityLevel                        INTEGER (1..127),
    packetErrorRate                         INTEGER,
    fiveQI                                  INTEGER (0..255),
    packetDelayBudget                       INTEGER (0..1023),
    averagingWindow                         INTEGER (0..4095)                       OPTIONAL,       --Cond ,
    ...
}

GBRQoSFlowInformation ::= SEQUENCE{
    maximumFlowBitRateDownlink              INTEGER,
    maximumFlowBitRateUplink                INTEGER,
    guaranteedFlowBitRateDownlink           INTEGER,
    guaranteedFlowBitRateUplink             INTEGER,
    maximumPacketLossRateDownlink           INTEGER                                 OPTIONAL,
    maximumPacketLossRateUplink             INTEGER                                 OPTIONAL,
    ...
}

E-UTRANQoS ::= SEQUENCE{
    qCI                                     INTEGER (0..255),
    allocationAndRetentionPriority          AllocationandRetentionPriority,
    gBRQosInformation                       GBRQoSFlowInformation                   OPTIONAL,
    ...
}

AllocationandRetentionPriority ::= SEQUENCE{
    priorityLevel                           INTEGER (0..15),
    pre-emptionCapability                   ENUMERATED {shallnottriggerpre-emption,maytriggerpre-emption},
    pre-emptionVulnerability                ENUMERATED {notpre-emptable,pre-emptable},
    ...
}

GBRQoSInformation ::= SEQUENCE{
    maximumFlowBitRateDownlink              INTEGER,
    maximumFlowBitRateUplink                INTEGER,
    guaranteedFlowBitRateDownlink           INTEGER,
    guaranteedFlowBitRateUplink             INTEGER,
    ...
}


END

-- ASN1STOP
```