 O-RAN.WG3.E2GAP-v01.01

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Technical Specification

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

Architecture &   
E2 General Aspects and Principles

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# Revision History

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# 1 Introductory Material

## 1.1 Scope

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

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

Release x.y.z

where:

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

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

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

The present document describes the overall architecture of the Near-RT-RIC (RAN Intelligent Controller) and the general aspects and principles of the E2 interface, including the interaction with applications hosted in the Near-RT RIC.

# 2 References

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

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

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

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

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

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

[3] ORAN-WG2.A1.GA&P, “O-RAN Working Group 2, A1 interface: General Aspects and Principles”.

[4] O-RAN-WG1.O1-Interface, “O-RAN Operations and Maintenance Interface Specification”.

[5] 3GPP TS 36.401: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Architecture Description".

[6] 3GPP TS 38.401: "NG-RAN; Architecture description".

[7] 3GPP TS 36.423: “Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 application protocol (X2AP)”.

[8] O-RAN-WG1.OAM Architecture, “O-RAN Operations and Maintenance Architecture”.

[9] 3GPP TS 38.410 “NG general aspects and principles”.

[10] 3GPP TS 38.420 “Xn general aspects and principles”.

[11] 3GPP TS 38.470 “F1 general aspects and principles”.

[12] IETF RFC 4960 (2007-09): “Stream Control Transmission Protocol”.

[13] 3GPP TS 33.401 “3GPP System Architecture Evolution (SAE); Security architecture”.

[14] 3GPP TS 33.501 “Security architecture and procedures for 5G System”.

[15] O-RAN.WG2.UCR-v02.00 "O-RAN Working Group 2 Use Cases and Requirements v02.00".

[16] 3GPP TS 38.300 NR; “NR and NG-RAN Overall Description; Stage 2”.

[17] ORAN-WG3.E2SM; “O-RAN Working Group 3, Near-Real-time RAN Intelligent Controller, ”.

[18] O-RAN-WG1-O-RAN Architecture Description - v01.00.00; “O-RAN Architecture Description”.

[19] O-RAN.WG3.RICARCH, “O-RAN Working Group 3, Near-Real-time RAN Intelligent Controller, Near-RT RIC Architecture”

# 3 Definitions and Abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply.   
A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

**O-CU** (O-RAN Central Unit): a logical node hosting RRC, SDAP and PDCP protocols

**O-CU-CP** (O-RAN Central Unit – Control Plane): a logical node hosting the RRC and the control plane part of the PDCP protocol

**O-CU-UP** (O-RAN Central Unit – User Plane): a logical node hosting the user plane part of the PDCP protocol and the SDAP protocol

**O-DU** (O-RAN Distributed Unit): a logical node hosting RLC/MAC/High-PHY layers based on a lower layer functional split.

**O-eNB** (O-RAN eNB):an eNB [5] or ng-eNB [16] that supports E2 interface.

**O-RU** (O-RAN Radio Unit): a logical node hosting Low-PHY layer and RF processing based on a lower layer functional split.  This is similar to 3GPP’s “TRP” or “RRH” but more specific in including the Low-PHY layer (FFT/iFFT, PRACH extraction).

**Non-RT RIC**(O-RAN non-real-time RAN Intelligent Controller):a logical function that enables non-real-time control and optimization of RAN elements and resources, AI/ML workflow including model training and updates, and policy-based guidance of applications/features in Near-RT RIC.

**Near-RT RIC (**O-RAN near-real-time RAN Intelligent Controller): a logical function that enables near-real-time control and optimization of RAN elements and resources via fine-grained (e.g. UE basis, Cell basis) data collection and actions over E2 interface.

**O1**: Interface between orchestration & management entities (Orchestration/NMS) and O-RAN managed elements, for operation and management, by which FCAPS management, Software management, File management and other similar functions shall be achieved.

**A1**: Interface between Non-RT RIC and Near-RT RIC to enable policy-driven guidance of Near-RT RIC applications/functions, and support AI/ML workflow.

**E2**: Interface connecting the Near-RT RIC and one or more O-CU-CPs, one or more O-CU-UPs, one or more O-DUs, and one or more O-eNBs.

**E2 Node**: a logical node terminating E2 interface. In this version of the specification, ORAN nodes terminating E2 interface are:

- for NR access: O-CU-CP, O-CU-UP, O-DU or any combination as defined in [8];

- for E-UTRA access: O-eNB.

**RAN Function**: A specific Function in a E2 Node; examples include X2AP, F1AP, E1AP, S1AP, NGAP interfaces and RAN internal functions handling UEs, Cells, etc.

**xApp:** An application designed to run on the Near-RT RIC. Such an application is likely to consist of one or more microservices and at the point of on-boarding will identify which data it consumes and which data it provides. The application is independent of the Near-RT RIC and may be provided by any third party. The E2 enables a direct association between the xApp and the RAN functionality.

xApp: 设计在Near-RT RIC上运行的应用。这个应用可能存在一个或者多个服务并且on-boarding将会确定数据在哪使用以及数据在哪提供。应用对于Near-RT RIC是独立的并且它可以由任何第三方提供。E2接口直接关联xApp和RAN功能的联系。

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

**RIC Service：**服务是由E2节点提供，Near-RT RIC用服务来接收E2节点的消息，访问E2节点的指数和/或控制E2节点

## 3.2 Abbreviations

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

O-CU O-RAN Central Unit

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

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

O-DU O-RAN Distributed Unit

O-eNB O-RAN eNB

O-RU O-RAN Radio Unit

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

Near-RT RICNear-real-time RAN Intelligent Controller

RAT Radio Access Technology

# 4 Near-RT RIC Architecture

## 4.1 General Architecture Principles

The general principles guiding the definition of Near-RT RIC architecture as well as the interfaces between Near-RT RIC, E2 Nodes and Service Management & Orchestration are the following:

引导Near-RT RIC架构定义的基本原则和Near-RT RIC，E2节点于服务管理&编排如下：

- Near-RT RIC and E2 Node functions are fully separated from transport functions. Addressing scheme used in Near-RT RIC and the E2 Nodes shall not be tied to the addressing schemes of transport functions.

Near-RT RIC 和E2节点的功能在传输功能上完全分离。 Near-RT RIC和E2节点的寻址方案于传输功能的寻址方案没有绑定。

- The E2 Nodes support all protocol layers and interfaces defined within 3GPP radio access networks that include eNB for E-UTRAN [5] and gNB/ ng-eNB for NG-RAN [16].

E2节点支持3GPP无线接入网络的所有协议层和接口（eNB for E-UTRAN [5] and gNB/ ng-eNB for NG-RAN [16]）

- Near-RT RIC and hosted “xApp” applications shall use a set of services exposed by an E2 Node that is described by a series of RAN function and Radio Access Technology (RAT) dependent “E2 Service Models”.

Near-RT RIC和部署的“xApp”应用应该使用由E2节点提供的一系列服务，这些服务由一系列RAN功能和无线接入技术（RAT）相关的“E2服务模型”描述。

- The Near-RT RIC interfaces are defined along the following principles:

- The functional division across the interfaces have as few options as possible.

- Interfaces are based on a logical model of the entity controlled through this interface.

- One physical network element can implement multiple logical nodes.

以下原则定义了Near-RT RIC接口：

接口的拆分尽可能小

接口是基于通过接口控制实体逻辑模型

一个实体网络可以实现多个逻辑节点

## 4.2 Near-RT RIC Architecture Overview

The Near-RT RIC is a logical network node placed between the Service Management & Orchestration layer [8], which hosts the Non-RT RIC, and the E2 Nodes.

Near-RT RIC是一个逻辑网络节点，这个逻辑节点放置在服务管理和编排层（部署着Non-RT RIC）于E2节点之间。

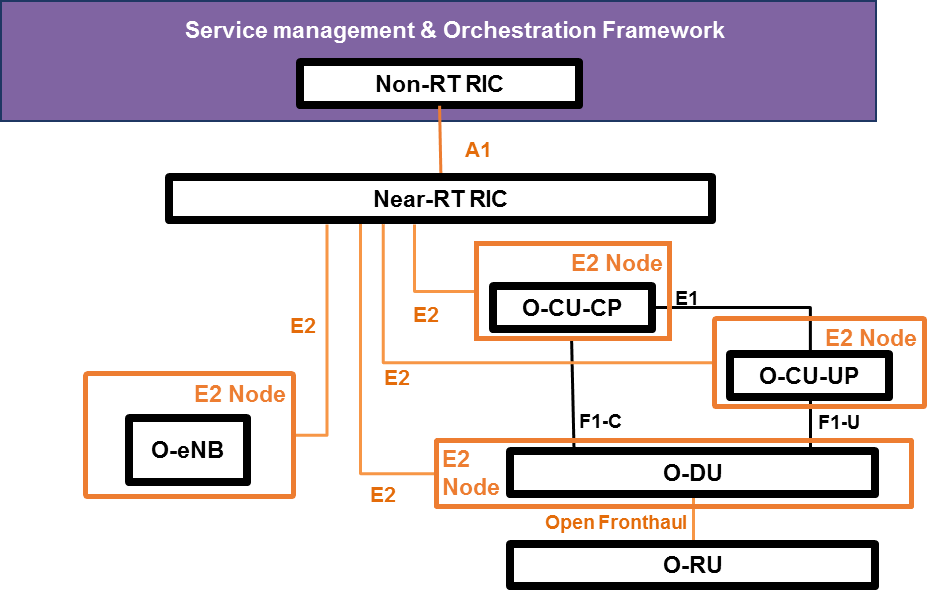


Figure 4.2-1: O-RAN Architecture Overview showing Near-RT RIC interfaces

The Near-RT-RIC logical architecture and related interfaces are shown in Figure 4.2-1:

- The Near-RT RIC is connected to the Non-RT RIC through the A1 interface [3];

- A Near-RT RIC is connected to only one Non-RT RIC;

- E2 is a logical interface connecting the Near-RT RIC with an E2 Node;

- The Near-RT RIC is connected to the O-CU-CP;

- The Near-RT RIC is connected to the O-CU-UP;

- The Near-RT RIC is connected to the O-DU;

- The Near-RT RIC is connected to the O-eNB;

- An E2 Node is connected to only one Near-RT RIC;

- A Near-RT RIC can be connected to multiple E2 Nodes, i.e. multiple O-CU-CPs, O-CU-UPs, O-DUs and O-eNBs.

- F1 (F1-C, F1-U) and E1 are logical 3GPP interfaces, whose protocols, termination points and cardinalities are specified in [6].

In addition, the near-RT RIC and other RAN nodes have O1 interfaces as defined in [8][18].

The Near-RT RIC hosts one or more xApps that use E2 interface to collect near real-time information (e.g. UE basis, Cell basis) and provide value added services.

The Near-RT RIC may receive declarative Policies and obtain Data Enrichment information over the A1 interface [3].

Near-RT RIC也许接收到声明性策略和通过A1接口获取Data Enrichment信息。

The protocols over E2 interface are based exclusively on Control plane protocols and are defined in [2].

E2接口完全基于控制面协议在[2]中定义。

On E2 or Near-RT RIC failure, the E2 Node will be able to provide services but there may be an outage for certain value-added services that may only be provided using the Near-RT RIC.

当 E2 或 Near-RT RIC 发生故障时，E2 节点将能够提供服务，但某些只能使用 Near-RT RIC 提供的增值服务可能会中断。

## 4.3 Near-RT RIC Requirements

The Near-RT RIC architecture shall support the following requirements:

- The Near-RT RIC shall use a dedicated E2 connection that uniquely identifies each E2 Node configured to directly provide RIC Services to the Near-RT RIC.

Near-RT RIC应该使用专门的E2连接，该连接唯一定位了每一个E2节点，每个节点直接为Near-RT RIC提供RIC服务。

- A given Near-RT RIC may support E2 connections from multiple E2 Nodes, each supporting a specific RAT type.

每个Near-RT RIC也许应该支持来自多个E2节点E2连接，每个节点都支持无线接入技术（RAT）类型

- The Near-RT RIC shall obtain from the E2 Nodes a list of functions supporting RIC Services and the corresponding E2 Service Model.

Near-RT RIC应该从E2节点那里获取支持RIC服务的功能列表和相应E2服务模型。

- The Near-RT RIC shall host a set of applications, known as xApps. Individual xApp in Near-RT RIC may address specific RAN Functions in a specific E2 Node.

Near-RT RIC应该部署一系列应用，比如xApps。在Near-RT RIC上的xApp应该处理在E2节点上的特定的RAN功能。

- The Near-RT RIC shall, as per any other network element, provide an O1 interface towards the Service Management & Orchestration layer for element management and configuration

像其他网络元素一样，Near-RT RIC应该面向服务管理和编排层提供一个O1接口以提供元素管理和配置。

- The Near-RT RIC shall provide an A1 interface [3] towards the Non-RT RIC. The A1 interface is used to provide Policies to the Near-RT RIC which may be used to modify Near-RT RIC and Near-RT RIC hosted xApp behavior and hence modify E2 Node behavior.

Near-RT RIC应该提供A1接口给Non-RT RIC。A1接口被用来提供策略给Near-RT RIC,该策略是用来修改Near-RT RIC和Near-RT部署的xApp的行为并且由此改变E2节点的行为。

- The E2 node shall be able to function independently of the Near-RT RIC when and if the E2 interface and/or Near-RT RIC fails.

E2节点应该能够在Near-RT RIC平台上功能独立如果当E2接口和/或者Near-RT RIC挂机

- The Near-RT RIC shall support latency requirements for near-real-time optimization, i.e. from 10 milliseconds up to 1 second [8].

Near-RT RIC应该对近实时的优化支持延时要求，比如10ms到1s

## 4.4 Near-RT RIC functional architecture

### 4.4.1 General

The Near-RT RIC supports the following functions:

- A1 interface termination

- Terminates the A1 interface from the Non-RT RIC and forwards A1 messages.

从non-RT RIC终止A1接口和转发A1消息

- O1 interface termination

- Terminates the O1 interface from Service Management & Orchestration layer and forwards management messages to the Near-RT RIC management function;

- E2 interface termination

- Terminates the E2 interface from an E2 Node;

连接E2Node节点的接口

- Routes xApp-related messages to the target xApp;

路由xApp-related信息给目标xApp

- Routes non xApp-related messages to the E2 Manager;

路由xApp相关信息给E2管理

- Hosted xApps

- allow RRM control functionalities to be executed at the Near-RT RIC and enforced in the E2 Nodes via E2 interface, as described in Section 4.4.2;

允许RRM控制功能在Near-RT RIC执行和通过E2接口控制E2节点

- Initiates xApp-related transactions over E2 interface;

通过E2接口发起xApp相关传输

- Handles xApp-related responses from the E2 interface;

从E2接口处理xApp相关响应

Near-RT RIC Architecture is described in detail in [19]

### 4.4.2 RRM Functional Allocation

The RRM functional allocation between the Near-RT RIC and the E2 Node is subject to the capability of the E2 node exposed over the E2 interface by means of the E2 Service Model, in order to support the use cases such as in [15].

The E2 service model describes the functions in the E2 Node which may be controlled by the Near RT RIC and the related procedures, thus defining a function-specific RRM split between the E2 node and the Near RT RIC.

在Near-RT RIC和E2节点之间的RRM功能受支配于被暴露在由E2服务模型上的E2接口的E2节点的能力，为了支持例如【15】上的服务。

For a function exposed in the E2 service model, the Near-RT RIC may e.g. monitor, suspend/stop, override or control via policies the behavior of E2 node.

对于暴露在E2服务模型上的一个功能，Near-RT RIC通过策略也许监测、挂起/停止，重写或者控制E2节点。

# 5 E2 Interface

## 5.1 E2 interface general principles

The general principles for the specification of the E2 interface are as follows:

- the E2 interface is open;

接口必须开放

- the E2 interface supports the exchange of control signaling information between the endpoints;

E2接口支持在终端之间的控制信令信息交换

- from a logical standpoint, the E2 is a point-to-point interface between the endpoints;

从逻辑上看，E2在端点之间是点到点的接口

- E2 should reuse interface management procedures, as already defined for existing 3GPP RAN interfaces such as 3GPP X2 [7].

E2应该重新使用接口管理过程，像已经在存在的3GPP RAN 接口中已经定义，比如3GPP X2【7】

- Near-RT RIC shall provide flexibility by separating the O-RAN data collection (e.g. network measurements, context information, etc.) from the supported use cases.

Near-RT RIC应该从支持的使用场景中分离O-RAN数据集来体统灵活性

- E2 should provide the capability to send predefined information towards the Near-RT RIC based on a pre-configured trigger event

E2应该面向提供基于预配置的触发事件Near-RT RIC发送预定义的信息的能力。

- E2 should support the ability to provide UE ID information towards the Near-RT RIC based on a pre-configured trigger event.

E2应该支持面向基于一个预配置的触发事件的Near-RT RIC日工UE ID信息的能力。

- E2 should enable the Near-RT-RIC to direct the E2 Node to suspend an RRM procedure by interrupting the E2 Node local process and forwarding the relevant information to the Near-RT RIC for processing.

通过中断E2节点的本地过程和转发相关信息给Near-RT RIC的方式，E2应该能够使Near-RT-RIC去管理E2节点去暂停一个RRM过程。

- E2 should support the ability to send control messages (e.g. UE basis, Cell basis) to the E2 Node.

E2接口应该支持发送控制信息给E2节点的能力

- E2 should support the ability to provide the E2 Node with a set of policies to use when defined events occur.

当定义的事件发生时，E2接口应该给E2节点提供一个策略集去使用的能力。

- E2 should support the ability for E2 Node to notify the Near-RT RIC of what functionality it supports.

E2接口应该支持E2节点通知Near-RT RIC支持那些功能。

With respect to the E2 interface, the E2 Node consists of:

参照E2接口，E2节点应该包含：

- E2 Agent used to terminate the E2 interface and to forward/receive E2 messages.

E2代理用来连接E2接口并且发送/接收E消息。

- One or more RAN functions that are controlled by the Near-RT RIC, i.e. supporting Near-RT RIC Services.

被Near-RT RIC控制一个或者多个RAN功能应该支持

- Other RAN functions that do not support Near-RT RIC Services.

其他的RAN功能不用支持Near-RT RIC服务

With respect to the E2 interface, the Near-RT RIC consists of:

根据E2接口，Near-RT RIC应该包含

- Database holding data from xApp applications and E2 Node and providing data to xApp applications

提供能为xApp应用和E2节点存数据的数据库和为xApp应用提供数据的数据库

- E2 Termination function

E2 终端功能

- One or more xApp applications

一个或者多个xApp应用



Figure 5.1-1: Relationship between Near-RT RIC and E2 Node

## 5.2 E2 interface specification objectives

The E2 interface specifications shall facilitate the following:

E2接口帮助如下：

Connectivity between Near-RT RIC and E2 Node supplied by different vendors;

- Exposure of selected E2 Node data (e.g. configuration information (cell configuration, supported slices, PLMNs, etc.), network measurements, context information, etc.) towards the Near-RT RIC

- Enables the Near-RT RIC to control selected functions on the E2 Node

在Near-RT RIC与E2节点之间的连接应该：

- 暴露在面向Near-RT RIC可选择的E2节点数据（例如：配置数据（基站配置、支持的切片，PLMNs等），网络测量，内容信息等）

- 能够在E2节点上去使得Near-RT RIC能够可哦你工作选择的功能

## 5.3 Functions of the E2 Interface

### 5.3.1 General

The E2 functions are grouped into the following categories:

NEAR-RT RIC services:

* Near-RT RIC Services (**REPORT**, **INSERT**, **CONTROL** and **POLICY**, as described in Section 5.3.2).
* Near-RT RIC 服务

NEAR-RT RIC support functions:

* Interface Management (E2 Setup, E2 Reset, E2 Node Configuration Update, Reporting of General Error Situations)
* 接口管理（E2建立，E2重置，E2节点配置更新，报告一般错误情况）
* Near-RT RIC Service Update, i.e. a E2 Node initiated procedure to inform Near-RT RIC of changes to list of supported Near-RT RIC services and mapping of services to functions.
* Near-RT RIC 服务更新，一个E2级点发起了过程去通知Near-RT RIC一系列near-RT 服务和服务映射功能的改变。

### 5.3.2 RIC services and related procedures

Near-RT RIC may use the following RIC services provided by an E2 node:

- **REPORT**: Near-RT RIC uses a RIC Subscription procedure to request that E2 Node sends a **REPORT** message to Near-RT RIC and the associated procedure continues in E2 Node after each occurrence of a defined RIC Subscription procedure Event Trigger.

REPORT服务：Near-RT RIC使用RIC订阅过程去请求E2节点发送一个REPORT消息给Near-RT RIC和在E2节点关联的过程

The **REPORT** service involves following steps:

1. Near-RT RIC configures a RIC Subscription procedure in the E2 Node with information used to configure an Indication (Report) that is to be performed by E2 Node with each occurrence of RIC trigger event condition

Near-RT RIC在E2Node配置了一个RIC订阅过程，其中的信息用来配置一个指示（报告），这个指示由E2节点每次RIC触发事件条件发生时执行。

1. During normal functioning of an associated procedure in the E2 Node, a RIC Event Trigger is detected.

在E2节点上一个关联过程的正常功能中，一个RIC 事件触发器被检测

1. E2 Node sends Indication procedure to Near-RT RIC containing requested **REPORT** information along with originating Request ID.

E2节点发送Indication过程给Near-RT RIC，这个过程包含REPORT信息并且带商量一个原始的Request ID。

1. Associated procedure instance continues in the E2 Node.

关联过程的实例在E2节点中继续。

@startuml

skinparam ParticipantPadding 5

skinparam BoxPadding 10

skinparam lifelineStrategy solid

participant “Near-RT RIC” as near

participant “E2 Node” as ran

ran<->near: RIC SUBSCRIPTION PROCEDURE (RIC Event Trigger, Action=REPORT)

...

note over ran #white: E2 Node detects \nRIC Event Trigger

ran->near: RIC INDICATION(REPORT)

note over ran #lime: Associated procedure \ninstance \*\*continues\*\*

@enduml

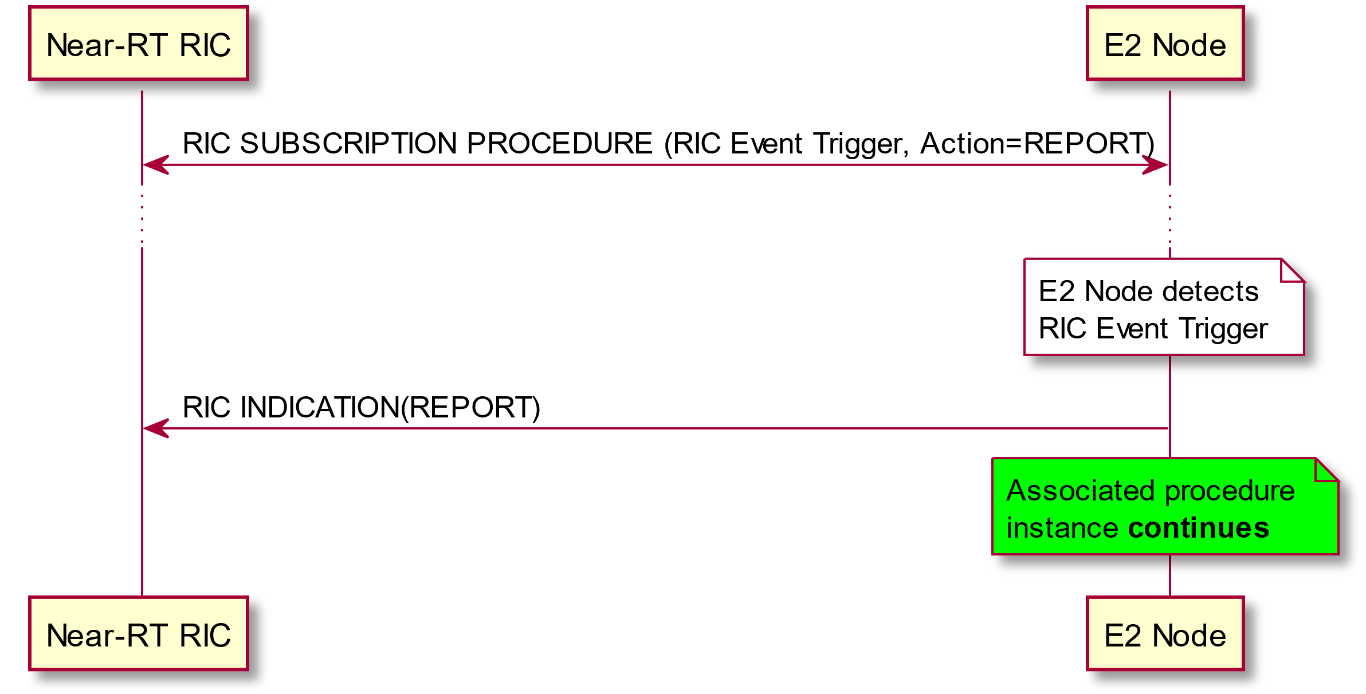


Figure 5.3.2-1: Near-RT RIC REPORT Service

- **INSERT**: Near-RT RIC uses a RIC Subscription to request that E2 Node sends an **INSERT** message to Near-RT RIC and suspends the associated procedure in E2 Node after each occurrence of a defined RIC Subscription procedure Event Trigger.

Near-RT RIC使用一个RIC订阅去请求E2节点发送一个INSERT消息给Near-RT RIC并且在一个定义好的RIC订阅过程事件触发器之后，在E2节点中挂起一个关联过程。

The **INSERT** service involves following steps:

1. Near-RT RIC configures a RIC Subscription in the E2 Node with information used to configure an Indication(Insert) along with a wait timer that is to be performed by E2 Node with each occurrence of Event

Near-RT RIC 在E2节点中配置一个RIC订阅，其中信息用来配置一个带有等待时间的timer的指示（插入），这个指示将由E2节点在每隔事件发生时执行。

1. During normal functioning of an associated procedure instance in the E2 Node, a trigger event is detected.

在E2节点中，在一个关联过程实例的正常功能期间，一个触发器事件将被检测。

1. E2 Node suspends associated procedure instance for up to a defined Wait Period (wait period may be set to zero)

E2节点挂起一个关联过程实例，在定义的等待周期内。

1. E2 Node sends Indication procedure to Near-RT RIC containing requested **INSERT** information along with originating Request ID and information used to identify the suspended associated procedure instance.

E2节点发送Indication过程给Near-RT RIC，这个过程包含带有原始的Request ID和用来定位挂起关联过程的过程实例信息的请求INSERT信息。

According to the timer state, arrival of RIC Control procedure and Subsequent Action parameter in RIC Subscription, the E2 Node may then:

根据timer状态，RIC控制过程的到达以及在RIC订阅中Subsequent Action参数，E2节点应该：

1. Resume associated procedure instance using information received from a RIC Control procedure sent by Near-RT RIC

恢复关联过程实例，这个动作的信息来自Near-RT RIC发送的一个RIC控制过程。

1. Continue the original associated procedure instance if and when the associated Wait timer expires and Subsequent Action set to Continue. A subsequent RIC Control procedure sent by Near-RT RIC shall be ignored.

如果当关联的Wait timer过期了和Subsequent Action设置成继续，那么继续元素关联的过程实例。一个后续由Near-RT RIC发送的RIC Control过程应该别忽视。

1. Halt the original associated procedure instance if and when the associated Wait timer expires and Subsequent Action set to Halt. A subsequent RIC Control procedure sent by Near-RT RIC shall be ignored.

如果当关联Wait timer过期和接下来动作设置成停止，那么停止原始关联过程实例。一个后续由Near-RT RIC发送的RIC Control过程应该别忽视。

@startuml

skinparam ParticipantPadding 5

skinparam BoxPadding 10

skinparam lifelineStrategy solid

participant “Near-RT RIC” as near

participant “E2 Node” as ran

ran<->near: RIC SUBSCRIPTION PROCEDURE (RIC Event Trigger, Action=INSERT)

...

note over ran #white: E2 Node detects \nRIC Event Trigger

note over ran #pink: Associated procedure \ninstance \*\*suspended\*\*

note over ran #aqua: Start Wait Timer

ran->near: RIC INDICATION(INSERT)

alt a) Near-RT RIC \_\_responds\_\_

note over near #white: Near-RT RIC \nperforms action

near->ran: RIC CONTROL REQUEST

note over ran #aqua: Cancel Wait Timer

note over ran #lime: Associated procedure \ninstance \*\*resumes\*\*

ran-->near: RIC CONTROL ACKNOWLEDGE

else b) Timer Expires and Subsequent Action = \_\_Continue\_\_

note over ran #aqua: Timer expires

note over ran #lime: Associated procedure \ninstance \*\*resumes\*\*

near<-->ran: RIC CONTROL PROCEDURE with outcome = Failure (expired)

else c) Timer Expires and Subsequent Action = \_\_Halt\_\_

note over ran #aqua: Timer expires

note over ran #red: Associated procedure \ninstance \*\*halted\*\*

near<-->ran: RIC CONTROL PROCEDURE with outcome = Failure (expired)

end

@enduml

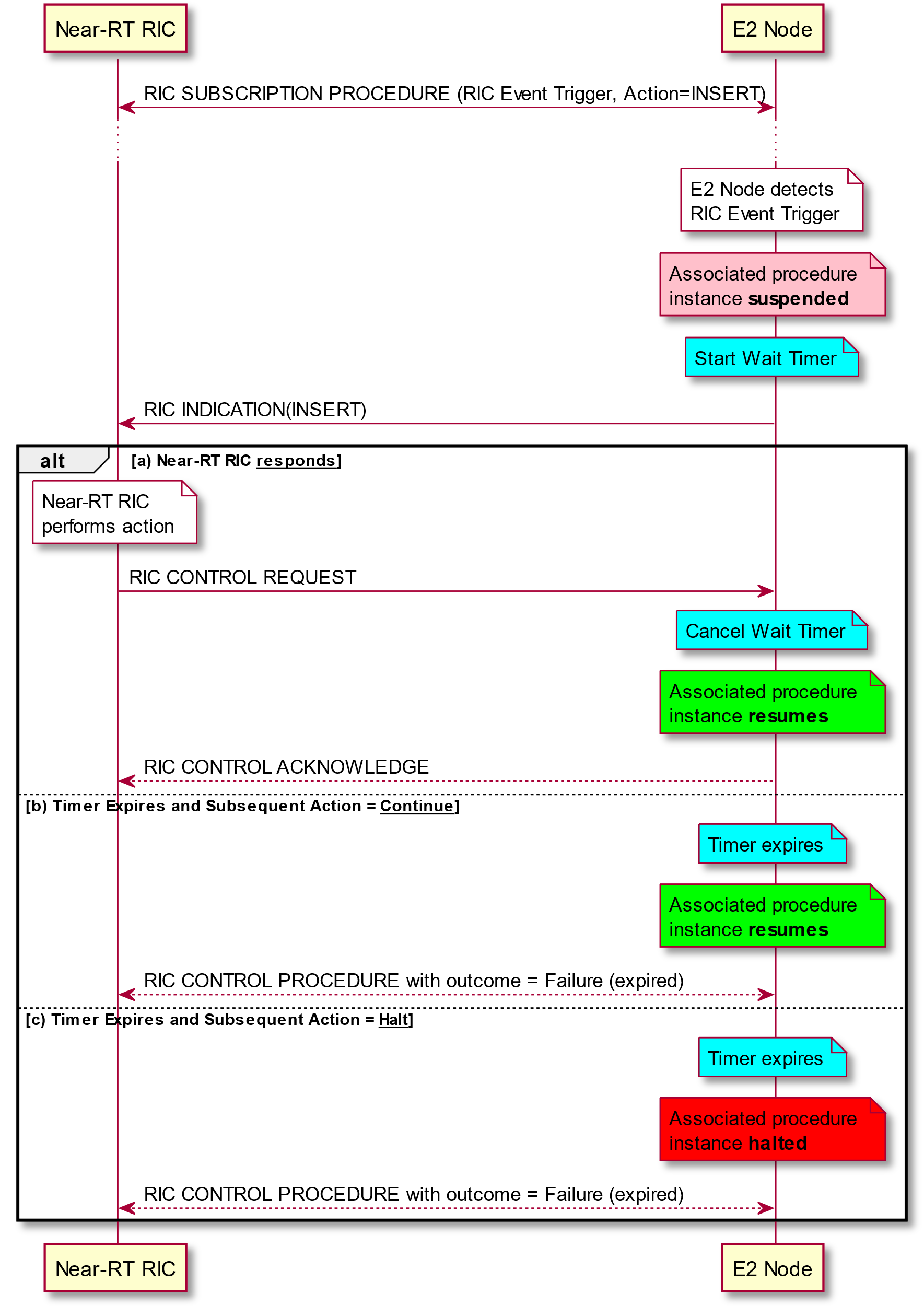


Figure 5.3.2-2: Near-RT RIC INSERT Service with three possible outcomes

- **CONTROL**: Near-RT RIC sends a Control message to E2 Node to initiate a new associated procedure or resume a previously suspended associated procedure in the E2 Node.

控制服务：Near-RT RIC 发送一个Control消息给E2节点去初始化在E2节点中一个新的关联过程或者恢复一个先前挂起的关联过程

The **CONTROL** service involves following steps:

Near-RT RIC detects an event trigger. This step may be triggered by either:

a) a previous RIC INDICATION sent by E2 Node

b) internal to Near-RT RIC

Near-RT RIC 检测事件触发器。这个步骤也许能够被下面之一所触发，

1. 一个先前由E2节点发送的RIC INDICATION

1. Near-RT RIC performs an action

2. Near-RT RIC sends RIC CONTROL REQUEST to E2 Node. This step may contain an information used to identify a previous suspended associated procedure instance and may request acknowledgement

3. E2 Node initiates or resumes associated procedure

4. If requested, E2 Node sends a RIC CONTROL ACKNOWLEDGE

1. Near-RT RIC执行一个动作

2. Near-RT RIC发送RIC CONTROL REQUEST给E2节点。这个步骤也许包含用来确定一个先前挂起的过程实例的消息和也许请求确认。

3. E2节点发起或者恢复关联过程

4. 如果请求，E2节点需要发送一个RIC CONTROL ACKNOWLEDGE

@startuml

skinparam ParticipantPadding 5

skinparam BoxPadding 10

skinparam lifelineStrategy solid

participant “Near-RT RIC” as near

participant “E2 Node” as ran

ran<->near: RIC SUBSCRIPTION PROCEDURE (RIC Event Trigger, Action=INSERT)

...

note over ran #white: E2 Node detects \nRIC Event Trigger

note over ran #pink: Associated procedure \ninstance \*\*suspended\*\*

ran->near: RIC INDICATION(INSERT)

note over near #white: Near-RT RIC \nperforms action

near->ran: RIC CONTROL REQUEST

alt a) Request received before wait timer expiry

note over ran #lime: Associated procedure \ninstance initiated \nor resumed

ran-->near: RIC CONTROL ACKNOWLEDGE (Success)

else b) Request received after Expiry with subsequent Action= Halt or Continue

note over ran #pink: Associated procedure instance \npreviously Halted or Continued

ran-->near: RIC CONTROL FAILURE (Expired)

else c) Request received with invalid Call Process ID set or request rejected

note over ran #pink: Associated procedure instance \nHalted or Continued

ran-->near: RIC CONTROL FAILURE

end

@enduml

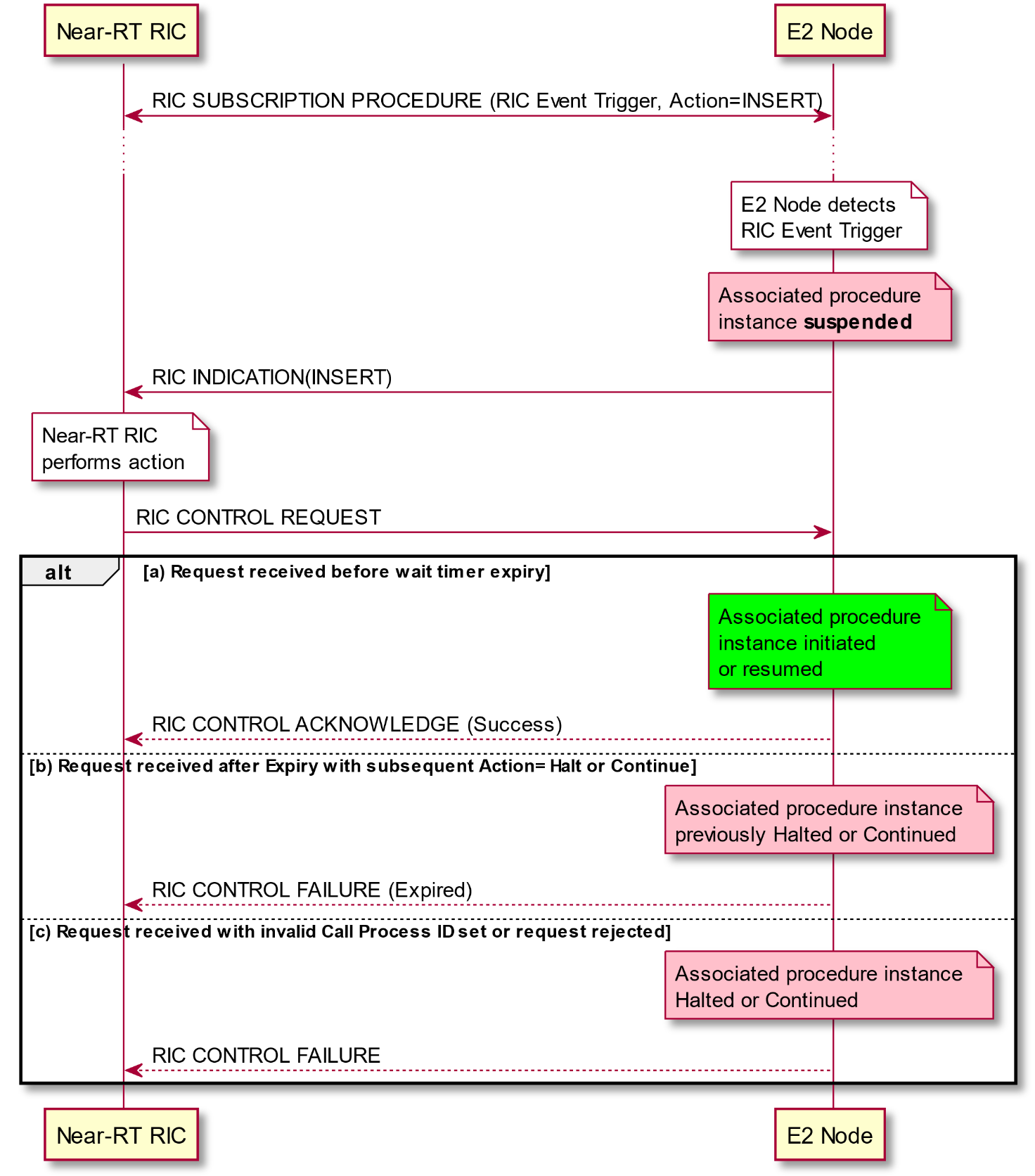


Figure 5.3.2-3A: Near-RT RIC CONTROL Service as response to Near-RT RIC Insert Service

@startuml

skinparam ParticipantPadding 5

skinparam BoxPadding 10

skinparam lifelineStrategy solid

participant “Near-RT RIC” as near

participant “E2 Node” as ran

note over near #white: RIC internal event

note over near #white: Near-RT RIC detects \nevent trigger

note over near #white: Near-RT RIC \nperforms action

near->ran: RIC CONTROL REQUEST

alt a) Request received without Call Process ID set and accepted by E2 Node

note over ran #lime: Associated procedure \ninstance initiated

ran-->near: RIC CONTROL ACKNOWLEDGE (Success)

else b) Request received without Call Process ID set and not accepted by E2 Node

note over ran #pink: Ignore Control request

ran-->near: RIC CONTROL FAILURE

end

@enduml

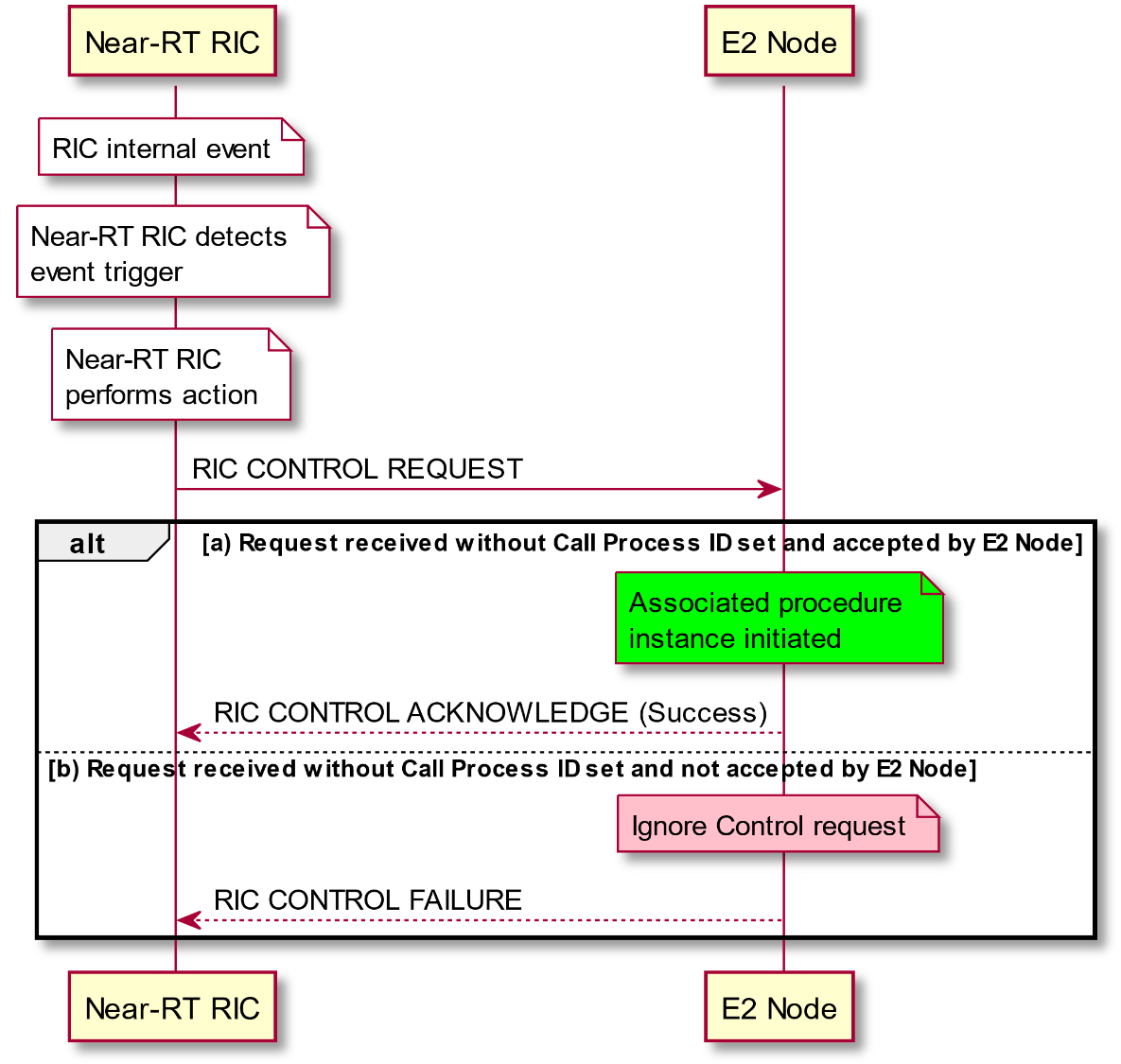


Figure 5.3.2-3B: Near-RT RIC CONTROL Service initiated by NEAR-RT RIC

- **POLICY:** Near-RT RIC requests that E2 Node executes a specific POLICY during functioning of the E2 Node after each occurrence of a defined RIC Subscription procedure Event Trigger.

策略服务：在E2节点的功能中，Near-RT RIC请求E2节点指示一个特殊的POLICY，这个请求是在每隔定义好的RIC订阅过程事件触发发生之后进行的。

The **POLICY** service involves following steps:

1. Near-RT RIC configures a RIC Subscription in the E2 Node with information used to configure a **POLICY** that is to be performed by E2 Node with each occurrence of trigger event

2. During normal functioning of the E2 Node, a trigger event is detected.

3. E2 Node modifies ongoing call process according to information contained in the **POLICY** description statement

4. Associated procedure instance continues in the E2 Node.

1. 在E2节点中，Near-RT RIC配置一个RI订阅，这个配置过程使用配置POLICY的信息，这个POLICY是由每个事件触发器发生的E2节点执行。

2. 在E2节点的正常功能，一个触发器事件被检测

3. E2节点根据包含POLICY描述陈述的信息修改正在调用的过程。

4. 关联过程实例在E2节点中继续。

@startuml

skinparam ParticipantPadding 5

skinparam BoxPadding 10

participant “Near-RT RIC” as near

participant “E2 Node” as ran

ran<->near: RIC SUBSCRIPTION PROCEDURE (RIC Event Trigger, Action=POLICY)

...

note over ran #white: E2 Node detects \nRIC Event Trigger

note over ran #white: E2 Node modifies \nongoing process \naccording to policy

note over ran #lime: Associated procedure \ninstance \*\*continues\*\*

@enduml

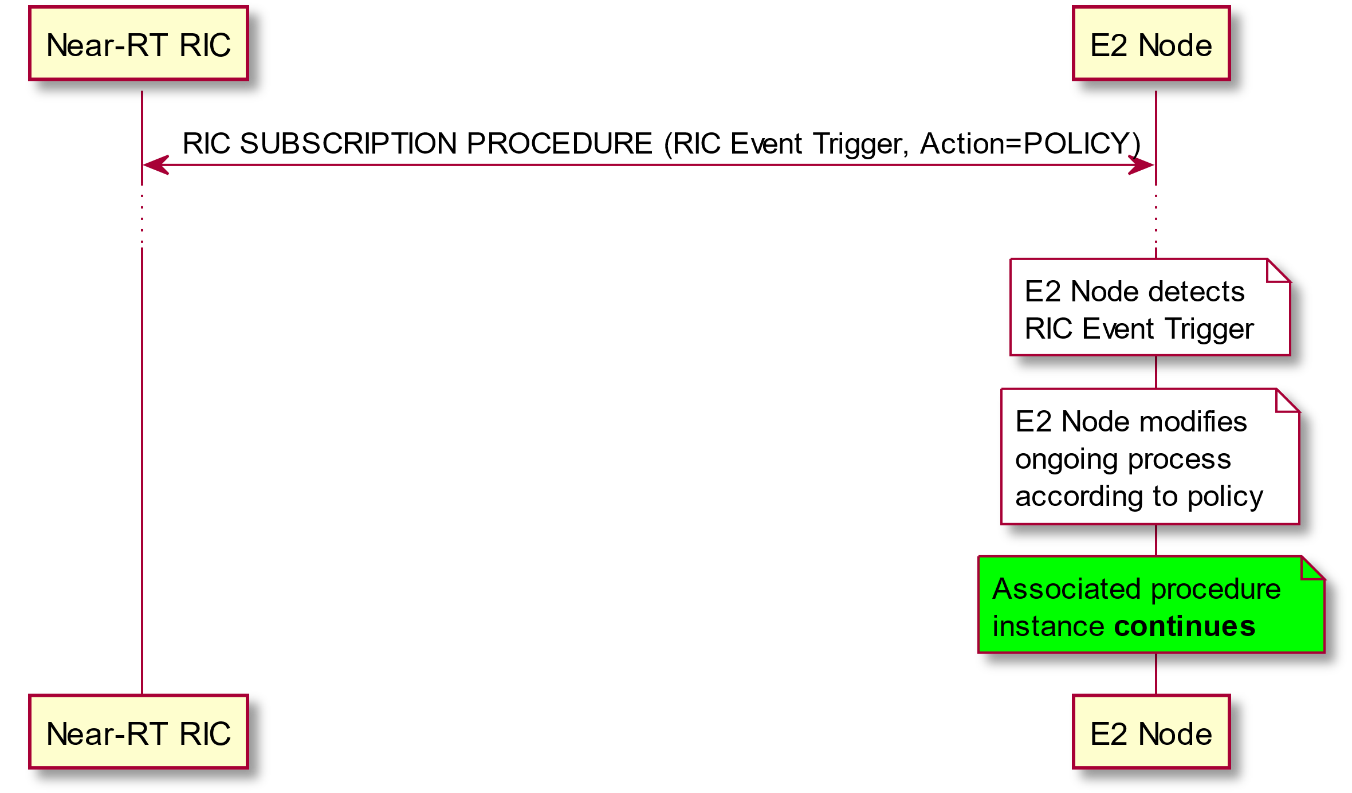


Figure 5.3.2-4: Near-RT RIC POLICY Service

The RIC Services may be realized using the following E2AP procedures:

E2AP RIC Subscription procedure

- Used to install Event Trigger and Actions corresponding to RIC services **REPORT**, **INSERT** and/or **POLICY**

E2AP RIC Indication procedure

- Used to carry outcome of RIC services **REPORT** and **INSERT**

E2AP RIC Control procedure

- Used to initiate RIC service **CONTROL**

RIC 服务也许使用以下E2AP过程来实现：

E2AP RIC 订阅过程，

* 用来安装事件触发器和RIC 服务REPORT/INSERT和/或POLICY的动作响应

E2AP的Indication过程：

* 用来装载RIC REPORT和INSERT服务的结果

E2AP RIC控制过程：

* 用来发起一个RIC CONTROL 服务

Table 5.3.2-1: Relationship between RIC Services and E2AP Procedures

|  |  |  |  |
| --- | --- | --- | --- |
|  | **E2AP Procedure** | | |
| **RIC Service** | **E2AP RIC SUBSCRIPTION** | **E2AP RIC INDICATION** | **E2AP RIC CONTROL** |
| **REPORT** | Installs RIC Service | Carries outcome of RIC Service | - |
| **INSERT** | Installs RIC Service | Carries outcome of RIC Service | - |
| **CONTROL** | - | - | Initiates or modifies RIC Service |
| **POLICY** | Installs RIC Service | - | - |

### 5.3.3 Combining RIC services within a common Subscription

RIC services defined in 5.3.2 may be combined within a common Subscription with each RIC Service implemented a part of a sequence of Actions.

定义在5.3.2中RIC服务也许结合在一个通用的订阅，这个订阅是实现动作序列的一部分的RIC服务。

Where appropriate in these cases, successive **REPORT** or **INSERT** messages sent to Near-RT RIC would indicate a common Subscription Request identifier, a common sequence number and a unique Action identifier.

在这些情况下，在适当的情况下，发送给Near-RT RIC的连续REPORT或者INSERT消息将会指示一个通用的订阅请求标识，这个标识是一个通用的序列号码和一个唯一的动作标识。

Examples include:

**- POLICY** then **REPORT**. In this case, at each occurrence of the defined Event Trigger, the E2 Node would be instructed to first execute a defined POLICY and then send a defined REPORT message

POLICY然后REPORT，在这种场景下，在定义每个好的事件触发器发生时，E2节点应该被命令先执行一个定义好的POLICY

**- REPORT** then **REPORT**. In this case, at each occurrence of the defined Event Trigger, the E2 Node would be instructed to first send a defined REPORT message to be followed by a second defined REPORT message containing normally different information.

REPORT然后REPORT。在这种场景下，在每个定义事件触发器发生时，E2节点将会被命令首先发送一个定义好的REPORT消息，然后会跟随第一个定义好的REPORT消息，这个消息正常应该带有不同的信息。

### 5.3.4 Combining RIC services as a sequence of RIC services

RIC services defined in 5.3.2 may be combined using a sequence of different RIC services implemented using a procedure executed within the Near-RT RIC.

在Near-RT RIC中，定义在5.3.2的RIC服务中应该被结合一系列不同的RIC服务，其中这个服务实现使用一个过程执行。

Examples include:（例子包括）

**- REPORT** followed by **POLICY.** In this case, at each occurrence of the defined Event Trigger, the E2 Node would be instructed to send a defined **REPORT** message. The Near-RT RIC would use the information from one or more successive **REPORT** messages as input to a procedure that may result in a change or establishment of a RIC **POLICY** service.

REPORT跟着POLICY。在这种场景下，在每隔定义事件触发器发生的情况下，E2节点应该被命令发送一个REPORT消息。Near-RT RIC将使用来自一个或者多个连续REPORT消息。Near-RTT RIC将使用来自一个或者多个连续的REPORT信息作为一个过程，这个过程可以导致RIC POLICY服务的改变和建立。

**- INSERT** followed by **CONTROL.** In this case, at each occurrence of the defined Event Trigger, the E2 Node would be instructed to send a defined **INSERT** message containing information used to identify the suspended associated procedure instance and then the Near-RT RIC would send a corresponding **CONTROL** message containing information used to identify a previous suspended associated procedure instance.

INSERT跟着CONTROL。在这种情况下，在每个定义的事件触发器发生时，E2节点将会被命令去发送过一个定义好的INSERT消息，这个消息中包含去用来定位挂起关联过程实例的信息，和然后Near-RT RIC应该发送一个相应的CONTROL消息，这个消息是用来定位险情怪奇关联过程实例的消息。

**- REPORT** followed by **CONTROL.** In this case, at each occurrence of the defined Event Trigger, the E2 Node would be instructed to send a defined **REPORT** message. The Near-RT RIC would use the information from one or more successive REPORT messages as input to a procedure that may result in a RIC **CONTROL** service message being sent to initiate an associated procedure instance in the E2 Node.

REPORT跟随CONTROL。在这种场景下，在每个定义事件触发器发生时，E2节点将被命令去发送过一个定义好的REPORT消息。Near-RT RIC应该使用来自一个或者多个连续的REPORT消息作为一个过程，这个过程是发起一个RIC CONTROL服务消息在E2节点中。

## 5.4 RAN Function E2 Service Model

As described in section 5.1 the E2 interface is used to carry messages between a given RAN Function and Near-RT RIC. These messages are RAN Function specific and are described in the corresponding RAN Function specific E2 Service Model.

Each RAN Function is described in the following terms:

- *RAN Function definition*. Defines the RAN Function Name and describes the E2 services that the specific RAN Function is currently configured to present over the E2 interface.

RAN功能定义。定义RAN功能名字和描述E2服务

- *RIC Event Trigger Definition* approach. Describes the approach to be used in Near-RT RIC Subscription messages to set Near-RT RIC Event Trigger Definition in the RAN Function.

RIC *Event Trigger Definition* 方法。描述这个方法在Near-RT RIC订阅消息中的使用是去设置在RAN功能中Near-RT RIC事件触发器定义

- *RIC Action Definition* approach. Describes the approach to be used in subsequent Near-RT RIC Subscription messages to set required sequence of Near-RT RIC Action in the RAN Function.

RIC *Action Definition* 方法。描述这个方法是去使用在Near-RT RIC后续订阅消息将其设置为Near-RT RIC动作中的序列集，在RAN功能中。

- *RIC Indication header* and *RIC Indication message* approach. Describes the approach to be used by RAN when composing Indication messages for Near-RT RIC **REPORT** and **INSERT** services.

RIC Indication header 和RIC indication message 方法。在RAN中使用去描述这个方法，当是为Near-RT REPORT和INSERT服务组成Indication消息。

- *RIC Control header* and *RIC Control message* approach. Describes the approach to be used by Near-RT RIC when composing **CONTROL** messages.

*RIC Control header* and *RIC Control message* 方法。当组成CONTROL消息时，

- RAN Function Policies. Describes the set of policies that the RAN Function is configured to support and the corresponding Parameters that may be used to configure the policy using Near-RT RIC **POLICY** services

RAN Function Policies.

## 5.5 Near-RT RIC support functions

### 5.5.1 General

The Near-RT RIC support functions facilitate the following:

* E2 Setup
* E2 Reset
* Near-RT RIC Service Update
* E2 Node Configuration Update
* Reporting of General Error Situations

The E2 Setup, E2 Reset, Near-RT RIC Service Update and E2 Node Configuration Update procedures are described in further details below.

### 5.5.2 E2 Setup procedure

The E2 Setup procedure is used to establish the E2 interface between the Near-RT RIC and an E2 Node. During this procedure the E2 Node provides:

* List of supported Near-RT RIC services and mapping of services to functions within the E2 Node. This information is specific to each RAN Function in the E2 node and is defined by a specific E2 Service Model as described in section 5.4
* 在E2节点内
* List of E2 Node configuration information. This information is specific to the E2 Node type (see section 4.2) and defined by the E2 Node system specifications

If the E2 Setup procedure fails, the Near-RT RIC may provide an alternative Transport Layer Information for the E2 Node to use when reinitiating the E2 Setup procedure.

如果E2 Setup过程失败，Near-RT RIC应该提供一个可选择性地Transport Layer信息给E2节点去使用，当重新发起E2 Setup过程地时候。

@startuml

skinparam ParticipantPadding 5

skinparam BoxPadding 10

skinparam lifelineStrategy solid

participant “Near-RT RIC” as near

participant “E2 Node” as ran

note over ran #white

E2 Node preconfigured with

Near-RT RIC address

and RIC service information

and E2 node configuration

end note

ran<-->near: SCTP connection establishment

ran->near: E2 SETUP REQUEST \n(RIC service and E2 Node configuration information)

note over near #white

Near-RT RIC extracts list of

supported Near-RT RIC Services

and mapping of services to

functions and stores information

end note

note over near #white

Near-RT RIC extracts list of

E2 Node configuration

information and stores information

end note

ran<-near: E2 SETUP RESPONSE \n(RIC Service and E2 Node configuration Ack)

@enduml

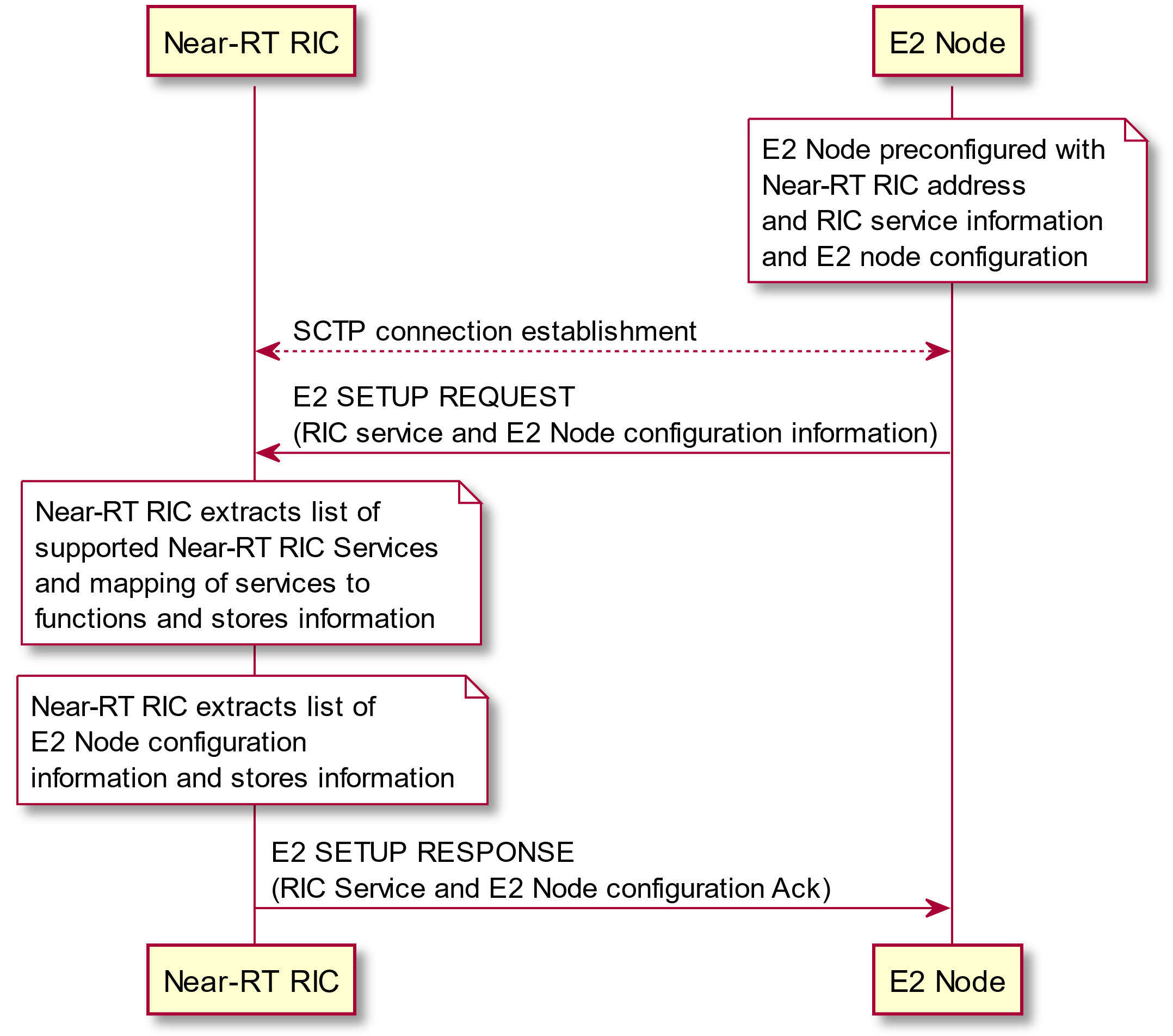


Figure 5.5.2-1: E2 Setup procedure

### 5.5.3 E2 Reset procedure

The E2 Reset procedure is used by either the E2 Node or Near-RT RIC to reset the E2 interface.

Information previous exchanged during E2 Setup, E2 Node Configuration Update and RIC Service Update procedures shall be maintained however the outcome of all previous RIC Subscription shall be deleted from the E2 Node and E2 Node gracefully terminates any ongoing Near-RT RIC call processes.

The Near-RT RIC may then proceed to re-establish any RIC Subscriptions as required.

@startuml

skinparam ParticipantPadding 100

skinparam BoxPadding 10

skinparam lifelineStrategy solid

participant “Near-RT RIC” as near

participant “E2 Node” as ran

note over ran #white

E2 Node detects abnormal failure

end note

ran->near: RESET REQUEST (Cause)

note over near #white

Near-RT RIC informs xApps of

RESET from E2 Node

end note

note over ran #white

E2 Node deletes any

pre-established RIC

Subscriptions

end note

note over ran #white

E2 Node gracefully

terminates any ongoing

Near-RT RIC call processes

end note

ran<-near: RESET RESPONSE

note over near #white

Near-RT RIC may re-establish

RIC Subscriptions

end note

@enduml

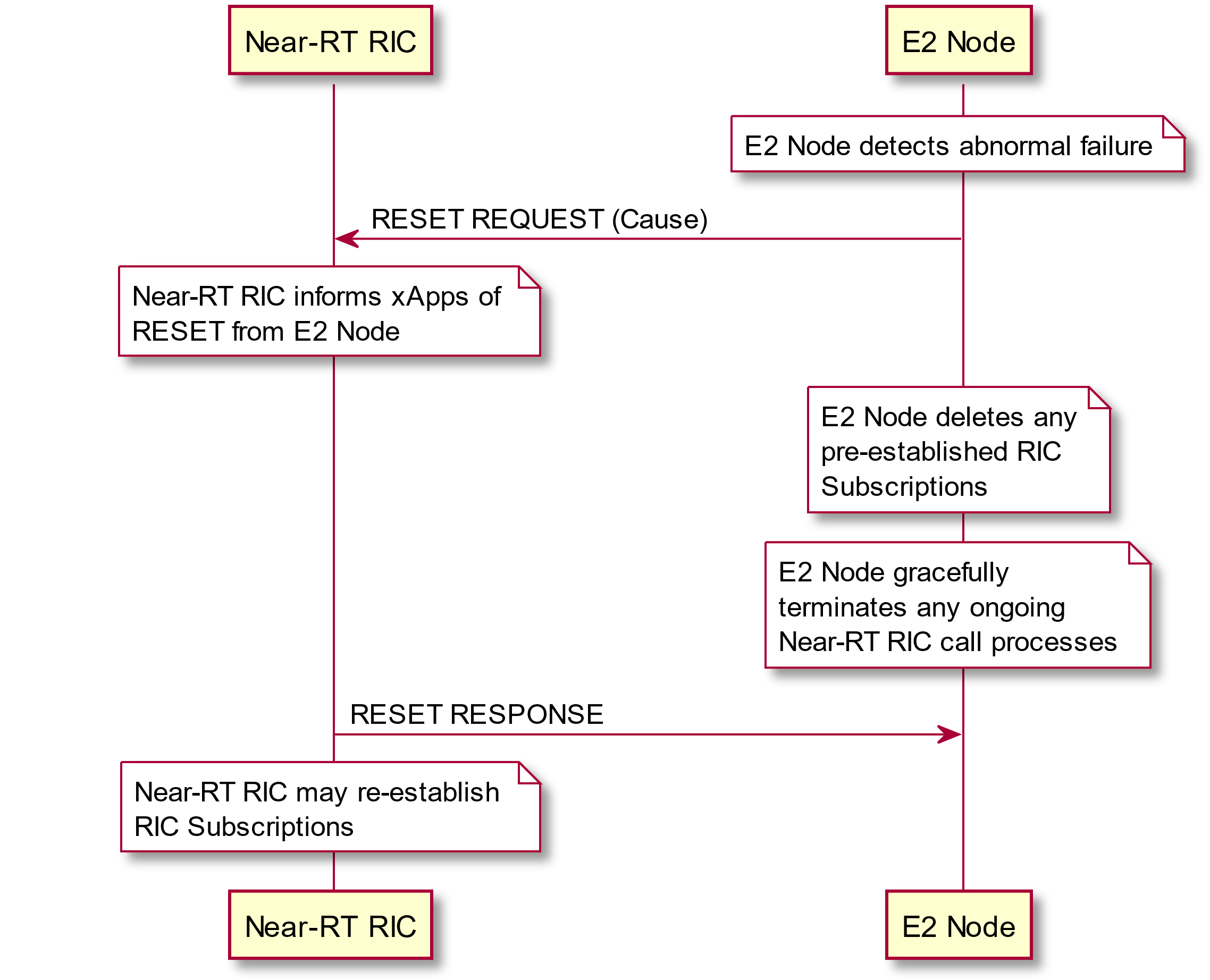


Figure 5.5.3-1: E2 Reset procedure (E2 Node initiated)

@startuml

skinparam ParticipantPadding 100

skinparam BoxPadding 10

skinparam lifelineStrategy solid

participant “Near-RT RIC” as near

participant “E2 Node” as ran

note over near #white

Near-RT RIC detects abnormal failure

end note

ran<-near: RESET REQUEST (Cause)

note over ran #white

E2 Node deletes any

pre-established RIC

Subscriptions

end note

note over ran #white

E2 Node gracefully

terminates any ongoing

Near-RT RIC call processes

end noteran->near: RESET RESPONSE

note over near #white

Near-RT RIC informs xApps of

RESET from E2 Node

end note

note over near #white

Near-RT RIC may re-establish

RIC Subscriptions

end note

@enduml

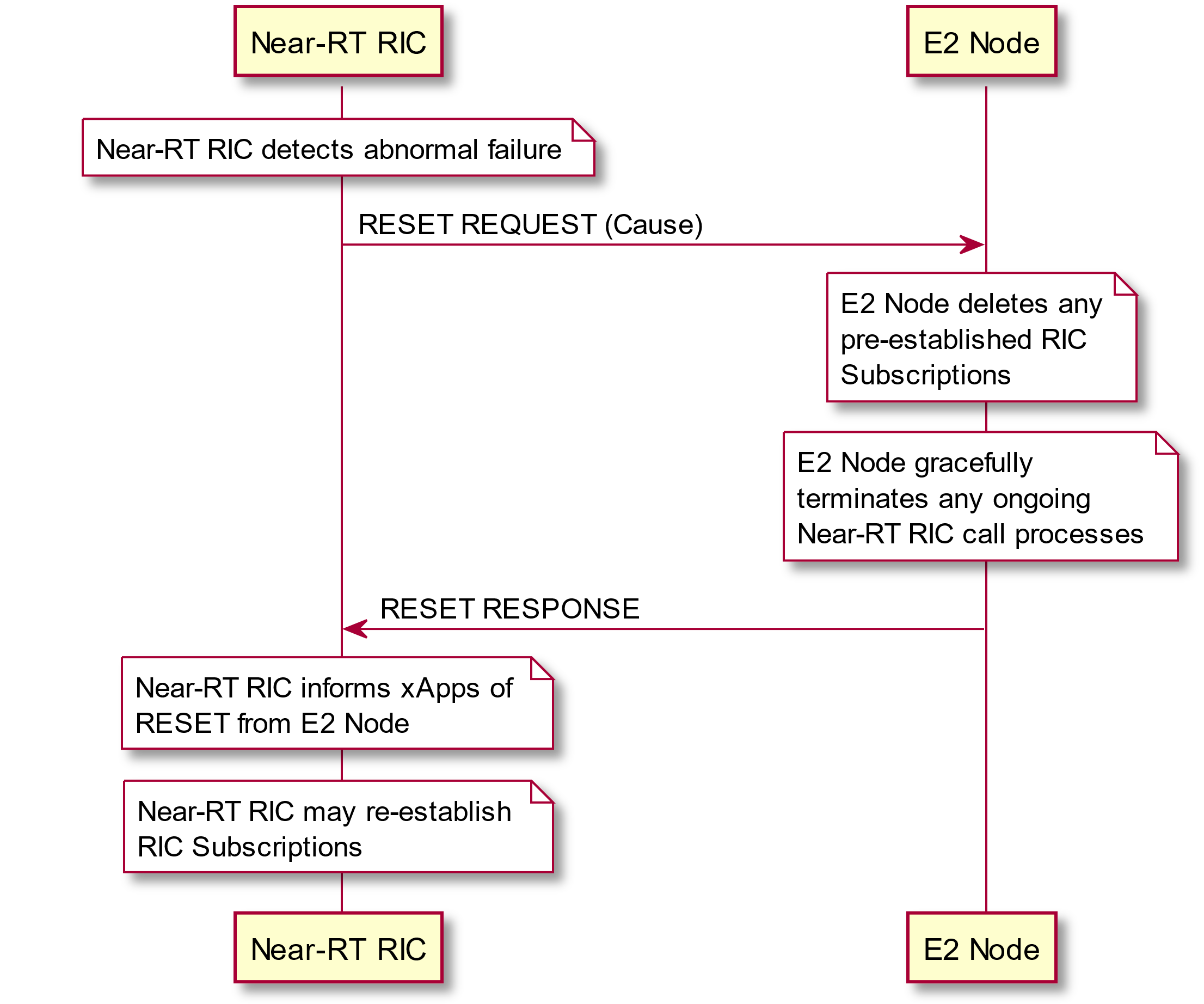


Figure 5.5.3-2: E2 Reset procedure (Near-RT RIC initiated)

### 5.5.4 Near-RT RIC Service Update procedure

The Near-RT RIC Service Update procedure is used by the E2 Node to inform the Near-RT RIC of any change to the list of supported Near-RT RIC services and mapping of services to functions within the E2 Node. This information is specific to each RAN Function in the E2 node and is defined by a specific E2 Service Model as described in section 5.4

This procedure may also be initiated by the Near-RT RIC sending a RIC SERVICE QUERY message.

@startuml

skinparam ParticipantPadding 5

skinparam BoxPadding 10

skinparam lifelineStrategy solid

participant “Near-RT RIC” as near

participant “E2 Node” as ran

note over near #white: Near-RT RIC decides to query E2 Node

near-->ran: RIC SERVICE QUERY

note over ran #white: Change to RIC service configuration on E2 Noderan->near: RIC SERVICE UPDATE (RIC service information)

note over near #white: Near-RT RIC extracts list of changes \nto supported Near-RT RIC Services \nand mapping of services to functions \nand updates stored information

ran<-near: RIC SERVICE UPDATE ACKNOWLEDGE (RIC Service Ack)

@enduml

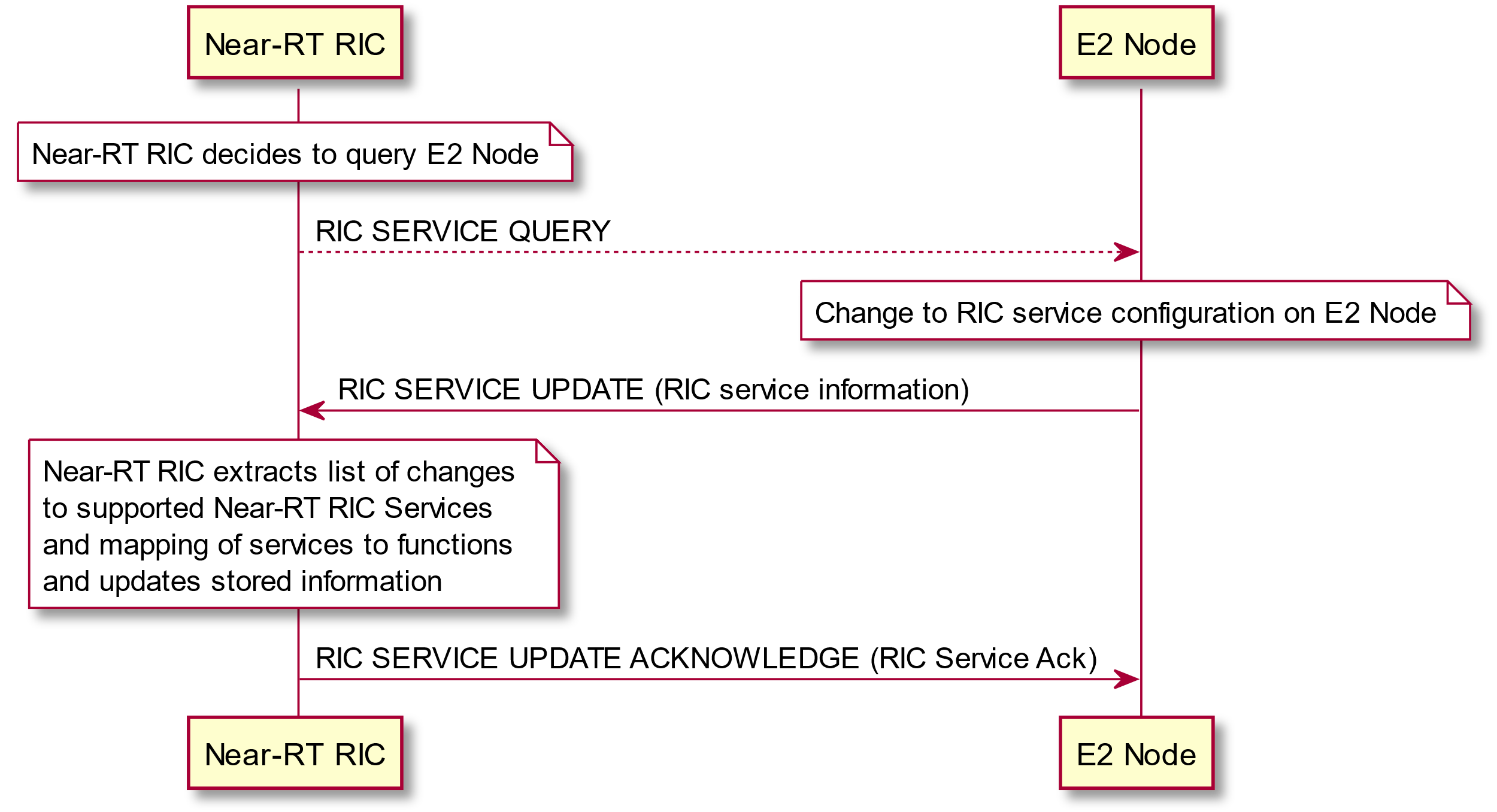


Figure 5.5.4-1: RIC Service update procedure

### 5.5.5 E2 Node Configuration Update procedure

The E2 Node Configuration Update procedure is used by the E2 Node to inform the Near-RT RIC of any change to the configuration of the E2 Node. This information is specific to the E2 Node type and defined by the E2 Node system specifications as described in section 4.2.

@startuml

skinparam ParticipantPadding 5

skinparam BoxPadding 10

skinparam lifelineStrategy solid

participant “Near-RT RIC” as near

participant “E2 Node” as ran

note over ran #white: Change to E2 node system configuration

ran->near: E2 NODE CONFIGURATION UPDATE \n(E2 node configuration information)

note over near #white: Near-RT RIC extracts list of changes \nto E2 Node configuration information \nand updates stored information

ran<-near: E2 NODE CONFIGURATION UPDATE ACKNOWLEDGE \n(E2 node configuration ack)

@enduml

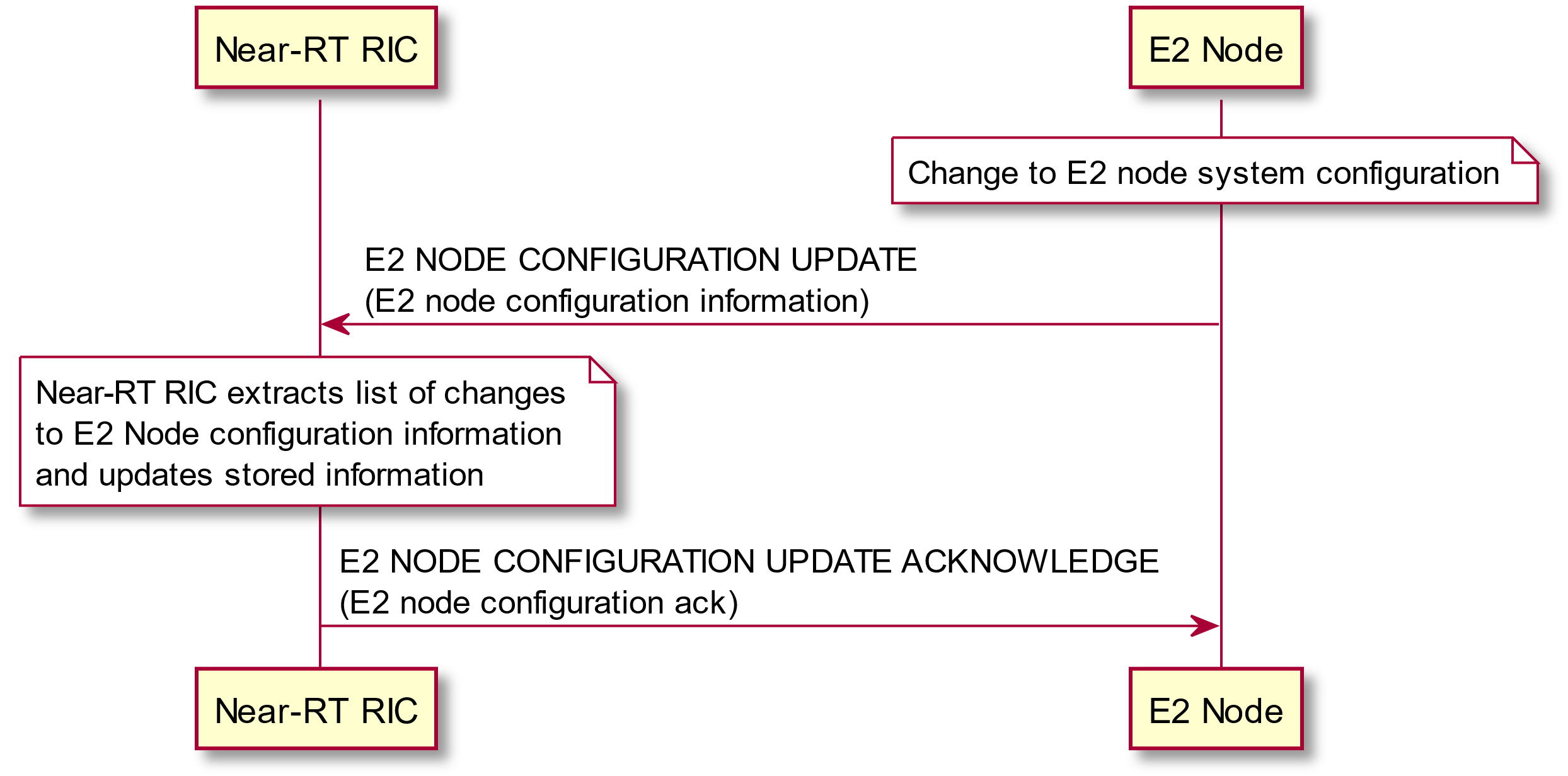


Figure 5.5.5-1: E2 Node configuration update procedure

# 6 Services expected from signalling transport

## 6.1 E2 Control Plane Protocol (E2AP)

The control plane protocol stack of the E2AP interface is shown on Figure 6.1-1. The transport network layer is built on IP transport. For the reliable transport of signaling messages, SCTP [12] is added on top of IP. When configurations with multiple SCTP associations are supported, the Near-RT RIC may request to dynamically add/remove SCTP associations between the E2 Node/Near-RT RIC pair. Within the set of SCTP associations established between one Near-RT RIC and E2 node pair, the Near-RT RIC may request the E2 Node to restrict the usage of SCTP association for certain types of E2 signaling. If no restriction information is provided for an SCTP association, any type of E2 signaling is allowed via the SCTP association. The application layer signaling protocol is referred to as E2AP (E2 Application Protocol). The Payload Protocol Identifier assigned by IANA to be used by SCTP for the application layer protocol E2AP is 70. This value is to be used for all deployment configurations described in this specification. Payload Protocol Identifiers 71 and 72, also assigned by IANA for E2, are reserved for future use.

E2AP接口控制面协议栈如图6.1-1所示。传输层是建立在IP传输。为了可靠地信令传输，SCTP被添加在IP之上。当多个SCTP关联地配置可以支持，Near-RT RIC可以请求动态添加/移除SCTP关联在E2节点/Near-RT RIC间。在SCTP关联集一个Near-RT RIC和E2节点对中，Near-RT RIC可以为E2信令确定地内容请求E2节点去现在SCTP关联地使用。如果不限制信息被提供给SCTP关联，任何E2信令的类型通过SCTP关联都是允许的。应用层信令协议简称E2AP（E2应用协议）。IANA分配用于SCTP应用层协议E2AP的Payload Protocol 是70。在这个说明文档中，这个值是被用来所有的部署配置。Payload Protocol 标识71和72，这个同样是被IANA分配给E2，它将保留给以后用。

No SCTP Destination Port number value was assigned by IANA for the E2AP protocol and so networks shall rely on E2 node and Near-RT RIC configuration to select a suitable port number.

没有SCTP目的端口号码值是为E2AP协议由IANA分配。因此网络应该依靠E2节点和Near-RT RIC配置去选择端口数目。

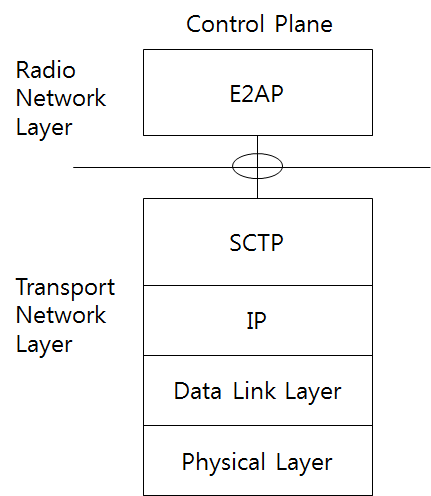


Figure 6.1-1: E2AP protocol stack

Note: The E2AP messages are transported over the E2 interfaces

E2AP消息在E2节点上传输

## 6.2 Multiple TNLAs over E2

The Near-RT RIC supports multiple TNL Associations over E2 interface.

An initial TNL Association is established during E2 SETUP procedure. At this point the single TNL association is configured to be used for both RIC Services and E2 Support functions.

TNL Associations may then be added, modified or removed during subsequent E2 CONNECTION UPDATE procedures.

Near-RT RIC在E2接口上支持多个TNL关联。

在E2 SETUP过程一个初始化的TNL关联会被建立。在这个点一个TNL关联被配置来RIC服务和E2支持的功能。

@startuml

skinparam ParticipantPadding 5

skinparam BoxPadding 10

skinparam lifelineStrategy solid

participant “Near-RT RIC” as near

participant “E2 Node” as ran

note over ran #white

E2 Node obtains Near-RT RIC

IP address and Port number

end note

ran<-->near : SCTP connection (TNLA1)

ran->near: E2 SETUP REQUEST

near->ran: E2 SETUP RESPONSE

note over near, ran #yellow: E2 interface using TNLA1

...

near->ran: E2 CONNECTION UPDATE (TNLA2 addition)

ran<-->near : SCTP connection (TNLA2)

ran->near: E2 CONNECTION UPDATE ACKNOWLEDGE (Status TNLA1, TNLA2)

note over near, ran #yellow: E2 interface using TNLA1 and TNLA2

...

near->ran: E2 CONNECTION UPDATE (TNLA1 and TNLA2 modification)

note over ran #white: Modify usage assignments \nfor TNLA1 and TNLA2

ran->near: E2 CONNECTION UPDATE ACKNOWLEDGE (Status TNLA1, TNLA2)

note over near, ran #yellow: E2 interface using TNLA1 and TNLA2 with modified usage

...

near->ran: E2 CONNECTION UPDATE (TNLA1 removal)

ran<-->near : SCTP connection removal (TNLA1)

ran->near: E2 CONNECTION UPDATE ACKNOWLEDGE (Status TNLA2)

note over near, ran #yellow: E2 interface using TNLA2

@enduml

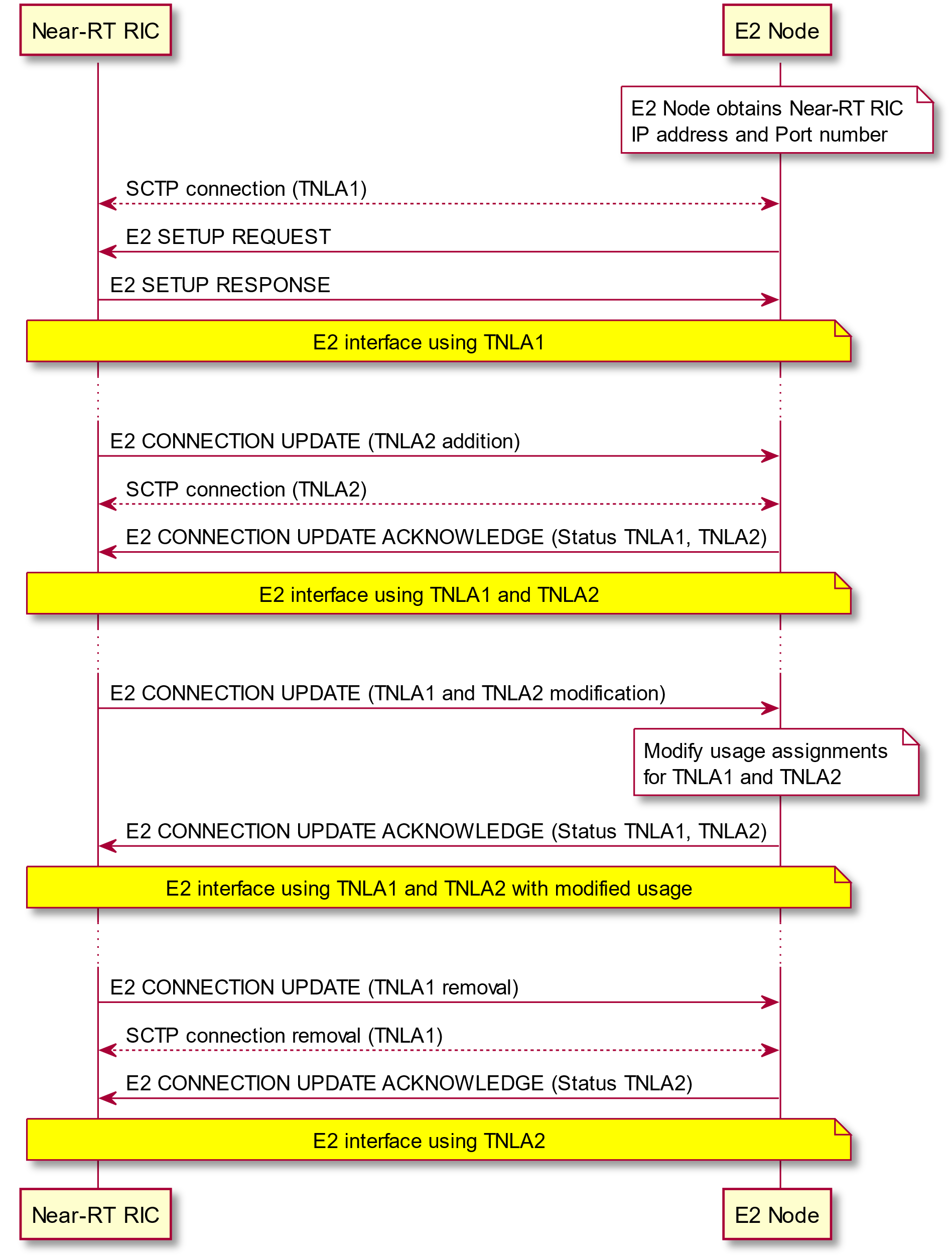


Figure 6.2-1: TNL management examples

# 7 Security Requirements

## 7.1 General

The security requirements given in this section only apply to the E2 interface. The security requirements for the 3GPP LTE eNB is defined in [13] and for the 5G NR gNB in [14].

## 7.2 Requirements for the E2 interfaces

The requirements given below apply to E2 interface defined in this document:

* E2 interface shall support confidentiality, integrity and replay protection.

# 8 Other E2 interface specifications

## 8.1 O-RAN E2 interface: E2 Application Protocol (E2AP) (ORAN-WG3.E2AP)

The technical specification ORAN-WG3.E2AP [2] specifies the signaling protocol between the Near-RT RIC and the E2 Node over the E2 interface.

## 8.2 O-RAN E2 interface: E2 Service Model (E2SM) specifications

The technical specification ORAN-WG3.E2SM [17] provides the list of the supported RAN Function-specific E2 Service Models supported over the E2 interface and presents a recommended layout for additional E2SM specifications.

# Annex A Deployment considerations

## A.1 Deployment use cases

The Near-RT RIC may be connected to range of different RAN configurations similar to the list of cases described in [8] for O&M architecture. Examples include:

- Standalone O-CU-CP connected to one or more standalone O-CU-UP and one or more standalone O-DU. Each logical node is considered as an E2 Node that presents an E2 interface to the Near-RT RIC.

- Combined O-CU-CP and O-CU-UP connected to one or more standalone O-DU. The combined O-CU-CP/O-CU-UP may present either a common E2 interface or individual E2 interfaces corresponding to the individual O-RAN components

- Combined O-CU-CP, O-CU-UP and O-DU. The combined node may present either a common E2 interface or individual E2 interfaces corresponding to the individual O-RAN components

In all cases the different RAN components may initiate either independent E2 connections to the Near-RT RIC for each logical O-RAN component or may present a shared E2 interface and hence present the combined RAN components as a common E2 Node supporting services appropriate to more than one logical O-RAN component.

In all cases each E2 Node shall present a single E2 interface to the Near-RT RIC and shall announce which E2 Services supports for each logical O-RAN component.

Example deployment use case are presented in figure A.1-1 and figure A.1-2. Note that in addition, the near-RT RIC and other RAN nodes have O1 interfaces as described in [8].

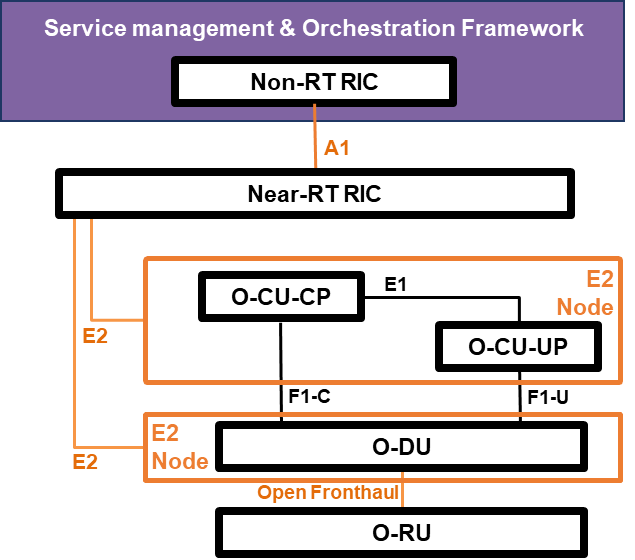


Figure A.1-1: Example deployment use case with single E2 Node supporting both O-CU-CP and O-CU-UP roles

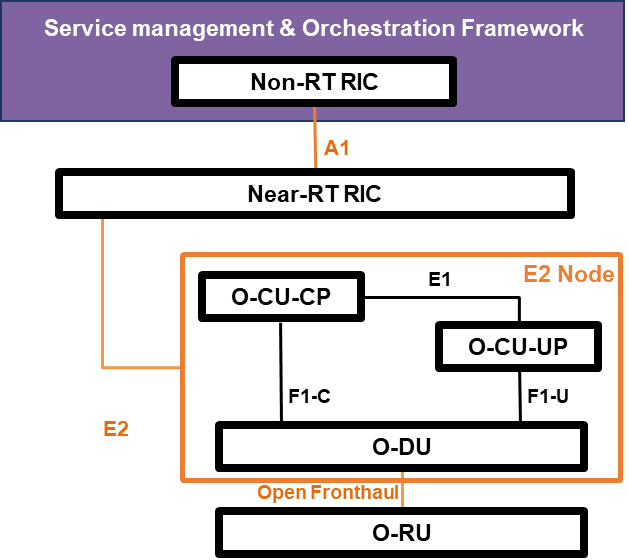


Figure A.1-2: Example deployment use case with single E2 Node supporting O-CU-CP, O-CU-UP and O-DU roles

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