ETSI TS 129 250 V18.0.0 (2024-04)

LTE;
Nu reference point between SCEF and PFDF
for sponsored data connectivity
(3GPP TS 29.250 version 18.0.0 Release 18)

Reference
RTS/TSGC-0329250vi00

Keywords
LTE

ETSI

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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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1 Scope

The present document provides the stage 3 specification of the Nu reference point. The functional requirements and the stage 2 specifications of the Nu reference point are specified in 3GPP TS 23.682 [2]. The Nu reference point lies between the Packet Flow Description Function (PFDF) and the Service Capability Exposure Function (SCEF).

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] 3GPP TS 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications".

[3] 3GPP TS 23.203: "Policy and charging control architecture".

[4] 3GPP TS 29.213: "Policy and Charging Control signalling flows and QoS parameter mapping".

[5] 3GPP TS 33.210: "3G security; Network Domain Security (NDS); IP network layer security".

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

[7] IETF RFC 793: "Transmission Control Protocol".

[8] Void.

[9] 3GPP TS 29.251: "Gw and Gwn reference points for sponsored data connectivity".

[10] IETF RFC 3986: "Uniform Resource Identifier (URI): Generic Syntax".

[11] IETF RFC 7159: "The JavaScript Object Notation (JSON) Data Interchange Format".

[12] IETF draft-newton-json-content-rules-09: "A Language for Rules Describing JSON Content".

NOTE: This individual draft will not further progress in IETF. It is available from the following link: https://www.ietf.org/archive/id/draft-newton-json-content-rules-09.txt.

[13] IETF RFC 7230: "Hypertext Transfer Protocol (HTTP/1.1): Message Syntax and Routing".

[14] IETF RFC 7231: "Hypertext Transfer Protocol (HTTP/1.1): Semantics and Content".

[15] IETF RFC 7232: "Hypertext Transfer Protocol (HTTP/1.1): Conditional Requests".

[16] IETF RFC 7233: "Hypertext Transfer Protocol (HTTP/1.1): Range Requests".

[17] IETF RFC 7234: "Hypertext Transfer Protocol (HTTP/1.1): Caching".

[18] IETF RFC 7235: "Hypertext Transfer Protocol (HTTP/1.1): Authentication".

[19] 3GPP TS 29.274: "Evolved GPRS Tunnelling Protocol for EPS (GTPv2)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP 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 3GPP TR 21.905 [1].

Packet Flow Description (PFD): A set of information enabling the detection of application traffic provided by a 3rd party service provider (from 3GPP TS 23.203 [3]).

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

JSON	JavaScript Object Notation
PCEF	Policy and Charging Enforcement Function
PFD	Packet Flow Description
PFDF	Packet Flow Description Function
SCEF	Service Capability Exposure Function
TDF	Traffic Detection Function

4 Nu reference point

4.1 Overview

The Nu reference point is located between the Packet Flow Description Function (PFDF) and the Service Capability Exposure Function (SCEF). The Nu reference point is used for provisioning of PFDs from the SCEF to the PFDF and reporting the result of the PFD Management from the PFDF to the SCEF.

The stage 2 level requirements for the Nu reference point are defined in 3GPP TS 23.682 [2].

4.2 Nu reference model

The Nu reference point is defined between the SCEF and the PFDF. The relationships between the different functional entities involved are depicted in figure 4.2.1. The overall PCC architecture is depicted in clause 3a of 3GPP TS 29.213 [4].

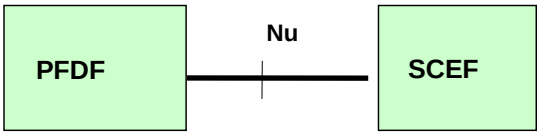

Figure 4.2.1: Nu reference model

4.3 Functional elements

4.3.1 PFDF

The PFDF (Packet Flow Description Function) is a functional element which receives and manages the PFDs associated to application identifier (s) from the SCEF via the Nu reference point.

The PFDF provisions PFDs for the corresponding application identifier (s) to the PCEF/TDF as defined in 3GPP TS 23.203 [3] and 3GPP TS 29.251 [9].

4.3.2 SCEF

The SCEF (Service Capability Exposure Function) is a functional element which provides means to securely expose the services and capabilities provided by the 3GPP network interfaces.

The SCEF shall support the management of PFDs provided by the 3rd party SCS/AS. The SCEF may provision the PFDs to the PFDF via the Nu reference point.

4.4 Procedures over Nu reference point

4.4.1 Management of PFD

The PFDs associated with application identifier (s) may be created, updated or removed in the PFDF by the third party SCS/AS via the SCEF as defined in 3GPP TS 23.682 [2].

If the SCEF receives one or more sets of PFDs for external application identifier (s) provisioned by the third party SCS/AS, which is authorized to perform the management of PFDs based on operator policies, the SCEF shall:

- If the external application identifier(s) is different from the application identifier(s) known at the PFDF, translate the external application identifier(s) to the application identifier(s) known at the PFDF; and
- may check if the allowed delay satisfies the required SLA against the minimum allowed delay as defined in 3GPP TS 23.682 [2]; and
- send an HTTP POST message to the PFDF including the provisioned PFD changes for the the application identifier (s) within the body of the HTTP POST as described in clause 5.3.5.2.

NOTE 1: It is up to operator configuration whether to use different external application identifiers that require a mapping to application identifiers known at the PFDF. The external application identifier can be the same as the application identifier known at the PFDF.

Upon receipt of the HTTP request for the provisioning operation from the SCEF, the PFDF shall perform the following steps:

- If an allowed delay is received for an application identifier, for Pull mode as defined in 3GPP TS 29.251 [9], the PFDF shall compare the allowed delay with the configured caching time which is:
  - a caching time value configured for that application identifier; or
  - the default caching time value if no caching time value is configured for that application identifier.
- Then if the PFDF cannot ensure the PCEF/TDF will pull the PFDs in time (i.e. allowed delay is shorter than the caching time), the PFDF shall within the HTTP response send a failure reason and that caching time value used in the comparison and may still store (create/update/remove) the PFDs for this application identifier.

NOTE 2: In the Combination mode as defined in 3GPP TS 29.251 [9], the PFDF can check the received allowed delay against the caching time but will always store (create/update/remove) the PFDs.

- In the Pull mode as defined in 3GPP TS 29.251 [9], for the application identifier(s) without the need to send failure reason; or in the Push or Combination mode as defined in 3GPP TS 29.251 [9], for received application identifier(s), the PFDF shall:

- delete all the PFD(s) for the application identifier(s) where the removal-flag is also provided and set to true;
- update the existing PFD(s) if a new PFD(s) with the same PFD identifier(s) is received , add new PFD(s) if the new PFD(s) with a new PFD identifier(s) is received, and/or delete an existing PFD(s) if the same PFD identifier(s) without any content is received, where the partial-flag is also provided and set to true;
- remove existing PFD(s) (if available) and install the new PFD(s) for the corresponding PFD identifier(s) whereno flag is provided;
- acknowledge the HTTP POST message by sending a corresponding HTTP response with the appropriate status code as defined in clause 5.3.2. If the POST operation was successful for at least one application identifier, the PFDF shall respond with an HTTP 200 OK status code.

4.4.2 PFD management notification

In the Push mode or Combination mode as defined in 3GPP TS 29.251 [9], if the PFDs are provisioned to at least one of the known PCEFs/TDFs (but not all) within the allowed delay (i.e. the provisioned PFDs can not be enforced successfully in some PCEF/TDFs known on the PFDF), the PFDF may notify the SCEF about the failed PFD provisioning with the HTTP POST message using the failure reason "PARTIAL_FAILURE" as defined in Table 5.4.7.1-1. In this case, the PFDF may include location area(s) of the PCEF/TDF(s) which can not enforce the provisioned PFD(s) within the field "user-plane-location-area" of the corresponding instance of the PFD report(s). If the PFDs are provisioned to none of the known PCEFs/TDFs within the allowed delay, the PFDF shall notify the SCEF about the failed PFD provisioning with the HTTP POST message using appropriate failure reason as defined in clause 6.4.6.3 of 3GPP TS 29.251 [9].

When receiving the HTTP POST message, the SCEF shall respond with an HTTP response message.

5 Nu protocol

5.1 Introduction

The following layers of the protocol stack for the Nu reference point between the SCEF and the PFDF are described in clauses:

- IETF RFC 793 [7] provides the communication service at the transport layer.
- An optional communication security layer can be added between the transport and the application delivery layer (see clause 6).
- The application delivery layer provides the transport of the specific application communication data using IETF RFC 7230 [13], IETF RFC 7231 [14], IETF RFC 7232 [15], IETF RFC 7233 [16], IETF RFC 7234 [17] and IETF RFC 7235 [18].
- The specific application communication layer constitutes the transport of the JSON content type.

Figure 5.1.1 illustrates the protocol stack of the RESTful Nu reference point.

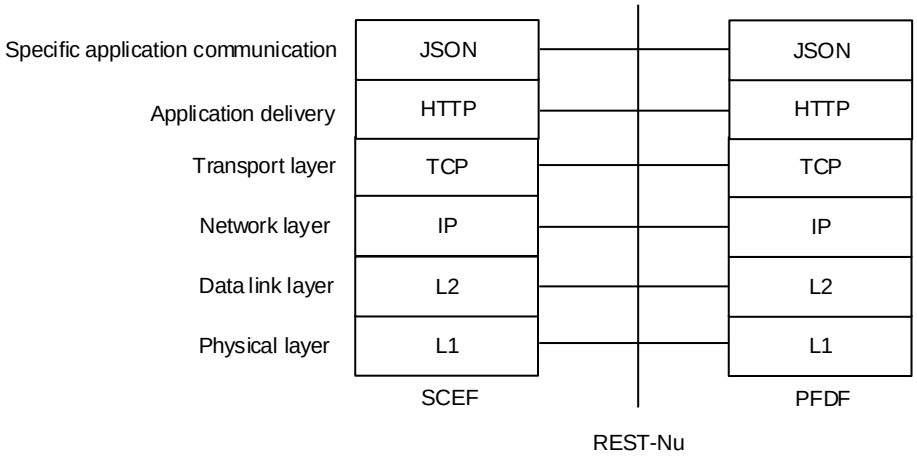

Figure 5.1.1: Protocol stack of the RESTful Nu reference point

5.2 Transport layer

HTTP is layered over TCP, which provides a reliable transport.

For provisioning of PFDs from the SCEF to the PFDF, the SCEF acts as an HTTP client and the PFDF acts as an HTTP server. As a result, the SCEF shall initiate a TCP connection with the PFDF.

5.3 Application delivery layer

5.3.1 General

The application delivery layer shall use RESTful HTTP.

The application delivery layer provides provisioning of the PFDs by the SCEF.

If the SCEF needs to provision PFDs for a set of application identifier(s) (creation/update/deletion) to the PFDF, the SCEF shall send an HTTP POST message.

5.3.2 HTTP status codes

The HTTP status codes for the REST-based Nu interface are specified in the IETF RFC 7231 [14].

5.3.3 Methods

Methods indicate to the server what action has to be performed. Every HTTP request message has a method.

The HTTP POST method is used by the SCEF to provision PFDs for a set of application identifiers. The request URI defines the address responsible for the management of the PFDs provisioning as a controller resource.

The HTTP POST method is also used by the PFDF to inform the SCEF for PFD management notification.

Every HTTP request results in a response message that comes back with a status code and further information in its body, if required. The HTTP request initiator waits for this response before initiating a further request.