ETSI TS 129 154 V14.3.0 (2019-10)

TECHNICAL SPECIFICATION

Universal Mobile Telecommunications System (UMTS);
LTE;
Service capability exposure functionality over Nt reference point
(3GPP TS 29.154 version 14.3.0 Release 14)

Reference

RTS/TSGC-0329154ve30

Keywords

LTE,UMTS

ETSI

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Contents

Foreword

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1 Scope

This document defines the protocol for Nt reference point. The functional requirements and the stage 2 specifications of the Nt reference point are contained in 3GPP TS 23.203 [2]. The Nt reference point lies between Service Capability Exposure Function (SCEF) and Policy and Charging Rules Function (PCRF).

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 23.203: "Policy and charging control architecture".

[3] IETF RFC 3588: "Diameter Base Protocol".

[4] IETF RFC 4006: "Diameter Credit Control Application".

[5] 3GPP TS 29.214: "Policy and Charging Control over Rx reference point".

[6] 3GPP TS 29.274: "3GPP Evolved Packet System. Evolved GPRS Tunnelling Protocol for EPS (GTPv2)".

[7] IETF RFC 5719: "Updated IANA Considerations for Diameter Command Code Allocations ".

[8] IETF RFC 2234: "Augmented BNF for syntax specifications ".

[9] 3GPP TS 29.213: "Policy and charging control signalling flows and Quality of Service (QoS) parameter mapping".

[10] IETF RFC 7683: "Diameter Overload Indication Conveyance".

[11] 3GPP TS 29.229: "Cx and Dx interfaces based on Diameter protocol; Protocol details".

[12] IETF RFC 7944: "Diameter Routing Message Priority".

[13] 3GPP TS 29.215: "Policy and Charging Control (PCC) over S9 reference point; Stage 3".

[14] IETF RFC 8583: "Diameter Load Information Conveyance".

[15] IETF RFC 6733: "Diameter Base Protocol".

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].

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].

ASP	Application Service Provider
BTA	Background Data Transfer Answer
BTR	Background Data Transfer Request
DRA	Diameter Routing Agent
DRMP	Diameter Routing Message Priority
PCRF	Policy and Charging Rules Function
SCEF	Service Capability Exposure Function
SPR	Subscription Profile Repository

4 Nt reference point

4.1 Overview

The Nt reference point is located between the PCRF and the SCEF. The Nt reference point is used for:

- Reporting the transfer policies from the PCRF to the SCEF;

The stage 2 requirements for Nt reference point are defined in TS 23.203 [2].

Refer to Annex G of 3GPP TS 29.213 [9] for Diameter overload control procedures over the Nt interface.

Refer to Annex J of 3GPP TS 29.213 [9] for Diameter message priority mechanism procedures over the Nt interface.

Refer to Annex K of 3GPP TS 29.213 [9] for Diameter load control procedures over the Nt interface.

4.2 Nt Reference Model

The Nt reference point resides between the SCEF and PCRF. The relationship between the two functional entities is depicted in figure 4.2-1. The overall PCC architecture is depicted in subclause 3a of 3GPP TS 29.213 [9].

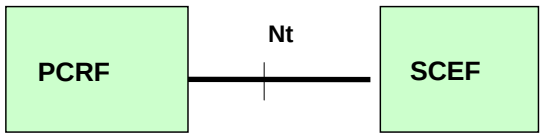

Figure 4.2-1: Nt reference model

NOTE: For roaming case, the SCEF is always in the H-PLMN and always contact the H-PCRF.

4.3 Functional elements

4.3.1 PCRF

The PCRF is a functional element that encompasses policy control decision and flow based charging control functionalities.

The PCRF uses the information received from SCEF and other available information to determine one or more transfer policies for background data to the application service provider. The PCRF provides the selected transfer policies with a reference ID to the SPR for storage.

4.3.2 SCEF

The SCEF is a functional element which provides a means to securely expose the services and capabilities provided by 3GPP network interfaces.

The SCEF is triggered by an SCS/AS which requests for the negotiation with the PCRF for providing necessary policy to transfer background data.

4.4 Procedures over the Nt reference point

4.4.1 Negotiation for future background data transfer

Based on the SCS/AS request, the SCEF shall send the Background-Data-Transfer-Request (BTR) command to the PCRF including the Transfer-Request-Type AVP with the value TRANSFER_POLICY_REQUEST(0), it shall also include the ASP identifier within the Application-Service-Provider-Identity AVP, volume of data per UE within the CC-Output-Octets AVP for downlink volume and/or the CC-Input-Octets AVP for uplink volume, or the CC-Total-Octets AVP for total volume regardless direction, expected number of UEs within the Number-Of-UEs AVP and desired time window within the Time-Window AVP.
The Time-Window AVP shall include desired start time within the Transfer-Start-Time AVP and desired end time within the Transfer-End-Time AVP.
The SCEF may also provide network area information within Network-Area-Info-List AVP.

Once the PCRF receives the BTR command, the PCRF shall retrieve all existing transfer policies stored for any ASP from the SPR.
When all existing transfer policies are retrieved, the PCRF shall determine one or more transfer policies based on the information received from the SCEF and other available information (e.g. network policy, congestion level (if available), load status estimation for the required time window and network area, existing transfer policies) and respond with a Background-Data-Transfer-Answer (BTA) command including the possible transfer policies within Transfer-Policy AVP (s) and a reference ID within Reference-Id AVP.
The Transfer-Policy AVP(s) shall include the Transfer-Policy-Id AVP, the Time-Window AVP, the Rating-Group AVP, and may also include an Max-Requested-Bandwidth-DL AVP and/or an Max-Requested-Bandwidth-UL AVP.

If more than one transfer policies are included in the BTA command, the PCRF shall also include the PCRF Id within the PCRF-Address AVP in the BTA command.

NOTE 1: If only one Transfer-Policy AVP is included in the BTA command, the PCRF sends a request to the SPR to store the reference ID together with the transfer policy and corresponding network area information(if available).
If there is more than one Transfer-Policy AVP included in the BTA command, the PCRF waits for the transfer policy selected by the SCS/AS before communicating with the SPR.

If there is more than one transfer policy provided from the PCRF to the SCEF in the BTA command, when the SCEF receives the selected transfer policy from the SCS/AS, the SCEF shall send Background-Data-Transfer-Request (BTR) command to the PCRF including the Transfer-Request-Type AVP set to the value TRANSFER_POLICY_NOTIFICATION (1). The SCEF shall also include the reference ID in the Reference-Id AVP, the identity of the selected transfer policy within the Transfer-Policy-Id AVP and the destination PCRF Id within the Destination-Host AVP.

NOTE 2: When receiving the BTA command from the PCRF, if there is only one transfer policy included, the SCEF forwards the transfer policy to SCS/AS.
If there is more than the one transfer policy included, the SCEF forwards these transfer policies to the SCS/AS and waits for the answer including the identity of the transfer policy selected by the SCS/AS.

The PCRF shall acknowledge the BTR command by sending Background-Data-Transfer-Answer (BTA) command.

NOTE 3: The PCRF sends a request to the SPR to store the reference ID together with the transfer policy and corresponding network area information (if available).

4.5 PCRF selection

The SCEF or DRA (if deployed) may select a PCRF in the HPLMN based on operator policy (e.g. pre-configured PCRF identities or routing strategy, etc).

5 Nt protocol

5.1 Protocol support

The Diameter Base Protocol as specified in IETF RFC 6733 [15] shall apply except as modified by the defined support of the methods and the defined support of the commands and AVPs, result and error codes as specified in this specification. Unless otherwise specified, the procedures specified in IETF RFC 6733 [15] (including error handling and unrecognised information handling) shall be used unmodified.

The Nt application is defined as vendor specific Diameter application, where the vendor is 3GPP and the Application-ID for the Nt Application in the present release is 16777348. The vendor identifier assigned by IANA to 3GPP (http://www.iana.org/assignments/enterprise-numbers) is 10415.

With regard to the Diameter protocol defined over the Nt interface, the PCRF acts as a Diameter server, in the sense that it is the network element that handles background data transfer request. The SCEF acts as the Diameter client, in the sense that it is the network element requesting background data transfer.

5.2 Initialization, maintenance and termination of connection and session

The initialization and maintenance of the connection between each SCEF and PCRF pair is defined by the underlying protocol. Establishment and maintenance of connections between Diameter nodes is described in IETF RFC 6733 [15].After establishing the transport connection, the SCEF and the PCRF shall advertise the support of the Nt specific Application by including the value of the application identifier in the Auth-Application-Id AVP and the value of the 3GPP (10415) in the Vendor-Id AVP of the Vendor-Specific-Application-Id AVP contained in the Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands. The Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands are specified in the Diameter Base Protocol (IETF RFC 6733 [15]).

An Nt Diameter session shall consist of a single request and answer pair. The Nt Diameter session is terminated after each request and answer pair interaction. In order to indicate that the session state is not to be maintained, the Diameter client and server shall include the Auth-Session-State AVP with the value set to NO_STATE_MAINTAINED (1), in the request and in the answer messages (see IETF RFC 6733 [15]).

5.3 Nt specific AVPs

5.3.1 General

Table 5.3.1.1 describes the Diameter AVPs defined for the Nt reference point, their AVP Code values, types, possible flag values, whether or not the AVP may be encrypted and which supported features the AVP is applicable to. The Vendor-Id header of all AVPs defined in the present document shall be set to 3GPP (10415).