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Technical Specification

Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control: DIAMETER protocol for session based policy set-up information exchange between the Application Function (AF) and the Service Policy Decision Function (SPDF); Protocol specification

Reference

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN).

1 Scope

The present document provides the stage 3 specification of the Gq' interface. The functional requirements and the stage 2 specifications of the Gq' interface are contained in ES 282 001 [1] and ES 282 003 [2]. The Gq' interface is the interface between the Application Function (AF) and the Service Policy Decision Function (SPDF) and is used for session based policy set-up information exchange between the SPDF and the AF.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

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2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

[1] ETSI ES 282 001: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Functional Architecture".

[2] ETSI ES 282 003: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control Sub-System (RACS): Functional Architecture".

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

[4] ETSI TS 129 209: "Universal Mobile Telecommunications System (UMTS); Policy control over Gq interface (3GPP TS 29.209 Release 6)".

[5] IETF RFC 4005: "Diameter Network Access Server Application".

[6] ETSI TS 133 210: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); 3G security; Network Domain Security (NDS); IP network layer security (3GPP TS 33.210)".

[7] ETSI ES 283 003: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IP Multimedia Call Control Protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP) Stage 3 [3GPP TS 24.229 (Release 7), modified]".

[8] ETSI ES 283 018: "Telecommunications and Internet Converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control: H.248 Profile for controlling Border Gateway Functions (BGF) in the Resource and Admission Control Subsystem (RACS); Protocol specification".

[9] IETF RFC 4566 (2006): "SDP: Session Description Protocol".

[10] IETF RFC 2960: "Stream Control Transmission Protocol".

[11] IETF RFC 3309: "Stream Control Transmission Protocol (SCTP) Checksum Change".

[12] ETSI TS 129 207: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Policy control over Go interface (3GPP TS 29.207 Release 6)".

[13] ETSI ES 283 035: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Network Attachment Sub-System (NASS); e2 interface based on the DIAMETER protocol".

[14] ETSI ES 283 026: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control; Protocol for QoS reservation information exchange between the Service Policy Decision Function (SPDF) and the Access-Resource and Admission Control Function (A-RACF) in the Resource and Protocol specification".

[15] ETSI ES 283 034: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Network Attachment Sub-System (NASS); e4 interface based on the DIAMETER protocol".

[16] IETF RFC 3556: "Session Description Protocol (SDP) Bandwidth Modifiers for RTP Control Protocol (RTCP) Bandwidth".

[17] IETF RFC 3388: "Grouping of Media Lines in the Session Description Protocol (SDP)".

[18] IETF RFC 3524: "Mapping of Media Streams to Resource Reservation Flows".

[19] ETSI TS 129 214: "Universal Mobile Telecommunications System (UMTS); LTE; Policy and charging control over Rx reference point (3GPP TS 29.214 Release 7)".

[20] ETSI TS 183 063: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IMS-based IPTV stage 3 specification".

[21] ETSI TS 183 048: "Telecommunications and Internet Converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control System (RACS); Protocol Signalling flows specification; RACS Stage 3".

[22] IETF RFC 3264: "An Offer/Answer Model with Session Description Protocol (SDP)".

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Not applicable.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

Application Function (AF): element offering applications that require the control of IP bearer resources

NOTE: The AF is capable of communicating with the SPDF to transfer dynamic QoS-related application information. One example of an AF is the P-CSCF of the IMS.

AF session: established by an application level signalling protocol offered by the AF that requires a session set-up with explicit session description before the use of the service

NOTE: One example of an application session is an IMS session.

AF session signalling: used to control the AF session

NOTE: One example of AF session signalling is SIP/SDP.

Attribute-Value Pair (AVP): Information Element in a Diameter message

NOTE: See RFC 3588 [3].

hard-state reservation: type of reservation whereby the requested resources are reserved without time limit

NOTE: Hard-state reservations are terminated when the DIAMETER session is terminated.

soft-state reservation: type of reservation whereby the requested resources are reserved for a finite amount of time

NOTE: Soft-state reservations are terminated if the DIAMETER session is terminated.

3.2 Abbreviations

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

AAA	AA-Answer
AAR	AA-Request
AF	Application Function
A-RACF	Access-RACF
ASA	Abort-Session-Answer
ASR	Abort-Session-Request
AVP	Attribute-Value Pair
BGF	Border Gateway Function
CEA	Capabilities-Exchange-Answer
CER	Capabilities-Exchange-Request
GPRS	General Packet Radio Service
IANA	Internet Assigned Numbers Authority
IMS	IP Multimedia Subsystem
IP	Internet Protocol
IP-CAN	IP Connectivity Access Network
IP-CAN	IP-Connectivity Access Network
NAPT	Network Address and Port Translation
NASREQ	Network Access Server Application
P-CSCF	Proxy - Call Session Control Function
PDF	Policy Decision Function
QoS	Quality of Service
RAA	Re-Auth-Answer
RACF	Resource and Admission Control Function
RACS	Resource and Admission Control Subsystem
RAR	Re-Auth-Request

RTCP	Realtime Transport Control Protocol
RTP	Realtime Transport Protocol
SCTP	Stream Control Transport Protocol
SDI	Session Description Information
SDP	Session Description Protocol
SIP	Session Initiation Protocol
SPDF	Service-based Policy Decision Function
STA	Session-Termination-Answer
STR	Session-Termination-Request
UDP	User Datagram Protocol
UE	User Equipment

4 Gq' interface

4.1 Overview

The Gq' interface is used for the service-based policy set-up information exchange between the SPDF and the AF, e.g. the P-CSCF. As defined in the stage 2 specification (ES 282 003 [2]), this information is used by the SPDF for the Service Based Policy decisions.

The Gq' interface may be an intra- or inter-domain interface. One SPDF instance shall be able to serve more than one AF instance and one given AF instance may interact with a number of SPDF instances, although on an AF session basis, it shall interact with only a single SPDF instance.

4.2 Gq' reference model

The Gq' interface is defined between the AF and the SPDF. Within the present release, the Gq' interface is used for requesting transport plane resources and admission control for fixed broadband access networks (e.g. xDSL).

NOTE: When supporting a GPRS IP-CAN, the AF will apply the procedures specified in TS 129 209 [4].

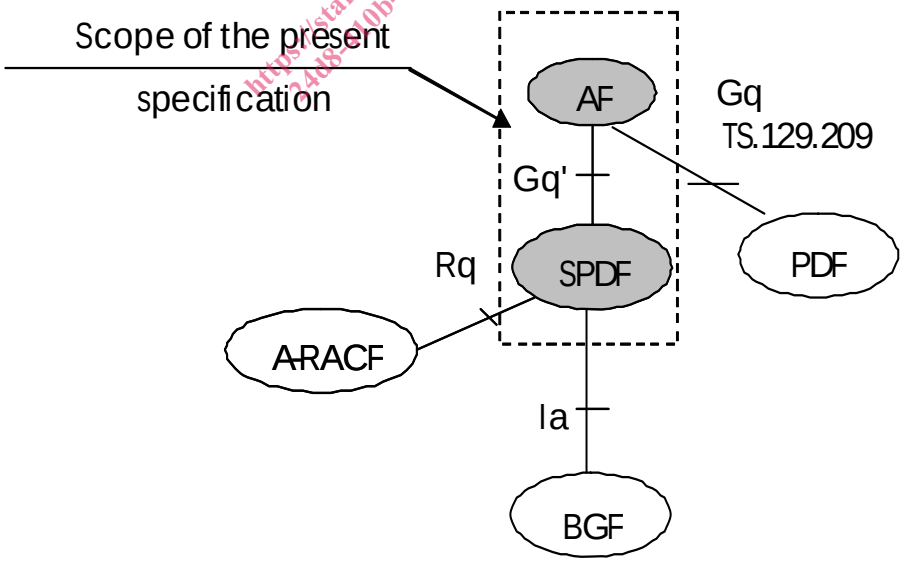

Figure 4.2.1: Gq' reference model

4.3 Functional elements and capabilities

4.3.1 Service-based Policy Decision Function (SPDF)

The SPDF is a functional element that coordinates the resource reservation requests received from the AF. The SPDF makes policy decisions using policy rules and forwards the session and media related information obtained from the AF to the A-RACF for admission control purposes. Additionally, based on information received on the Gq' interface and on configuration data, the SPDF may request the instantiation of a border gateway function (BGF) via the Ia interface. The functionality of the SPDF is further detailed in ES 282 003 [2].

4.3.2 Application Function (AF)

The AF is a functional element offering applications that request and use IP bearer resources. The AF shall use the Gq' interface to exchange session and media related information with the SPDF. One example of an application function is the P-CSCF of the IMS.

5 Procedures descriptions

5.1 Procedures at the AF

5.1.1 Initial reservation for a session

Upon receipt of an AF session signalling message initiating a new AF session, the AF shall request an authorization for the session from the SPDF by sending the AA-Request message. This AA-Request message shall contain a new Session-Id.

NOTE: As specified in RFC 3588 [3], the Session-Id is globally unique and is meant to uniquely identify a user session without reference to any other information. The Session-Id begins with the sender's identity encoded in the DiameterIdentity type.

The AA-Request message may contain an Authorization-Lifetime AVP as a hint of the maximum lifetime that it is requesting. When requesting for Hard-state reservation, the AF shall not include an Authorization-Lifetime AVP.

The AF shall include the corresponding Media-Component-Description AVP(s) into the message if the SDI is already available at the AF. The AF may include the Flow-Grouping AVP(s) to request a particular way for the IP flows described within the service description to be distributed to IP-CAN bearers.

When providing a given Media-Component-Description AVP in the initial AA-Request, the AF may request the SPDF to Commit the requested resources by setting the Flow-Status AVP to the value ENABLED, ENABLED-UPLINK or ENABLED-DOWNLINK. Alternatively, the AF may perform this in two phases in using separate reserve and commit operations. When using the two phases method, the Flow-Status AVP value of the initial AA-Request message shall be set to DISABLED.

The AF may also include the AF-Charging-Identifier AVP into the message for the charging correlation purposes.

Based on local configuration data, the AF determines that address translation needs to occur on the user plane (e.g. a BGF on the media path performs NAPT, IP version interworking or hosted NAPT procedures), upon receipt of SDI pointing towards the endpoint served by the AF (e.g. for IMS, in case the P-CSCF receives an SDP offer sent by the served UE), the AF shall include the Binding-Information AVP with the Input-List AVP. The Input-List AVP shall be populated based on the received SDI as follows:

- for each IP-flow information within the received SDI, the AF shall set the V6-Transport-Address AVP or V4-Transport-Address AVP with the corresponding IP address and port number.

If required (e.g. the received SDI is sent by a served endpoint with hosted-NAPT configuration), the AF may also include the Latching-Indication AVP set to "LATCH".

For the purpose of access profile correlation in the A-RACF, the AF shall include within the AA-Request a correlation identifier in the form:

- either of the User-Name AVP; and/or
- the Globally-Unique-Address AVP.

The above AVPs are defined in [13] and their contents are made available to the AF via the e2 interface.

The mapping of information element names defined in TS 129 214 [19] and Diameter AVPs used in the present document is given in table 5.1.1.1.

Table 5.1.1.1: Mapping of information element names to Diameter AVPs

Information element name	Mapping to Diameter AVP	Cat.
Subscriber ID	User-Name	O
Globally Unique IP Address	Globally-Unique-Address	O
Requestor Name	AF-Application-Identifier	O
Service Class	Service-Class	O
Media Type	Media-Type	O
Reservation Class	Reservation-Class	O
Authorization package ID	Authorization package ID	O
Media_Authorization Context ID	Media_Authorization Context ID	O
Transport Service Class	Transport-Class	O

The AF may specify the Reservation-Priority AVP at request level in the AA-Request in order to assign a priority to the request. The AF may further specify the Reservation-Priority AVP in Media-Component-Description AVP(s) in order to assign priority to individual media. If the Reservation-Priority AVP is not specified the requested priority is DEFAULT (0).

The AF may specify one or more Media-Authorization-Context-Id AVP or Authorization-Package-Id AVP to specify the authorization context of a media component or a session respectively. In the case of a multicast media reservation, the derived authorization context stored in A-RACF may provide information on the multicast channels allowed or not allowed during the session and their respective QoS requirements.

The AF may specify the Specific-Action AVP in the AA-Request with the events of which it wants to be informed.

The AF shall store the contents of the Output-List AVP received within the Binding-Information AVP contained in the AA-Answer message for future use.

The behaviour when the AF does not receive the AA-Answer, or when it arrives after the internal timer waiting for it has expired, or when it arrives with an indication different than DIAMETER_SUCCESS, is outside the scope of the present document.

The AF may specify the Overbooing Indicator AVP in the AA-Request when it is known by the AF that the resources required by the session may be used by more than one AF-session but not at a same time.

5.1.2 Session modification

During the AF session modification, the AF shall send an update for the session description information to the SPDF based on the new SDI exchanged within the AF session signalling. The AF does this by sending the AA-Request message with an existing Session-Id and Media-Component-Description AVP(s) containing the updated service information.

The AF may request the SPDF to commit the requested resource modifications by setting the Flow-Status-AVP to the value ENABLED, ENABLED-UPLINK or ENABLED-DOWNLINK. Alternatively, the AF may perform the modification in two phases in using separate modification reserve and commit operations. When using the two phases method, the Flow-Status-AVP value of the first AA-Request message for modifications shall be set to DISABLED. The affected media flows shall not be stopped. Resources need to be reserved in a way that they allow either to commit the updated media components or to roll back to the unmodified media components. In case the modification needs to be reverted due to the received SDP answer, the AF shall request the SPDF to roll back to the unmodified reservation by sending an AA-Request with the unmodified Media-Component-Description AVP(s), setting the Flow-Status-AVP back to the values ENABLED, ENABLED-UPLINK or ENABLED-DOWNLINK. To commit the modification, the AF shall send an AAR request with the updated Media-Component-Description AVP(s), setting the Flow-Status-AVP to the values ENABLED, ENABLED-UPLINK or ENABLED-DOWNLINK.

When refreshing an existing session, the AF may issue an AA-Request without any Media-Component-Description AVP. The AF may include the Flow-Grouping AVP(s) to request a particular way for the IP flows described within the service description to be distributed to IP-CAN bearers.

The AF SHALL NOT use the RAA to modify the session service information. As an option, the AF MAY send an AAR command following an RAA to update the session service information.

The AF may perform the following operations:

- Add a new IP flow within an existing media component - provide a new Media-Sub-Component AVP within the corresponding Media-Component-Description AVP.
- Add a new IP flow within a new media component - provide a new Media-Component-Description AVP.
- Modify a media component - update the corresponding Media-Component-Description AVP (e.g. increase or decrease the allocated bandwidth).
- Modify an existing IP flow within a media component - update the corresponding Media-Sub-Component AVP.
- Modify the commit status - change the Flow-Status AVP of the corresponding Media-Component-Description AVP and/or Media-Sub-Component to one of the values ENABLED-UPLINK (0), ENABLED-DOWNLINK (1) or ENABLED (2), according to the direction in which the resources are to be committed.
- Release a media component - provide the corresponding Media-Component-Description AVP with the Flow-Status AVP set to the value REMOVED (4).
- Release an IP flow within a media component - provide the corresponding Media-Sub-Component AVP with the Flow-Status AVP set to the value REMOVED (4).
- Refresh a soft-state reservation - provide an Authorization-Lifetime AVP in the AA-Request as a hint of the maximum lifetime that it is requesting.
- Modify the media level authorization context - provide new Media-Authorization-Context-Id AVP(s). The new Authorization-Context-Id AVP(s) replace any authorization context previously associated to the media component.
- Modify the session level authorization context - provide new Authorization-Package-Id AVP(s). The new Authorization-Package-Id AVP(s) replace any authorization context previously associated to session.
- In case overbooking is set when having a modification than no additional resources need to be reserved.

In case any of the Specific-Action AVP, the AF-Charging-Identifier AVP, the Flow-Grouping AVP, the Service-Class AVP, the User-Name AVP, or the Globally-Unique-Address AVP was provided in an initial AA-Request, the provided AVP(s) shall have the same value if provided also in a modifying AA-Request.

If present, the Reservation-Priority AVP associated with a reservation request or a media component shall not be modified by the AF.