ETSI TS 183 071 V3.1.1 (2010-02)

Technical Specification

Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control Sub-System (RACS); Rr interface based on the DIAMETER protocol

Reference

DTS/TISPAN-03196-NGN-R3

Keywords

interface, network, system

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:
http://www.etsi.org

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at
http://portal.etsi.org/tb/status/status.asp

If you find errors in the present document, please send your comment to one of the following services:
http://portal.etsi.org/chaircor/ETSI_support.asp

Contents

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://webapp.etsi.org/IPR/home.asp).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

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 defines a specification applicable to the Rr interface between Generic Resource Admission Control Function (x-RACF) instances, based on the Diameter protocol. Other alternative protocols which may also be used for this interface such as ANCP are not specified in the present document.

Whenever it is possible the present document specifies the requirements for this protocol by reference to specifications produced by the IETF within the scope of Diameter. Where this is not possible, extensions to Diameter are defined within the present document.

2 References

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

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
  - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
  - for informative references.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

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 (V3.y.z): "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Functional Architecture".

[2] ETSI ES 282 003 (V3.y.z): "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control Sub-System (RACS): Functional Architecture".

[3] ETSI ES 282 004 (V3.y.z): "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Functional Architecture; Network Attachment Sub-System (NASS)".

[4] ETSI ES 283 034 (V2.y.z): "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Network Attachment Sub-System (NASS); e4 interface based on the DIAMETER protocol".

[5] ETSI TS 183 017 (V3.y.z): "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".

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

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

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

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

[10] ETSI TS 183 026 (V3.y.z): "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".

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

[12] IETF RFC 4960: "Stream Control Transmission Protocol".

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

[14] IETF RFC 3554: "On the Use of Stream Control Transmission Protocol (SCTP) with IPSec".

[15] ETSI TS 129 329: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Sh interface based on the Diameter protocol; Protocol details (3GPP TS 29.329)".

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:

delegated x-RACF: x-RACF instance which works in the Rr delegated Model and performs admission control for the resources delegated by the delegating x-RACF

delegating x-RACF: x-RACF instance which works in the Rr delegated Model and delegates a bulk of resources to another x-RACF instance for admission control

3.2 Abbreviations

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

AAA	AA-Answer
AAR	AA-Request
ABNF	Augmented Backus–Naur Form
AF	Application Function
ANCP	Access Node Control Protocol
ASA	Abort-Session-Answer
ASR	Abort-Session-Request

ATM	Asynchronous Transfer Mode
AVP	Attribute-Value Pair
CCA	CC-Answer
CCR	CC-Request
CEA	Capabilities-Exchange-Answer
CER	Capabilities-Exchange-Request
DHCP	Dynamic Host Configuration Protocol
FQDN	Fully Qualified Domain Name
IANA	Internet Assigned Numbers Authority
ID	IDentifier
IETF	Internet Engineering Task Force
IP	Internet Protocol
IPSec	IP Security
NASREQ	Network Access Server Application
NASS	Network Attachment Sub-System
PNA	Push-Notification-Answer
PNR	Push-Notification-Request
QoS	Quality of Service
RAA	Re-Auth-Answer
RACS	Resource and Admission Control Sub-System
RAR	Re-Auth-Request
RCEF	Resource Control Enforcement Function
RFC	Request For Comments
Rr	reference point Rr
RTCP	Realtime Transport Control Protocol
SCTP	Stream Control Transport Protocol
SDI	Session Description Information
SPDF	Service-based Policy Decision Function
STA	Session-Termination-Answer
STR	Session-Termination-Request
TISPAN	Telecommunications and Internet converged Services and Protocols for Advanced Networking
UDA	User-Data-Answer
UDR	User-Data-Request
UE	User Equipment
VC	Virtual Channel
VP	Virtual Path
x-RACF	Generic Resource Admission Control Function

4 Overview

The present document specifies the Diameter protocol for the RACS Rr interface. The Rr interface is used for QoS resource reservation between x-RACF instances of RACS within a single administrative domain. The functional requirements and the stage 2 specifications of the Rr interface are contained in ES 282 001 [1] and ES 282 003 [2].

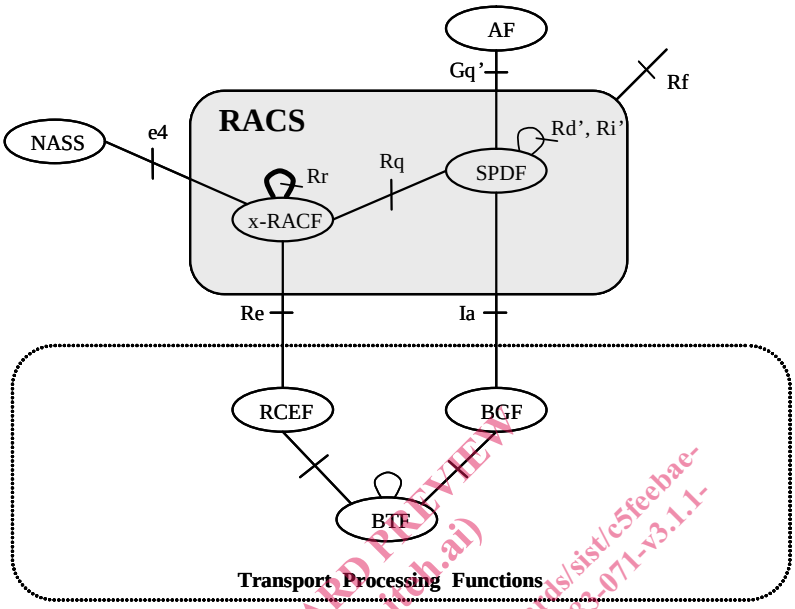

Figure 4.1: Rr interface

5 Procedure descriptions

5.1 General

5.1.1 Information elements

The following clauses describe the realization of the functional procedures defined in the RACS (ES 282 003 [2]) using Diameter commands described in clauses 6 and 7. This involves describing a mapping between the Information Elements defined in the RACS specification (ES 282 003 [2]) and Diameter AVPs.

In the tables that describe this mapping, each Information Element is marked as (M) Mandatory, (C) Conditional or (O) Optional:

- A mandatory Information Element (marked as (M) in the table) shall always be present in the command. If this Information Element is absent, an application error occurs at the receiver and an answer message shall be sent back to the originator of the request with the Result-Code set to DIAMETER_MISSING_AVP. This message shall also include a Failed-AVP AVP containing the missing Information Element i.e. the corresponding Diameter AVP defined by the AVP Code and the other fields set as expected for this Information Element.

- A conditional Information Element (marked as (C) in the table) shall be present in the command if certain conditions are fulfilled:

  - If the receiver detects that those conditions are fulfilled and the Information Element is absent, an application error occurs and an answer message shall be sent back to the originator of the request with the Result-Code set to DIAMETER_MISSING_AVP. This message shall also include a Failed-AVP AVP containing the missing Information Element i.e. the corresponding Diameter AVP defined by the AVP Code and the other fields set as expected for this Information Element. If multiple Information Elements are missing, all corresponding AVP codes shall be included in the Failed-AVP AVP.

- If those conditions are not fulfilled, the Information Element shall be absent. If however this Information Element appears in the message, it shall not cause an application error and it may be ignored by the receiver if this is not explicitly defined as an error case. Otherwise, an application error occurs at the receiver and an answer message with the Result-Code set to DIAMETER_AVP_NOT_ALLOWED shall be sent back to the originator of the request. A Failed-AVP AVP containing a copy of the corresponding Diameter AVP shall be included in this message.

- An optional Information Element (marked as (O) in the table) may be present or absent in the command, at the discretion of the application at the sending entity. Absence or presence of this Information Element shall not cause an application error and may be ignored by the receiver.

5.2 Procedures on the Rr interface

5.2.1 Resource control procedures for Request Model

The resource control process supports the following operations:

1) Resource Reservation: the resources are admitted by the requested entity (e.g. lower-tier x-RACF). In relation to the enforcement operations performed in the co-located RCEF, it can be divided into the following categories:

   - Reservation only: the resources are reserved but not allocated.

   - Commit only: the pre-reserved resources are allocated.

   - Reservation and commit: the resources are reserved and allocated.

2) Resource Modification: the pre-reserved/committed resources are updated upon the request of the originating entity (e.g. top-tier x-RACF).

3) Resource Release: the pre-reserved/committed resources are terminated upon the request of the originating entity.

4) Event notification: a specific action is requested when a pre-defined event occurs (e.g. reservation expiration).

The Flow-Status AVP is used to define the action to be taken for each AA-Request made by the top-tier x-RACF to the lower-tier x-RACF. The rules for interpreting the Flow-Status AVP are the following:

- Resource Reservation: can be invoked by any of the following status:

   - Reservation only: New Media-Description-Component AVP(s) and optionally Media-Sub-Component AVP(s) with Flow-Status AVP(s) set to DISABLED (3).

   - Commit only: Media-Description-Component AVP(s) and optionally Media-Sub-Component AVP(s) of existing reservations with Flow-Status AVP(s) set to ENABLED-UPLINK (0), ENABLED-DOWNLINK (1) or ENABLED (2).

   - ReservationAndCommit: New Media-Component-Description AVP(s) and optionally Media-Sub-Component AVP(s). Flow-Status AVP(s) set to ENABLED-UPLINK (0), ENABLED-DOWNLINK (1) or ENABLED (2).

NOTE: For the purpose of the resource admission and reservation, any of above status triggers the procedure. The distinction of above flow status is only meaningful in the case the lower-tier x-RACF needs to control the enforcement operations (e.g. Opening the gate) in the co-located RCEF.

- Resource Modification: Updated Media-Description-Component AVP(s) and Media-Sub-Component AVP(s). Flow-Status AVP not modified, unless the state needs to be modified (e.g. for committing a resource reservation, or for releasing a resource reservation).

- Resource Release: Media-Description-Component AVP(s) and optionally Media-Sub-Component AVP(s) of existing reservations with Flow-Status AVP(s) set to REMOVED (4).

These resource control operations are described in the following clauses. During the operations Diameter AVPs are passed between the top-tier x-RACF and the lower-tier x-RACF.

5.2.1.1 Procedures at the Top-tier x-RACF

5.2.1.1.1 Resource Reservation Session Establishment and Initial Resource Reservation

Upon the receipt of a new request from the SPDF, the top-tier x-RACF sends an initial request to the lower-tier x-RACF for initiating a resource reservation session. The AA-Request issued to request an initial reservation contains a new Session-Id assigned by the top-tier x-RACF. As specified in RFC 3588 [8], the Session-Id is globally unique and is meant to uniquely identify a resource session without reference to any other information. The Session-Id begins with the sender's identity encoded in the DiameterIdentity type.

This AA-Request message contains one or more Media-Component-Description Attribute-Value Pair(s) (AVP(s)). Each Media-Component-Description AVP describes the set of flows of a particular media type (i.e. it may contain one or more Media-Sub-Component AVP(s) and requirements for the flows).

The top-tier x-RACF may forward an AF-Charging-Identifier AVP from the SPDF in the message for charging correlation purposes between AF and RACS.

The resource admission and reservation operation that shall be performed by the lower-tier x-RACF for each individual media and flow is triggered by the following value of the Flow-Status AVP, as indicated in table 5.1:

- Reservation; the value of the Flow-Status AVP shall be set to DISABLED (3).
- ReservationAndCommit; the value of the Flow-Status AVP shall be set to ENABLED-UPLINK (0), ENABLED-DOWNLINK (1) or ENABLED (2).
- The Flow-Status AVP shall be specified in the Media-Component-Description AVP and in the Media-Sub-Component AVP(s). The Flow-Status AVP shall be set to the same value in both these AVPs.

Table 5.1: Initial Reservation operations

Message Type	Flow-Status AVP at the level of		Meaning
	Media	Sub-Media	
AAR	New Media, DISABLED	New flow, DISABLED	Reserve Resources for all the flows in the request. The media(s) and flow(s) descriptions MUST be new ones.
AAR	[New Media, ENABLE*]	New flow, ENABLE*	Reserve Resources. In addition, instruct the co-located RCEF to commit resources for some of the flows. The media(s) and flow(s) descriptions MUST be new ones (see note).
NOTE: The control of committing resources in the co-located RCEF is an implementation choice and out of scope in the present document.			

As specified in clause 8.9 of RFC 3588 [8], the top-tier x-RACF may specify the Authorization-Lifetime AVP in the AA-Request to request a maximum lifetime for a session. To request a hard-state session the top-tier x-RACF shall omit the Authorization-Lifetime AVP in the AA-Request. To request a soft-state session the top-tier x-RACF shall specify this AVP in the AA-Request.

The AA-Answer may contain the Authorization-Lifetime AVP. The AA-Answer may contain the Auth-Grace-Period AVP in addition to the Authorization-Lifetime AVP. The Authorization-Lifetime AVP specifies the maximum number of seconds before the Session must be refreshed by the top-tier x-RACF. The Auth-Grace-Period AVP contains the number of seconds the lower-tier x-RACF will wait for a Refresh following the expiration of the Authorization-Lifetime AVP.

Whether the Authorization-Lifetime AVP and Auth-Grace-Period need to be included in the AA-Answer is a local decision of the lower-tier x-RACF. This means that the top-tier x-RACF may be offered a soft-state reservation although it asked for hard-state or a hard-state reservation although it asked for soft-state. Should the top-tier x-RACF not accept what is offered by the lower-tier x-RACF it must explicitly release the resources through issuing another AAR command.

The top-tier x-RACF may specify, in the Specific-Action AVP of the AA-Request through which the initial reservation request is made, the events of which it wants to be informed. The supported events are listed in clause 6.5.9.