ETSI TS 183 067 V3.1.1 (2009-11)

Technical Specification

Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Mapping of multicast and unicast transport control protocols to Re - stage 3

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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 describes the signalling behaviour of the transport functions BTF & RCEF for the listed multicast and unicast transport control protocols (IGMP, MLD, RSVP) and Diameter Re and provides a mapping between these multicast and unicast transport control protocols and the TISPAN RACS Re interface.

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.

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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]   IETF RFC 2205: "Resource ReSerVation Protocol (RSVP) -- Version 1 Functional Specification".

[2]   ETSI TS 183 060: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control Subsystem (RACS); Re interface based on the DIAMETER protocol".

[3]   IETF RFC 3181: "Signaled Preemption Priority Policy Element".

[4]   IETF RFC 3182: "Identity Representation for RSVP".

[5]   IETF draft-ietf-tsvwg-rsvp-proxy-proto: "RSVP Extensions for Path-Triggered RSVP Receiver Proxy".

[6]   IETF RFC 3376: "Internet Group Management Protocol, Version 3".

[7]   IETF RFC 2236: "Internet Group Management Protocol, Version 2".

[8]   IETF RFC 3810: "Multicast Listener Discovery Version 2 (MLDv2) for IPv6".

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:

termination point: element acting as the neighbouring multicast router receiving and handling IGMP/MLD request from the UE

3.2 Abbreviations

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

AF	Application Function
A-RACF	Access-Resource and Admission Control Function
BTF	Basic Transport Functions
CAC	Connection Admission Control
CCA	Credit-Control-Answer
CCR	Credit-Control-Request
CPN	Customer Premises Network
IGMP	Internet Group Management Protocol
IPTV	Internet Protocol Television
MLD	Multicast Listener Discovery
QoS	Quality of Service
RACS	Resource and Admission Control Subsystem
RCEF	Resource Control Enforcement Function
RSVP	Resource ReSerVation Protocol
UE	User Equipment

4 Overview

4.1 Overview of multicast transport control protocol to Re mapping

PULL mode for multicast applies in two cases:

- PULL mode case 1: when it applies below the termination point in the access segment, the PULL mode is used to request resources for a channel in the access network and/or to indicate that the resources associated to a channel can be released as the channel is left. This is per user and can be combined with the PUSH mode at session initiation to allow the A-RACF to download the permitted multicast flow for that user to the RCEF.

- PULL mode case 2: when it applies beyond the termination point, the PULL mode is used to request shared resources to transport a multicast flow corresponding to a channel that has been requested by one or more users.

The following figure shows a generic scenario for both cases of PULL mode. Transport processing nodes comprises one or several BTFs and one or several RCEFs that may be colocalised.
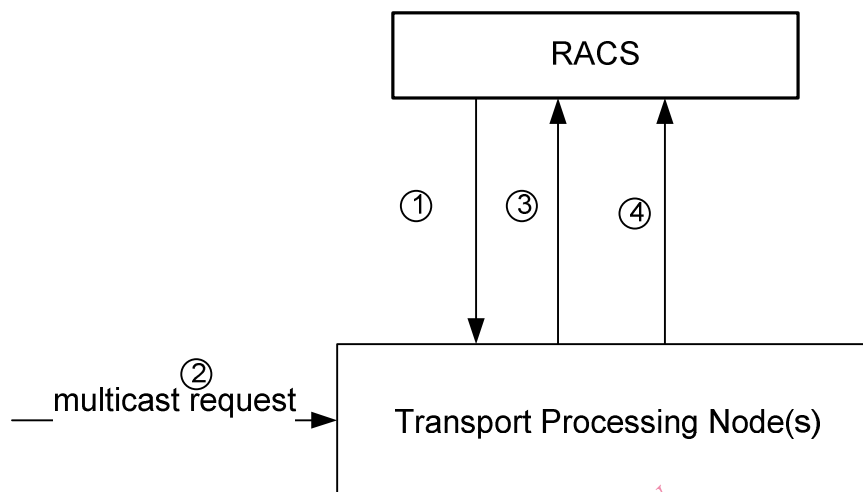
Figure 4.1: A generic scenario for both cases of PULL mode

1)   Upon session activation, the RACS downloads the policy rules in the RCEF in charge of enforcing policies applicable to the access segment. This corresponds e.g. to the list of subscribed channels in case of IPTV service activation. For each policy, bandwidth is set to zero, this will force the transport processing node to trigger the PULL mode.

2)   The BTF receives a multicast request. This message may contain IGMP/MLD "leave" and/or "join" requests.

3)   The BTF requests CAC towards the RCEF. The RCEF checks that the requested channel corresponds to an existing policy-rule. If not, it ignores the request and the user will not receive the channel. If a policy-rule exists, and if PULL mode applies below the termination point, the RCEF sends a CC-Request to the RACS based on parameters received in the multicast request. It has therefore to indicate to the RACS that the UE wants to leave a particular channel and/or wants to join another one. If enough resource is available to join the requested channel, the RACS answers positively to the RCEF.

4)   If the step 3 is successful, the BTF forwards the request to the RCEF dealing with resource beyond the termination point. If PULL mode applies beyond the termination point, the RCEF sends a CC-Request to the RACS based on parameters received in the multicast request. It does not have to check any policy-rule previously downloaded because this request is not linked to any user's rights. The RACS can determine if enough resource is available in the aggregation segment. If this is the case, the RACS answers positively to the RCEF.

4.2   Overview of unicast transport control protocol to Re mapping

The mapping between unicast transport control protocol and Re may be invoked in the Push Mode or the Pull Mode. An overview is provided below for both cases.

The mapping is defined with RSVP ([1]) as the unicast transport control protocol.

4.2.1   Push Mode

Figure 4.2 illustrates the RSVP to Re mapping in Push Mode with on-path QoS reservation in the case of a successful reservation establishment.
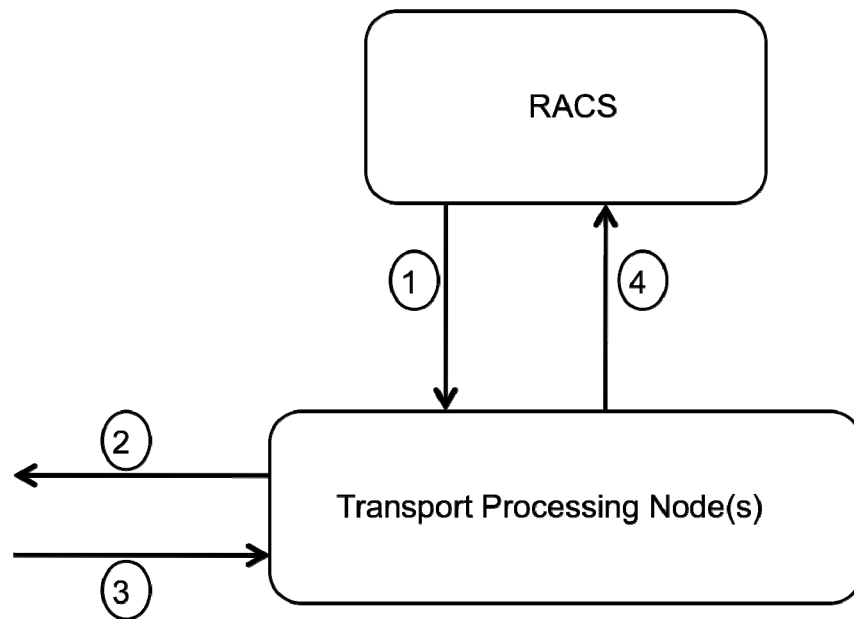
Figure 4.2: RSVP to Re mapping in Push Mode with on-path QoS reservation

1) As a result of a request from the AF for admission and resource reservation, the RACS sends a Policy-Install-Request to the RCEF in order to install a policy rule into the Transport Processing Nodes.

2) In the Push mode with on-path QoS signaling, the RCEF communicates the request to the BTF that issues an RSVP Path message to initiate path-coupled QoS signaling in order to establish the necessary reservation in the Transport Processing Nodes.

3) On receipt of an RSVP Resv message, the BTF communicates the reservation establishment to the RCEF.

4) The RCEF sends a Policy-Install-Answer to the RACS to confirm policy rule installation in the Transport Processing Nodes.

4.2.2   Pull Mode

Figure 4.3 illustrates the RSVP to Re mapping in Pull Mode in the case of a successful reservation establishment.
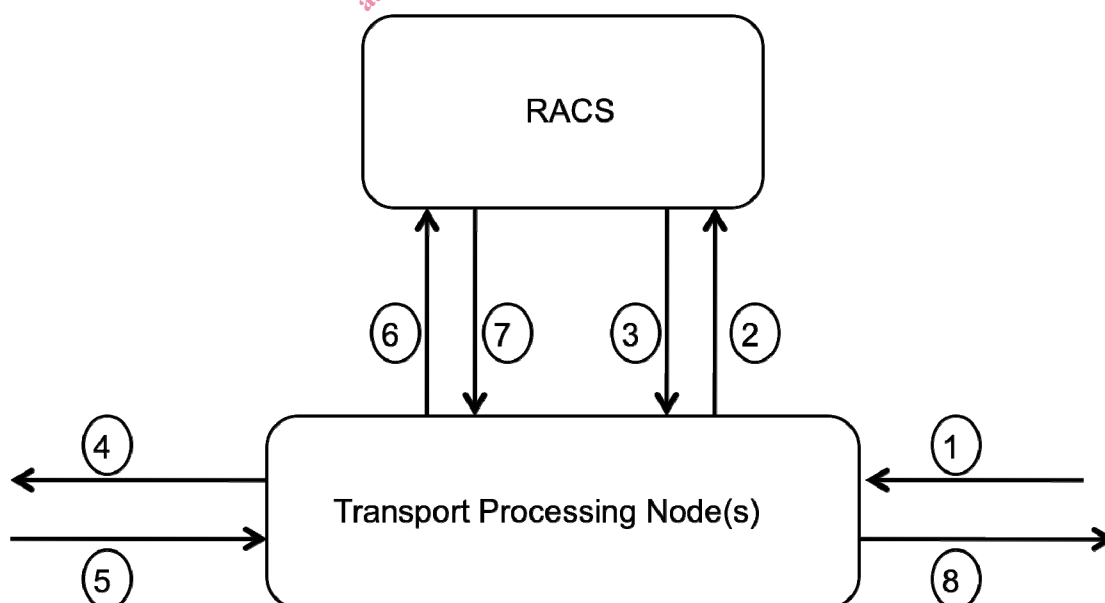

Figure 4.3: RSVP to Re mapping in Pull Mode

1) The BTF receives an RSVP Path message corresponding to a path-coupled QoS reservation initiation request from a Transport Node (e.g. a CPN Device). The BTF communicates the request to the RCEF.

2) The RCEF sends a CCR request to the RACS to request authorization of the reservation initiation request based on parameters mapped from the RSVP Path message.

3) The RCEF responds to the RCEF with a CCA to confirm that the reservation initiation request is authorized. The RCEF confirms the authorization decision to the BTF.

4) The BTF forwards the RSVP Path message towards the reservation destination.

5) The BTF receives an RSVP Resv message requesting reservation establishment. After successful RSVP reservation establishment, the BTF communicates the resource reservation establishment to the RCEF.

6) The RCEF sends a CCR request to the RACS to request resource reservation based on parameters mapped from the RSVP Resv message.

7) The RACS responds to the RCEF with a CCA to confirm the reservation establishment. The RCEF communicates the establishment decision to the BTF.

8) The BTF forwards the RSVP Resv message towards the reservation source.

5 Behaviours of the transport functions for multicast

5.1 PULL mode: case 1

On reception of an IGMPv3/MLDv2 request, the BTF communicates the request to the RCEF. If the type is set to 0x22 "v3 Membership Report" in case of IGMPv3 or to 143 "Version 2 Multicast Listener Report" in case of MLDv2, the RCEF shall take the following actions for each Group/multicast Records present in the request:

*   If Record Type indicates ALLOW_NEW_SOURCE with INCLUDE filter mode or CHANGE_TO_EXCLUDE_MODE with no "Source address" fields, the RCEF shall check for each multicast address/source address pair if it corresponds to an existing policy rule. If not, the RCEF shall ignore the request for that pair. If this is the case, the RCEF shall consider that the UE wants to join the corresponding multicast flow and shall send a CC-Request applying the mapping defined in clause 6.1 for IGMPv3/MLDv2.

*   If Record Type indicates BLOCK_OLD_SOURCE or CHANGE_TO_INCLUDE_MODE with an empty source list, the RCEF shall consider that the UE wants to leave the corresponding multicast flow and shall send a CC-Request applying the mapping defined in clause 6.1 for IGMPv3/MLDv2.

On reception of an IGMPv2 request, the BTF communicates the request to the RCEF.

If the type is set to 0x16 "v2 Membership Report", the RCEF shall consider that the UE wants to join the corresponding multicast flow and shall take the following actions:

*   If the multicast address indicated in the Group Address parameter corresponds to an existing policy rule, the RCEF shall consider that the UE wants to join the corresponding multicast flow and shall send a CC-Request applying the mapping defined in clause 6.1 for IGMPv2.

*   If not, the RCEF shall ignore the request for that pair.

If the type is set to 0x17 "Leave Group", the RCEF shall consider that the UE wants to leave the corresponding multicast flow and shall send a CCR request applying the mapping defined in clause 6.1 for IGMPv2.

On receipt of a CC-Answer, the RCEF shall behave as defined in TS 183 060 [2].

For each Policy-Rule-Install AVP that corresponds to a previously reported Policy-Update-Request in the CCR, the RCEF shall update the Max-Requested-Bandwidth-DL for the corresponding policy based on the value received from the A-RACF. If the value is set to zero, the BTF shall not forward the corresponding multicast flow.