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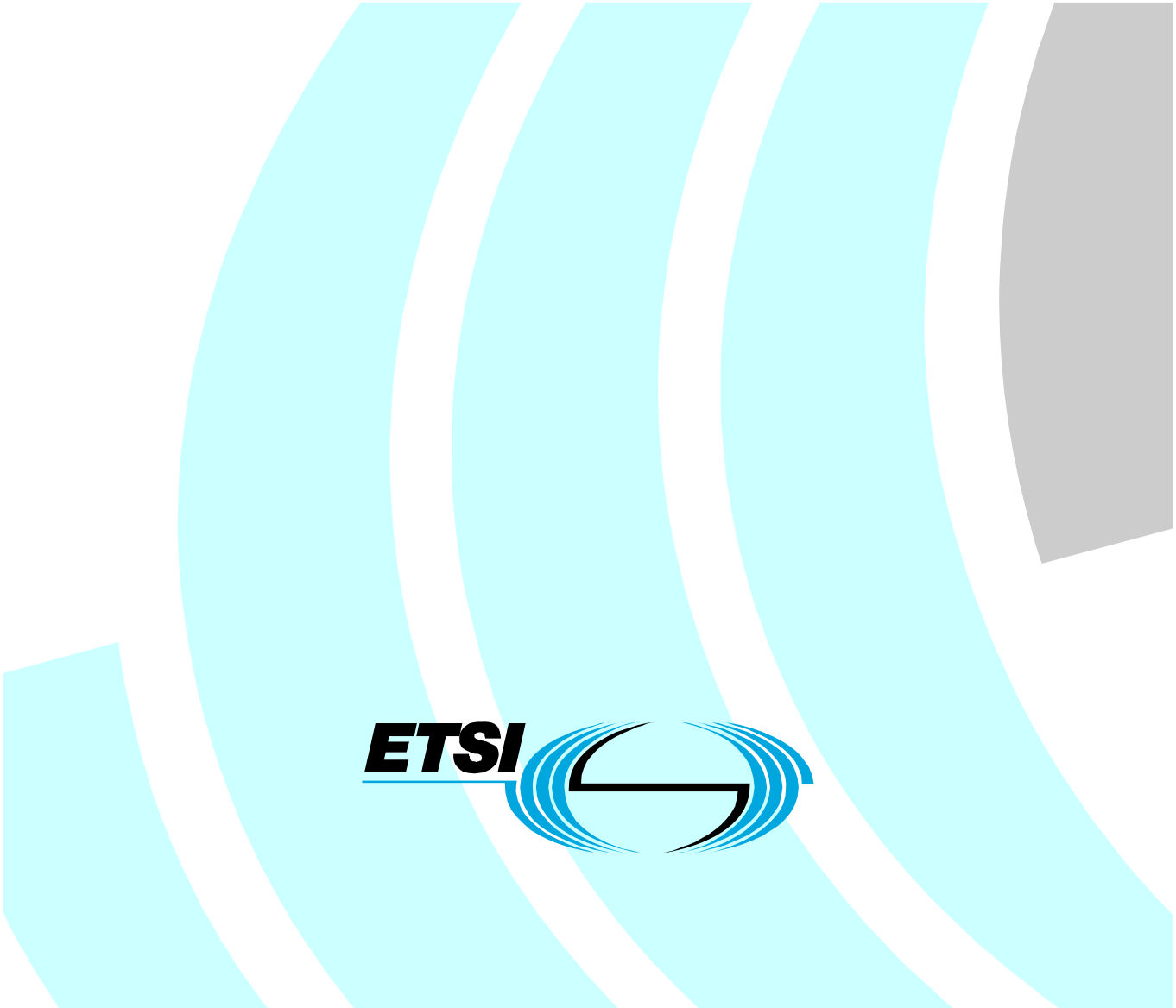
Technical Specification

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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Contents

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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.

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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.

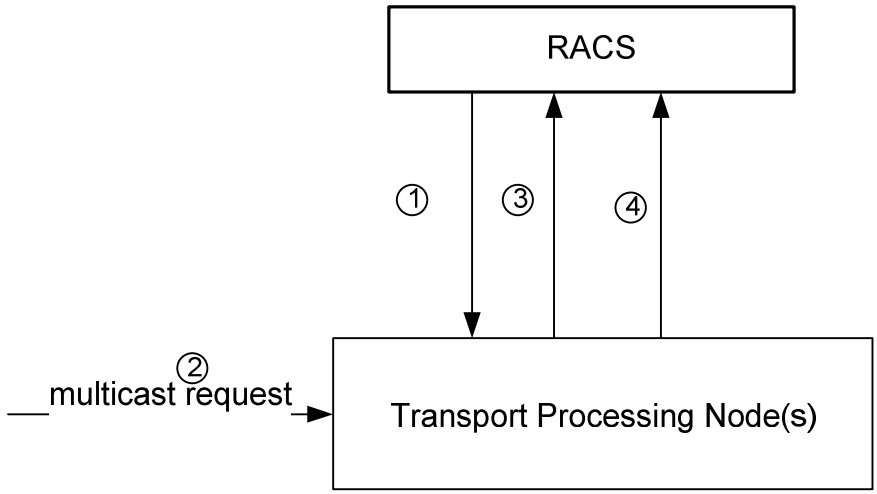

Figure 4.1: A generic scenario for both cases of PULL mode

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.

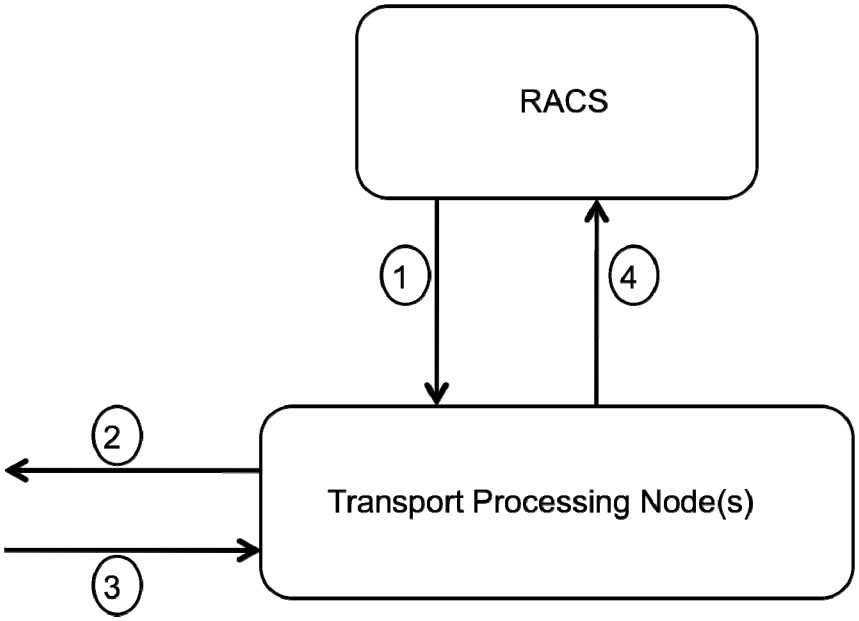

Figure 4.2: RSVP to Re mapping in Push Mode with on-path QoS reservation

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.

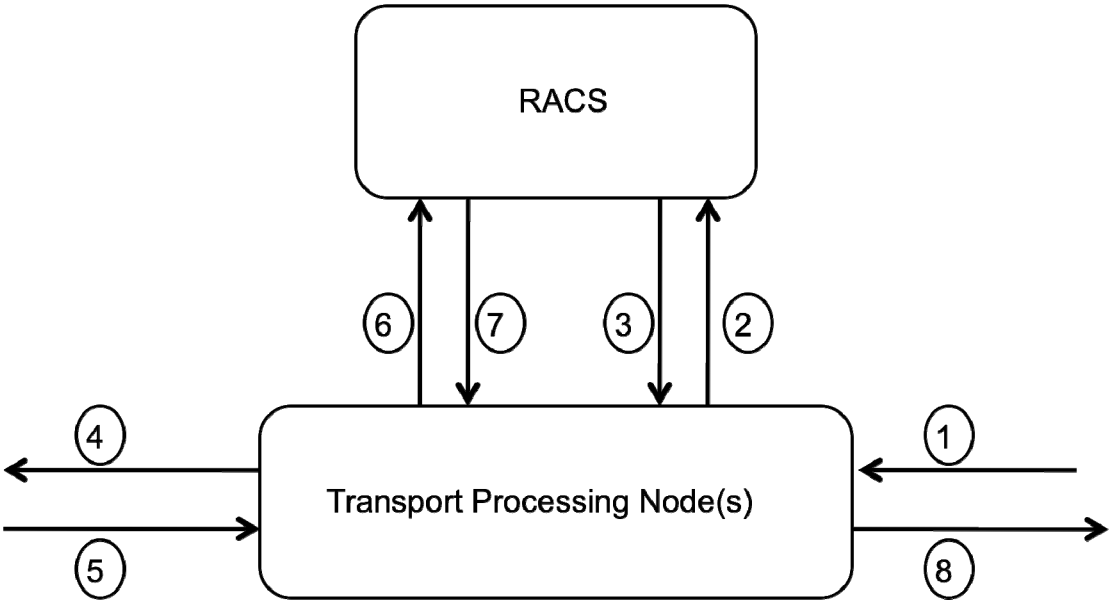

Figure 4.3: RSVP to Re mapping in Pull Mode

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.

5.2 PULL mode: case 2

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 the corresponding multicast flow is already received. If it is the case, the RCEF shall ignore the request for that pair. If not, the RCEF shall send a CC-Request applying the mapping defined in clause 6.2 for IGMPv3/MLDv2.

- If Record Type indicates BLOCK_OLD_SOURCE or CHANGE_TO_INCLUDE_MODE with an empty source list, the RCEF shall check if other UE are still requesting the corresponding multicast flow. If not, the RCEF may send a CC-Request applying the mapping defined in clause 6.2 for IGMPv3/MLDv2.

NOTE: The way the transport functions know that a channel is not required by any other UEs is based on Membership Query mechanisms as defined in RFC 3376 [6] (IGMPv3) and RFC 2236 [7] (IGMPv2) and based on Membership Listener query mechanisms as defined in RFC 3810 [8] (MLDv2).

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

If the type is set to 0x16 "v2 Membership Report", the RCEF shall check if the requested multicast address indicated in the Group Address parameter is already received. If it is the case, the RCEF shall ignore the request. If not, the RCEF shall send a CC-Request applying the mapping defined in clause 6.2 for IGMPv2.

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 check if other UEs are still requesting the corresponding multicast flow. If not, the RCEF may send a CC-Request applying the mapping defined in clause 6.2 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 Flow-Description, the RCEF shall create the corresponding policy. The transport function shall forward the corresponding multicast flow applying QoS parameters defined in the Policy-Rule-Install AVP. For any previously reported Flow-Description that does not receive any corresponding Policy-Rule-Install AVP, the BTF shall not forward the corresponding multicast flow.

6 Multicast to Re parameters mapping

6.1 PULL mode: case 1

When the RCEF sends a CCR for PULL mode case 1, it shall use the mapping defined in table 6.1 for IGMPv3/MLDv2 request.

Table 6.1: Rules for derivation of CCR AVPs from IGMPv3/MLDv2 requests for PULL mode case 1

CCR AVPs	Derivation from IGMPv3/MLDv2 Parameters
CC-Request-Type	It shall be set to UPDATE_REQUEST.
Event-Trigger	It shall be set to RESOURCES_MODIFICATION.
Policy-Update-Request	For each multicast/source address: • Policy-rule-Name shall be set to the corresponding policy rule name for that pair. • Policy_rule_status shall be set to ACTIVE. • if Record Type indicates ALLOW_NEW_SOURCE with INCLUDE filter mode or CHANGE_TO_EXCLUDE_MODE with no "Source address" fields: o Max-Requested-Bandwidth-UL shall be set to zero. o Max-Requested-Bandwidth-DL shall be set to FFFFFFFF. • if Record Type indicates BLOCK_OLD_SOURCE or CHANGE_TO_INCLUDE_MODE with an empty source list: o Max-Requested-Bandwidth-UL shall be set to zero. o Max-Requested-Bandwidth-DL shall be set to zero.

When the RCEF sends a CCR for PULL mode case 1, it shall use the mapping defined in table 6.2 for IGMPv2 request.

Table 6.2: Rules for derivation of CCR AVPs from IGMPv2 requests for PULL mode case 1

CCR AVPs	Derivation from IGMPv2 Parameters
CC-Request-Type	It shall be set to UPDATE_REQUEST.
Event-Trigger	It shall be set to RESOURCES_MODIFICATION.
Policy-Update-Request	• Policy-rule-Name shall be set to the corresponding policy rule name for that group address indicated in the request. • Policy_rule_status shall be set to ACTIVE. • If the type is set to 0x16 "v2 Membership Report": o Max-Requested-Bandwidth-UL shall be set to zero. o Max-Requested-Bandwidth-DL shall be set to FFFFFFFF. • If the type is set to 0x17 "Leave Group": o Max-Requested-Bandwidth-UL shall be set to zero. o Max-Requested-Bandwidth-DL shall be set to zero.

6.2 PULL mode: case 2

When the RCEF sends a CCR for PULL mode case 2, it shall use the mapping defined in table 6.3 for IGMPv3/MLDv2 request.

Table 6.3: Rules for derivation of CCR AVPs from IGMPv3/MLDv2 requests for PULL mode case 2

CCR AVPs	Derivation from IGMPv3/MLDv2 Parameters
CC-Request-Type	It shall be set to UPDATE_REQUEST.
Framed-IP address	It shall set to termination point IP address.
Physical-Access-Id	It shall not be present.
Logical-Access-Id	It shall not be present.
User-Name	It shall not be present.
Called-station-ID	It shall not be present.
Event-Trigger	It shall be set to RESOURCES_MODIFICATION.
Policy-rule-Report	If the flow is already received, for each multicast/source address: • Policy-rule-Name shall be set to the corresponding policy rule name for that pair. • If Record Type indicates BLOCK_OLD_SOURCE or CHANGE_TO_INCLUDE_MODE with an empty source list, Policy-Rule-status shall be se to INACTIVE.
Flow-Description	If the flow is not already received, for each multicast/source address: • Direction shall be set to "in". • Destination address shall be set to the "multicast address". • Source address shall be set to the Source address if present. • Source and Destination port shall be not be supplied.

When the RCEF sends a CCR for PULL mode case 2, it shall use the mapping defined in table 6.4 for IGMPv2 request.

Table 6.4: Rules for derivation of CCR AVPs from IGMPv2 requests for PULL mode case 2

CCR AVPs	Derivation from IGMPv2 Parameters
CC-Request-Type	It shall be set to UPDATE_REQUEST.
Event-Trigger	It shall be set to RESOURCES_MODIFICATION.
Policy-rule-Report	If the flow is already received: • Policy-rule-Name shall be set to the corresponding policy rule name for the Group Address indicated in the request. • If the type is set to 0x17 "Leave Group" Policy-Rule-status shall be se to INACTIVE.
Flow-Description	If the flow is not already received: • Direction shall be set to "in". • Destination address shall be set to the Group Address parameter. • Source address shall not be supplied. • Source and Destination port shall be not be supplied.

7 Behaviours of the transport functions for unicast

7.1 Push mode (RACS initiated Procedures)

This clause specifies the behavior of the RSVP transport functions for unicast in the case of Push mode with on-path QoS reservation.

7.1.1 Handling Policy-Install-Request from RACS

On receipt of a Policy-Install-Request from RACS, the RCEF shall process the message as specified in TS 183 060 [2]. In addition, when operating in the Push mode with on-path QoS reservation, the RCEF shall extend this behavior as defined in clause 7.1.1.1 (respectively clauses 7.1.1.2 and 7.1.1.3) in case of policy activation (respectively policy modification and policy deactivation).

7.1.1.1 Activation of a Policy Rule

On receipt of a Policy-Install-Request with PI-Request-Type AVP containing the value INITIAL_REQUEST that activates a new Policy Rule with Flow-Status ENABLED-DOWNLINK, the RCEF shall consider that a new on-path QoS reservation is to be initiated for each IP Flow defined in a Flow-Description AVP. The RCEF shall communicate with the BTF to ensure that an RSVP Path message is transmitted. The parameters in the RSVP Path message shall be mapped from those of the PIR command in accordance with table 8.1.

The BTF is responsible for refreshing the RSVP path state in accordance with RSVP procedures during all the time that the corresponding Policy Rule is maintained active by the RACS.

7.1.1.2 Policy Modification

On receipt of a Policy-Install-Request with the PI-Request-Type AVP set to UPDATE_REQUEST, and a Policy-Rule-Install AVP specified (with Flow-Status ENABLED-DOWNLINK), the RCEF shall consider that the existing on-path QoS reservation for each IP Flow is to be modified. The RCEF shall communicate with the BTF to ensure that an RSVP Path message is re-signalled for each such existing on-path QoS reservation. The parameters in the RSVP Path message shall be mapped using the same mapping rules as used for establishment of an initial on-path QoS reservation (i.e. in accordance with table 8.1).

On receipt of a Policy-Install-Request with the PI-Request-Type AVP set to UPDATE_REQUEST, and a Policy-Rule-Install AVP (with Flow-Status REMOVED) or a Policy-Rule-Remove AVP specified, the RCEF shall consider that the existing on-path QoS reservation for each IP Flow is to be torn down. The RCEF shall communicate with the BTF to ensure that an RSVP PathTear message is transmitted for each such existing on-path QoS reservation. The parameters in the RSVP PathTear message shall be the same as those used in the Path messages that were sent previously for the corresponding on-path QoS reservation. The BTF shall then communicate with the RCEF to confirm that the on-path QoS reservation has been torn down. Then, assuming all the other processing of the Policy-Install-Request as defined in [2] is successful, the RCEF shall return a Policy-Install-Answer to the RACS with the Result-Code AVP set to DIAMETER_SUCCESS.

7.1.1.3 Deactivation of a Policy Rule

On receipt of a Policy-Install-Request with PI-Request-Type AVP set to TERMINATION_REQUEST, if the terminated Policy Rule(s) had a Flow-Status ENABLED-DOWNLINK the RCEF shall consider that the corresponding on-path QoS reservation for each IP Flow is to be torn down. The RCEF shall communicate with the BTF to ensure that an RSVP PathTear message is transmitted for each such existing on-path QoS reservation. The parameters in the RSVP PathTear message shall be the same as those used in the Path messages that were sent previously for the corresponding on-path QoS reservation.

The BTF shall then communicate with the RCEF to confirm that the on-path QoS reservation has been torn down. Then, assuming all the other processing as defined in [2] is successful, the RCEF shall return a Policy-Install-Answer to the RACS with the Result-Code AVP set to DIAMETER_SUCCESS.

7.1.2 Handling unicast transport control protocol events

7.1.2.1 RSVP Reservation establishment

On receipt of an RSVP Resv message for a new, or a modified on-path QoS reservation, the BTF shall process the RSVP message as per procedures specified in [1]. On successful establishment of the Resv state, the BTF shall notify the RCEF. Then, assuming all the other processing of the corresponding Policy-Install-Request as defined in [2] is successful, the RCEF shall return a Policy-Install-Answer to the RACS with the Result-Code AVP set to DIAMETER_SUCCESS.

The BTF is responsible for managing the soft state of the RSVP Resv state. This includes handling received RSVP Resv refresh messages and processing of those in accordance with RSVP procedures. This also includes detecting time-out of the Resv state and handling of this situation as defined in clause 7.1.1.4.

7.1.2.2 RSVP Reservation Reject/Establishment Failure/Modification Failure

On receipt of an RSVP message indicating that a new on-path QoS reservation establishment has been rejected (e.g. receipt of a PathErr message containing an ERROR_SPEC object with an error code of "Code 1 - Admission Control Failure" or "Code 2 - Policy Control Failure" as specified in [5]) or has failed possibly after appropriate re-attempts (e.g. a corresponding Resv message is not received in a timely manner) for an on-path QoS reservation that the BTF is attempting to establish, the BTF shall communicate this to the RCEF. In turn, the RCEF shall return a Policy-Install-Answer to the RACS with the Experimental-Result-Code AVP set to POLICY_ACTIVATION_FAILURE. The RCEF shall set the Rule-Failure-Code AVP within the Policy-Rule-Report AVP to RESOURCES_LIMITATION. The RCEF may include in the Error-Message AVP the following string:

- "On-Path reservation Admission Control Failure" in case of a PathErr message with an ERROR_SPEC containing an error code "Code 1- Admission Control Failure".
- "On-Path reservation Policy Control Failure" in case of a PathErr message with an ERROR_SPEC containing an error code "Code 2- Policy Control Failure".
- "On-Path reservation failure because of Transport Network reasons" in the other cases of QoS reservation failure.

The BTF should remove the corresponding Path state in the transport nodes by issuing an RSVP PathTear message (with the same parameters as the corresponding Path messages) unless the BTF knows that the path state has already been removed or never got established.

On receipt of an RSVP message indicating that an on-path QoS reservation modification (e.g. reservation bandwidth increase) has been rejected but that the original reservation has been maintained (.i.e. on receipt of a PathErr with the InPlace flag set in the ERROR_SPEC as specified in [5]), the BTF shall communicate this to the RCEF. In turn, the RCEF shall return a Policy-Install-Answer to the RACS with the Experimental-Result-Code AVP set to POLICY_MODIFICATION FAILURE. The RCEF shall set the Rule-Failure-Code AVP within the Policy-Rule-Report AVP to RESOURCES_LIMITATION. The RCEF may include in the Error-Message AVP the following string:

- "On-Path QoS reservation modification Admission Control Failure" in case of a PathErr message with an ERROR_SPEC containing an error code "Code 1- Admission Control Failure".
- "On-Path QoS reservation modification Policy Control Failure" in case of a PathErr message with an ERROR_SPEC containing an error code "Code 2- Policy Control Failure".
- "On-Path reservation failure because of Transport Network reasons" in the other cases of QoS reservation modification failure.

The BTF shall maintain the Path state corresponding to the original QoS reservation.

7.1.2.3 RSVP Reservation Loss/Tear-Down

The BTF shall detect the loss or teardown on an existing on-path QoS reservation that the RCEF established. The detection is based on existing RSVP procedures as specified in [2] and [5]. For example, this includes time-out of received Resv refreshes or receipt of an RSVP PathErr containing an ERROR_SPEC object with an error code of "Code 1 - Admission Control Failure" or "Code 2 - Policy Control Failure".

In case the BTF deems that attempting to re-establish the reservation is likely to succeed, the BTF may optionally re-attempt such reestablishment by resending an RSVP Path message with corresponding parameters. If that attempt fails, or if the BTF deems that re-attempting reservation establishment is unlikely to succeed, the BTF shall notify the RCEF that the on-path QoS reservation has been torn down. In turn, the RCEF shall generate an event towards the RACS (assuming explicit or implicit subscription of RACS for this event type). The event is of type LOSS_OF_BEARER. The RCEF shall set the Rule-Failure-Code AVP within the Policy-Rule-Report AVP to RESOURCES_LIMITATION. The RCEF may include in the Error-Message AVP the following string:

- "On-Path Reservation Admission Control Failure" when the BTF detects the loss of reservation by receipt of a PathErr containing an ERROR_SPEC with an error code of "Admission Control Failure".
- "On-Path Reservation Policy Control Failure" when the BTF detects the loss of reservation by receipt of a PathErr containing an ERROR_SPEC with an error code of "Policy Control Failure".
- "On-Path QoS reservation failure because of Transport Network reasons" when the BTF detects the loss of reservation by any other means (e.g. Resv Refresh time-out).

The BTF should remove the Path state for the reservation that was lost or torn downs by issuing an RSVP PathTear message (with the same parameters as the corresponding Path messages) unless it knows the Path state has already been torn down. If there are on-path QoS reservations for flows corresponding to the same Policy-Install-Request, the RCEF shall tear down these reservations by issuing an RSVP PathTear message for each other reservation.

7.2 Pull mode (RCEF initiated Procedures)

7.2.1 Reservation pre-authorization

NOTE: The current release does not specify reservation pre-authorization for unicast pull-mode.

7.2.2 Reservation establishment in pull mode

On receipt of an RSVP Resv message for a new on-path QoS reservation, the BTF shall process the RSVP message as per procedures specified in [1]. In case of RSVP message processing failure, the BTF shall behave in accordance with [1] (e.g. generate a ResvErr). In case of successful message processing, the BTF shall notify the RCEF. The RCEF shall then send a CCR request to the RACS to request actual reservation of the corresponding resources. The parameters in the CCR request shall be mapped from those of the RSVP Resv message in accordance with table 8.2, the CC-Request-Type AVP shall be set to INITIAL_REQUEST and the Flow-Status shall be set to ENABLED-DOWNLINK.

The RACS shall respond to the RCEF with a CCA indicating whether the resource reservation was successfully performed by RACS.

If the resource reservation is authorized by RACS, the RACS shall send a CCA with a Result-Code AVP set to DIAMETER_SUCCESS. The RCEF shall then confirm the positive decision to the BTF. In turn, the BTF shall forward the RSVP Resv message towards the reservation destination.

If the resource reservation is not authorized by RACS, the RACS shall send a CCA with a Result-Code AVP set to DIAMETER_AUTHORIZATION_REJECTED. The RCEF shall then communicate the negative decision to the BTF. In turn, the BTF shall generate a ResvErr message with an ERROR_SPEC object whose Error Code is set to Policy Control Failure and shall not forward the Resv message.

7.2.3 Reservation Loss/Tear-Down

The BTF shall detect the loss or tear-down on an existing on-path QoS reservation. The detection is based on existing RSVP procedures as specified in [2] and [5]. For example, this includes:

- time-out of received Resv refreshes;
- receipt of a ResvTear;
- receipt of an RSVP PathErr containing an ERROR_SPEC object with an error code of "Code 1 - Admission Control Failure" or "Code 2 - Policy Control Failure";
- receipt of a PathTear.

The BTF shall notify the RCEF of such reservation loss or tear-down. In turn, the RCEF shall send a CCR request to the RACS to notify RACS of the resource reservation termination. The CC-Request-Type AVP in this CCR shall be set to TERMINATION_REQUEST. The RACS shall release the corresponding resources and respond to RCEF with a CCA with Result-Code AVP set to DIAMETER_SUCCESS.

7.2.4 Reservation Modification

The BTF shall detect the modification of an existing on-path QoS reservation (i.e. the change of one or more reservation parameters specified in the received Resv message). The BTF shall first process the RSVP message as per procedures specified in [1]. In case of RSVP message processing failure, the BTF shall behave in accordance with [1] (e.g. generate a ResvErr). In case of successful message processing, the BTF shall notify the RCEF of the reservation modification. The RCEF shall then send a CCR request to the RACS to request reservation adjustment of the corresponding resources. The parameters in the CCR request shall be mapped from those of the RSVP Resv message in accordance with table 8.2 and the CC-Request-Type AVP shall be set to UPDATE_REQUEST.

The RACS shall respond to the RCEF with a CCA indicating whether the resource reservation was successfully modified by RACS.

If the resource reservation modification is authorized by RACS, the RACS shall send a CCA with a Result-Code AVP set to DIAMETER_SUCCESS. The RCEF shall then confirm the positive decision to the BTF. In turn, the BTF shall forward the RSVP Resv message towards the reservation destination.

If the resource reservation is not authorized by RACS, the RACS shall send a CCA with a Result-Code AVP set to DIAMETER_AUTHORIZATION_REJECTED. The RCEF shall then communicate the negative decision to the BTF. In turn, the BTF shall generate a ResvErr message with an ERROR_SPEC object whose Error Code is set to Policy Control Failure and shall not forward the Resv message.

8 RSVP to Re parameters mapping

8.1 Push Mode

8.1.1 Re PIR to RSVP Path Parameter Mapping

When, in accordance with clause 7.1.1.1, the RCEF/BTF sends an RSVP Path message to initiate an on-path QoS reservation as a result of a received Policy-Install-Request from RACS, the mapping defined in the following table shall be used:

Table 8.1: Re PIR to RSVP Path Parameter mapping

RSVP Objects	Derivation from PIR AVPs
SESSION	It shall be mapped from the Policy-Rule-Install AVP ->Policy-Rule-Definition AVP -> Flow-Description AVP: • Destination IP Address shall be set to Flow-Description AVP ->Destination IP Address. • Protocol shall be set to Flow-Description AVP ->Protocol. • Destination Port shall be set to Flow-Description AVP ->Destination Port.
SENDER_TEMPLATE	It shall be mapped from the Policy-Rule-Install AVP ->Policy-Rule-Definition AVP -> Flow-Description AVP: • Sender IP Address shall be Flow-Description AVP ->Source IP Address. • Sender Port shall be set to Flow-Description AVP ->Source Port.
SENDER_TSPEC	The RSVP Peak Data Rate [p] shall be mapped from Policy-Rule-Install AVP ->Policy-Rule-Definition AVP ->QoS-Information AVP: • Peak Data Rate shall be computed from the Flow-Description AVP -> Max-Requested-Bandwidth-DL. The Peak Data Rate shall be expressed in bytes/sec. It shall include IP headers but shall not include Layer-2 headers or any other Layer-2 overheads. The RSVP Token Bucket Rate [r] shall be mapped from Traffic-Descriptor-DL AVP: • Token Bucket Rate shall be computed from the Traffic-Descriptor-DL-> Committed-Data-Rate. The Token Bucket Rate shall be expressed in bytes/sec. It shall include IP headers but shall not include Layer-2 headers or any other Layer-2 overheads. The other SENDER_TSPEC parameters may be mapped from the Traffic-Descriptor-DL AVP or from the traffic class identified by the TOS-Traffic-class AVP.
POLICY_DATA (Preemption [3], AUTH_USER [4], AUTH_APP [4])	NOTE: The current release does not specify mapping from the Re PIR into the RSVP Path POLICY_DATA object.

8.2 Pull Mode

8.2.1 RSVP Resv to Re CCR Parameter Mapping

When, in accordance with clause 7.2.2, the RCEF/BTF sends a CCR request to RACS to request resource reservation as a result of a received RSVP Resv message, the mapping defined in the following table shall be used:

Table 8.2: RSVP Resv to Re CCR Parameter mapping

CCR AVP	Derivation from RSVP Resv
Flow-Description AVP	It shall be mapped from the SESSION and FILTER_SPEC objects: • Source Address shall be set to FILTER_SPEC IP Source Address. • Source Port shall be set to FILTER_SPEC Source Port. • Destination Address shall be set SESSION IP Destination Address. • Destination Port shall be set to SESSION Destination Port. • Protocol shall be set to SESSION Protocol Id.
QoS-Information AVP	It shall be mapped from the FLOWSPEC object: • QoS-Information AVP -> Max-Requested-Bandwidth-DL shall be computed from FLOWSPEC Peak Data Rate. • QoS-Information AVP ->Traffic-Descriptor-DL-> Committed-Data-Rate shall be computed from FLOWSPEC Token Bucket Rate. • QoS-Information AVP ->Traffic-Descriptor-DL-> Committed-Burst-Size shall be mapped from the FLOWSPEC Token Bucket Size.

Annex A (informative): Change history

Change history							
Date	**WG Doc.**	**CR**	**Rev**	**CAT**	**Title / Comment**	**Current Version**	**New Version**
25-02-09	20WTD146r1	001		F	WI3191 Unicast Pull Mode – RSVP Reservation Loss/Teardown	0.0.8	0.0.9
25-02-09	20WTD147r1	002		F	WI3191 Unicast Pull Mode – RSVP Reservation Modification	0.0.8	0.0.9
25-02-09	20WTD213r1	003		F	WI-03191 Editorial corrections	0.0.8	0.0.9
25-02-09	20WTD215r1	004		F	WI3191 – Clarification of reservation pre-authorization for pull mode	0.0.8	0.0.9
11-03-09					CRs 001 to 004 TB approved at plenary#20 and move to v3.x.x since R2 deliverable has been TB approved	0.0.9	3.0.0
17-03-09	20bTD259r1	005		D	CR 005 WG approved at 20Bis	3.0.0	3.0.1
28-09-09	22WTD146r1	006		D	Editorial Cleanup	3.0.1	3.0.2
					Publication		3.1.1

History

Document history		
V2.1.1	April 2009	Publication
V3.1.1	November 2009	Publication