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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Infrastructure of audiovisual services – Communication
procedures

**Gateway control protocol: Support of the
resource reservation protocol**

Recommendation ITU-T H.248.65



ITU-T H-SERIES RECOMMENDATIONS
AUDIOVISUAL AND MULTIMEDIA SYSTEMS

CHARACTERISTICS OF VISUAL TELEPHONE SYSTEMS	H.100–H.199
INFRASTRUCTURE OF AUDIOVISUAL SERVICES	
General	H.200–H.219
Transmission multiplexing and synchronization	H.220–H.229
Systems aspects	H.230–H.239
Communication procedures	H.240–H.259
Coding of moving video	H.260–H.279
Related systems aspects	H.280–H.299
Systems and terminal equipment for audiovisual services	H.300–H.349
Directory services architecture for audiovisual and multimedia services	H.350–H.359
Quality of service architecture for audiovisual and multimedia services	H.360–H.369
Supplementary services for multimedia	H.450–H.499
MOBILITY AND COLLABORATION PROCEDURES	
Overview of Mobility and Collaboration, definitions, protocols and procedures	H.500–H.509
Mobility for H-Series multimedia systems and services	H.510–H.519
Mobile multimedia collaboration applications and services	H.520–H.529
Security for mobile multimedia systems and services	H.530–H.539
Security for mobile multimedia collaboration applications and services	H.540–H.549
Mobility interworking procedures	H.550–H.559
Mobile multimedia collaboration inter-working procedures	H.560–H.569
BROADBAND, TRIPLE-PLAY AND ADVANCED MULTIMEDIA SERVICES	
Broadband multimedia services over VDSL	H.610–H.619
Advanced multimedia services and applications	H.620–H.629
IPTV MULTIMEDIA SERVICES AND APPLICATIONS FOR IPTV	
General aspects	H.700–H.719
IPTV terminal devices	H.720–H.729
IPTV middleware	H.730–H.739
IPTV application event handling	H.740–H.749
IPTV metadata	H.750–H.759
IPTV multimedia application frameworks	H.760–H.769
IPTV service discovery up to consumption	H.770–H.779

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T H.248.65

Gateway control protocol: Support of the resource reservation protocol

Summary

Recommendation ITU-T H.248.65 provides an ITU-T H.248 package for the support of the resource reservation protocol (RSVP). The protocol capabilities are tightly coupled with the pull mode defined in Recommendation ITU-T H.248.55. The *RSVP extension* package complements the *generic pull mode* package by providing additional capabilities for the specific path-coupled QoS/resource control protocol RSVP. This package allows the ITU-T H.248 entities to make the resource reservation, i.e., set up the bearer path with the desired QoS. Based on this package, the MGC and the MG are able to initiate/terminate the RSVP messages.

Source

Recommendation ITU-T H.248.65 was approved on 16 March 2009 by ITU-T Study Group 16 (2009-2012) under Recommendation ITU-T A.8 procedures.

FOREWORD

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CONTENTS

	Page
1 Scope	1
2 References.....	1
3 Definitions	2
3.1 Terms defined elsewhere	2
3.2 Terms defined in this Recommendation.....	2
4 Abbreviations and acronyms	2
5 Conventions	3
6 RSVP extension package.....	3
6.1 Properties.....	3
6.2 Events	3
6.3 Signals	11
6.4 Statistics.....	15
6.5 Error codes.....	15
6.6 Procedures	15

Recommendation ITU-T H.248.65

Gateway control protocol: Support of the resource reservation protocol

1 Scope

[ITU-T H.248.55] provides a *generic package* (as *base package*) for pull mode support. Such a capability is, for instance, required for bearer/media path-coupled QoS control protocols, like the resource reservation protocol (RSVP) according to [IETF RFC 2205].

This *extension* package describes the RSVP-specific procedures and enables the ITU-T H.248 entities to support an RSVP mechanism, which includes the initiation/termination of RSVP messages. This package provides a means of resource reservation, by which the MGC and the MG are able to set up the bearer path with the desired QoS.

[IETF RFC 2205] defines several RSVP message types. In addition to the two fundamental types: (Path and Resv), there are also teardown messages (PathTear and ResvTear), error messages (PathErr and ResvErr) and a confirm message (ResvConf). This Recommendation introduces a generic method for the MGC and the MG to deal with these above messages to support RSVP.

The ITU-T H.248 media gateway acts as an RSVP-aware policy enforcement point (PEP) when processing RSVP messages. The ITU-T H.248 MGC acts as an RSVP-aware policy decision point (PDP), it is the MGC that determines when to send the RSVP messages. On reception of incoming RSVP messages, the MG reports the related events to the MGC for its resource policy decision.

As such, the packages in this Recommendation allow the support of the functionality outlined by the application/RSVP interface (clause 3.11.1 of [IETF RFC 2205]).

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T H.248.1] Recommendation ITU-T H.248.1 (2005), *Gateway control protocol: Version 3; Amendment 1* (2008).
- [ITU-T H.248.55] Recommendation ITU-T H.248.55 (2008), *Gateway control protocol: Generic pull mode package*.
- [ITU-T Y.2111] Recommendation ITU-T Y.2111 (2006), *Resource and admission control functions in Next Generation Networks*.
- [IETF RFC 2205] IETF RFC 2205 (1997), *Resource ReSerVation Protocol (RSVP) – Version 1 Functional Specification*.
- [IETF RFC 2210] IETF RFC 2210 (1997), *The Use of RSVP with IETF Integrated Services*.
- [IETF RFC 2750] IETF RFC 2750 (2000), *RSVP Extensions for Policy Control*.
- [IETF RFC 3182] IETF RFC 3182 (2001), *Identity Representation for RSVP*.
- [IETF RFC 3520] IETF RFC 3520 (2003), *Session Authorization Policy Element*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 ADSPEC: An object of a RSVP message, defined in Appendix A "Object Definitions" of [IETF RFC 2205], "Carries OPWA data, in a Path message"; see also its detailed format in clause 3.3 "RSVP ADSPEC Object" of [IETF RFC 2210].

3.1.2 ERROR_SPEC: An object of a RSVP message, defined in Appendix A of [IETF RFC 2205], "Specifies an error in a PathErr, ResvErr, or a confirmation in a ResvConf message".

3.1.3 FILTER_SPEC: An object of a RSVP message, defined in Appendix A of [IETF RFC 2205], "Defines a subset of session data packets that should receive the desired QoS (specified by a FLOWSPEC object), in a Resv message".

3.1.4 POLICY_DATA: An object of a RSVP message, defined in Appendix A of [IETF RFC 2205], "Carries information that will allow a local policy module to decide whether an associated reservation is administratively permitted. It may appear in Path, Resv, PathErr, or ResvErr message".

3.1.5 FLOWSPEC: An object of a RSVP message, defined in Appendix A of [IETF RFC 2205], "Defines a desired QoS, in a Resv message"; see also its detailed format in clause 3.2 "RSVP FLOWSPEC Object" of [IETF RFC 2210].

3.1.6 SENDER_TSPEC: An object of a RSVP message, defined in Appendix A of [IETF RFC 2205], "Defines the traffic characteristics of a sender's data flow"; see also its detailed format in clause 3.1 "RSVP SENDER_TSPEC Object" of [IETF RFC 2210].

3.1.7 SESSION: An object of a RSVP message, defined in Appendix A of [IETF RFC 2205], "Contains the IP destination address (DestAddress), the IP protocol id, and some form of generalized destination port, to define a specific session for the other objects that follow. It is required in every RSVP message".

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations:

IP	Internet Protocol
MG	Media Gateway
MGC	Media Gateway Controller
PDP	Policy Decision Point
PEP	Policy Enforcement Point
QoS	Quality of Service
RSVP	Resource ReSerVation Protocol
SIP	Session Initiation Protocol

TTL Time to Live

5 Conventions

None.

6 RSVP extension package

Package Name: RSVP extension package

Package ID: rsvp (0x00d2)

Description: This package complements the generic pull mode package by providing additional capabilities for the specific path-coupled QoS/resource control protocol RSVP [IETF RFC 2205]. This package allows the ITU-T H.248 entities to make the resource reservation, i.e., set up the bearer path with the desired QoS. Based on this package, the MGC and the MG are able to initiate/terminate the RSVP messages.

Version: 1

Extends: Generic pull mode package (*plm*) version 1 [ITU-T H.248.55].

6.1 Properties

None.

6.2 Events

6.2.1 Path Received

Event Name: Path Received

Event ID: pathr (0x0004)

Description: This event enables the MGC to be notified when the first RSVP Path message is received by the MG, or if the path state is changed by later Path messages. The parameters are related to RSVP information elements contained in the received message.

This event shall be applied to the **Root termination** or to **ephemeral terminations** only.

6.2.1.1 EventDescriptor Parameters

None.

6.2.1.2 ObservedEventsDescriptor Parameters

6.2.1.2.1 Session ID

Parameter Name: Session ID

Parameter ID: session (0x0001)

Description: This parameter relates to RSVP object "SESSION".

Type: Octet String

Optional: No

Possible values: A sequence of octets

Default: None

6.2.1.2.2 Sender TSpec

Parameter Name: Sender TSpec

Parameter ID: stspec (0x0002)

Description: This parameter relates to RSVP object "SENDER_TSPEC".

Type: Octet String

Optional: Yes

Possible values: A sequence of octets

Default: None

6.2.1.2.3 Ad Spec

Parameter Name: Ad Spec

Parameter ID: adspec (0x0003)

Description: This parameter relates to RSVP object "ADSPEC".

Type: Octet String

Optional: Yes

Possible values: A sequence of octets

Default: None

6.2.1.2.4 Policy Data

Parameter Name: Policy Data

Parameter ID: policy (0x0004)

Description: This parameter relates to RSVP object "POLICY_DATA".

Type: Octet String

Optional: Yes

Possible values: A sequence of octets

Default: None

6.2.2 Resv Received

Event Name: Resv Received

Event ID: resvr (0x0005)

Description: This event enables the MGC to be notified when the first RSVP Resv message is received by the MG, or if the reservation state is changed by later Resv messages. The parameters are related to RSVP information elements contained in the received message.

This event shall be applied to the **Root termination** or to **ephemeral terminations** only.

6.2.2.1 EventDescriptor Parameters

None.

6.2.2.2 ObservedEventsDescriptor Parameters

6.2.2.2.1 Session ID

Parameter Name: Session ID

Parameter ID: session (0x0001)

Description: This parameter relates to RSVP object "SESSION".

Type: Octet String

Optional: No

Possible values: A sequence of octets

Default: None

6.2.2.2.2 Style

Parameter Name: Style

Parameter ID: style (0x0002)

Description: This parameter represents the reservation style.

Type: Enumeration

Optional: No

Possible values: "FF" (0x0001) Fixed-Filter
"SE" (0x0002) Shared-Explicit
"WF" (0x0003) Wildcard-Filter

Default: None

6.2.2.2.3 Flow Spec

Parameter Name: Flow Spec

Parameter ID: flowspec (0x0003)

Description: This parameter relates to RSVP object "FLOWSPEC". It is reported if contained in the received message.

Type: Octet String

Optional: Yes

Possible values: A sequence of octets

Default: None

6.2.2.2.4 Filter Spec

Parameter Name: Filter Spec

Parameter ID: filterspec (0x0004)

Description: This parameter relates to RSVP object "FILTER_SPEC". It is reported if contained in the received message.

Type: Octet String

Optional: Yes

Possible values: A sequence of octets

Default: None

6.2.2.2.5 Policy Data

Parameter Name: Policy Data

Parameter ID: policy (0x0005)

Description: This parameter relates to RSVP object "POLICY_DATA". It is reported if contained in the received message.

Type: Octet String

Optional: Yes

Possible values: A sequence of octets

Default: None

6.2.3 Path Error

Event Name: Path Error

Event ID: patherr (0x0006)

Description: This event indicates a RSVP PathErr message has been received by the MG. The parameters are related to RSVP information elements contained in the received message.

This event shall be applied to the **Root termination** or to **ephemeral terminations** only.

6.2.3.1 EventDescriptor Parameters

None.

6.2.3.2 ObservedEventsDescriptor Parameters

6.2.3.2.1 Session ID

Parameter Name: Session ID

Parameter ID: session (0x0001)

Description: This parameter relates to RSVP object "SESSION".

Type: Octet String

Optional: No

Possible values: A sequence of octets

Default: None

6.2.3.2.2 Error Spec

Parameter Name: Error Spec

Parameter ID: errspec (0x0002)

Description: This parameter relates to RSVP object "ERROR_SPEC".

Type: Octet String

Optional: No

Possible values: A sequence of octets

Default: None

6.2.3.2.3 Policy Data

Parameter Name: Policy Data

Parameter ID: policy (0x0003)

Description: This parameter relates to RSVP object "POLICY_DATA" from the failed Path message. It is reported if contained in the received message.

Type: Octet String

Optional: Yes

Possible values: A sequence of octets

Default: None

6.2.4 Resv Error

Event Name: Resv Error

Event ID: resverr (0x0007)

Description: This event indicates a RSVP ResvErr message has been received by the MG. The parameters are related to RSVP information elements contained in the received message.

This event shall be applied to the **Root termination** or to **ephemeral terminations** only.

6.2.4.1 EventDescriptor Parameters

None.

6.2.4.2 ObservedEventsDescriptor Parameters

6.2.4.2.1 Session ID

Parameter Name: Session ID

Parameter ID: session (0x0001)

Description: This parameter relates to RSVP object "SESSION".

Type: Octet String

Optional: No

Possible values: A sequence of octets

Default: None

6.2.4.2.2 Error Specification

Parameter Name: Error Specification

Parameter ID: errspeg (0x0002)

Description: This parameter relates to RSVP object "ERROR_SPEC".

Type: Octet String

Optional: No

Possible values: A sequence of octets

Default: None

6.2.4.2.3 Flow Spec

Parameter Name: Flow Spec

Parameter ID: flowspec (0x0003)

Description: This parameter relates to RSVP object "FLOWSPEC". It is reported if contained in the received message.

Type: Octet String

Optional: Yes

Possible values: A sequence of octets

Default: None

6.2.4.2.4 Filter Spec

Parameter Name: Filter Spec

Parameter ID: filterspec (0x0004)

Description: This parameter relates to RSVP object "FILTER_SPEC". It is reported if contained in the received message.

Type: Octet String

Optional: Yes

Possible values: A sequence of octets

Default: None

6.2.4.2.5 Policy Data

Parameter Name: Policy Data

Parameter ID: policy (0x0005)

Description: This parameter relates to RSVP object "POLICY_DATA". It is reported if contained in the received message.

Type: Octet String

Optional: Yes

Possible values: A sequence of octets

Default: None

6.2.5 Resv Confirm

Event Name: Resv Confirm

Event ID: resvconf (0x0008)

Description: This event indicates a RSVP ResvConf message has been received by the MG. The parameters are related to RSVP information elements contained in the received message.

This event shall be applied to the **Root termination** or to **ephemeral terminations** only.

6.2.5.1 EventDescriptor Parameters

None.

6.2.5.2 ObservedEventsDescriptor Parameters

6.2.5.2.1 Session ID

Parameter Name: Session ID

Parameter ID: session (0x0001)

Description: This parameter relates to RSVP object "SESSION".

Type: Octet String

Optional: No

Possible values: A sequence of octets

Default: None

6.2.5.2.2 Style

Parameter Name: Style

Parameter ID: style (0x0002)

Description: This parameter represents the reservation style of the RSVP session.

Type: Enumeration

Optional: No

Possible values: "FF" (0x0001) Fixed-Filter
"SE" (0x0002) Shared-Explicit
"WF" (0x0003) Wildcard-Filter

Default: None

6.2.5.2.3 Flow Spec

Parameter Name: Flow Spec

Parameter ID: flowspec (0x0003)

Description: This parameter relates to RSVP object "FLOWSPEC". It is reported if contained in the received message.

Type: Octet String

Optional: Yes

Possible values: A sequence of octets

Default: None

6.2.5.2.4 Filter Spec

Parameter Name: Filter Spec

Parameter ID: filterspec (0x0004)

Description: This parameter relates to RSVP object "FILTER_SPEC". It is reported if contained in the received message.

Type: Octet String

Optional: Yes

Possible values: A sequence of octets

Default: None

6.2.5.2.5 Policy Data

Parameter Name: Policy Data

Parameter ID: policy (0x0005)

Description: This parameter relates to RSVP object "POLICY_DATA". It is reported if contained in the received message.

Type: Octet String

Optional: Yes

Possible values: A sequence of octets

Default: None

6.2.6 RSVP Teardown

Event Name: RSVP Teardown

Event ID: teardown (0x0009)

Description: This event enables the MGC to be notified when the RSVP teardown message has been received.

6.2.6.1 EventDescriptor Parameters

None.

6.2.6.2 ObservedEventsDescriptor Parameters

6.2.6.2.1 Session ID

Parameter Name: Session ID

Parameter ID: session (0x0001)

Description: This parameter relates to RSVP object "SESSION", to identify the session that needs to be released.

Type: Octet String

Optional: No

Possible values: A sequence of octets

Default: None

6.2.7 State Expiration

Event Name: State Expiration

Event ID: se (0x000a)

Description: This event is used to detect the state expiration of the RSVP sessions. The state of the RSVP session in the MG will expire if not refreshed within a specified amount of time. Once the session state expires, the MG shall report this event to the MGC.

6.2.7.1 EventDescriptor Parameters

6.2.7.1.1 State Expiration Interval

Parameter Name: State Expiration Interval

Parameter ID: sei (0x0001)

Description: This parameter provides the state cleanup timeout value of the RSVP session. The state of the session expires if no matching refresh RSVP messages arrive at a state expiration interval. If a RSVP refresh message arrives, the timer is reset.

Type: Integer

Optional: Yes

Possible values: Any positive integer in milliseconds. See section 3.7 of [IETF RFC 2205] for more information regarding the setting of this parameter.

Default: Provisioned

6.2.7.2 ObservedEventsDescriptor Parameters

6.2.7.2.1 Session ID

Parameter Name: Session ID

Parameter ID: session (0x0001)

Description: This parameter relates to RSVP object "SESSION", to identify the session whose state expires.

Type: Octet String

Optional: No

Possible values: A sequence of octets

Default: None

6.3 Signals

6.3.1 Send Path

Signal Name: Send Path

Signal ID: path (0x0001)

Description: This signal triggers the MG to send a RSVP Path message (messages in case of a refresh) for the resource reservation session.

Signal Type: On/Off

Default: Provisioned

6.3.1.1 Additional parameters

6.3.1.1.1 Session ID

Parameter Name: Session ID

Parameter ID: session (0x0001)

Description: This parameter relates to RSVP object "SESSION".

Type: Octet String

Optional: No

Possible values: A sequence of octets

Default: None

6.3.1.1.2 Sender TSpec

Parameter Name: Sender TSpec

Parameter ID: stspec (0x0002)
Description: This parameter relates to RSVP object "SENDER_TSPEC".
Type: Octet String
Optional: Yes
Possible values: A sequence of octets
Default: None

6.3.1.1.3 Ad Spec

Parameter Name: Ad Spec
Parameter ID: adspec (0x0003)
Description: This parameter relates to RSVP object "ADSPEC".
Type: Octet String
Optional: Yes
Possible values: A sequence of octets
Default: None

6.3.1.1.4 Policy Data

Parameter Name: Policy Data
Parameter ID: policy (0x0004)
Description: This parameter relates to RSVP object "POLICY_DATA".
Type: Octet String
Optional: Yes
Possible values: A sequence of octets
Default: None

6.3.1.1.5 Data TTL

Parameter Name: Data TTL
Parameter ID: dttl (0x0005)
Description: This parameter indicates the IP Time-To-Live value that is associated with the data packets.
Type: Integer
Optional: Yes
Possible values: Any positive integer
Default: Provisioned

6.3.1.1.6 Time Value

Parameter Name: Time Value
Parameter ID: time (0x0006)
Description: This parameter indicates the refresh period of the path messages.
Type: Integer

Optional: Yes
Possible values: Any positive integer; represents milliseconds
Default: Provisioned

6.3.2 Send Resv

Signal Name: Send Resv
Signal ID: resv (0x0002)
Description: This signal triggers the MG to send a RSVP Resv message (messages in case of a refresh) for the resource reservation session.
Signal Type: On/Off
Default: Provisioned

6.3.2.1 Additional parameters

6.3.2.1.1 Session ID

Parameter Name: Session ID
Parameter ID: session (0x0001)
Description: This parameter relates to RSVP object "SESSION".
Type: Octet String
Optional: No
Possible values: A sequence of octets
Default: None

6.3.2.1.2 Style

Parameter Name: Style
Parameter ID: style (0x0002)
Description: This parameter represents the reservation style of the RSVP session.
Type: Enumeration
Optional: No
Possible values: "FF" (0x0001) Fixed-Filter
"SE" (0x0002) Shared-Explicit
"WF" (0x0003) Wildcard-Filter
Default: Provisioned

6.3.2.1.3 Flow Spec

Parameter Name: Flow Spec
Parameter ID: flowspec (0x0003)
Description: This parameter relates to RSVP object "FLOWSPEC", which depends upon the value of the 'Style'.
Type: Octet String
Optional: Yes
Possible values: A sequence of octets

Default: None

6.3.2.1.4 Filter Spec

Parameter Name: Filter Spec

Parameter ID: filterspec (0x0004)

Description: This parameter relates to RSVP object "FILTER_SPEC", which depends upon the value of the 'Style'.

Type: Octet String

Optional: Yes

Possible values: A sequence of octets

Default: None

6.3.2.1.5 Policy Data

Parameter Name: Policy Data

Parameter ID: policy (0x0005)

Description: This parameter relates to RSVP object "POLICY_DATA".

Type: Octet String

Optional: Yes

Possible values: A sequence of octets

Default: None

6.3.2.1.6 Confirm Flag

Parameter Name: Confirm Flag

Parameter ID: confirm (0x0006)

Description: This parameter indicates if a reservation confirmation is desired.

Type: Boolean

Optional: Yes

Possible values: ON: confirmation is required
OFF: confirmation is not required

Default: Provisioned

6.3.2.1.7 Time Value

Parameter Name: Time Value

Parameter ID: time (0x0007)

Description: This parameter indicates the refresh period of the resv messages.

Type: Integer

Optional: Yes

Possible values: Any positive integer; represents milliseconds

Default: Provisioned

6.3.3 RSVP Release

Signal Name: RSVP Release
Signal ID: release (0x0003)
Description: This signal triggers the MG to send an appropriate RSVP Teardown message for the resource reservation session.
Signal Type: Brief
Duration: Not applicable to Brief signals

6.3.3.1 Additional parameters

6.3.3.1.1 Session ID

Parameter Name: Session ID
Parameter ID: session (0x0001)
Description: This parameter relates to RSVP object "SESSION".
Type: Octet String
Optional: No
Possible values: A sequence of octets
Default: None

6.3.3.1.2 Message Type

Parameter Name: Message Type
Parameter ID: mtype (0x0002)
Description: This parameter represents the type of the Teardown message.
Type: Enumeration
Optional: Yes
Possible values: "PathTear" (0x0001)
"ResvTear" (0x0002)
Default: None

6.4 Statistics

None.

6.5 Error codes

None.

6.6 Procedures

6.6.1 RSVP processing ways in the RSVP-aware ITU-T H.248 MG

There are different possible ways of RSVP processing in an ITU-T H.248 MG, a *termination* way, a *snooping* way or a *proxy* way (see, e.g., Figure 15 of [ITU-T Y.2111] "Three possible QoS signalling processing ways at the PE-FE"). The particular RSVP processing shall *not* impact the ITU-T H.248 procedures as such.

6.6.2 RSVP messages processing

RSVP makes resource reservations for unidirectional data flows, so in the normal bidirectional cases, the MGC and the MG need to maintain two separate RSVP sessions. The MG plays different roles in the two sessions, i.e., sender and receiver of the two unidirectional data flows.

6.6.2.1 MG at the receiver side

When the MGC and the MG act as a receiver of the data flow, the MG receives RSVP Path messages sent by the sender and sends RSVP reservation request (Resv) messages upstream towards the sender.

Based on the first received Path message, the MG creates the path state for the session and reports the request event (*rsvp/pathr*) to the MGC via the Notify Command. This is similar to the policy pull procedures. The MGC makes the resource reservation decision based on the reported event and relevant parameters, after which the MGC instructs the MG to set up the bearer path with a desired QoS. This can be achieved by sending the *rsvp/resv* signal via a MODIFY Command, which triggers the MG to send an RSVP Resv message for the resource reservation session. RSVP takes a "soft state" approach to managing the reservation state, the 'Time Value' parameter within this signal indicates the refresh period of the resv messages. If there is no update *rsvp/resv* or *rsvp/release* signal sent from the MGC, the MG should resend the resv messages automatically after every refresh period. For the incoming direction, the MG may receive refresh Path messages including duplicated ones and updated ones. Only the update Path message would modify the path state of the session and trigger the notification of the *rsvp/pathr* event.

The MG is also required to be aware of the other types of RSVP messages. This is achieved by the MGC setting the appropriate events on the MG. When an RSVP ResvErr message is received, the MG should notify the *rsvp/resverr* event to the MGC. Furthermore, if the Confirm Flag parameter is set to 'ON' in the *rsvp/resv* signal, the MG would receive the RSVP ResvConf message after the reservation request is accepted by the bearer path. The MG should then notify the *rsvp/resvconf* event to the MGC based on the ResvConf message it received. The MG may also receive the explicit teardown message PathTear, at that time, the MG deletes the path state that is saved for the session and triggers a *rsvp/teardown* event notification.

When the MGC wants to release the RSVP session (according to the policy decision for the bearer path), the MGC sends the *rsvp/release* signal to the MG via ITU-T H.248 Commands, which triggers the MG to send a RSVP ResvTear message.

6.6.2.2 MG at the sender side

In the case where the MGC and the MG act as a sender of the data flow, the MGC controls the MG in order to maintenance an RSVP session. The MG would then construct the appropriate RSVP messages and send them to the receivers.

The initiation of the RSVP session can be achieved by sending the *rsvp/path* signal to the MG. This would trigger the MG to send out a RSVP Path message, which is used to create the bearer path between the MG and the data flow receivers. The 'Time Value' parameter within this signal indicates the refresh period of the path messages. If there is no update *rsvp/path* or *rsvp/release* signal received for the RSVP session, the MG should resend the path message automatically after every refresh period to maintain the path state on the bearer path.

The MG should be aware of the reception of the other types of RSVP messages. This is achieved by the MGC setting the appropriate events on the MG. When the very first RSVP Resv message is received, the MG creates the reservation state for the session and reports the *rsvp/resvr* event with the relevant parameters to the MGC via the Notify Command. After that, only the update Resv message received by the MG would modify the reservation state of the session and trigger the notification of the *rsvp/resvr* event. An RSVP PathErr message should trigger the notification of the *rsvp/patherr* event to the MGC. The MG may also receive the explicit teardown message ResvTear,

at that time, the MG deletes the reservation state that is saved for the session and triggers a *rsvp/teardown* event notification.

When the MGC wants to stop the data flow, the MGC sends the *rsvp/release* signal to the MG via ITU-T H.248 Commands, which triggers the MG to send an RSVP PathTear message to the receiver.

6.6.2.3 RSVP session state maintenance

RSVP takes a soft state approach for managing the session state along the bearer path. When the MG acts as a sender or a receiver in a RSVP session, the session state (path state and reservation state) is also created and maintained in the MG. This session state is periodically refreshed by the Path and Resv messages, including the duplicated messages and updated messages that carry the same Session ID.

If no matching refresh message arrives before the expiration of a "cleanup timeout" interval, the session state expires. For example, when the MG acts as a sender of the data flow, there is no Resv message received by the MG at the time interval; when the MG acts as a receiver of the data flow, there is no Path message received by the MG at the time interval. In these cases, the related RSVP sessions are expired.

To enable the notification of the state expiration to be sent, the event *rsvp/se* with the *sei* parameter is set by the MGC on the applicable termination. This parameter sets the time period between the last RSVP refresh message received and the generation of the *rsvp/se* event. This timer is reset by any refresh message for the indicated RSVP session. The MG can detect whether the session state has expired based on this timer parameter which specifies the cleanup timeout interval. If the session state expires, the MG should notify the *rsvp/se* event to the MGC.

On receipt of the state expiration event, the MGC makes a resource decision and may then release the related session.

6.6.3 Encapsulation of the authorization token

6.6.3.1 Overview of relevant RSVP-related RFCs

RSVP is a purpose-designed resource reservation control protocol. This Recommendation only considers the aspect of policy control, which is just a small subset capability of the entire RSVP. Figure 1 provides an overview of relevant RSVPs.

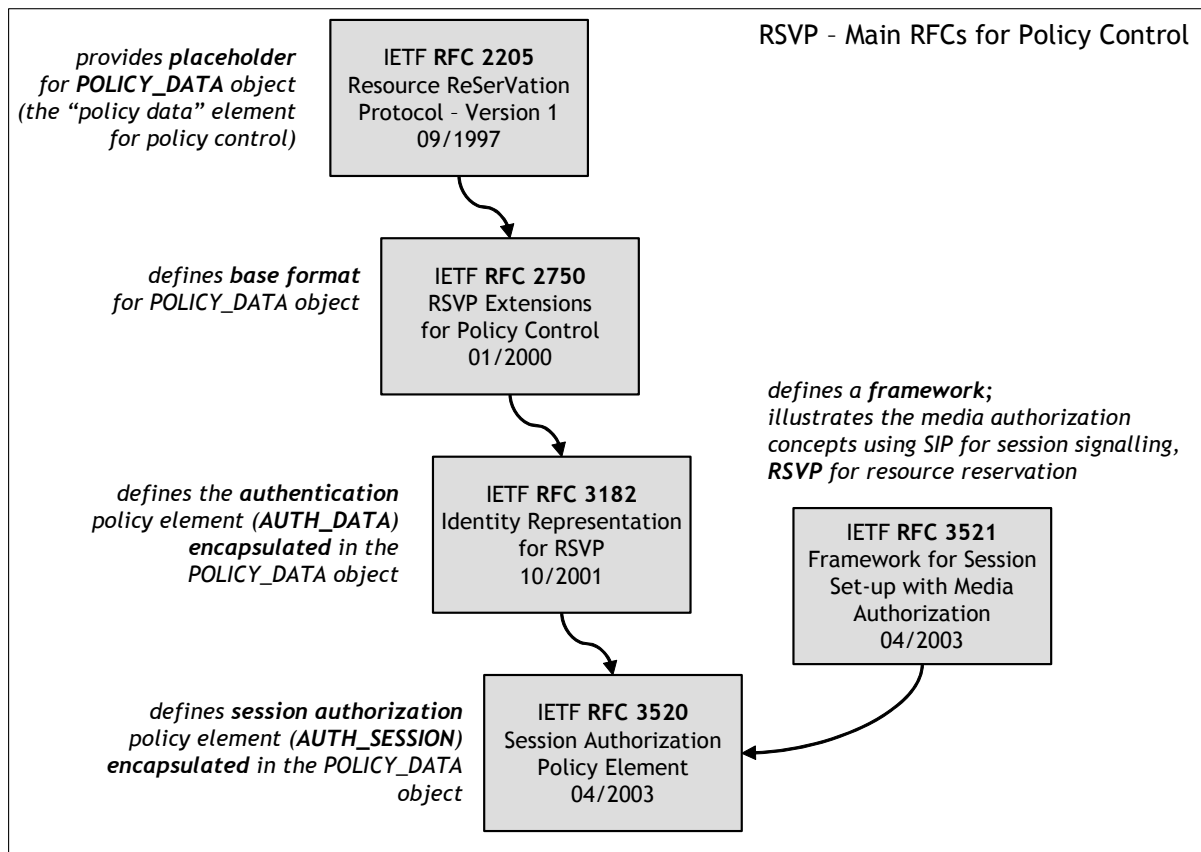


Figure 1 – RSVP – Landscape of important RSVP-related RFCs, relevant for policy control

RSVP messages in general carry a *set of objects*. The POLICY_DATA object is the relevant one from a policy control point of view. This object may contain an authorization token (see clause 3.2.1 in [ITU-T H.248.55]).

6.6.3.2 Encapsulation procedure: forwarding the authorization token from RSVP to ITU-T H.248

The POLICY_DATA object may carry different information elements. The AUTH_DATA element [IETF RFC 3182] and AUTH_SESSION element [IETF RFC 3520] are just two examples; there may also be other types of policy data. However, the specific content shall be transparent for the MG and is thus not relevant in the scope of pull mode packages.

The RSVP POLICY_DATA objects are to be forwarded as is, without any modification. This means that the MG transparently encapsulates the POLICY_DATA object into the ObservedEventsDescriptor parameter *authok* of the *plm* events *rdrr*, *rdrm* and *rdrl*. The particular ITU-T H.248 event depends on the RSVP message type (see next clause).

6.6.4 RSVP message to ITU-T H.248 event mapping

There are seven basic RSVP message types defined by [IETF RFC 2205]. Further RSVP message types are defined by extension specifications. Just four RSVP message types are relevant for *successful* policy control, see Tables 1 and 2.

Table 1 – RSVP message to ITU-T H.248 event mapping when the MG acts as data receiver

RSVP message type	may trigger	H.248.55 event type	H.248.65 event type	Comment
Path	→	<i>plm/rdr</i>	<i>rsvp/pathr</i>	Reservation
Path(update)	→	<i>plm/rdrm</i>	<i>rsvp/pathr</i>	Modification
Resv	–	–	–	Not applicable
PathTear	→	<i>plm/rdrl</i>	<i>rsvp/teardown</i>	Release
ResvTear	–	–	–	Not applicable
PathErr	–	–	–	Not applicable
ResvErr	→	–	<i>rsvp/resvrr</i>	Error
ResvConf	→	–	<i>rsvp/resvconf</i>	Reservation confirmation

Table 2 – RSVP message to ITU-T H.248 event mapping when the MG acts as data sender

RSVP message type	may trigger	H.248.55 event type	H.248.65 event type	Comment
Path	–	–	–	Not applicable
Resv	→	<i>plm/rdr</i>	<i>rsvp/resvr</i>	Reservation
Resv(update)	→	<i>plm/rdrm</i>	<i>rsvp/resvr</i>	Modification
PathTear	–	–	–	Not applicable
ResvTear	→	<i>plm/rdrl</i>	<i>rsvp/teardown</i>	Release
PathErr	→	–	<i>rsvp/patherr</i>	Error
ResvErr	–	–	–	Not applicable
ResvConf	–	–	–	Not applicable

When the MGC and the MG act as a receiver of the data flow, the MG receives Path messages and sends out Resv messages. The first Path message initiating the RSVP session can be considered as a trigger of the reservation. The following refresh Path messages, if they contain updated information, can be treated as a session modification. The PathTear message is the explicit way to tear down the session, it may trigger the *plm/rdrl* event. In this case, Resv and ResvTear messages are sent with the instructions specified by the MGC. They do not trigger any events on the MG. See Table 1 above for the detailed mappings.

When the MGC and the MG act as a sender of the data flow, the MG sends Path messages and receives Resv messages. The first Resv message makes the reservation which may then trigger the *plm/rdr* event. The following refresh Resv messages, if they contain updated information, can be treated as a session modification. The ResvTear message is the explicit way to tear down the session, it may trigger the *plm/rdrl* event. In this case, Path and PathTear messages are sent with the instructions specified by the MGC. They do not trigger any events on the MG. See Table 2 above for the detailed mappings.

6.6.5 ITU-T H.248 reporting of RSVP flow specifications

The RSVP flow specification specifies the desired QoS of the session and it may provide additional information for policy control. This information is always carried in a RSVP Resv message. When the MG acts as a sender of the data flow, the PDP (MGC) may subscribe to the *rsvp/resvr* event. The PEP (MG) shall then report the flow specification when the correspondent RSVP message is carrying a FLOWSPEC object (besides the POLICY_DATA object).

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