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Quality of Service (QoS) Mechanism Selection in the Session Description Protocol (SDP)

Status of This Memo

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Abstract

The offer/answer model for the Session Description Protocol (SDP) assumes that endpoints somehow establish the Quality of Service (QoS) required for the media streams they establish. Endpoints in closed environments typically agree out-of-band (e.g., using configuration information) regarding which QoS mechanism to use. However, on the Internet, there is more than one QoS service available. Consequently, there is a need for a mechanism to negotiate which QoS mechanism to use for a particular media stream. This document defines such a mechanism.

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1. Introduction

The offer/answer model [RFC3264] for SDP [RFC4566] does not provide any mechanism for endpoints to negotiate the QoS mechanism to be used for a particular media stream. Even when QoS preconditions [RFC3312] are used, the choice of the QoS mechanism is left unspecified and is up to the endpoints.

Endpoints that support more than one QoS mechanism need a way to negotiate which one to use for a particular media stream. Examples of QoS mechanisms are RSVP (Resource Reservation Protocol) [RFC2205] and NSIS (Next Steps in Signaling) [QoS-NSLP].

This document defines a mechanism that allows endpoints to negotiate the QoS mechanism to be used for a particular media stream. However, the fact that endpoints agree on a particular QoS mechanism does not imply that that particular mechanism is supported by the network. Discovering which QoS mechanisms are supported at the network layer is out of the scope of this document. In any case, the information the endpoints exchange to negotiate QoS mechanisms, as defined in this document, can be useful for a network operator to resolve a subset of the QoS interoperability problem -- namely, to ensure that a mechanism commonly acceptable to the endpoints is chosen and make it possible to debug potential misconfiguration situations.

2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

3. SDP Attributes Definition

This document defines the 'qos-mech-send' and 'qos-mech-recv' session and media-level SDP [RFC4566] attributes. The following is their Augmented Backus-Naur Form (ABNF) [RFC5234] syntax, which is based on the SDP [RFC4566] grammar:

```
attribute           =/ qos-mech-send-attr
attribute           =/ qos-mech-recv-attr

qos-mech-send-attr  = "qos-mech-send" ":"
                      [[SP] qos-mech *(SP qos-mech)]
qos-mech-recv-attr  = "qos-mech-recv" ":"
                      [[SP] qos-mech *(SP qos-mech)]

qos-mech            = "rsvp" / "nsis" / extension-mech
extension-mech      = token
```

The 'qos-mech' token identifies a QoS mechanism that is supported by the entity generating the session description. A token that appears in a 'qos-mech-send' attribute identifies a QoS mechanism that can be used to reserve resources for traffic sent by the entity generating the session description. A token that appears in a 'qos-mech-recv' attribute identifies a QoS mechanism that can be used to reserve resources for traffic received by the entity generating the session description.

The 'qos-mech-send' and 'qos-mech-recv' attributes are not interdependent; one can be used without the other.

The following is an example of an 'm' line with 'qos-mech-send' and 'qos-mech-recv' attributes:

```
m=audio 50000 RTP/AVP 0
a=qos-mech-send: rsvp nsis
a=qos-mech-recv: rsvp nsis
```

4. Offer/Answer Behavior

Through the use of the 'qos-mech-send' and 'qos-mech-recv' attributes, an offer/answer exchange allows endpoints to come up with a list of common QoS mechanisms sorted by preference. However, note that endpoints negotiate in which direction QoS is needed using other mechanisms, such as preconditions [RFC3312]. Endpoints may also use other mechanisms to negotiate, if needed, the parameters to use with a given QoS mechanism (e.g., bandwidth to be reserved).

4.1. Offerer Behavior

Offerers include a 'qos-mech-send' attribute with the tokens corresponding to the QoS mechanisms (in order of preference) that are supported in the send direction. Similarly, offerers include a 'qos-mech-recv' attribute with the tokens corresponding to the QoS mechanisms (in order of preference) that are supported in the receive direction.

4.2. Answerer Behavior

On receiving an offer with a set of tokens in a 'qos-mech-send' attribute, the answerer takes those tokens corresponding to QoS mechanisms that it supports in the receive direction and includes them, in order of preference, in a 'qos-mech-recv' attribute in the answer. On receiving an offer with a set of tokens in a 'qos-mech-recv' attribute, the answerer takes those tokens corresponding to QoS mechanisms that it supports in the send direction and includes them, in order of preference, in a 'qos-mech-send' attribute in the answer.

When ordering the tokens in a 'qos-mech-send' or a 'qos-mech-recv' attribute by preference, the answerer may take into account its own preferences and those expressed in the offer. However, the exact algorithm to be used to order such token lists is outside the scope of this specification.

Note that if the answerer does not have any QoS mechanism in common with the offerer, it will return empty 'qos-mech-send' and 'qos-mech-recv' attributes.

4.3. Resource Reservation

Once the offer/answer exchange completes, both offerer and answerer use the token lists in the 'qos-mech-send' and 'qos-mech-recv' attributes of the answer to perform resource reservations. Offerers and answerers SHOULD attempt to use the QoS mechanism with highest priority in each direction first. If an endpoint (the offerer or the answerer) does not succeed in using the mechanism with highest priority in a given direction, it SHOULD attempt to use the next QoS mechanism in order of priority in that direction, and so on.

If an endpoint unsuccessfully tries all the common QoS mechanisms for a given direction, the endpoint MAY attempt to use additional QoS mechanisms not supported by the remote endpoint. This is because there may be network entities out of the endpoint's control (e.g., an RSVP proxy) that make those mechanisms work.

4.4. Subsequent Offer/Answer Exchanges

If, during an established session for which the QoS mechanism to be used for a given direction was agreed upon using the mechanism defined in this specification, an endpoint receives a subsequent offer that does not contain the QoS selection attribute corresponding to that direction (i.e., the 'qos-mech-send' or 'qos-mech-recv' attribute is missing), the endpoints SHOULD continue using the same QoS mechanism used up to that moment.

5. Example

The following is an offer/answer exchange between two endpoints using the 'qos-mech-send' and 'qos-mech-recv' attributes. Parts of the session descriptions are omitted for clarity purposes.

The offerer generates the following session description, listing both RSVP and NSIS for both directions. The offerer would prefer to use RSVP and, thus, includes it before NSIS.

```
m=audio 50000 RTP/AVP 0
a=qos-mech-send: rsvp nsis
a=qos-mech-recv: rsvp nsis
```

The answerer supports NSIS in both directions, but not RSVP. Consequently, it returns the following session description:

```
m=audio 55000 RTP/AVP 0
a=qos-mech-send: nsis
a=qos-mech-recv: nsis
```

6. IANA Considerations

This specification registers two new SDP attributes and creates a new registry for QoS mechanisms.

6.1. Registration of the SDP 'qos-mech-send' Attribute

IANA has registered the following SDP att-field under the Session Description Protocol (SDP) Parameters registry:

Contact name: Gonzalo.Camarillo@ericsson.com

Attribute name: qos-mech-send

Long-form attribute name: QoS Mechanism for the Send Direction

Type of attribute: Session and Media levels

Subject to charset: No

Purpose of attribute: To list QoS mechanisms supported in the send direction

Allowed attribute values: IANA Registered Tokens

6.2. Registration of the SDP 'qos-mech-recv' Attribute

IANA has registered the following SDP att-field under the Session Description Protocol (SDP) Parameters registry:

Contact name: Gonzalo.Camarillo@ericsson.com

Attribute name: qos-mech-recv

Long-form attribute name: QoS Mechanism for the Receive Direction

Type of attribute: Session and Media levels

Subject to charset: No

Purpose of attribute: To list QoS mechanisms supported in the receive direction

Allowed attribute values: IANA Registered Tokens

6.3. Registry for QoS Mechanism Tokens

The IANA has created a subregistry for QoS mechanism token values to be used in the 'qos-mech-send' and 'qos-mech-recv' attributes under the Session Description Protocol (SDP) Parameters registry. The initial values for the subregistry are as follows:

QoS Mechanism	Reference
rsvp	RFC 5432
nsis	RFC 5432

As per the terminology in [RFC5226], the registration policy for new QoS mechanism token values shall be 'Specification Required'.

7. Security Considerations

An attacker may attempt to add, modify, or remove 'qos-mech-send' and 'qos-mech-recv' attributes from a session description. This could result in an application behaving in a non-desirable way. For example, the endpoints under attack may not be able to find a common QoS mechanism to use.

Consequently, it is strongly RECOMMENDED that integrity and authenticity protection be applied to SDP session descriptions carrying these attributes. For session descriptions carried in SIP [RFC3261], S/MIME [RFC3851] is the natural choice to provide such end-to-end integrity protection, as described in [RFC3261]. Other applications MAY use a different form of integrity protection.

8. Acknowledgements

Dave Oran helped form this effort. Flemming Andreasen and Magnus Westerlund provided useful comments on this specification.

9. References

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