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A Framework for SDP Attributes when Multiplexing
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Abstract

The Session Description Protocol (SDP) provides mechanisms to describe attributes of multimedia sessions and of individual media streams (e.g., Real-time Transport Protocol (RTP) sessions) within a multimedia session. In the RTCWEB WG, there is a need to use a single 5-tuple for sending and receiving media associated with multiple media descriptions ("m=" lines). Such a requirement has raised concerns over the semantic implications of the SDP attributes associated with the RTP Media Streams multiplexed over a single underlying transport layer flow.

The scope of this specification is to provide a framework for analyzing the multiplexing characteristics of SDP attributes. This specification also categorizes the existing SDP attributes based on the framework described herein.

Status of This Memo

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1. Introduction

Real-Time Communication in WEB-browsers (Rtcweb) framework requires Real-time Transport Protocol (RTP) as the media transport protocol and Session Description Protocol (SDP) [RFC4566] for describing and negotiating multi-media communication sessions.

SDP defines several attributes for capturing characteristics that apply to the individual media descriptions (described by "m=" lines") and the overall multimedia session. Typically different media types (audio, video etc) described using different media descriptions represent separate RTP Sessions that are carried over individual transport layer flows. However in the IETF RTCWEB WG, a need to use a single 5-tuple for sending and receiving media associated with multiple SDP media descriptions ("m=" lines) has been identified. This would for e.g. allow the usage of a single set of Interactive Connectivity Establishment (ICE) [RFC5245] candidates for multiple media descriptions. This in turn has made necessary to understand the interpretation and usage of the SDP attributes defined for the multiplexed media descriptions.

Given the number of SDP attributes registered with the [IANA] and possibility of new attributes being defined in the future, there is

need for generic future-proof framework to analyze these attributes for their applicability in the transport multiplexing use-cases.

The document starts with providing the motivation for requiring such a framework. This is followed by introduction to the SDP attribute analysis framework/procedures, following which several sections applies the framework to the SDP attributes registered with the [IANA].

2. Terminology

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

3. Motivation

The time and complications of setting up ICE [RFC5245] and DTLS-SRTP [RFC5763] transports for use by RTP, and conservation of ports, forms an requirement to try and reduce the number of transport level flows needed. This has resulted in the definition of ways, such as, [I-D.ietf-mmusic-sdp-bundle-negotiation] to multiplex RTP over a single transport flow in order to preserve network resources such as port numbers. This imposes further restrictions on applicability of these SDP attributes as they are defined today.

The specific problem is that there are attribute combinations which make sense when specified on independent "m= " lines -- as with classical SDP -- that do not make sense when those "m=" lines are then multiplexed over the same transport. To give an obvious example, ICE permits each "m=" line to have an independently specified ice-ufrag attribute. However, if the media from multiple "m=" lines is multiplexed over the same ICE component, then the meaning of media-level ice-ufrag attributes becomes muddled.

As of today there are close to 250 SDP attributes registered with the [IANA] and more will be added in the future. There is no clearly defined procedure to establish the validity/applicability of these attribute when used with transport multiplexing.

4. SDP Attribute Analysis Framework

Attributes in an SDP session description can be defined at the session-level and media-level. These attributes could be semantically grouped as noted below.

- Attributes related to media content such as media type, encoding schemes, payload types.

- Attributes specifying media transport characteristics like RTP/RTCP port numbers, network addresses, QOS.
- Metadata description attributes capturing session timing and origin information.
- Attributes establishing relationships between media streams such as grouping framework

With the above semantic grouping as a reference, the proposed framework classifies each attribute into one of the following categories:

4.1. Category: NORMAL

Attributes that can be independently specified when multiplexing and retain their original semantics.

In the example given below, the direction and label attributes are independently specified for audio and video m=lines. These attributes are not impacted by multiplexing these media streams over a single transport layer flow.

```
v=0
o=alice 2890844526 2890844527 IN IP4 host.atlanta.example.com
s=
c=IN IP4 host.atlanta.example.com
t=0 0
m=audio 49172 RTP/AVP 99
a=sendonly
a=label:1
a=rtpmap:99 iLBC/8000
m=video 49172 RTP/AVP 31
a=recvonly
a=label:2
a=rtpmap:31 H261/90000
```

4.2. Category: NOT RECOMMENDED

Attributes that are recommended against multiplexing since their usage under multiplexing might lead to incorrect behavior.

Example: Multiplexing media descriptions having attribute zrtp-hash defined with the media descriptions lacking it, would either complicate the handling of multiplexed streams or might fail multiplexing altogether.

```
v=0
o=bob 2890844527 2890844527 IN IP4 client.biloxi.example.com
s=
c=IN IP4 client.biloxi.example.com
t=0 0
m=audio 3456 RTP/AVP 97 // with zrtp
a=rtpmap:97 iLBC/8000
<allOneLine>
a=zrtp-hash:1.10 fe30efd02423cb054e50efd0248742ac7a52c8f91bc2
df881ae642c371ba46df
</allOneLine>
m=video 34567 RTP/AVP 31 //without zrtp
a=rtpmap:31 H261/90000
```

4.3. Category: IDENTICAL

Attributes that MUST be identical across all the media descriptions being multiplexed.

Attributes such as rtcp-mux fall into this category. Since RTCP reporting is done per RTP Session, RTCP Multiplexing MUST be enabled for both the audio and video m=lines if they are transported over a single 5-tuple.

```
v=0
o=bob 2890844527 2890844527 IN IP4 client.biloxi.example.com
s=
c=IN IP4 client.biloxi.example.com
t=0 0
m=audio 34567 RTP/AVP 97
a=rtcp-mux
m=video 34567 RTP/AVP 31
a=rtpmap:31 H261/90000
a=rtcp-mux
```

4.4. Category: SUM

Attributes can be set as they are normally used but software using them in the multiplexing scenario, MUST apply the sum of all the attributes being multiplexed instead of trying to use them independently. This is typically used for bandwidth or other rate limiting attributes to the underlying transport.

The software parsing the SDP sample below, should use the aggregate Application Specific (AS) bandwidth value from the individual media descriptions to determine the AS value for the multiplexed session. Thus the calculated AS value would be 256+64 bytes for the given example.

```
v=0
o=test 2890844526 2890842807 IN IP4 126.16.64.4
c=IN IP4 client.biloxi.example.com
t=0 0
m=audio 49170 RTP/AVP 0
b=AS:64
m=video 51372 RTP/AVP 31
b=AS:256
```

4.5. Category: TRANSPORT

Attributes that can be set normally for multiple items in a multiplexed group but the software MUST pick just one of the attribute of the given type for use. The one chosen is the attribute associated with the "m=" line that represents the information being used for the transport of the RTP.

In the example below, "a=crypto" attribute is defined for both the audio and the video m=lines. The video media line's a=crypto attribute is chosen since its mid value (bar) appears first in the a=group:BUNDLE line. This is due to BUNDLE grouping semantic [I-D.ietf-mmusic-sdp-bundle-negotiation] which mandates the values from m=line corresponding to the mid appearing first on the a=group:BUNDLE line to be considered for setting up the RTP Transport.

```
v=0
o=alice 2890844526 2890844527 IN IP4 host.atlanta.example.com
s=
c=IN IP4 host.atlanta.example.com
t=0 0
a=group:BUNDLE bar foo
m=audio 49172 RTP/AVP 99
a=mid:foo
a=crypto:1 AES_CM_128_HMAC_SHA1_80
  inline:d0RmdmcmVCspeEc3QGZiNWpVLFJhQX1cfHAwJSoj|2^20|1:32
a=rtpmap:99 iLBC/8000
m=video 51374 RTP/AVP 31
a=mid:bar
a=crypto:1 AES_CM_128_HMAC_SHA1_80
  inline:EcGZiNWpFJhQXdspcl1ekcmVCNWpVLcfHAwJSoj|2^20|1:32
a=rtpmap:96 H261/90000
```

4.6. Category: INHERIT

Attributes that encapsulate other SDP attributes or parameters. These attributes inherit their multiplexing characteristics from the attributes or parameters they encapsulate. Such attributes as of today, are defined in [RFC3407], [RFC5939] and [RFC6871] as part of a generic framework for indicating and negotiating transport, media and media format related capabilities in the SDP.

The inheritance manifests itself when the encapsulated attribute or parameter is being leveraged. In the case of SDP Capability Negotiation [RFC5939] for example, this occurs when a capability (encapsulating attribute) is used as part of a configuration; the configuration inherits the multiplexing category of each of its constituent (encapsulated) attributes and parameters. This in turn may place constraints on what constitutes a valid configuration from a multiplexing point of view, e.g. because some attributes must be IDENTICAL (see Section 14 for further details).

```
v=0
o=alice 2890844526 2890844527 IN IP4 host.atlanta.example.com
s=
c=IN IP4 host.atlanta.example.com
t=0 0
m=video 3456 RTP/AVP 100
a=rtpmap:100 VP8/90000
a=fmtp:100 max-fr=30;max-fs=8040
a=sqn: 0
a=cdsc: 1 video RTP/AVP 100
a=cpar: a=rtcp-mux
m=video 3456 RTP/AVP 101
a=rtpmap:101 VP8/90000
a=fmtp:100 max-fr=15;max-fs=1200
a=cdsc: 2 video RTP/AVP 101
a=cpar: a=rtcp-mux
```

In the above example , the category IDENTICAL is inherited for the cpar encapsulated rtcp-mux attribute.

4.7. Category: IDENTICAL-PER-PT

Attributes that define the RTP payload configuration on per Payload Type basis and MUST have identical values across all the media descriptions for a given RTP Payload Type when repeated. These Payload Types identify the same codec configuration as defined in the Section 10.1.2 of [I-D.ietf-mmusic-sdp-bundle-negotiation] under this context.

In the SDP example below, Payload Types 96 and 97 are repeated across all the video m= lines and all the payload specific parameters (ex: rtpmap, fmtp) are identical.

```
v=0
o=alice 2890844526 2890844527 IN IP4 host.atlanta.example.com
s=
c=IN IP4 host.atlanta.example.com
t=0 0
a=group:BUNDLE cam1, cam2
m = video 96 97
a=mid:cam1
a=rtpmap:96 H264/90000
a=fmtp:96 profile-level-id=42400d; max-fs=3600; max-fps=3000;
max-mbps=108000; max-br=1000
a=rtpmap:97 H264/90000
a=fmtp:97 profile-level-id=42400a; max-fs=240; max-fps=3000;
max-mbps=7200; max-br=200
m = video  96 97
a=mid:cam2
a=rtpmap:96 H264/90000
a=fmtp:96 profile-level-id=42400d; max-fs=3600; max-fps=3000;
max-mbps=108000; max-br=1000
a=rtpmap:97 H264/90000
a=fmtp:97 profile-level-id=42400a; max-fs=240; max-fps=3000;
max-mbps=7200; max-br=200
```

4.8. Category: SPECIAL

Attributes where the text in the source draft must be consulted for further handling when multiplexed.

As an example, for the attribute extmap, the specification defining the extension MUST be referred to understand the multiplexing implications.

4.9. Category: TBD

Attributes that have not been analyzed under the proposed multiplexing framework yet. For the purposes of implementations it is advised to consider "NOT RECOMMENDED" as the category when multiplexing these attributes.

5. Analysis of Existing Attributes

This section analyzes attributes listed in [IANA], grouped under the IETF document that defines them.

The "Level" column indicates whether the attribute is currently specified as:

- S -- Session level
- M -- Media level
- B -- Both
- SR -- Source-level (for a single SSRC)

The "Mux Category" column identifies multiplexing category assigned per attribute and the "Notes" column captures additional informative details regarding the assigned category, wherever necessary.

5.1. RFC4566 - SDP: Session Description Protocol

[RFC4566] defines the Session Description Protocol (SDP) that is intended for describing multimedia sessions for the purposes of session announcement, session invitation, and other forms of multimedia session initiation.

Attr Name	Notes	Level	Mux Category
sendrecv	Not impacted	B	NORMAL
sendonly	Not impacted	B	NORMAL
recvonly	Not impacted	B	NORMAL
inactive	Not impacted	B	NORMAL
cat	Not impacted	S	NORMAL
ptime	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT
maxptime	The attribute value must be same for a given codec	M	IDENTICAL-PER-PT

	configuration		
orient	Not Impacted	M	NORMAL
framerate	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT
quality	Not Impacted	M	NORMAL
rtpmap	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT
fmtp	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT
keywds	Not impacted	S	NORMAL
type	Not Impacted	S	NORMAL
type:broadcast	Not Impacted	S	NORMAL
type:H332	Not Impacted	S	NORMAL
type:meeting	Not Impacted	S	NORMAL
type:moderated	Not Impacted	S	NORMAL
type:test	Not Impacted	S	NORMAL
tool	Not Impacted	S	NORMAL
charset	Not Impacted	S	NORMAL
sdplang	Not Impacted	B	NORMAL
lang	Not Impacted	B	NORMAL

RFC4566 Attribute Analysis

5.2. RFC4585 - RTP/AVPF

[RFC4585] defines an extension to the Audio-visual Profile (AVP) that enables receivers to provide, statistically, more immediate feedback to the senders and thus allows for short-term adaptation and efficient feedback-based repair mechanisms to be implemented.

Attr Name	Notes	Level	Mux Category
rtcp-fb	Since RTCP feedback attributes are Payload Type (PT) scoped, their values MUST be identical for a given PT across the multiplexed m=lines.	M	IDENTICAL-PER-PT

RFC4585 Attribute Analysis

5.3. RFC5761 - Multiplexing RTP and RTCP

[RFC5761] discusses issues that arise when multiplexing RTP data packets and RTP Control Protocol (RTCP) packets on a single UDP port. It describes when such multiplexing is and is not appropriate, and it explains how the Session Description Protocol (SDP) can be used to signal multiplexed sessions.

Name	Notes	Level	Mux Category
rtcp-mux	RTP and RTCP Multiplexing affects the entire RTP Session	M	IDENTICAL

RFC5761 Attribute Analysis

5.4. RFC3312 - Integration of Resource Management and (SIP)

[RFC3312] defines a generic framework for preconditions, which are extensible through IANA registration. This document also discusses how network quality of service can be made a precondition for establishment of sessions initiated by the Session Initiation

Protocol (SIP). These preconditions require that the participant reserve network resources before continuing with the session.

Name	Notes	Level	Mux Category
des	Refer to notes below	M	NOT RECOMMENDED
conf	Refer to notes below	M	NOT RECOMMENDED
curr	Refer to notes below	M	NOT RECOMMENDED

RFC3312 Attribute Analysis

A mismatched set of preconditions across media descriptions results in Session establishment failures due to inability in meeting the right resource reservations requested.

5.5. RFC4574 - SDP Label Attribute

[RFC4574] defines a new Session Description Protocol (SDP) media-level attribute: "label". The "label" attribute carries a pointer to a media stream in the context of an arbitrary network application that uses SDP. The sender of the SDP document can attach the "label" attribute to a particular media stream or streams. The application can then use the provided pointer to refer to each particular media stream in its context.

Name	Notes	Level	Mux Category
label	Not Impacted	M	NORMAL

RFC4574 Attribute Analysis

5.6. RFC5432 - QoS Mechanism Selection in SDP

[RFC5432] defines procedures to negotiate QOS mechanisms using the Session Description Protocol (SDP) offer/answer model.

Name	Notes	Level	Mux Category
qos-mech-send	Refer to notes below	B	NORMAL
qos-mech-recv	Refer to notes below.	B	NORMAL

RFC5432 Attribute Analysis

A single DSCP code point per flow being multiplexed doesn't impact multiplexing since QOS mechanisms are signaled/scoped per flow. For scenarios that involves having different DSCP code points for packets being transmitted over the same 5-tuple, issues as discussed in [I.D-draft-ietf-dart-dscp-rtp] needs to be taken into consideration.

5.7. RFC4568 - SDP Security Descriptions

[RFC4568] defines a Session Description Protocol (SDP) cryptographic attribute for unicast media streams. The attribute describes a cryptographic key and other parameters that serve to configure security for a unicast media stream in either a single message or a roundtrip exchange.

Name	Notes	Level	Mux Category
crypto	crypto attribute must be the one that corresponds to the "m=" line chosen for setting up the underlying transport flow	M	TRANSPORT

RFC4568 Attribute Analysis

5.8. RFC5762 - RTP over DCCP

The Real-time Transport Protocol (RTP) is a widely used transport for real-time multimedia on IP networks. The Datagram Congestion Control Protocol (DCCP) is a transport protocol that provides desirable services for real-time applications. [RFC5762] specifies a mapping of RTP onto DCCP, along with associated signaling, such that real-time applications can make use of the services provided by DCCP.

Name	Notes	Current	Mux Category
dccp-service-code	If RFC6773 is not being used in addition to RFC5762, the port in the "m=" line is a DCCP port. DCCP being a connection oriented protocol, does not allow multiple connections on the same 5-tuple.	M	NOT RECOMMENDED

RFC5762 Attribute Analysis

If RFC6773 is being used in addition to RFC5762 and provided that DCCP-in-UDP layer has additional demultiplexing, then it may be possible to use different DCCP service codes for each DCCP flow, given each uses a different DCCP port. Although doing so might conflict with the media type of the "m=" line. None of this is standardized yet and it wouldn’t work as explained. Hence multiplexing MUST NOT be performed even in this alternate scenario.

5.9. RFC6773 - DCCP-UDP Encapsulation

[RFC6773] document specifies an alternative encapsulation of the Datagram Congestion Control Protocol (DCCP), referred to as DCCP-UDP. This encapsulation allows DCCP to be carried through the current generation of Network Address Translation (NAT) middle boxes without modification of those middle boxes.

Name	Notes	Level	Mux Category
dccp-port	Multiplexing MUST NOT be performed due to potential conflict between the port used for DCCP en/decapsulation and the RTP.	M	NOT RECOMMENDED

RFC6773 Attribute Analysis

Since RFC6773 is about tunneling DCCP in UDP, with the UDP port being the port of the DCCP en-/de-capsulation service. This encapsulation allows arbitrary DCCP packets to be encapsulated and the DCCP port chosen MAY conflict with the port chosen for the RTP traffic.

For multiplexing several DCCP-in-UDP encapsulations on the same UDP port, with no RTP traffic on the same port implies collapsing several DCCP port spaces together. This MAY or MAY NOT work depending on the nature of DCCP encapsulations and ports choses thus rendering it to be very application dependent.

5.10. RFC5506 - Reduced-Size RTCP in RTP Profile

[RFC5506] discusses benefits and issues that arise when allowing Real-time Transport Protocol (RTCP) packets to be transmitted with reduced size.

Name	Notes	Level	Mux Category
rtcp-rsize	Reduced size RTCP affects the entire RTP Session	M	IDENTICAL

RFC5506 Attribute Analysis

5.11. RFC6787 - Media Resource Control Protocol Version 2

The Media Resource Control Protocol Version 2 (MRCPv2) allows client hosts to control media service resources such as speech synthesizers, recognizers, verifiers, and identifiers residing in servers on the network. MRCPv2 is not a "stand-alone" protocol -- it relies on other protocols, such as the Session Initiation Protocol (SIP), to coordinate MRCPv2 clients and servers and manage sessions between them, and the Session Description Protocol (SDP) to describe, discover, and exchange capabilities. It also depends on SIP and SDP to establish the media sessions and associated parameters between the media source or sink and the media server. Once this is done, the MRCPv2 exchange operates over the control session established above, allowing the client to control the media processing resources on the speech resource server. [RFC6787] defines attributes for this purpose.

Name	Notes	Level	Mux Category
resource	Not Impacted	M	NORMAL
channel	Not Impacted	M	NORMAL
cmid	Not Impacted	M	NORMAL

RFC6787 Attribute Analysis

5.12. RFC5245 - Interactive Connectivity Establishment (ICE)

[RFC5245] describes a protocol for Network Address Translator(NAT) traversal for UDP-based multimedia sessions established with the offer/answer model. This protocol is called Interactive Connectivity Establishment (ICE). ICE makes use of the Session Traversal Utilities for NAT (STUN) protocol and its extension,Traversal Using Relay NAT (TURN). ICE can be used by any protocol utilizing the offer/answer model, such as the Session Initiation Protocol (SIP).

Name	Notes	Level	Mux Category
ice-lite	Not Impacted	S	NORMAL
ice-options	Not Impacted	S	NORMAL
ice-mismatch	Not Impacted	S	NORMAL
ice-pwd	ice-pwd MUST be the one that corresponds to the m=line chosen for setting up the underlying transport flow	B	TRANSPORT
ice-ufrag	ice-ufrag MUST be the one that corresponds to the m=line chosen for setting up the underlying transport flow	B	TRANSPORT
candidate	ice candidate MUST be the one that corresponds to the m=line chosen for setting up the underlying transport flow	M	TRANSPORT
remote-candidates	ice remote candidate MUST be the one that corresponds to the m=line chosen for setting up the underlying transport flow	M	TRANSPORT

RFC5245 Attribute Analysis

5.13. RFC5285 - RTP Header Extensions

[RFC5285] provides a general mechanism to use the header extension feature of RTP (the Real-Time Transport Protocol). It provides the option to use a small number of small extensions in each RTP packet, where the universe of possible extensions is large and registration is de-centralized. The actual extensions in use in a session are signaled in the setup information for that session.

Name	Notes	Level	Mux Category
extmap	Specific RTP extension document MUST be referred	B	SPECIAL

RFC5285 Attribute Analysis

5.14. RFC3605 - RTCP attribute in SDP

Originally, SDP assumed that RTP and RTCP were carried on consecutive ports. However, this is not always true when NATs are involved. [RFC3605] specifies an early mechanism to indicate the RTCP port.

Name	Notes	Level	Mux Category
rtcp	Identical attribute value MUST be used since the RTCP port affects the entire RTP session.	M	IDENTICAL

RFC3605 Attribute Analysis

5.15. RFC5576 - Source-Specific SDP Attributes

[RFC5576] defines a mechanism to describe RTP media sources, which are identified by their synchronization source (SSRC) identifiers, in SDP, to associate attributes with these sources, and to express relationships among sources. It also defines several source-level attributes that can be used to describe properties of media sources.

Name	Notes	Level	Mux Category
ssrc	Refer to Notes below	M	NORMAL
ssrc-group	Refer to section Section 9 for specific analysis of the grouping semantics	M	NORMAL
cname	Not Impacted	SR	NORMAL
previous-ssrc	Refer to notes below	SR	NORMAL
fmtp	The attribute value must be same for a given codec configuration	SR	IDENTICAL-PER-PT

RFC5576 Attribute Analysis

If SSRCs are repeated across m=lines being multiplexed, they MUST all represent the same underlying RTP Source.

5.16. RFC7273 - RTP Clock Source Signalling

[RFC7273] specifies Session Description Protocol (SDP) signalling that identifies timestamp reference clock sources and SDP signalling that identifies the media clock sources in a multimedia session.

Name	Notes	Level	Mux Category
ts-refclk	Not Impacted	B	NORMAL
mediaclk	Not Impacted	B	NORMAL

RFC7273 Attribute Analysis

5.17. RFC6236 - Image Attributes in SDP

[RFC6236] proposes a new generic session setup attribute to make it possible to negotiate different image attributes such as image size. A possible use case is to make it possible for a low-end hand-held terminal to display video without the need to rescale the image,something that may consume large amounts of memory and processing power. The document also helps to maintain an optimal bitrate for video as only the image size that is desired by the receiver is transmitted.

Name	Notes	Level	Mux Category
imageattr	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT

RFC6236 Attribute Analysis

5.18. RFC7197 - Duplication Delay Attribute in SDP

[RFC7197] defines an attribute to indicate the presence of temporally redundant media streams and the duplication delay in the Session Description Protocol.

Name	Notes	Level	Mux Category
duplication-delay	Not Impacted	B	NORMAL

RFC7197 Attribute Analysis

5.19. RFC7266 - RTCP XR Blocks for MOS Metric Reporting

[RFC7266] defines an RTP Control Protocol (RTCP) Extended Report (XR) Block including two new segment types and associated Session Description Protocol (SDP) parameters that allow the reporting of mean opinion score (MOS) Metrics for use in a range of RTP applications.

Name	Notes	Level	Mux Category
calgextmap	Not Impacted	B	NORMAL

RFC7266 Attribute Analysis

5.20. RFC6285 - Rapid Acquisition of Multicast RTP Sessions

[RFC6285] describes a method using the existing RTP and RTP Control Protocol (RTCP) machinery that reduces the acquisition delay. In this method, an auxiliary unicast RTP session carrying the Reference Information to the receiver precedes or accompanies the multicast stream. This unicast RTP flow can be transmitted at a faster than natural bitrate to further accelerate the acquisition. The motivating use case for this capability is multicast applications that carry real-time compressed audio and video.

Name	Notes	Level	Mux Category
rams-updates	Not recommended	M	NOT RECOMMENDED

RFC6285 Attribute Analysis

5.21. RFC6230 - Media Control Channel Framework

[RFC6230] describes a framework and protocol for application deployment where the application programming logic and media processing are distributed. This implies that application programming logic can seamlessly gain access to appropriate resources that are not co-located on the same physical network entity. The framework uses the Session Initiation Protocol (SIP) to establish an application-level control mechanism between application servers and associated external servers such as media servers.

Name	Notes	Level	Mux Category
cfw-id	Not Applicable	M	NORMAL

RFC6230 Attribute Analysis

5.22. RFC6364 - SDP Elements for FEC Framework

[RFC6364] specifies the use of the Session Description Protocol (SDP) to describe the parameters required to signal the Forward Error Correction (FEC) Framework Configuration Information between the sender(s) and receiver(s). This document also provides examples that show the semantics for grouping multiple source and repair flows together for the applications that simultaneously use multiple instances of the FEC Framework.

Name	Notes	Level	Mux Category
fec-source-flow	Specific FEC scheme document needs to be referred	M	SPECIAL
fec-repair-flow	Specific FEC scheme document needs to be referred	M	SPECIAL
repair-window	Specific FEC scheme document needs to be referred	M	SPECIAL

RFC6364 Attribute Analysis

5.23. RFC4796 - Content Attribute

[RFC4796] defines a new Session Description Protocol (SDP) media-level attribute, 'content'. The 'content' attribute defines the content of the media stream to a more detailed level than the media description line. The sender of an SDP session description can attach the 'content' attribute to one or more media streams. The receiving application can then treat each media stream differently (e.g., show it on a big or small screen) based on its content.

Name	Notes	Level	Mux Category
content	Not Impacted	M	NORMAL

RFC4796 Attribute Analysis

5.24. RFC3407 - SDP Simple Capability Declaration

[RFC3407] defines a set of Session Description Protocol (SDP) attributes that enables SDP to provide a minimal and backwards compatible capability declaration mechanism.

Name	Notes	Level	Mux Category
sqn	Not Impacted	B	NORMAL
cdsc	Not Impacted.	B	NORMAL
cpar	Refer to Section 14	B	INHERIT
cparmin	Refer to notes below	B	SPECIAL
cparmax	Refer to notes below	B	SPECIAL

RFC3407 Attribute Analysis

Since the attributes (a=cparmin and a=cparmax) define minimum and maximum numerical values associated with the attributes described in a=cpar, it is recommended to consult the document defining the attribute.

5.25. RFC6284 - Port Mapping between Unicast and Multicast RTP Sessions

[RFC6284] presents a port mapping solution that allows RTP receivers to choose their own ports for an auxiliary unicast session in RTP applications using both unicast and multicast services. The solution provides protection against denial-of-service or packet amplification attacks that could be used to cause one or more RTP packets to be sent to a victim client.

Name	Notes	Level	Mux Category
portmapping-req	Not recommended, if port mapping is required by the application	M	NOT RECOMMENDED

RFC6284 Attribute Analysis

5.26. RFC6714 - MSRP-CEMA

[RFC6714] defines a Message Session Relay Protocol (MSRP) extension, Connection Establishment for Media Anchoring (CEMA). Support of this extension is OPTIONAL. The extension allows middle boxes to anchor the MSRP connection, without the need for middle boxes to modify the MSRP messages; thus, it also enables secure end-to-end MSRP communication in networks where such middle boxes are deployed. This document also defines a Session Description Protocol (SDP) attribute, 'msrp-cema', that MSRP endpoints use to indicate support of the CEMA extension.

Name	Notes	Level	Mux Category
msrp-cema	Not Impacted	M	NORMAL

RFC6714 Attribute Analysis

5.27. RFC4583 - SDP Format for BFCP Streams

[RFC4583] document specifies how to describe Binary Floor Control Protocol (BFCP) streams in Session Description Protocol (SDP) descriptions. User agents using the offer/answer model to establish BFCP streams use this format in their offers and answers.

Name	Notes	Level	Mux Category
floorctrl	Must be repeated across all the multiplexed m=lines	M	IDENTICAL
confid	Not Impacted	M	NORMAL
userid	Not Impacted	M	NORMAL
floorid	The floorid MUST be globally unique	M	NORMAL

RFC4583 Attribute Analysis

5.28. RFC5547 - SDP Offer/Answer for File Transfer

[RFC5547] provides a mechanism to negotiate the transfer of one or more files between two endpoints by using the Session Description Protocol (SDP) offer/answer model specified in [RFC3264].

Name	Notes	Level	Mux Category
file-selector	Not Impacted	M	NORMAL
file-transfer-id	Not Impacted	M	NORMAL
file-disposition	Not Impacted	M	NORMAL
file-date	Not Impacted	M	NORMAL
file-iconfile-range	Not Impacted	M	NORMAL

RFC5547 Attribute Analysis

5.29. RFC6849 - SDP and RTP Media Loopback Extension

[RFC6849] adds new SDP media types and attributes, which enable establishment of media sessions where the media is looped back to the transmitter. Such media sessions will serve as monitoring and troubleshooting tools by providing the means for measurement of more advanced VoIP, Real-time Text and Video over IP performance metrics.

Name	Notes	Level	Mux Category
loopback rtp-pkt-loopback	Not Impacted	M	NORMAL
loopback rtp-media-loopback	Not Impacted	M	NORMAL
loopback-source	Not Impacted	M	NORMAL
loopback-mirror	Not Impacted	M	NORMAL

RFC6849 Analysis

5.30. RFC5760 - RTCP with Unicast Feedback

[RFC5760] specifies an extension to the Real-time Transport Control Protocol (RTCP) to use unicast feedback to a multicast sender. The proposed extension is useful for single-source multicast sessions such as Source-Specific Multicast (SSM) communication where the traditional model of many-to-many group communication is either not available or not desired.

Name	Notes	Level	Mux Category
rtcp-unicast	The attribute MUST be reported across all m=lines multiplexed	M	IDENTICAL

RFC5760 Attribute Analysis

5.31. RFC3611 - RTCP XR

[RFC3611] defines the Extended Report (XR) packet type for the RTP Control Protocol (RTCP), and defines how the use of XR packets can be signaled by an application if it employs the Session Description Protocol (SDP).

Name	Notes	Level	Mux Category
rtcp-xr	Not Impacted	B	NORMAL

RFC3611 Attribute Analysis

5.32. RFC5939 - SDP Capability Negotiation

[RFC5939] defines a general SDP Capability Negotiation framework. It also specifies how to provide attributes and transport protocols as capabilities and negotiate them using the framework. Extensions for other types of capabilities (e.g., media types and media formats) may be provided in other documents.

Name	Notes	Level	Mux Category
pcfg	Refer to Section Section 14	M	SPECIAL
acfg	Refer to Section Section 14	M	SPECIAL
csup	Not Impacted	B	NORMAL
creq	Not Impacted	B	NORMAL
acap	Refer to section Section 14	B	INHERIT
tcap	Refer to section Section 14	B	INHERIT
cap-v0	Not Impacted	B	NORMAL

RFC5939 Attribute Analysis

5.33. RFC6871- SDP Media Capabilities Negotiation

Session Description Protocol (SDP) capability negotiation provides a general framework for indicating and negotiating capabilities in SDP. The base framework defines only capabilities for negotiating transport protocols and attributes. [RFC6871] extends the framework by defining media capabilities that can be used to negotiate media types and their associated parameters.

Name	Notes	Level	Mux Category
rmcap	Refer to Section Section 14	B	IDENTICAL-PER-PT
omcap	Not Impacted	B	NORMAL
mfcap	Refer to Section Section 14	B	IDENTICAL-PER-PT
mscap	Refer to Section Section 14	B	INHERIT
lcfg	Refer to Section Section 14	B	SPECIAL
sescap	Refer to notes below	S	NOT RECOMMENDED
med-v0	Not Impacted	S	NORMAL

RFC6871 - Attribute Analysis

The "sescap" attribute is NOT RECOMMENDED for use with multiplexing. The reason is that it requires the use of unique configuration numbers across the entire SDP (per [RFC6871]) as opposed to within a media description only (per [RFC5939]). As described in Section 14, the use of identical configuration numbers between multiplexed (bundled) media descriptions is the default way of indicating compatible configurations in a bundle.

5.34. RFC7006 - Miscellaneous Capabilities Negotiation SDP

[RFC7006] extends the SDP capability negotiation framework to allow endpoints to negotiate three additional SDP capabilities. In particular, this memo provides a mechanism to negotiate bandwidth ("b=" line), connection data ("c=" line), and session or media titles ("i=" line for each session or media).

Name	Notes	Level	Mux Category
bcap	Inherit the category SUM as applicable to b= attribute	B	INHERIT
bcap-v0	Not Impacted	B	NORMAL
ccap	The connection address type MUST be identical across all the multiplexed m= lines.	B	IDENTICAL
ccap-v0	Not Impacted.	B	NORMAL
icap	Not Impacted	B	NORMAL
icap-v0	Not Impacted	B	NORMAL

RFC7006 - Attribute Analysis

5.35. RFC4567 - Key Management Extensions for SDP and RTSP

[RFC4567] defines general extensions for Session Description Protocol (SDP) and Real Time Streaming Protocol (RTSP) to carry messages, as specified by a key management protocol, in order to secure the media. These extensions are presented as a framework, to be used by one or more key management protocols. As such, their use is meaningful only when complemented by an appropriate key management protocol.

Name	Notes	Level	Mux Category
key-mgmt	Key management protocol MUST be identical across all the m=lines	B	IDENTICAL
mikey	Key management protocol MUST be identical across all the m=lines	B	IDENTICAL

RFC4567 Attribute Analysis

5.36. RFC4572 - Comedia over TLS in SDP

[RFC4572] specifies how to establish secure connection-oriented media transport sessions over the Transport Layer Security (TLS) protocol using the Session Description Protocol (SDP). It defines a new SDP protocol identifier, 'TCP/TLS'. It also defines the syntax and semantics for an SDP 'fingerprint' attribute that identifies the certificate that will be presented for the TLS session. This mechanism allows media transport over TLS connections to be established securely, so long as the integrity of session descriptions is assured.

Name	Notes	Level	Mux Category
fingerprint	fingerprint value from the m=line defining the underlying transport is chosen	B	TRANSPORT

RFC4572 Attribute Analysis

5.37. RFC4570 - SDP Source Filters

[RFC4570] describes how to adapt the Session Description Protocol (SDP) to express one or more source addresses as a source filter for one or more destination "connection" addresses. It defines the syntax and semantics for an SDP "source-filter" attribute that may reference either IPv4 or IPv6 address(es) as either an inclusive or exclusive source list for either multicast or unicast destinations. In particular, an inclusive source-filter can be used to specify a Source-Specific Multicast (SSM) session.

Name	Notes	Level	Mux Category
source-filter	The attribute MUST be repeated across all m=lines multiplexed	B	IDENTICAL

RFC4570 Attribute Analysis

5.38. RFC6128 - RTCP Port for Multicast Sessions

The Session Description Protocol (SDP) has an attribute that allows RTP applications to specify an address and a port associated with the RTP Control Protocol (RTCP) traffic. In RTP-based source-specific multicast (SSM) sessions, the same attribute is used to designate the address and the RTCP port of the Feedback Target in the SDP description. However, the RTCP port associated with the SSM session itself cannot be specified by the same attribute to avoid ambiguity, and thus, is required to be derived from the "m=" line of the media description. Deriving the RTCP port from the "m=" line imposes an unnecessary restriction. [RFC6128] removes this restriction by introducing a new SDP attribute.

Name	Notes	Level	Mux Category
multicast-rtcp	Multicast RTCP port MUST be identical across all the m=lines	B	IDENTICAL

RFC6128 Attribute Analysis

5.39. RFC6189 - ZRTP

[RFC6189] defines ZRTP, a protocol for media path Diffie-Hellman exchange to agree on a session key and parameters for establishing unicast Secure Real-time Transport Protocol (SRTP) sessions for Voice over IP (VoIP) applications.

Name	Notes	Level	Mux Category
zrtp-hash	Complicates if all the m=lines are not authenticated as given in the example below	M	NOT RECOMMENDED

RFC6189 Attribute Analysis

5.40. RFC4145 - Connection-Oriented Media

[RFC4145] describes how to express media transport over TCP using the Session Description Protocol (SDP). It defines the SDP 'TCP' protocol identifier, the SDP 'setup' attribute, which describes the connection setup procedure, and the SDP 'connection' attribute, which handles connection reestablishment.

Name	Notes	Level	Mux Category
setup	MUST be identical across all m=lines	B	IDENTICAL
connection	MUST be identical across all m=lines	B	IDENTICAL

RFC4145 Attribute Analysis

5.41. RFC6947 - The SDP ALTC Attribute

[RFC6947] proposes a mechanism that allows the same SDP offer to carry multiple IP addresses of different address families (e.g., IPv4 and IPv6). The proposed attribute, the "altc" attribute, solves the backward-compatibility problem that plagued Alternative Network Address Types (ANAT) due to their syntax.

Name	Notes	Level	Mux Category
altc	The IP Address and port must be the one that corresponds to the m=line chosen for setting up the underlying transport flow.	M	TRANSPORT

RFC6947 Attribute Analysis

5.42. RFC7195 - SDP Extension for Circuit Switched Bearers in PSTN

[RFC7195] describes use cases, requirements, and protocol extensions for using the Session Description Protocol (SDP) offer/answer model

for establishing audio and video media streams over circuit-switched bearers in the Public Switched Telephone Network (PSTN).

Name	Notes	Level	Mux Category
cs-correlation:callerid	Not Impacted.	M	NORMAL
cs-correlation:uuie	Not Impacted.	M	NORMAL
cs-correlation:dtmf	Not Impacted.	M	NORMAL
cs-correlation:external	Not Impacted.	M	NORMAL

RFC7195 Attribute Analysis

5.43. RFC7272 - IDMS Using the RTP Control Protocol (RTCP)

[RFC7272] defines a new RTP Control Protocol (RTCP) Packet Type and an RTCP Extended Report (XR) Block Type to be used for achieving Inter-Destination Media Synchronization (IDMS).

Name	Notes	Level	Mux Category
rtcp-idms	Not Impacted.	M	NORMAL

RFC7272 Attribute Analysis

5.44. RFC5159 - OMA BCAST SDP Attributes

[RFC5159] provides descriptions of Session Description Protocol (SDP) attributes used by the Open Mobile Alliance’s Broadcast Service and Content Protection specification.

Name	Notes	Level	Mux Category
bcastversion	Not Impacted	S	NORMAL
stkmstream	Not Impacted	B	NORMAL
SRTPAuthentication	Not Impacted	M	NORMAL
SRTPROCTxRate	Not Impacted	M	NORMAL

RFC5159 Attribute Analysis

5.45. RFC6193 - Media Description for IKE in SDP

[RFC6193] specifies how to establish a media session that represents a virtual private network using the Session Initiation Protocol for the purpose of on-demand media/application sharing between peers. It extends the protocol identifier of the Session Description Protocol (SDP) so that it can negotiate use of the Internet Key Exchange Protocol (IKE) for media sessions in the SDP offer/answer model.

Name	Notes	Level	Mux Category
ike-setup	Attribute MUST be identical across all the m=lines	B	IDENTICAL
psk-fingerprint	Attribute MUST be identical across all the m=lines	B	IDENTICAL
ike-esp	Attribute MUST be identical across all the m=lines	B	IDENTICAL
ike-esp-udpencap	Attribute MUST be identical across all the m=lines	B	IDENTICAL

RFC6193 Attribute Analysis

With the above SDP constraints, a session multiplexed with multiple m=lines will use only one IPSec association for all of the m= lines.

5.46. RFC2326 - Real Time Streaming Protocol

The Real Time Streaming Protocol, or RTSP, is an application-level protocol for control over the delivery of data with real-time properties. RTSP provides an extensible framework to enable controlled, on-demand delivery of real-time data, such as audio and video.

Name	Notes	Level	Mux Category
etag	RTSP is not supported for RTP Stream multiplexing	B	NOT RECOMMENDED
range	RTSP is not supported for RTP Stream multiplexing	B	NOT RECOMMENDED
control	RTSP is not supported for RTP Stream multiplexing	B	NOT RECOMMENDED
mtag	RTSP is not supported for RTP Stream multiplexing	B	NOT RECOMMENDED

RFC2326 Attribute Analysis

5.47. RFC6064 - SDP and RTSP Extensions for 3GPP

The Packet-switched Streaming Service (PSS) and the Multimedia Broadcast/Multicast Service (MBMS) defined by 3GPP use the Session Description Protocol (SDP) and Real Time Streaming Protocol (RTSP) with some extensions. [RFC6064] provides information about these extensions and registers the RTSP and SDP extensions with IANA.

Name	Notes	Level	Mux Category
X-predecbufsize	Refer to notes below	M	NOT RECOMMENDED
X-initpredecbufperiod	Refer to notes below	M	NOT RECOMMENDED

X-initpostdecbufperiod	Refer to notes below	M	NOT RECOMMENDED
X-decbyterate	Refer to notes below	M	NOT RECOMMENDED
3gpp-videopostdecbufsize	Refer to notes below	M	NOT RECOMMENDED
framesize	Refer to notes below	M	NOT RECOMMENDED
3GPP-Integrity-Key	Refer to notes below	S	NOT RECOMMENDED
3GPP-SDP-Auth	Refer to notes below	S	NOT RECOMMENDED
3GPP-SRTP-Config	Refer to notes below	M	NOT RECOMMENDED
alt	Refer to notes below	M	NOT RECOMMENDED
alt-default-id	Refer to notes below	M	NOT RECOMMENDED
alt-group	Refer to notes below	M	NOT RECOMMENDED
3GPP-Adaptation-Support	Refer to notes below	M	NOT RECOMMENDED
3GPP-Asset-Information	Refer to notes below	B	NOT RECOMMENDED

mbms-mode	Refer to notes below	B	NOT RECOMMENDED
mbms-flowid	Refer to notes below	M	NOT RECOMMENDED
mbms-repair	Refer to notes below	B	NOT RECOMMENDED
3GPP-QoE-Metrics	Refer to notes below	M	NOT RECOMMENDED
3GPP-QoE-Metrics:Corruption duration	Refer to notes below	M	NOT RECOMMENDED
3GPP-QoE-Metrics:Rebuffering duration	Refer to notes below	M	NOT RECOMMENDED
3GPP-QoE-Metrics:Initial buffering duration	Refer to notes below	M	NOT RECOMMENDED
3GPP-QoE-Metrics:Successive loss of RTP packets	Refer to notes below	M	NOT RECOMMENDED
3GPP-QoE-Metrics:Frame rate deviation	Refer to notes below	M	NOT RECOMMENDED
3GPP-QoE-Metrics:Jitter duration	Refer to notes below	M	NOT RECOMMENDED
3GPP-QoE-Metrics:Content Switch Time	Refer to notes below	B	NOT RECOMMENDED
3GPP-QoE-Metrics:Average Codec Bitrate	Refer to notes below	M	NOT RECOMMENDED

3GPP-QoE-Metrics:Codec Information	Refer to notes below	M	NOT RECOMMENDED
3GPP-QoE-Metrics:Buffer Status	Refer to notes below	M	NOT RECOMMENDED

RFC6064 Attribute Analysis

[RFC6064] defines SDP attributes that are applicable in the declarative usage of SDP alone. For purposes of this document, only the Offer/Answer usage of SDP is considered as mandated by [I-D.ietf-mmusic-sdp-bundle-negotiation].

5.48. RFC3108 - ATM SDP

RFC3108 [RFC3108] describes conventions for using the Session Description Protocol (SDP) described for controlling ATM Bearer Connections, and any associated ATM Adaptation Layer (AAL).

Name	Notes	Level	Mux Category
aalType	Not Impacted	B	NORMAL
eecid	Not Impacted	B	NORMAL
aalType	Not Impacted	B	NORMAL
capability	Not Impacted	B	NORMAL
qosClass	Not Impacted	B	NORMAL
bcob	Not Impacted	B	NORMAL
stc	Not Impacted	B	NORMAL
upcc	Not Impacted	B	NORMAL
atmQOSparms	Not Impacted	B	NORMAL
atmTrfcDesc	Not Impacted	B	NORMAL
abrParms	Not Impacted	B	NORMAL
abrSetup	Not Impacted	B	NORMAL
bearerType	Not Impacted	B	NORMAL
lij	Not Impacted	B	NORMAL
anycast	Not Impacted	B	NORMAL
cache	Not Impacted	B	NORMAL
bearerSigIE	Not Impacted	B	NORMAL
aalApp	Not Impacted	B	NORMAL
cbrRate	Not Impacted	B	NORMAL
sbc	Not Impacted	B	NORMAL
clkrec	Not Impacted	B	NORMAL

fec	Not Impacted	B	NORMAL
prtfl	Not Impacted	B	NORMAL
structure	Not Impacted	B	NORMAL
cpsSDUsize	Not Impacted	B	NORMAL
aal2CPS	Not Impacted	B	NORMAL
aal2CPSSDUrate	Not Impacted	B	NORMAL
aal2sscs3661unassured	Not Impacted	B	NORMAL
aal2sscs3661assured	Not Impacted	B	NORMAL
aal2sscs3662	Not Impacted	B	NORMAL
aal5sscop	Not Impacted	B	NORMAL
atmmap	Not Impacted	B	NORMAL
silenceSupp	Not Impacted	B	NORMAL
ecan	Not Impacted	B	NORMAL
gc	Not Impacted	B	NORMAL
profileDesc	Not Impacted	B	NORMAL
vsel	Not Impacted	B	NORMAL
dsel	Not Impacted	B	NORMAL
fsel	Not Impacted	B	NORMAL
onewaySel	Not Impacted	B	NORMAL
codecconfig	Not Impacted	B	NORMAL
isup_usi	Not Impacted	B	NORMAL
uiLayer1_Prot	Not Impacted	B	NORMAL
chain	Not Impacted	B	NORMAL

RFC3108 Attribute Analysis

RFC3108 describes conventions for using the Session Description Protocol (SDP) for characterizing ATM bearer connections using an AAL1, AAL2 or AAL5 adaptation layers. For AAL1, AAL2 and AAL5, bearer connections can be used to transport single media streams. In addition, for AAL1 and AAL2, multiple media streams may be multiplexed into a bearer connection. For all adaptation types (AAL1, AAL2 and AAL5), bearer connections may be bundled into a single media group. In all cases addressed by RFC3108, a real-time media stream (voice, video, voiceband data, pseudo-wire and others) or a multiplex of media streams is mapped directly into an ATM connection. RFC3108 does not address cases where ATM serves as a low-level transport pipe for IP packets which in turn may carry one or more real-time (e.g. VoIP) media sessions with a life-cycle different from that of the underlying ATM transport.

5.49. 3GPP TS 26.114

[R3GPPTS26.114] specifies IP multimedia subsystem: Media handling and interaction

Name	Notes	Level	Mux Category
3gpp_sync_info	Usage defined for the IP Multimedia Subsystem	M	NORMAL
3gpp_MaxRecvSDUSize	Usage defined for the IP Multimedia Subsystem	M	NORMAL

3GPP TS 26.114 Attribute Analysis

5.50. 3GPP TS 183.063

[R3GPPTS183.063] Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN);

Name	Notes	Level	Mux Category
PSCid	Not Impacted	Not-Applicable	NORMAL
bc_service	Not Impacted	Not-Applicable	NORMAL
bc_program	Not Impacted	Not-Applicable	NORMAL
bc_service_package	Not Impacted	Not-Applicable	NORMAL

3GPP TS 183.063 Attribute Analysis

5.51. 3GPP TS 24.182

[R3GPPTS24.182] specifies IP multimedia subsystem Custom Alerting tones

Name	Notes	Level	Mux Category
g.3gpp.cat	Usage defined for the IP Multimedia Subsystem	M	NORMAL

3GPP TS 24.182 Attribute Analysis

5.52. 3GPP TS 24.183

[R3GPPTS24.183] specifies IP multimedia subsystem Custom Ringing Signal

Name	Notes	Level	Mux Category
g.3gpp.crs	Usage defined for the IP Multimedia Subsystem	M	NORMAL

3GPP TS 24.183 Attribute Analysis

5.53. 3GPP TS 24.229

[R3GPPTS24.229] specifies IP multimedia call control protocol based on Session Initial protocol and Session Description Protocol.

Name	Notes	Level	Mux Category
secondary-realm	secondary-realm must be the one that corresponds to the m=line chosen for setting up the underlying transport flow.	M	TRANSPORT
visited-realm	visited-realm must be the one that corresponds to the m=line chosen for setting up the underlying transport flow.	M	TRANSPORT
omr-m-cksum	Not Impacted	M	NORMAL
omr-s-cksum	Not Impacted	M	NORMAL
omr-m-att	Not Impacted	M	NORMAL
omr-s-att	Not Impacted	M	NORMAL
omr-m-bw	Not Impacted	M	NORMAL
omr-s-bw	Not Impacted	M	NORMAL
omr-codecs	Not Impacted	M	NORMAL

3GPP TS 24.229 Attribute Analysis

5.54. ITU T.38

[T.38] defines procedures for real-time Group 3 facsimile communications over IP networks.

Name	Notes	Level	Mux Category
T38FaxVersion	Not Impacted	S	NORMAL
T38MaxBitRate	Not Impacted	S	NORMAL
T38FaxFillBitRemoval	Not Impacted	S	NORMAL
T38FaxTranscodingMMR	Not Impacted	S	NORMAL
T38FaxTranscodingJBIG	Not Impacted	S	NORMAL
T38FaxRateManagement	Not Impacted	S	NORMAL
T38FaxMaxBuffer	Not Impacted	S	NORMAL
T38FaxMaxDatagram	Not Impacted	S	NORMAL
T38FaxUdpEC	Not Impacted	S	NORMAL
T38FaxMaxIFP	Not Impacted	S	NORMAL
T38FaxUdpECDepth	Not Impacted	S	NORMAL
T38FaxUdpFECMaxSpan	Not Impacted	S	NORMAL
T38ModemType	Not Impacted	S	NORMAL
T38VendorInfo	Not Impacted	S	NORMAL

ITU T.38 Attribute Analysis

The ITU T.38 attributes are clearly unaffected by multiplexing and are specific to the working of the fax protocol itself.

5.55. ITU-T-REC.Q1970

[ITU-T-REC.Q1970] defines BICC IP bearer control protocol.

Name	Notes	Level	Mux Category
ipbcp	Not Impacted	S	NORMAL

ITU-T-REC.Q1970 Attribute Analysis

5.56. ITU-T H.248.15

ITU-T H.248.15 [H.248.15] defines Gateway Control Protocol SDP H.248 package attribute

Name	Notes	Level	Mux Category
h248item	It is only applicable for signaling the inclusion of H.248 extension packages to a gateway via the local and remote descriptors. The attribute itself is unaffected by multiplexing, but the packaged referenced in a specific use of the attribute may be impacted. Further analysis of each package is needed to determine if there is an issue. This is only a concern in environments using a decomposed server/gateway with H.248 signaled between them. The ITU-T will need to do further analysis of various packages when they specify how to signal the use of multiplexing to a gateway.	B	SPECIAL

ITU-T H.248.15 Attribute Analysis

5.57. RFC4975 - The Message Session Relay Protocol

[RFC4975] the Message Session Relay Protocol, a protocol for transmitting a series of related instant messages in the context of a session. Message sessions are treated like any other media stream

when set up via a rendezvous or session creation protocol such as the Session Initiation Protocol.

Name	Notes	Level	Mux Category
accept-types	Not Impacted	M	NORMAL
accept-wrapped-types	Not Impacted	M	NORMAL
max-size	Not Impacted	M	NORMAL
path	Not Impacted	M	NORMAL

RFC4975 Attribute Analysis

5.58. Historical Attributes

This section specifies analysis for the attributes that are included for historic usage alone by the [IANA].

Name	Notes	Level	Mux Category
rtpred1	Historic attributes.	Not-Applicable	NOT RECOMMENDED
rtpred2	Historic attributes.	Not-Applicable	NOT RECOMMENDED

Historical Attribute Analysis

6. bwtype Attribute Analysis

This section specifies handling of specific bandwidth attributes when used in multiplexing scenarios.

6.1. RFC4566 - SDP: Session Description Protocol

Name	Notes	Level	Mux Category
bwtype:CT	Not Impacted	S	NORMAL
bwtype:AS	For the media level usage, the aggregate of individual bandwidth values is considered.	B	SUM

RFC4566 bwtype Analysis

6.2. RFC3556 - SDP Bandwidth Modifiers for RTCP Bandwidth

[RFC3556] defines an extension to the Session Description Protocol (SDP) to specify two additional modifiers for the bandwidth attribute. These modifiers may be used to specify the bandwidth allowed for RTP Control Protocol (RTCP) packets in a Real-time Transport Protocol (RTP) session.

Name	Notes	Level	Mux Category
bwtype:RS	Session level usage represents session aggregate and media level usage indicates SUM of the individual values while multiplexing	B	SUM
bwtype:RR	Session level usage represents session aggregate and media level usage indicates SUM of the individual values while multiplexing	B	SUM

RFC3556 bwtype Analysis

6.3. RFC3890 - Bandwidth Modifier for SDP

[RFC3890] defines a Session Description Protocol (SDP) Transport Independent Application Specific Maximum (TIAS) bandwidth modifier that does not include transport overhead; instead an additional packet rate attribute is defined. The transport independent bit-rate

value together with the maximum packet rate can then be used to calculate the real bit-rate over the transport actually used.

Name	Notes	Level	Mux Category
bwtype:TIAS	The usage of TIAS is not clearly defined Offer/Answer usage.	B	SPECIAL
bwtype:maxprate	The usage of TIAS and maxprate is not well defined under multiplexing	B	SPECIAL

RFC3890 bwtype Analysis

The intention of TIAS is that the media level bit-rate is multiplied with the known per-packet overhead for the selected transport and the maxprate value to determine the worst case bit-rate from the transport to more accurately capture the required usage. Summing TIAS values independently across m=lines and multiplying the computed sum with maxprate and the per-packet overhead would inflate the value significantly. Instead performing multiplication and adding the individual values is a more appropriate usage.

7. rtcp-fb Attribute Analysis

This section analyzes rtcp-fb SDP attributes.

7.1. RFC4585 - RTP/AVPF

[RFC4585] defines an extension to the Audio-visual Profile (AVP) that enables receivers to provide, statistically, more immediate feedback to the senders and thus allows for short-term adaptation and efficient feedback-based repair mechanisms to be implemented.

Attr Name	Notes	Level	Mux Category
ack rpsi	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT
ack app	Feedback parameters MUST be handled in the app specific way when multiplexed	M	SPECIAL
nack	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT
nack pli	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT
nack sli	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT
nack rpsi	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT
nack app	Feedback parameters MUST be handled in the app specific way when multiplexed	M	SPECIAL
trr-int	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT

RFC4585 Attribute Analysis

7.2. RFC5104 - Codec Control Messages in AVPF

[RFC5104] specifies a few extensions to the messages defined in the Audio-Visual Profile with Feedback (AVPF). They are helpful primarily in conversational multimedia scenarios where centralized

multipoint functionalities are in use. However, some are also usable in smaller multicast environments and point-to-point calls.

Attr Name	Notes	Level	Mux Category
ccm	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT

RFC5104 Attribute Analysis

7.3. RFC6285 - Unicast-Based RAMS

Name	Notes	Level	Mux Category
nack rai	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT

RFC6285 Attribute Analysis

7.4. RFC6679 - ECN for RTP over UDP/IP

[RFC6679] specifies how Explicit Congestion Notification (ECN) can be used with the Real-time Transport Protocol (RTP) running over UDP, using the RTP Control Protocol (RTCP) as a feedback mechanism. It defines a new RTCP Extended Report (XR) block for periodic ECN feedback, a new RTCP transport feedback message for timely reporting of congestion events, and a Session Traversal Utilities for NAT (STUN) extension used in the optional initialization method using Interactive Connectivity Establishment (ICE).

Name	Notes	Level	Mux Category
ecn-capable-rtp	ECN markup are enabled at the RTP Session level	M	IDENTICAL
nack ecn	This attribute enables ECN at the RTP session level	M	IDENTICAL

RFC6679 Attribute Analysis

7.5. RFC6642 - Third-Party Loss Report

In a large RTP session using the RTP Control Protocol (RTCP) feedback mechanism defined in [RFC4585], a feedback target may experience transient overload if some event causes a large number of receivers to send feedback at once. This overload is usually avoided by ensuring that feedback reports are forwarded to all receivers, allowing them to avoid sending duplicate feedback reports. However, there are cases where it is not recommended to forward feedback reports, and this may allow feedback implosion. [RFC6642] memo discusses these cases and defines a new RTCP Third-Party Loss Report that can be used to inform receivers that the feedback target is aware of some loss event, allowing them to suppress feedback. Associated Session Description Protocol (SDP) signaling is also defined.

Name	Notes	Level	Mux Category
nack tllei	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT
nack pslei	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT

RFC6642 Attribute Analysis

7.6. RFC5104 - Codec Control Messages in AVPF

Attr Name	Notes	Level	Mux Category
ccm fir	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT
ccm tmmbr	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT
ccm tstr	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT
ccm vbcm	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT

RFC5104 Attribute Analysis

8. group Attribute Analysis

This section analyzes SDP "group" semantics.

8.1. RFC5888 - SDP Grouping Framework

[RFC5888] defines a framework to group "m" lines in the Session Description Protocol (SDP) for different purposes.

Name	Notes	Level	Mux Category
group:LS	Not Impacted	S	NORMAL
group:FID	Not Impacted	S	NORMAL

RFC5888 Attribute Analysis

8.2. RFC3524 - Mapping Media Streams to Resource Reservation Flows

[RFC3524] defines an extension to the Session Description Protocol (SDP) grouping framework. It allows requesting a group of media streams to be mapped into a single resource reservation flow. The SDP syntax needed is defined, as well as a new "semantics" attribute called Single Reservation Flow (SRF).

Name	Notes	Level	Mux Category
group:SRF	Not Impacted	S	NORMAL

RFC3524 Attribute Analysis

8.3. RFC4091 - ANAT Semantics

[RFC4091] defines the Alternative Network Address Types (ANAT) semantics for the Session Description Protocol (SDP) grouping framework. The ANAT semantics allow alternative types of network addresses to establish a particular media stream.

Name	Notes	Level	Mux Category
group:ANAT	ANAT semantics is obseleted	S	NOT RECOMMENDED

RFC4091 Attribute Analysis

8.4. RFC5956 - FEC Grouping Semantics in SDP

[RFC5956] defines the semantics for grouping the associated source and FEC-based (Forward Error Correction) repair flows in the Session Description Protocol (SDP). The semantics defined in the document are to be used with the SDP Grouping Framework (RFC 5888). These semantics allow the description of grouping relationships between the source and repair flows when one or more source and/or repair flows are associated in the same group, and they provide support for additive repair flows. SSRC-level (Synchronization Source) grouping semantics are also defined in this document for Real-time Transport Protocol (RTP) streams using SSRC multiplexing.

Name	Notes	Level	Mux Category
group:FEC-FR	Not Impacted	S	NORMAL

RFC5956 Attribute Analysis

8.5. RFC5583 - Signaling Media Decoding Dependency in SDP

[RFC5583] defines semantics that allow for signaling the decoding dependency of different media descriptions with the same media type in the Session Description Protocol (SDP). This is required, for example, if media data is separated and transported in different network streams as a result of the use of a layered or multiple descriptive media coding process.

Name	Notes	Level	Mux Category
dependay	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT
depend mdc	The attribute value must be same for a given codec configuration	M	IDENTICAL-PER-PT

RFC5583 Attribute Analysis

8.6. RFC7104 - Duplication Grouping Semantics in the SDP

[RFC7104] defines the semantics for grouping redundant streams in the Session Description Protocol (SDP). The semantics defined in this document are to be used with the SDP Grouping Framework. Grouping semantics at the Synchronization Source (SSRC) level are also defined in this document for RTP streams using SSRC multiplexing.

Name	Notes	Level	Mux Category
group:DUP	Not Impacted	S	NORMAL

RFC7104 Attribute Analysis

9. ssrc-group Attribute Analysis

This section analyzes "ssrc-group" semantics.

9.1. RFC5576 - Source-Specific SDP Attributes

Name	Notes	Level	Mux Category
ssrc-group:FID	Not Impacted	SR	NORMAL
ssrc-group:FEC	Not Impacted	SR	NORMAL
ssrc-groupFEC-FR	Not Impacted	SR	NORMAL

RFC5576 Attribute Analysis

9.2. RFC7104 - Duplication Grouping Semantics in the SDP

Name	Notes	Level	Mux Category
ssrc-group:DUP	Not Impacted	SR	NORMAL

RFC7104 Attribute Analysis

10. QoS Mechanism Token Analysis

This section analyzes QoS tokes specified with SDP.

10.1. RFC5432 - QoS Mechanism Selection in SDP

Name	Notes	Level	Mux Category
rsvp	Not Impacted, since QOS mechanisms are applied per flow.	B	NORMAL
nsis	Not Impacted, since QOS mechanisms are applied per flow.	B	NORMAL

RFC5432 Attribute Analysis

11. k= Attribute Analysis

11.1. RFC4566 SDP: Session Description Protocol

Name	Notes	Level	Mux Category
k=	It is NOT recommended to use this attribute	S	NOT RECOMMENDED

RFC4566 Attribute Analysis

12. content Attribute Analysis

12.1. RFC4796

Name	Notes	Level	Mux Category
content:slides	Not Impacted	M	NORMAL
content:speaker	Not Impacted	M	NORMAL
content:main	Not Impacted	M	NORMAL
content:sl	Not Impacted	M	NORMAL
content:alt	Not Impacted	M	NORMAL

RFC4796 Attribute Analysis

13. Payload Formats

13.1. RFC5109 - RTP Payload Format for Generic FEC

[RFC5109] describes a payload format for generic Forward Error Correction (FEC) for media data encapsulated in RTP. It is based on the exclusive-or (parity) operation. The payload format allows end systems to apply protection using various protection lengths and levels, in addition to using various protection group sizes to adapt to different media and channel characteristics. It enables complete recovery of the protected packets or partial recovery of the critical parts of the payload depending on the packet loss situation.

Name	Notes	Level	Mux Category
audio/ulpfec	Not recommended for multiplexing due to reuse of SSRCs	M	NOT RECOMMENDED
video/ulpfec	Not recommended for multiplexing due to reuse of SSRCs	M	NOT RECOMMENDED
text/ulpfec	Not recommended for multiplexing due to reuse of SSRCs	M	NOT RECOMMENDED
application/ulpfec	Not recommended for multiplexing due to reuse of SSRCs	M	NOT RECOMMENDED

RFC5109 Payload Format Analysis

Draft draft-lennox-payload-ulp-ssrc-mux proposes a simple fix to make it possible to use ULP with multiplexing and ULP is allowed when used with that.

14. Multiplexing Considerations for Encapsulating Attributes

This sections deals with recommendations for defining the multiplexing characteristics of the SDP attributes that encapsulate other SDP attributes/parameters. Such attributes as of today, for example, are defined in [RFC3407], [RFC5939] and [RFC6871] as part of a generic framework for indicating and negotiating transport, media and media format related capabilities in the SDP.

The behavior of such attributes under multiplexing is in turn defined by the multiplexing behavior of the attributes they encapsulate which are made known once the Offer/Answer negotiation process is completed.

14.1. RFC3407 - cpar Attribute Analysis

[RFC3407] capability parameter attribute (a=cpar) encapsulates b= (bandwidth) or an a= attribute. For bandwidth attribute encapsulation, the category SUM is inherited. For the case of a= attribute, the category corresponding to the SDP attribute being encapsulated is inherited.

```
v=0
o=alice 2890844526 2890844527 IN IP4 host.atlanta.example.com
s=
c=IN IP4 host.atlanta.example.com
t=0 0
m=video 3456 RTP/AVP 100
a=rtpmap:100 VP8/90000
a=sqn: 0
a=cdsc: 1 video RTP/AVP 100
a=cpar: a=rtcp-mux
m=video 3456 RTP/AVP 101
a=rtpmap:101 VP8/90000
a=fmtp:100 max-fr=15;max-fs=1200
a=cdsc: 2 video RTP/AVP 101
a=cpar: a=rtcp-mux
```

In the above example ,the category IDENTICAL is inherited for the cpar encapsulated rtcp-mux attribute.

14.2. RFC5939 Analysis

[RFC5939] defines a general SDP capability negotiation framework. It also specifies how to provide transport protocols and SDP attributes as capabilities and negotiate them using the framework.

For this purpose, [RFC5939] defines the following

- A set of capabilities for the session and its associated media stream components, supported by each side. The attribute ("a=acap") defines how to list an attribute name and its associated value (if any) as a capability. The attribute ("a=tcap") defines how to list transport protocols (e.g., "RTP/AVP") as capabilities.

- o A set of potential configurations ("a=pcfg") provided by the offerer to indicate whcich combination of those capabilities can be used for the session and its associated media stream components. Potential configurations are not ready for use until fully negotiated. They provide an alternative that may be used, subject to SDP capability negotiation procedures. In particular the answerer may choose one of the potential configurations for use as part of the current Offer/Answer exchange.

- o An actual configuration ("a=acfg") for the session and its associated media stream components. The actual configuration identifies the potential configuration that was negotiated for use. Use of an actual configuration does not require any further negotiation.

- o A negotiation process that takes the current actual and the set of potential configurations (combinations of capabilities) as input and provides the negotiated actual configurations as output. In [RFC5939] the negotiation process is done independently for each media description.

14.2.1. Recommendation - Procedures for Potential Configuration Pairing

This section provides recommendations for entities generating and processing SDP under the generic capability negotiation framework as defined in [RFC5939] under the context of media stream multiplexing.

These recommendations are provided for the purposes of enabling the Offerer to make sure that the generated potential configurations between the multiplexed streams can (easily) be negotiated to be consistent between those streams. In particular, the procedures aim to simplify Answerer’s procedure to choose potential configurations that are consistent across all the bundled media descriptions.

A potential configuration selects a set of attributes and parameters that become part of the media description when negotiated. When multiplexing media descriptions with potential configurations specified, there may be a need for coordinating this selection between multiplexed media descriptions ensuring right multiplexing behavior.

Although it is possible to analyze the various potential configurations in bundled media descriptions to find combinations that satisfy such constraints, it can quickly become complicated to do so.

The procedures defined in [RFC5939] state that each potential configuration in the SDP has a unique configuration number, however

the scope of uniqueness is limited to each media description. To make it simple for the answerer to chose valid combinations of potential configurations across media descriptions in a given bundle group, we provide a simple rule for constructing potential configurations:-

- Let m-bundle be the set of media descriptions that form a given bundle .
- Let m-bundle-pcfg be the set of media descriptions in m-bundle that include one or more potential configurations.
- Each media description in m-bundle-pcfg MUST have at least one potential configuration with the same configuration number (e.g. "1").
- For each potential configuration with configuration number x in m-bundle-pcfg, the offerer MUST ensure that if the answerer chooses configuration number x in each of the media descriptions in m-bundle-pcfg, then the resulting SDP will have all multiplexing constraints satisfied for those media descriptions.
- Since it is nearly impossible to define a generic mechanism for various capability extensions , this document does’t provide procedures for dealing with the capability extension attributes. However, Section 14.3 provide analysis of media capability extension attributes as defined in [RFC6871].

The above allows the answerer to easily find multiplexing compatible combinations of potential configurations:- The answerer simply choses a potential configuration (number) that is present in all of the media descriptions with potential configurations in the bundle.

Note that it is still possible for the offerer to provide additional potential configurations with independent configuration numbers. The answerer will have to perform more complicated analysis to determine valid multiplexed combinations of those.

14.2.1.1. Example: Transport Capability Multiplexing

```
v=0
o=alice 2890844526 2890844527 IN IP4 host.atlanta.example.com
s=
c=IN IP4 host.atlanta.example.com
t=0 0
a=tcap:1 RTP/SAVPF
a=tcap:2 RTP/SAVP
a=group:BUNDLE audio video
m= audio
a=mid:audio
a=pcfg:1 t=1
a=pcfg:2
m= video
a=mid:video
a=pcfg:1 t=1
a=pcfg:2 t=2
```

In the example above, the potential configurations that offer transport protocol capability of RTP/SAVPF has the same configuration number "1" in both the audio and video media descriptions.

14.2.1.2. Example: Attribute Capability Multiplexing

```
v=0
o=alice 2890844526 2890844527 IN IP4 host.atlanta.example.com
s=
c=IN IP4 host.atlanta.example.com
t=0 0
a=acap:1 a=rtcp-mux
a=acap:2 a=crypto:1 AES_CM_128_HMAC_SHA1_80
       inline:EcGZiNWpFJhQXdspcl1ekcmVCNWpVLcfHAwJSoj|2^20|1:32
a=group:BUNDLE audio video
m= audio 49172 RTP/AVP 99
a=mid:audio
a=pcfg:1 a=1
a=pcfg:2
m= video 560024 RTP/AVP 100
a=mid:video
a=pcfg:1 a=1
a=pcfg:2 a=2
```

In the example above, the potential configuration number "1" is repeated while referring to attribute capability a=rtcp-mux, since the behavior is IDENTICAL for the attribute a=rtcp-mux under multiplexing.

14.3. RFC6871 Analysis

[RFC6871] extends capability negotiation framework described in [RFC5939] by defining media capabilities that can be used to indicate and negotiate media types and their associated format parameters. It also allows indication of latent configurations and session capabilities.

14.3.1. Recommendation: Dealing with Payload Type Numbers

[RFC6871] defines a new payload type ("pt") parameter to be used with the potential, actual and latent configuration parameters. The parameter associates RTP payload type numbers with the referenced RTP-based media format capabilities ("a=rmcap") defined in [RFC6871] and is appropriate only when the transport protocol uses RTP. This means that the same payload type number can be assigned as part of potential or actual configurations in different media descriptions in a bundle. There are rules for the usage of identical Payload Type values across multiplexed m=lines as described in [I-D.ietf-mmusic-sdp-bundle-negotiation], which MUST be followed here as well. As described in Section 14.2.1, the use of identical configuration numbers for compatible configurations in different media descriptions that are part of the bundle provides a way to ensure that the answerer can easily pick compatible configurations here as well.

14.3.1.1. Example: Attribute Capability Under Shared Payload Type

The attributes (a=rmcap, a=mfcap) follow the above recommendations under mutliplexing.

```
v=0
o=- 25678 753849 IN IP4 192.0.2.1
s=
c=IN IP4 192.0.2.1
t=0 0
a=creq:med-v0
m=audio 54322 RTP/AVP 96
a=rtpmap:96 AMR-WB/16000/1
a=fmtp:96 mode-change-capability=1; max-red=220;
mode-set=0,2,4,7
a=rmcap:1,3 audio AMR-WB/16000/1
a=rmcap:2 audio AMR/8000/1
a=mfcap:1,2 mode-change-capability=1
a=mfcap:3 mode-change-capability=2
a=pcfg:1 m=1 pt=1:96
a=pcfg:2 m=2 pt=2:97
a=pcfg:3 m=3 pt=3:98
m=audio 54322 RTP/AVP 96
a=rtpmap:96 AMR-WB/16000/1
a=fmtp:96 mode-change-capability=1; max-red=220;
mode-set=0,2,4,7
a=rmcap:4 audio AMR/8000/1
a=rmcap:5 audio OPUS/48000/2
a=mfcap:5 minptime=40
a=mfcap:4 mode-change-capability=1
a=pcfg:1 m=4 pt=4:97
a=pcfg:4 m=5 pt=5:101
```

In the example above, the potential configuration number "1" is repeated when referring to media and media format capability used for the Payload Type 97. This implies that both the media capability 2 and 4 along with their media format capabilities MUST refer to the same codec configuration , as per the definition of IDENTICAL-PER-PT.

14.3.2. Recommendation: Dealing with Latent Configurations

[RFC6871] adds the notion of a latent configurations, which provides configuration information that may be used to guide a subsequent offer/exchange, e.g. by adding another media stream or use alternative codec combinations not currently offered. Latent configurations have configuration numbers which cannot overlap with the potential configuration numbers [RFC6871]. Supported combinations of potential and latent configurations are indicated by use of the "a=sescap" attribute, however use of this attribute is not recommended with bundled media, since it requires the use of unique configuration numbers across the SDP. Taken together, this means there is no well-defined way to indicate supported combinations of

latent configurations, or combinations of latent and potential configurations with bundled media. It is still allowed to use the latent configuration attribute, however the limitations above will apply. To determine valid combinations, actual negotiation will have to be attempted subsequently instead.

15. IANA Considerations

[RFC EDITOR NOTE: Please replace RFCXXXX with the RFC number of this document.]

The IANA is requested to add a new column named "Mux Category" to several of the subregistries in the "Session Description Protocol (SDP) Parameters" registry. Section 15.1 defines a new subregistry for identifying the initial registrations for various multiplexing categories applicable, as proposed in this document.

The tables in Section 15.2 identify name of an entry in the existing subregistry and specify the value to put in the new "Mux Category" column of the associated IANA registry. Any entries in the existing tables that do not have a value for the "Mux Category" specified in this RFC will get a value of "TBD". Future specifications can change the "TBD" entries to the correct value.

15.1. New 'Multiplexing Categories' subregistry

A new sub-registry needs to be defined called the "Multiplexing Categories", with the following registrations created initially: "NORMAL", "NOT RECOMMENDED", "IDENTICAL", "TRANSPORT", "SUM", "INHERIT", "IDENTICAL-PER-PT", "SPECIAL" and "TBD" as defined in this document.

Initial value registration for "Multiplexing Categories".

Multiplexing Categories	Reference
NORMAL	RFCXXXX
NOT RECOMMENDED	RFCXXXX
IDENTICAL	RFCXXXX
TRANSPORT	RFCXXXX
SUM	RFCXXXX
INHERIT	RFCXXXX
IDENTICAL-PER-PT	RFCXXXX
SPECIAL	RFCXXXX
TBD	RFCXXXX

Further entries may be registered on a first-come first-serve basis. Each registration needs to indicate the multiplexing category value to be added to the "Multiplexing Categories" subregistry as defined in this section.

Such a registration must also indicate the applicability of the newly defined multiplexing category value to various subregistries defined at "Session Description Protocol (SDP) Parameters".

The general registration procedures of [RFC4566] apply.

15.2. 'Mux Category' column for subregistries

Each sub-section identifies a subregistry in the "Session Description Protocol (SDP) Parameters" registry. The tables list the column that identifies the SDP attribute name/Token/Value from the corresponding subregistries and the values to be used for the new "Mux Category" column to be added.

15.2.1. Table: SDP bwtype

The following values are to be added to the 'SDP bwtype' subregistry in the "Session Description Protocol (SDP) Parameters" registry. The references should be updated to point at this RFC as well as the previous references.

SDP Name	Mux Category
CT	NORMAL
AS	SUM
RS	SUM
RR	SUM
TIAS	SPECIAL

15.2.2. Table: att-field (session level)

The following values are to be added to the "att-field (session level)" subregistry in the "Session Description Protocol (SDP) Parameters" registry. The references should be updated to point at this RFC as well as the previous references.

SDP Name	Mux Category
cat	NORMAL
keywds	NORMAL
type	NORMAL
type:broadcast	NORMAL
type:H332	NORMAL
type:meeting	NORMAL
type:moderated	NORMAL
type:test	NORMAL
charset	NORMAL
charset:iso8895-1	NORMAL
tool	NORMAL
ipbcp	NORMAL
group	NORMAL
ice-lite	NORMAL
ice-options	NORMAL
bcastversion	NORMAL
3GPP-Integrity-Key	NOT RECOMMENDED
3GPP-SDP-Auth	NOT RECOMMENDED
alt-group	NOT RECOMMENDED
PSCid	NORMAL
bc_service	NORMAL
bc_program	NORMAL
bc_service_package	NORMAL
sescap	NOT RECOMMENDED
rtsp-ice-d-m	NOT RECOMMENDED

15.2.3. Table: att-field (both session and media level)

The following values are to be added to the "att-field (both session and media level)" subregistry in the "Session Description Protocol (SDP) Parameters" registry. The references should be updated to point at this RFC as well as the previous references.

SDP Name	Mux Category
recvonly	NORMAL
sendrecv	NORMAL
sendonly	NORMAL
sdplang	NORMAL
lang	NORMAL
h248item	SPECIAL
sqn	NORMAL
cdsc	NORMAL

cpar	INHERIT
cparmin	SPECIAL
cparmax	SPECIAL
rtcp-xr	NORMAL
maxprate	SPECIAL
setup	IDENTICAL
connection	IDENTICAL
key-mgmt	IDENTICAL
source-filter	IDENTICAL
inactive	NORMAL
fingerprint	TRANSPORT
flute-tsi	TBD
flute-ch	TBD
FEC-declaration	TBD
FEC-OTI-extension	TBD
content-desc	TBD
ice-pwd	TRANSPORT
ice-ufrag	TRANSPORT
stkmstream	NORMAL
extmap	SPECIAL
qos-mech-send	NORMAL
qos-mech-recv	NORMAL
csup	NORMAL
creq	NORMAL
acap	INHERIT
tcap	INHERIT
3GPP-QoE-Metrics	NOT RECOMMENDED
3GPP-Asset-Information	NOT RECOMMENDED
mbms-mode	NOT RECOMMENDED
mbms-repair	NOT RECOMMENDED
ike-setup	IDENTICAL
psk-fingerprint	IDENTICAL
multicast-rtcp	IDENTICAL
rmcap	IDENTICAL-PER-PT
omcap	NORMAL
mfcap	IDENTICAL-PER-PT
mscap	INHERIT
3gpp.iut.replication	TBD
bcap	INHERIT
ccap	IDENTICAL
icap	NORMAL
3gpp_sync_info	NORMAL
3gpp_MaxRecvSDUSize	NORMAL
etag	NOT RECOMMENDED
duplication-delay	NORMAL
range	NOT RECOMMENDED
control	NOT RECOMMENDED
mtag	NOT RECOMMENDED

ts-refclk	NORMAL
mediaclk	NORMAL
calgextmap	NORMAL

15.2.4. Table: att-field (media level only)

The following values are to be added to the "att-field (media level only)" registry in the "Session Description Protocol (SDP) Parameters" registry. The references should be updated to point at this RFC as well as the previous references.

SDP Name	Mux Category
ptime	IDENTICAL-PER-PT
orient	NORMAL
orient:portrait	NORMAL
orient:landscape	NORMAL
orient:seascape	NORMAL
framerate	IDENTICAL-PER-PT
quality	NORMAL
rtpmap	IDENTICAL-PER-PT
fmtp	IDENTICAL-PER-PT
rtpred1	NOT RECOMMENDED
rtpred2	NOT RECOMMENDED
T38FaxVersion	NORMAL
T38MaxBitRate	NORMAL
T38FaxFillBitRemoval	NORMAL
T38FaxTranscodingMMR	NORMAL
T38FaxTranscodingJBIG	NORMAL
T38FaxRateManagement	NORMAL
T38FaxMaxBuffer	NORMAL
T38FaxMaxDatagram	NORMAL
T38FaxUdpEC	NORMAL
maxptime	IDENTICAL-PER-PT
des	NOT RECOMMENDED
curr	NOT RECOMMENDED
conf	NOT RECOMMENDED
mid	NORMAL
rtcp	IDENTICAL
rtcp-fb	IDENTICAL-PER-PT
label	NORMAL
T38VendorInfo	NORMAL
crypto	TRANSPORT
eecid	NORMAL
aalType	NORMAL
capability	NORMAL

qosClass	NORMAL
bcob	NORMAL
stc	NORMAL
upcc	NORMAL
atmQOSparms	NORMAL
atmTrfcDesc	NORMAL
abrParms	NORMAL
abrSetup	NORMAL
bearerType	NORMAL
lij	NORMAL
anycast	NORMAL
cache	NORMAL
bearerSigIE	NORMAL
aalApp	NORMAL
cbrRate	NORMAL
sbc	NORMAL
clkrec	NORMAL
fec	NORMAL
prtfl	NORMAL
structure	NORMAL
cpsSDUsize	NORMAL
all2CPS	NORMAL
all2CPSSDUrate	NORMAL
aal2sscs3661unassured	NORMAL
aal2sscs3661assured	NORMAL
aal2sscs3662	NORMAL
aal5sscop	NORMAL
atmmap	NORMAL
silenceSupp	NORMAL
ecan	NORMAL
gc	NORMAL
profileDesc	NORMAL
vsel	NORMAL
dsel	NORMAL
fsel	NORMAL
onewaySel	NORMAL
codecConfig	NORMAL
isup_usi	NORMAL
uiLayer1_Prot	NORMAL
chain	NORMAL
floorctrl	IDENTICAL
confid	NORMAL
userid	NORMAL
floorid	NORMAL
FEC	NORMAL
accept-types	NORMAL
accept-wrapped-types	NORMAL
max-size	NORMAL

path	NORMAL
dccp-service-code	NOT RECOMMENDED
rtcp-mux	IDENTICAL
candidate	TRANSPORT
ice-mismatch	NORMAL
remote-candidates	TRANSPORT
SRTPAuthentication	NORMAL
SRTPROCTxRate	NORMAL
rtcp-rsize	IDENTICAL
file-selector	NORMAL
file-transfer-id	NORMAL
file-disposition	NORMAL
file-date	NORMAL
file-icon	NORMAL
file-range	NORMAL
depend	IDENTICAL-PER-PT
ssrc	NORMAL
ssrc-group	NORMAL
rtcp-unicast	IDENTICAL
pcfg	SPECIAL
acfg	SPECIAL
zrtp-hash	NOT RECOMMENDED
X-predecbufsize	NOT RECOMMENDED
X-initpredecbufperiod	NOT RECOMMENDED
X-initpostdecbufperiod	NOT RECOMMENDED
X-decbyterate	NOT RECOMMENDED
3gpp-videopostdecbufsize	NOT RECOMMENDED
framesize	NOT RECOMMENDED
3GPP-SRTP-Config	NOT RECOMMENDED
alt	NOT RECOMMENDED
alt-default-id	NOT RECOMMENDED
3GPP-Adaption-Support	NOT RECOMMENDED
mbms-flowid	NOT RECOMMENDED
fec-source-flow	SPECIAL
fec-repair-flow	SPECIAL
repair-window	SPECIAL
rams-updates	NOT RECOMMENDED
imageattr	IDENTICAL-PER-PT
cfw-id	NORMAL
portmapping-req	NOT RECOMMENDED
g.3gpp.cat	NORMAL
g.3gpp.crs	NORMAL
ecn-capable-rtp	IDENTICAL
visited-realm	TRANSPORT
secondary-realm	TRANSPORT
omr-s-cksum	NORMAL
omr-m-cksum	NORMAL
omr-codecs	NORMAL

omr-m-att	NORMAL
omr-s-att	NORMAL
omr-m-bw	NORMAL
omr-s-bw	NORMAL
msrp-cema	NORMAL
dccp-port	NOT RECOMMENDED
resource	NORMAL
channel	NORMAL
cmid	NORMAL
content	NORMAL
lcfg	SPECIAL
loopback	NORMAL
loopback-source	NORMAL
loopback-mirror	NORMAL
chatroom	TBD
altc	TRANSPORT
T38FaxMaxIFP	NORMAL
T38FaxUdpECDepth	NORMAL
T38FaxUdpFECMaxSpan	NORMAL
T38ModemType	NORMAL
cs-correlation	NORMAL
rtcp-idms	NORMAL

15.2.5. Table: att-field (source level)

The following values are to be added to the "att-field (source level)" registry in the "Session Description Protocol (SDP) Parameters" registry. The references should be updated to point at this RFC as well as the previous references.

SDP Name	Mux Category
cname	NORMAL
previous-ssrc	NORMAL
fmtp	IDENTICAL-PER-PT
ts-refclk	NORMAL
mediaclk	NORMAL

15.2.6. Table: content SDP Parameters

The following values are to be added to the "content SDP Parameters" subregistry in the "Session Description Protocol (SDP) Parameters" registry. The references should be updated to point at this RFC as well as the previous references.

SDP Name	Mux Category
slides	NORMAL
speaker	NORMAL
sl	NORMAL
main	NORMAL
alt	NORMAL

15.2.7. Table: Semantics for the ’group’ SDP Attribute

The following values are to be added to the "Semantics for the "group" SDP Attribute" subregistry in the "Session Description Protocol (SDP) Parameters" registry. The references should be updated to point at this RFC as well as the previous references.

Token	Mux Category
LS	NORMAL
FID	NORMAL
SRF	NORMAL
ANAT	NOT RECOMMENDED
FEC	NORMAL
FEC-FR	NORMAL
CS	NORMAL
DDP	NORMAL
DUP	NORMAL

15.2.8. Table: ’rtcp-fb’ Attribute Values

The following values are to be added to the " ’rtcp-fb’ Attribute Values" subregistry in the "Session Description Protocol (SDP) Parameters" registry. The references should be updated to point at this RFC as well as the previous references.

Value Name	Mux Category
ack	IDENTICAL-PER-PT
app	SPECIAL
ccm	IDENTICAL-PER-PT
nack	IDENTICAL-PER-PT
trr-int	IDENTICAL-PER-PT

15.2.9. Table: 'ack' and 'nack' Attribute Values

The following values are to be added to the " 'ack' and 'nack' Attribute Values" subregistry in the "Session Description Protocol (SDP) Parameters" registry. The references should be updated to point at this RFC as well as the previous references.

Value Name	Mux Category
sli	IDENTICAL-PER-PT
pli	IDENTICAL-PER-PT
rpsi	IDENTICAL-PER-PT
app	SPECIAL
rai	IDENTICAL-PER-PT
tllei	IDENTICAL-PER-PT
pslei	IDENTICAL-PER-PT
ecn	IDENTICAL

15.2.10. Table: 'depend' SDP Attribute Values

The following values are to be added to the " 'depend' SDP Attribute Values" subregistry in the "Session Description Protocol (SDP) Parameters" registry. The references should be updated to point at this RFC as well as the previous references.

Token	Mux Category
lay	IDENTICAL-PER-PT
mdc	IDENTICAL-PER-PT

15.2.11. Table: 'cs-correlation' Attribute Values

The following values are to be added to the " "cs-correlation" Attribute Values" subregistry in the "Session Description Protocol (SDP) Parameters" registry. The references should be updated to point at this RFC as well as the previous references.

Value	Mux Category
callerid	NORMAL
uuie	NORMAL
dtmf	NORMAL
external	NORMAL

15.2.12. Table: Semantics for the ’ssrc-group’ SDP Attribute

The following values are to be added to the Semantics for the "Semantics for the "ssrc-group" SDP Attribute" subregistry in the "Session Description Protocol (SDP) Parameters" registry. The references should be updated to point at this RFC as well as the previous references.

Token	Mux Category
FID	NORMAL
FEC	NORMAL
FEC-FR	NORMAL
DUP	NORMAL

15.2.13. Table: SDP/RTSP key management protocol identifiers

The following values are to be added to the "SDP/RTSP key management protocol identifiers" subregistry in the "Session Description Protocol (SDP) Parameters" registry. The references should be updated to point at this RFC as well as the previous references.

Value Name	Mux Category
mikey	IDENTICAL

15.2.14. Table: Codec Control Messages

The following values are to be added to the "Codec Control Messages" subregistry in the "Session Description Protocol (SDP) Parameters" registry. The references should be updated to point at this RFC as well as the previous references.

Value Name	Mux Category
fir	IDENTICAL-PER-PT
tmmbr	IDENTICAL-PER-PT
tstr	IDENTICAL-PER-PT
vbcm	IDENTICAL-PER-PT

15.2.15. Table: QoS Mechanism Tokens

The following values are to be added to the "QoS Mechanism Tokens" subregistry in the "Session Description Protocol (SDP) Parameters" registry. The references should be updated to point at this RFC as well as the previous references.

QoS Mechanism	Mux Category
rsvp	NORMAL
nsis	NORMAL

15.2.16. Table: SDP Capability Negotiation Option Tags

The following values are to be added to the "SDP Capability Negotiation Option Tags" subregistry in the "Session Description Protocol (SDP) Parameters" registry. The references should be updated to point at this RFC as well as the previous references.

QoS Mechanism	Mux Category
cap-v0	NORMAL
med-v0	NORMAL
bcap-v0	NORMAL
ccap-v0	NORMAL
icap-v0	NORMAL

15.2.17. Table: Timestamp Reference Clock Source Parameters

The following values are to be added to the "Timestamp Reference Clock Source Parameters" subregistry in the "Session Description Protocol (SDP) Parameters" registry. The references should be updated to point at this RFC as well as the previous references.

Name	Mux Category
ntp	NORMAL
ptp	NORMAL
gps	NORMAL
gal	NORMAL
glonass	NORMAL
local	NORMAL
private	NORMAL

15.2.18. Table: Media Clock Source Parameters

The following values are to be added to the "Media Clock Source Parameters" subegistry in the "Session Description Protocol (SDP) Parameters" registry. The references should be updated to point at this RFC as well as the previous references.

Name	Mux Category
sender	NORMAL
direct	NORMAL
IEEE1722	NORMAL

16. Security Considerations

This document does not add any new security considerations beyond the existing considerations in the RFC for protocols that are being multiplexed together.

The ways that SRTP streams are keyed is not believed to create any two-time pad vulnerability for the currently defined SRTP keying mechanism.

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18. Change Log

[RFC EDITOR NOTE: Please remove this section when publishing]

Changes from draft-ietf-mmusic-sdp-mux-attributes-04

- Fixed minor nits overall.
- Updated Acknowledgement Sections
- Last Call Version.

Changes from draft-ietf-mmusic-sdp-mux-attributes-03

- More re-work on the IANA section.
- Clean ups preparing for the last call.

Changes from draft-ietf-mmusic-sdp-mux-attributes-02

- Incorporated suggestions from Flemming on Capability Negotiation.
- Closed open issues from IETF90
- Added IANA section to list the categories for all the SDP attributes anlayzed
- Lots of cleanup
- Reformatted Refernces section to use short-form notation

Changes from draft-ietf-mmusic-sdp-mux-attributes-01

- Updated section 15 to provide detailed recommendation on dealing with encapsulating attributes. Also updated sections 5.20, 5.28, 5.29 to refer to Section 15.

- Added new categories IDENTICAL-PER-PT and INHERIT
- Updated Sections 16 to add the new categories.
- Updated Sections 5.1, 5.14, 5.15, 5.38, 8.5 to reflect the category IDENTICAL-PER-PT.
- Reformatted section 4 to add individual categories to their own sections.

Changes from draft-ietf-mmusic-sdp-mux-attributes-00

- Added Section 15 to provide recommendations on multiplexing SDP encapsulating attributes. Also updated sections 5.20, 5.28, 5.29 to refer to Section 15.
- Updated Section 5.38 to incorporate PM-dir review inputs from Qin Wu
- Updated Sections 5.2,5.14,8.5 to refer to BUNDLE draft for more clarity.
- Fixed few nits regarding sentence clarity and fill-in the NOTES section where information was lacking.

Changes from draft-nandakumar-mmusic-mux-attributes-05

- Renamed the document to be a WG document.
- Added Section 14.
- Updated Open Issues based on IETF88 discussions.

Changes from draft-nandakumar-mmusic-mux-attributes-04

- Added few OPEN ISSUES that needs to be discussed.
- Updated sections 5.10,5.23,5,24,5,25,7.2,9.1,5.12,5.27,8.4, 5.44,5.11,5.4,5.19,10.1,10.5,5.21,10.4,15.1
- Updated Table Column name Current to Level and improved TRANSPORT category explanation on suggestions form Dan Wing.
- Grouped all the rtcp-fb attribute analysis under a single section as suggested by Magnus/

Changes from draft-nandakumar-mmusic-mux-attributes-03

- Maintenance change to clean up grammatical nits and wordings.

Changes from draft-nandakumar-mmusic-mux-attributes-02

- Updated Sections 5.3,5.5,5.6,5.7,5.9,5.8,5.11,5.13,5.22,5.34, 5.37,5.40,5.41,5.42,5.43,5.44,5.45,6.1,6.2,6.3,8,3,12.1 based on the inputs from the respective RFC Authors.

Changes from draft-nandakumar-mmusic-mux-attributes-01

- Replaced Category BAD with NOT RECOMMENDED.
- Added Category TBD.
- Updated IANA Consideration Section.

Changes from draft-nandakumar-mmusic-mux-attributes-00

- Added new section for dealing with FEC payload types.

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