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**Annotated Example SDP for WebRTC
draft-ietf-rtcweb-sdp-14**

Abstract

The Web Real Time Communications (WebRTC) family of protocols defines mechanism for direct interactive rich communication using audio, video, and data between two peers' web browsers. Within the WebRTC framework, the Session Description Protocol (SDP) is used for negotiating session capabilities between the peers. Such a negotiation happens based on the SDP offer/answer exchange mechanism

This document provides an informational reference in describing the role of SDP and the offer/answer exchange mechanism for the most common WebRTC use cases.

This document makes no changes to the SDP offer/answer exchange mechanism.

Status of This Memo

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1. Introduction

JavaScript Session Establishment Protocol (JSEP) [[I-D.ietf-rtcweb-jsep](#)] specifies a generic protocol needed to generate [[RFC3264](#)] SDP offers and answers negotiated between the [[WebRTC](#)] peers for setting up, updating, and tearing down a WebRTC session. For this purpose, SDP is used for describing (media and non-media) streams as appropriate for the recipients of the session description to participate in the session.

The remainder of this document is organized as follows: Sections [3](#) and [4](#) provide an overview of SDP and the offer/answer exchange mechanism. [Section 5](#) provides sample SDP generated for the most common WebRTC use cases.

2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [BCP 14](#) [[RFC2119](#)] [[RFC8174](#)] when, and only when, they appear in all capitals, as shown here.

Readers should be familiar with the terminology defined in [[RFC3264](#)] and in [[RFC7656](#)].

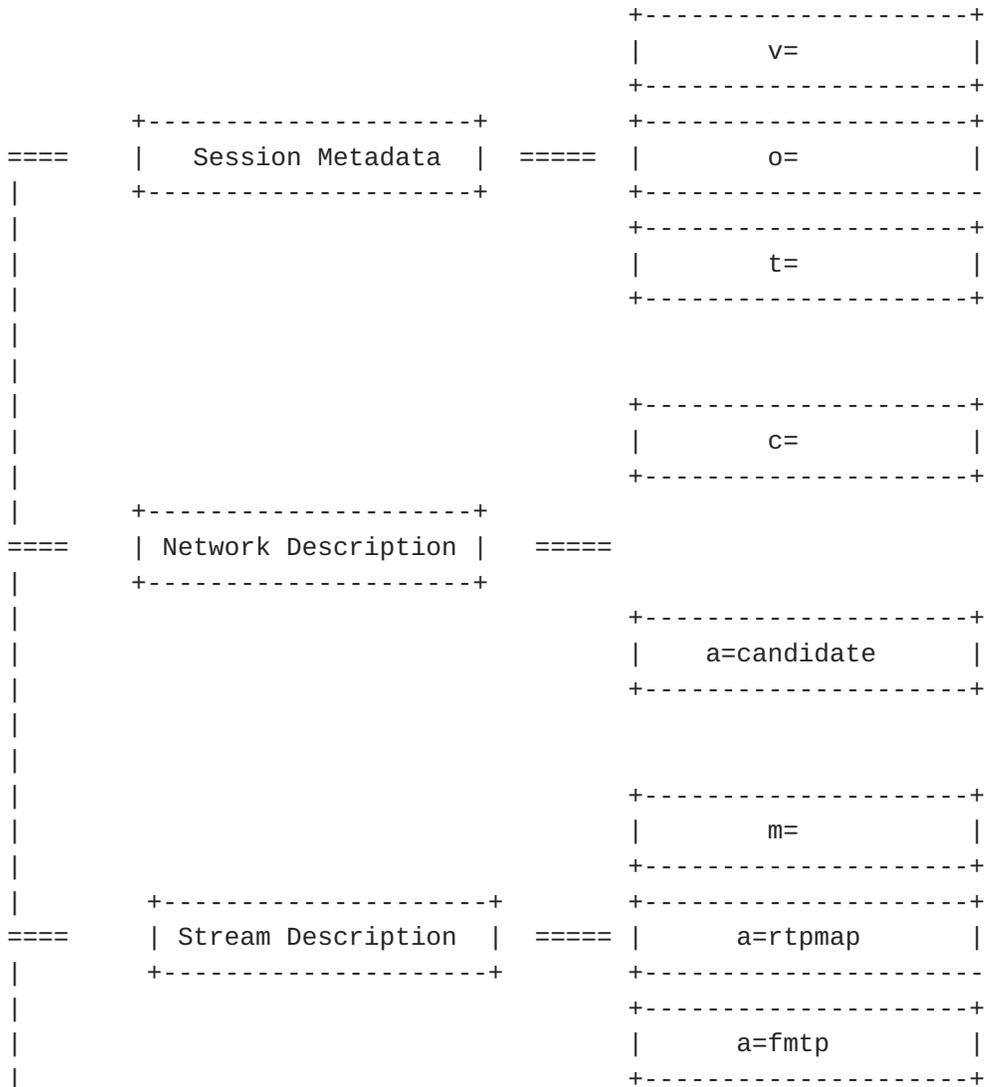
3. SDP and WebRTC

The purpose of this section is to provide a general overview of SDP and its components. For a more in-depth understanding, the readers are advised to refer to [[RFC4566](#)].

The Session Description Protocol (SDP) [[RFC4566](#)] describes a multimedia session, which can contain audio, video, whiteboard, fax, modem, and other streams. SDP provides a general purpose, standard representation to describe various aspects of multimedia sessions such as media capabilities, transport addresses, and related metadata in a transport agnostic manner, for the purposes of session announcement, session invitation, and parameter negotiation.

SDP is widely used in the context of Session Initiation Protocol [[RFC3261](#)], Real-time Transport Protocol [[RFC3550](#)], and Real-time Streaming Protocol [[RFC7826](#)] applications.

Figure 1 introduces a high-level breakup of SDP into components that semantically describe a multimedia session, in our case, a WebRTC session [[WebRTC](#)]. It by no means captures everything about SDP and hence, should be used for informational purposes only.



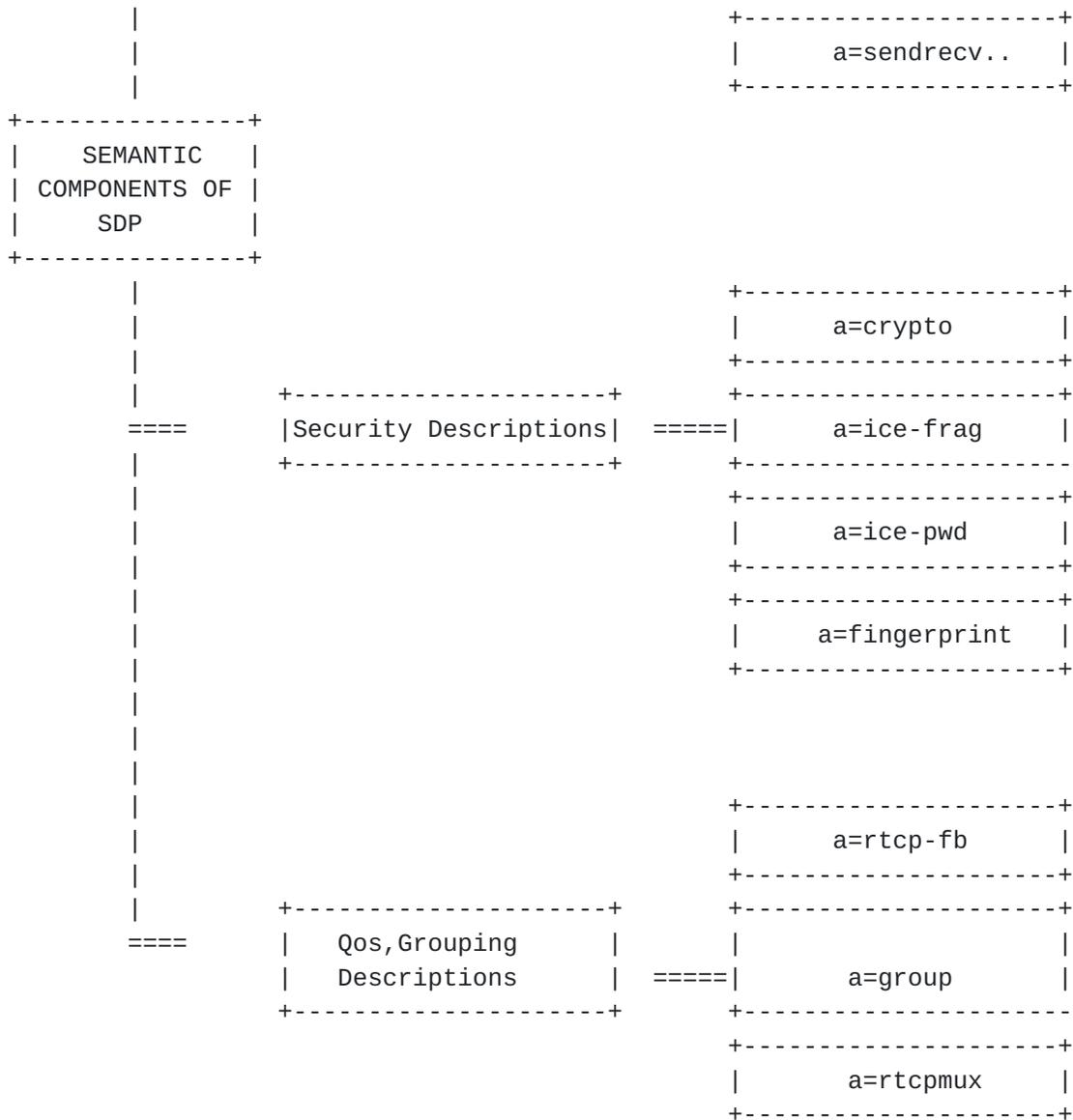


Figure 1: Semantic Components of SDP

[WebRTC] is architected in such a way that the design of the control plane is specified and implemented by the JavaScript application, as described in the JSEP specification [[I-D.ietf-rtcweb-jsep](#)]. JSEP provides mechanisms to create session characterization and media definition information to conduct the session based on SDP exchanges.

In this context, SDP serves two purposes:

1. Provide grammatical structure syntactically.
2. Semantically convey a participant's intention and capabilities required to successfully negotiate a session.

4. Offer/Answer and the WebRTC

This section introduces the SDP offer/answer Exchange mechanism mandated by WebRTC for negotiating session capabilities while setting up, updating, and tearing down a WebRTC session. This section is intentionally brief in nature, and interested readers are recommended to refer to [[RFC3264](#)] for specific details on the protocol operations.

The offer/answer [[RFC3264](#)] model specifies rules for the bilateral exchange of Session Description Protocol (SDP) messages for creation of multimedia streams. It defines a protocol with the involved participants exchanging desired session characteristics with each other constructed as SDP messages to negotiate the session between them.

In the most basic form, the protocol operation begins by one of the participants sending an initial SDP offer describing its intent to start a multimedia communication session. The participant receiving the offer may generate an SDP answer accepting the offer or it may reject the offer. If the session is accepted the offer/answer model provides a common view of the multimedia session between the participants.

Within the context of WebRTC, the offer/answer model defines the state-machinery for WebRTC peers to negotiate session descriptions between themselves during the initial setup stages as well as for eventual session updates. The JSEP specification [[I-D.ietf-rtcweb-jsep](#)] for WebRTC provides the mechanism for generating [[RFC3264](#)] SDP offers and answers in order for both sides of the session to agree upon the details such as the list of media formats to be sent/received, bandwidth information, crypto parameters, and transport parameters, for example.

5. WebRTC Session Description Examples

A typical web-based real-time multimedia communication session can be characterized as follows:

- * It has zero or more audio-only, video-only or audio/video RTP sessions,
- * may contain zero or more non-media data sessions,

- * All the sessions are secured with DTLS-SRTP,
- * Supports NAT traversal using the ICE mechanism,
- * Provides RTCP-based feedback mechanisms,
- * Sessions can be over IPv4-only or IPv6-only or dual-stack based clients,
- * Supports BUNDLE-based grouping of media streams over a single 5-tuple transport.

5.1. Some Conventions

The examples given in this document follow the conventions listed below:

- * In all the examples, Alice and Bob are assumed to be the WebRTC peers.
- * It is assumed that for most of the examples, the support for [\[I-D.ietf-mmusic-sdp-bundle-negotiation\]](#) is established a priori either out-of-band or as a consequence of a successful offer/answer negotiation between Alice and Bob, unless explicitly stated otherwise.
- * Call-flow diagrams that accompany the use cases capture only the prominent aspects of the system behavior and intentionally are not detailed, to improve readability.
- * Even though the call-flow diagrams show SDP being exchanged between the parties, it doesn't represent the only way an WebRTC setup is expected to work. Other approaches may involve WebRTC applications to exchange the media setup information via non-SDP mechanisms as long as they conform to the [\[I-D.ietf-rtcweb-jsep\]](#) API specification.
- * The SDP examples deviate from actual on-the-wire SDP notation in several ways. This is done to facilitate readability and to conform to the restrictions imposed by the RFC formatting rules.
 - Visual markers/Empty lines in any SDP example are inserted to make functional divisions in the SDP clearer, and are not actually part of the SDP syntax.
 - Excepting the above two conventions, line endings are to be interpreted as <CR><LF> pairs (that is, a US-ASCII 13 followed by a US-ASCII 10).

- * Against each SDP line, pointers to the appropriate RFCs are provided for further informational reference. Also an attempt has been made to provide explanatory notes to enable better understanding of the SDP usage, wherever appropriate.
- * The following SDP details are common across all the use cases defined in this document unless mentioned otherwise.
 - DTLS fingerprint for SRTP (a=fingerprint)
 - RTP/RTCP Multiplexing (a=rtcp-mux)
 - RTCP Feedback support (a=rtcp-fb)
 - Host and server-reflexive candidate lines (a=candidate)
 - DTLS-SRTP Setup framework parameters (a=setup)
 - RTCP attribute (a=rtcp)
 - RTP header extension indicating audio-levels from client to the mixer

For specific details, readers must refer to the [\[I-D.ietf-rtcweb-jsep\]](#) specification.

- * The term "session" is used rather loosely in this document to refer to either a "communication session" or an "RTP session" or a "RTP stream" depending on the context.
- * Payload type 109 is usually used for OPUS, 0 for PCMU, 8 for PCMA, 99 for H.264, and 120 for VP8 in most of the examples to maintain uniformity.
- * The IP Address:Port combinations '192.0.2.4:61665' (host) and '203.0.113.141:54609' (Server Reflexive) are typically used for Alice.
- * The IP Address:Port combinations '198.51.100.7:51556' (host) and '203.0.113.77:49203' (Server Reflexive) are typically used for Bob.
- * The IPv6 addresses 2001:db8:8101:3a55:4858:a2a9:22ff:99b9 and 2001:db8:30c:1266:5916:3779:22f6:77f7 are used to represent Alice and Bob's host addresses respectively.

- * In actual use the values that represent SSRCs, ICE candidate foundations, WebRTC MediaStream, and MediaStreamTrack IDs values shall be much larger than and/or random in comparison to the ones shown in the examples.
- * `tls-id` attribute values `89J2LRATQ3ULA24G9AHWVR31VJWSLB68` and `UKA29UQLTF690JW4WNPNU02Y0GF1FJ0Z` are used for Alice. The values `CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31` and `9AIFS8AQ009IXF5D6QUJ7P8BXPEZJ8G` are used for Bob.
- * `identity` attribute values are split across multiple lines to enhance readability, thus any line breaks and indentations in the value must be ignored.
- * SDP attributes in the examples closely follow the checklist defined in [Appendix A.1](#).

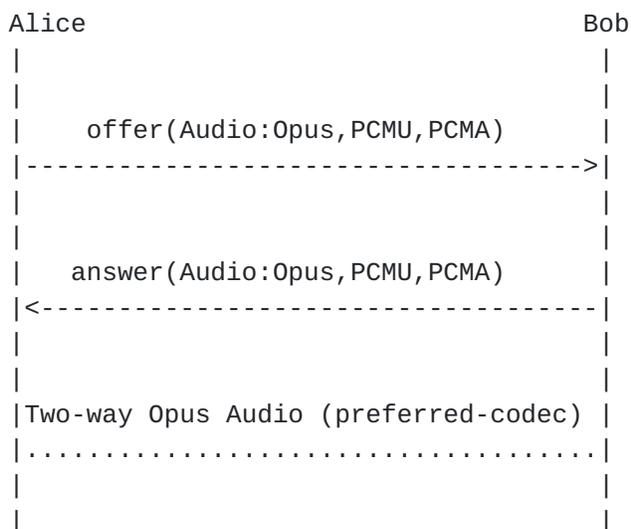
5.2. Basic Examples

5.2.1. Audio Only Session

This common scenario shows the SDP for a secure two-way audio session with Alice offering Opus, PCMU, PCMA and Bob accepting all the offered audio codecs.

This example also shows the endpoints being [\[RFC8445\]](#) compliant by including "ice2" ice-options attribute.

Two-way Audio Only Session




```

=====
  |Offer SDP
Contents
|RFC#/Notes      |
=====
  |
v=0
|[RFC4566]       |
-----+-----
  |o=- 20518 0 IN IP4
0.0.0.0          |
|[RFC4566] - Session Origin Information |
-----+-----
  |
s=-
|[RFC4566]       |
-----+-----
  |t=0
0
|[RFC4566]       |
-----+-----
  |a=group:BUNDLE
audio
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|
-----+-----
  |a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice]         |
-----+-----
  |a=ice-
options:ice2
|[RFC8445]       |
-----+-----
  |

```

a=identity:eyJpZHAiOnsiZG9tYWluIjoibmlpZi5odSIsInByb3RvY29sIjoiaWRwLmh0bWwifSwiYXNzZXJ0a
| [Section 7.4](#) of |
|
W9uIjoiZXlKaGJHY2lPaUpTVXpJMU5pSXNjb1I1Y0NjNk1rcFhVeUo5LmV5SmpiMjUwWlc1MGN5STZleUptYVc1b
| [[I-D.ietf-rtcweb-security-arch](#)] |
|
lpYSndjbx1ZENJNlczc2lZV3huYjNKcGRHaHRJam9pYzJoaExUSTF0aUlzSW1ScFoyVnPkQ0k2SWprek9rTXdPa
| |
|
k16T2pKR09rRXlPakF3T2pBd09qQkVPalV4T2tGRE9rUXlPalUwT2pZMU9rWTBPak5DT2pkRU9qa3lPa1JET2pnN
| |
|
E9qTXpPalV4T2pJek9qUXdPamN5T2preE9qZ3pPalZDT2pBeE9qSkdPalV3T2pjNE9qTkdJbjFkZlN3aWFXUmXib
| |
|
lJwZEhraU9pSnRhWE5wUuc1cGFwXVhSFVpZlEuSTVQdGhKNFFDT05T0FVXd2500Uh3MEdaTDl3d0RBVGRrTwtFW
| |
|
llmdlNVTTJ6Umd5R09WSGgzRmpnc2FPZk1kRnFsNUx6azBFbndV0TNQOUlCQ0xZOWtia3V1c0V1S25YRGVNLTNIN
| |
|
WFmdTJvZl9CTlZjUnB3MmdBdlNBbVVR6S1l1tcEppMFETdmV0TmtVT1huZE9HLUIzT3ZGb3QwZVNENlZSNUdhb2wyc
| |
|
GduS3FSTkt0d3dacEZ1eUZZbFRodHJIdGNiT19WV3o4QnZpTThKS250dExWd1JxNUhMX2ZLTlRCNzFDYkoyWmh5W
| |
|
XU1UEdwWDhXcXJMWC1ybm5YSFY3RnhoTTh50HdrLwd5cnRZazVnbFlZeUFrcTVqZk1SXzRzWER5d19Qc1BWTW1aZ
| |
|
XltenVGv3BQTzVFWlJYR0ZprjFET0o4Q0Q3Z3Zta2dUdlBXSwpkemtBIn0=
| |

+-----+
+-----+

|***** Audio m=line

+-----+
+-----+

|m=audio 54609 UDP/TLS/RTP/SAVPF 109 0
8 | [[RFC4566](#)]
|

+-----+
+-----+

|c=IN IP4
203.0.113.141
| [[RFC4566](#)]

```
+-----+
+-----+
|
a=mid:audio
|[RFC5888] |
```

```
+-----+
+-----+
|a=msid:ma
ta
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (ta) |
```

```
+-----+
+-----+
|
a=sendrecv
|[RFC3264] - Alice can send and recv |
|
|audio |
```

```
+-----+
+-----+
|a=rtpmap:109 opus/
48000/2 |
|[RFC7587] - Opus Codec 48 kHz, 2 |
|
|channels |
```

```
+-----+
+-----+
|a=rtpmap:0 PCMU/
8000
|[RFC3551] PCMU Audio Codec |
```

```

|a=rtpmap:8 PCMA/
8000
|[RFC3551] PCMA Audio Codec |

```

```

+-----+
+-----+
|a=maxptime:
120
|[RFC4566] |

```

```

+-----+
+-----+
|a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp] - ICE user|
|
|fragment |

```

```

+-----+
+-----+
|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[I-D.ietf-mmusic-ice-sip-sdp] - ICE |
|
|password |

```

```

+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122] - DTLS Fingerprint for SRTP |
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2| |

```

```

+-----+
+-----+
|
a=setup:actpass
|[RFC5763] - Alice can act as DTLS client|
|
|or server |

```

```

+-----+
+-----+
|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68

```

| [[I-D.ietf-mmusic-dtls-sdp](#)] |

+-----+
+-----+

|a=rtcp-
mux
| [[RFC5761](#)] - Alice can perform RTP/RTCP |

|
| Muxing |

+-----+
+-----+

|a=rtcp:60065 IN IP4
203.0.113.141 |
| [[RFC3605](#)] |

+-----+
+-----+

|a=rtcp-
rsize
| [[RFC5506](#)] - Alice intends to use reduced|

|
| size RTCP for this session |

+-----+
+-----+

|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [[RFC6464](#)] Alice supports RTP
header |

|
| extension to indicate audio levels |

+-----+
+-----+

|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid | [[I-D.ietf-
mmusic-sdp-bundle-negotiation](#)] |

+-----+
+-----+

|a=candidate:0 1 UDP 2122194687 192.0.2.4 61665 typ
host | [[I-D.ietf-mmusic-ice-sip-sdp](#)] -
RTP Host |

|
| Candidate |

+-----+
+-----+

```

|a=candidate:1 1 UDP 1685987071 203.0.113.141 54609 typ srflx raddr
192.0.2.4 rport 61665      |[I-D.ietf-mmusic-ice-sip-sdp] - RTP      |

|
|Server Reflexive ICE Candidate          |

+-----+
+-----+
|a=candidate:0 2 UDP 2122194687 192.0.2.4 61667 typ
host                                     |[I-D.ietf-mmusic-ice-sip-sdp] -
RTCP      |

|
|Host Candidate                          |

+-----+
+-----+
|a=candidate:1 2 UDP 1685987071 203.0.113.141 60065 typ srflx raddr
192.0.2.4 rport 61667      |[I-D.ietf-mmusic-ice-sip-sdp] - RTCP      |

|
|Server Reflexive ICE Candidate          |

+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice]          |

+-----+
+-----+

```

Table 1: 5.2.1 SDP Offer

```

=====
|Answer SDP
Contents
|RFC#/Notes |
=====
|
v=0
|[RFC4566] |
+-----+
+-----+
|o=- 16833 0 IN IP4
0.0.0.0 |
|[RFC4566] - Session Origin Information |
+-----+
+-----+
|
s=-
|[RFC4566] |
+-----+
+-----+
|t=0
0
|[RFC4566] |
+-----+
+-----+
|a=group:BUNDLE
audio
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|a=ice-
options:ice2
|[RFC8445] |
+-----+
+-----+
|

```

a=identity:ew0KICAiaWRwIjp7DQogICAgImRvbWFpbiI6ICJjaXNjb3NwYXJrLmNvbSIzDQogICAg
| [Section 7.4](#) of |
|
InByb3RVYz29sIjogImRlZmF1bHQiDQogIH0sDQogICJhc3NlcnRpb24iOiAibEp3WkVocmFV0XBTblJo
| [[I-D.ietf-rtcweb-security-arch](#)] |
|
V0U1d1VVYzFjR0ZYV1hWafNGVnBabEV1U1RWUWRHaEtORkZEVDA1VE9GV1hkMjVPT1VoM01FZGFURGwz
| |
|
ZDBSQlZHUUnJUV3RGVw0KICAgICAgICAgICAgICBsbG1kbE5wVFRKN1vtZDVSMdlXU0dne1JtcG5jMkZQ
| |
|
Wmts a1JuRnNOVXg2YXpCRmJuZFZPVE5RT1VsQ1EweFpPV3RpYTNWMMwVjFTMjVZUkdWTkxUTklODQog
| |
|
ICAgICAgICAgICAgIFdGbWRUSnZabDlDVGxaa1VuQjNNbWRCZGx0QmJWUjZTbGx0Y0VwcU1GRXRkbVYw
| |
|
VG10VlQxaHVart1ITFVJelQzWkdIM1F3WlZORU5swlNOVWRoYjJ3eWMNCiAgICAgICAgICAgICAgR2R1
| |
|
UZNGU1RrdE9kM2Rhy0VaMwVWw1piRlJvZEhKSWRHTmlUMTlXVjNvNFfuWnBUVGhLUzI1T2RFefdkMUp4
| |
|
TlVoTVgyWkxUbFJDnGRFlrb3lXbwg1VyINCn0=
| |

+-----+
+-----+
| ***** Audio m=line

+-----+
+-----+
| m=audio 49203 UDP/TLS/RTP/SAVPF 109 0
8 | [[RFC4566](#)]

+-----+
+-----+
| c=IN IP4
203.0.113.77
| [[RFC4566](#)]

+-----+
+-----+
|
a=mid:audio
| [[RFC5888](#)]

```

+-----+
+-----+
|a=msid:ma
ta
|[I-D.ietf-mmusic-msid] Identifies |
|
|MediaStream ID (ma) and MediaStreamTrack|
|
|ID (ta) |
+-----+
+-----+
|
a=sendrecv
|[RFC3264] - Bob can send and recv audio |
+-----+
+-----+
|a=rtpmap:109 opus/
48000/2 |
|[RFC7587] Opus Codec |
+-----+
+-----+
|a=rtpmap:0 PCMU/
8000
|[RFC3551] PCMU Audio Codec |
+-----+
+-----+
|a=rtpmap:8 PCMA/
8000
|[RFC3551] PCMA Audio Codec |
+-----+
+-----+
|a=maxptime:
120
|[RFC4566] |

```

```

+-----+
+-----+
|a=ice-ufrag:
05067423
|[I-D.ietf-mmusic-ice-sip-sdp] - ICE user|
|
|fragment|

```

```

+-----+
+-----+
|a=ice-pwd:
1747d1ee3474a28a397a4c3f3af08a068
|[I-D.ietf-mmusic-ice-sip-sdp] - ICE|
|
|password parameter|

```

```

+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122] - DTLS Fingerprint for SRTP|
|6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08|

```

```

+-----+
+-----+
|
a=setup:active
|[RFC5763] - Bob is the DTLS client|

```

```

+-----+
+-----+
|a=tls-
id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31
|[I-D.ietf-mmusic-dtls-sdp]|

```

```

+-----+
+-----+
|a=rtcp-
mux
|[RFC5761] - Bob can perform RTP/RTCP|
|
|Muxing on port 49203|

```

```

+-----+

```

```

+-----+
|a=rtcp-
rsize
|[RFC5506] - Bob intends to use reduced |
|
|size RTCP for this session          |
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level                               |[RFC6464] Bob supports audio
level RTP |
|
|header extension as well          |
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid                               |[I-D.ietf-
music-sdp-bundle-negotiation]|
+-----+
+-----+
|a=candidate:0 1 UDP 2122194687 198.51.100.7 51556 typ
host                               |[I-D.ietf-mmusic-ice-sip-sdp] - RTP/
RTCP|
|
|Host ICE Candidate                |
+-----+
+-----+
|a=candidate:1 1 UDP 1685987071 203.0.113.77 49203 typ srflx raddr
198.51.100.7 rport 51556          |[I-D.ietf-mmusic-ice-sip-sdp] - RTP/RTCP|
|
|Server Reflexive ICE Candidate    |
+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+

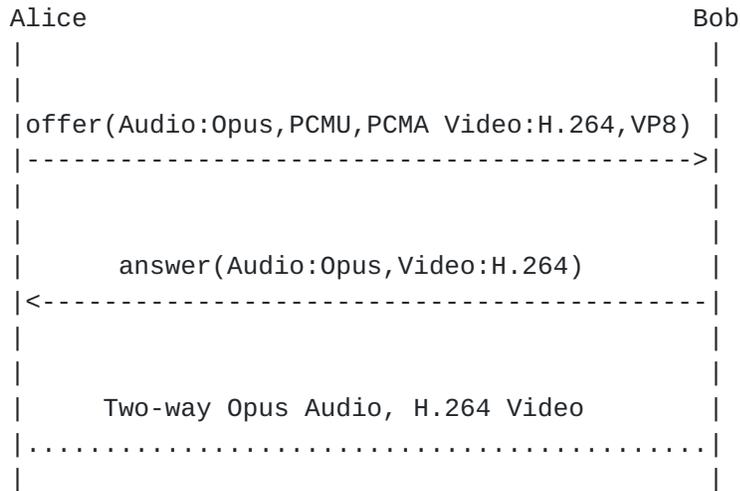
```

Table 2: 5.2.1 SDP Answer

5.2.2. Audio/Video Session

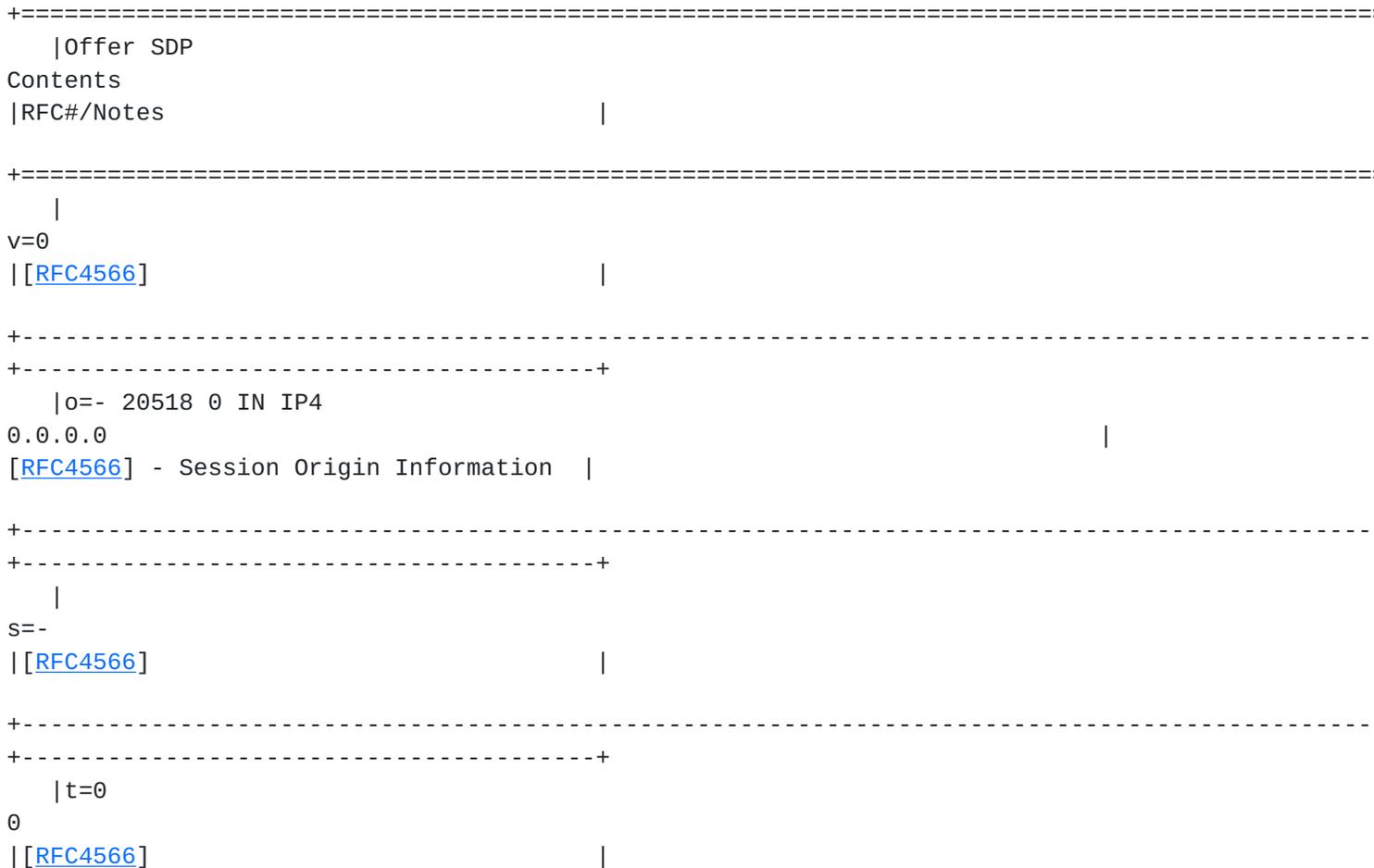
Alice and Bob establish a two-way audio and video session with Opus as the audio codec and H.264 as the video codec.

Two-way Audio/Video Session



5.2.2.1. IPv4 Audio/Video Session

This section shows the IPv4-only offer/answer exchange.



```
+-----+
+-----+
|a=group:BUNDLE audio
video | [I-D.ietf-mmusic-sdp-bundle-negotiation] |
```

```
+-----+
+-----+
|a=group:LS audio
video |
| [RFC5888] - Alice wants to lip sync her |
|
|audio and video streams |
```

```
+-----+
+-----+
|a=ice-
options:trickle
| [I-D.ietf-mmusic-trickle-ice] |
```

```
+-----+
+-----+
|a=ice-
options:ice2
| [RFC8445] |
```

```
+-----+
+-----+
| ***** Audio m=line
| *****
| *****
```

```
+-----+
+-----+
|m=audio 54609 UDP/TLS/RTP/SAVPF 109 0
8 | [RFC4566] |
```

```
+-----+
+-----+
|c=IN IP4
203.0.113.141
| [RFC4566] |
```

```
+-----+
+-----+
```

```

|
a=mid:audio
|[RFC5888]

```

```

+-----+
+-----+

```

```

|a=msid:ma
ta
|[I-D.ietf-mmusic-msid] Identifies

```

```

|
|MediaStream ID (ma) and MediaStreamTrack|

```

```

|
|ID (ta)

```

```

+-----+
+-----+

```

```

|
a=sendrecv
|[RFC3264] - Alice can send and recv

```

```

|
|audio

```

```

+-----+
+-----+

```

```

|a=rtptime:109 opus/
48000/2
|[RFC7587] - Opus Codec 48 kHz, 2

```

```

|
|channels

```

```

+-----+
+-----+

```

```

|a=rtptime:0 PCMU/
8000
|[RFC3551] PCMU Audio Codec

```

```

+-----+
+-----+

```

```

|a=rtptime:8 PCMA/
8000
|[RFC3551] PCMA Audio Codec

```

```

+-----+
+-----+

```

```

|a=maxptime:

```

120

| [[RFC4566](#)] |

+-----+
+-----+

|a=ice-ufrag:
074c6550
| [[I-D.ietf-mmusic-ice-sip-sdp](#)] - ICE user |

|
|fragment |

+-----+
+-----+

|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
| [[I-D.ietf-mmusic-ice-sip-sdp](#)] - ICE |

|
|password parameter |

+-----+
+-----+

|
a=fingerprint:sha-256
| [[RFC8122](#)] - DTLS Fingerprint for SRTP |
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2| |

+-----+
+-----+

|
a=setup:actpass
| [[RFC5763](#)] - Alice can act as DTLS client |

|
|or server |

+-----+
+-----+

|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68
| [[I-D.ietf-mmusic-dtls-sdp](#)] |

+-----+
+-----+

|a=rtcp-
mux
| [[RFC5761](#)] - Alice can perform RTP/RTCP |

|
|Mixing |

```

+-----+
+-----+
|a=rtcp-mux-
only
|[I-D.ietf-mmusic-mux-exclusive] |
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506] - Alice intends to use reduced|
|
|size RTCP for this session |
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [RFC6464]
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=candidate:0 1 UDP 2122194687 192.0.2.4 61665 typ
host | [I-D.ietf-mmusic-ice-sip-sdp] -
RTP/RTCP|
|
|Host Candidate |
+-----+
+-----+
|a=candidate:1 1 UDP 1685987071 203.0.113.141 54609 typ srflx raddr
192.0.2.4 rport 61665 | [I-D.ietf-mmusic-ice-sip-sdp] - RTP/RTCP|

```

|
|Server Reflexive ICE Candidate |

+-----+
+-----+

|a=end-of-
candidates
|[[I-D.ietf-mmusic-trickle-ice](#)] |

+-----+
+-----+

|***** Video m=line

***** |

+-----+
+-----+

|m=video 0 UDP/TLS/RTP/SAVPF 99
120 | [[RFC4566](#)]
|

+-----+
+-----+

|c=IN IP4
203.0.113.141
|[[RFC4566](#)] |

+-----+
+-----+

|a=bundle-
only
|[[I-D.ietf-mmusic-sdp-bundle-negotiation](#)] |

+-----+
+-----+

|
a=mid:video
|[[RFC5888](#)] |

+-----+
+-----+

|a=msid:ma
tb
|Identifies MediaStream ID (ma) and |

|
|MediaStreamTrack ID (tb) |

```
+-----+
+-----+
|
a=sendrecv
|[RFC3264] - Alice can send and recv |
|
|video |
+-----+
+-----+
|a=rtpmap:99
H264/90000
|[RFC6184] - H.264 Video Codec |
+-----+
+-----+
|a=fmtp:99 profile-level-id=4d0028;packetization-
mode=1 | [RFC6184]
|
+-----+
+-----+
|a=rtpmap:120
VP8/90000
|[RFC7741] - VP8 video codec |
+-----+
+-----+
|a=rtcp-fb:99
nack
|[RFC4585] - Indicates NACK RTCP feedback|
|
|support |
+-----+
+-----+
|a=rtcp-fb:99 nack
pli |
|[RFC4585] - Indicates support for |
|
|Picture loss Indication and NACK |
+-----+
+-----+
|a=rtcp-fb:99 ccm
fir |
|[RFC5104] - Full Intra Frame Request- |
|
```

```

|Codec Control Message support          |
+-----+
+-----+
|a=rtcp-fb:120
nack
|[RFC4585] - Indicates NACK RTCP feedback|
|
|support                                |
+-----+
+-----+
|a=rtcp-fb:120 nack
pli                                     |
|[RFC4585] - Indicates support for      |
|Picture loss Indication and NACK      |
+-----+
+-----+
|a=rtcp-fb:120 ccm
fir                                     |
|[RFC5104] - Full Intra Request-Codec  |
|
|Control Message support                |
+-----+
+-----+
|a=extmap:2 urn:iETF:params:rtp-
hdext:sdes:mid                          |[[I-D.iETF-
mmusic-sdp-bundle-negotiation]]|
+-----+
+-----+

```

Table 3: 5.2.2.1 SDP Offer

```

=====
|Answer SDP
Contents
|RFC#/Notes |
=====
|
v=0
|[RFC4566] |
+-----+
+-----+
|o=- 16833 0 IN IP4
0.0.0.0 |
|[RFC4566] - Session Origin Information |
+-----+
+-----+
|
s=-
|[RFC4566] |
+-----+
+-----+
|t=0
0
|[RFC4566] |
+-----+
+-----+
|a=group:BUNDLE audio
video | [I-
D.ietf-mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=group:LS audio
video |
|[RFC5888] - Bob agrees to do the same |
+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|a=ice-

```

options:ice2

| [[RFC8445](#)] |

+-----+
+-----+

| ***** Audio m=line
***** |
***** |

+-----+
+-----+

| m=audio 49203 UDP/TLS/RTP/SAVPF
109 | [[RFC4566](#)]
|

+-----+
+-----+

| c=IN IP4
203.0.113.77
| [[RFC4566](#)] |

+-----+
+-----+

|
a=mid:audio
| [[RFC5888](#)] |

+-----+
+-----+

| a=msid:ma
ta
| Identifies MediaStream ID (ma) and |
| MediaStreamTrack ID (ta) |

+-----+
+-----+

|
a=sendrecv
| [[RFC3264](#)] - Bob can send and recv audio |

+-----+
+-----+

| a=rtpmap:109 opus/
48000/2 |
| [[RFC7587](#)] - Bob accepts only Opus Codec |

+-----+
+-----+

| a=maxptime:

120

| [[RFC4566](#)] |

+-----+
+-----+

|a=ice-
ufrag:c300d85b
| [[I-D.ietf-mmusic-ice-sip-sdp](#)] - ICE |

|
|username frag |

+-----+
+-----+

|a=ice-
pwd:de4e99bd291c325921d5d47efbabd9a2
| [[I-D.ietf-mmusic-ice-sip-sdp](#)] - ICE |

|
|password |

+-----+
+-----+

|
a=fingerprint:sha-256
| [[RFC8122](#)] - DTLS Fingerprint for SRTP |
|6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08| |

+-----+
+-----+

|
a=setup:active
| [[RFC5763](#)] - Bob is the DTLS client |

+-----+
+-----+

|a=tls-
id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31
| [[I-D.ietf-mmusic-dtls-sdp](#)] |

```

+-----+
+-----+
  |a=rtcp-
mux
|[RFC5761] - Bob can perform RTP/RTCP  |
|
|Muxing                                |
+-----+

```

```

+-----+
+-----+
  |a=rtcp-mux-
only
|[I-D.ietf-mmusic-mux-exclusive]      |
+-----+

```

```

+-----+
+-----+
  |a=rtcp-
rsize
|[RFC5506] - Bob intends to use reduced |
|
|size RTCP for this session           |
+-----+

```

```

+-----+
+-----+
  |a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level                                |[RFC6464]
|
+-----+

```

```

+-----+
+-----+
  |a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid                        |[I-D.ietf-
mmusic-sdp-bundle-negotiation]|
+-----+

```

```

+-----+
+-----+
  |a=candidate:0 1 UDP 3618095783 198.51.100.7 49203 typ
host                                  |[I-D.ietf-mmusic-ice-sip-sdp] - RTP/
RTCP|
|
|Host ICE Candidate                   |
+-----+

```

```

+-----+
+-----+
  |a=candidate:1 1 UDP 565689203 203.0.113.77 49203 typ srflx raddr
+-----+

```

198.51.100.7 rport 51556 | [[I-D.ietf-mmusic-ice-sip-sdp](#)] - RTP/RTCP |

|
|Server Reflexive ICE Candidate |

+-----+
+-----+

|a=end-of-candidates

| [[I-D.ietf-mmusic-trickle-ice](#)] |

+-----+
+-----+

|***** Video m=line

***** |

+-----+
+-----+

|m=video 0 UDP/TLS/RTP/SAVPF
99

| [[RFC4566](#)]

|
+-----+
+-----+

|c=IN IP4
203.0.113.77

| [[RFC4566](#)] |

+-----+
+-----+

|a=bundle-only

| [[I-D.ietf-mmusic-sdp-bundle-negotiation](#)] |

+-----+
+-----+

|
a=mid:video

| [[RFC5888](#)] |

+-----+
+-----+

|a=msid:ma
tb

|Identifies MediaStream ID (ma) and |

|
|MediaStreamTrack ID (tb) |

+-----+
+-----+

|
a=sendrecv
|[RFC3264] - Bob can send and recv video |

+-----+
+-----+

|a=rtpmap:99
H264/90000
|[RFC6184] - Bob accepts H.264 Video |

|
|Codec. |

+-----+
+-----+

|a=fmtp:99 profile-level-id=4d0028;packetization-
mode=1 | [RFC6184]
|

+-----+
+-----+

|a=rtcp-fb:99
nack
|[RFC4585] - Indicates support for NACK- |

|
|based RTCP feedback |

+-----+
+-----+

|a=rtcp-fb:99 nack
pli |
|[RFC4585] - Indicates support for |

|
|Picture loss Indication and NACK |

+-----+
+-----+

|a=rtcp-fb:99 ccm
fir |
|[RFC5104] - Full Intra Request-Codec |

	Control Message support	
+-----		+-----
	a=extmap:2 urn:iETF:params:rtp-hdrext:sdes:mid	
		[I-D.ietf-mmusic-sdp-bundle-negotiation]
+-----		+-----

Table 4: 5.2.2.1 SDP Answer

5.2.2.2. Dual Stack Audio/Video Session

This section captures offer/answer exchange when Alice and Bob support both IPv4 and IPv6 host addresses.

+=====		
	Offer SDP	
Contents		
	RFC#/Notes	
+=====		
v=0		
	[RFC4566]	
+-----		
	o=- 20518 0 IN IP4	
0.0.0.0		
	[RFC4566] - Session Origin Information	
+-----		
s=-		
	[RFC4566]	
+-----		
	t=0	
0		
	[RFC4566]	

```
+-----+
+-----+
|a=group:BUNDLE audio
video | [I-D.ietf-mmusic-sdp-bundle-negotiation] |
```

```
+-----+
+-----+
|a=group:LS audio
video |
| [RFC5888] - Alice wants to lip sync her |
|
|audio and video streams |
```

```
+-----+
+-----+
|a=ice-
options:trickle
| [I-D.ietf-mmusic-trickle-ice] |
```

```
+-----+
+-----+
|a=ice-
options:ice2
| [RFC8445] |
```

```
+-----+
+-----+
| ***** Audio m=line
*****
***** |
```

```
+-----+
+-----+
|m=audio 54609 UDP/TLS/RTP/SAVPF 109 0
8 | [RFC4566] |
```

```
+-----+
+-----+
|c=IN IP4
203.0.113.141
| [RFC4566] |
```

```
+-----+
+-----+
|
a=mid:audio
| [RFC5888] |
```

```
+-----+
+-----+
|a=msid:ma
ta
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (ta) |
```

```
+-----+
+-----+
|
a=sendrecv
|[RFC3264] - Alice can send and recv |
|
|audio |
```

```
+-----+
+-----+
|a=rtpmap:109 opus/
48000/2 |
|[RFC7587] - Opus Codec 48 kHz, 2 |
```

|
|channels |

+-----+
+-----+

|a=rtpmap:0 PCMU/
8000
|[RFC3551] PCMU Audio Codec |

+-----+
+-----+

|a=rtpmap:8 PCMA/
8000
|[RFC3551] PCMA Audio Codec |

+-----+
+-----+

|a=maxptime:
120
|[RFC4566] |

+-----+
+-----+

|a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp] - ICE user|

|
|fragment |

+-----+
+-----+

|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[I-D.ietf-mmusic-ice-sip-sdp] - ICE |

|
|password parameter |

+-----+
+-----+

|
a=fingerprint:sha-256
|[RFC8122] - DTLS Fingerprint for SRTP |
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2| |

+-----+

+-----+
|
a=setup:actpass
|[RFC5763] - Alice can act as DTLS client|

|
|or server |

+-----+
+-----+
|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68
|[I-D.ietf-mmusic-dtls-sdp] |

+-----+
+-----+
|a=rtcp-
mux
|[RFC5761] - Alice can perform RTP/RTCP |
|
|Mixing |

+-----+
+-----+
|a=rtcp-mux-
only
|[I-D.ietf-mmusic-mux-exclusive] |

+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506] - Alice intends to use reduced|
|
|size RTCP for this session |

+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [RFC6464]
|

+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation] |

+-----+
+-----+

```
|a=candidate:0 1 UDP 2122194687 192.0.2.4 61665 typ
host | [I-D.ietf-mmusic-ice-sip-sdp] -
RTP/RTCP|
```

```
|
|Host Candidate |
```

```
+-----+
+-----+
|a=candidate:0 1 UDP 2122194687 2001:db8:8101:3a55:4858:a2a9:22ff:99b9 61665
typ host | [I-D.ietf-mmusic-ice-sip-sdp] - RTP/RTCP|
```

```
|
|IPv6 Host Candidate |
```

```
+-----+
+-----+
```

```
|a=end-of-
candidates
| [I-D.ietf-mmusic-trickle-ice] |
```

```
+-----+
+-----+
```

```
|***** Video m=line
***** |
***** |
```

```
+-----+
+-----+
```

```
|m=video 0 UDP/TLS/RTP/SAVPF 99
120 | [RFC4566]
```

```
+-----+
+-----+
```

```
|c=IN IP4
203.0.113.141
| [RFC4566] |
```

```
+-----+
+-----+
```

```

    |a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation]

```

```

+-----+
+-----+
    |
a=mid:video
|[RFC5888]

```

```

+-----+
+-----+
    |a=msid:ma
tb
|Identifies MediaStream ID (ma) and
|
|MediaStreamTrack ID (tb)

```

```

+-----+
+-----+
    |
a=sendrecv
|[RFC3264] - Alice can send and recv
|
|video

```

```

+-----+
+-----+
    |a=rtpmap:99
H264/90000
|[RFC6184] - H.264 Video Codec

```

```

+-----+
+-----+
    |a=fmtp:99 profile-level-id=4d0028;packetization-
mode=1
|[RFC6184]

```

```

+-----+
+-----+
    |a=rtpmap:120
VP8/90000
|[RFC7741] - VP8 video codec

```

```

+-----+
+-----+
    |a=rtcp-fb:99
nack

```

| [[RFC4585](#)] - Indicates NACK RTCP feedback|

|
|support |

+-----+
+-----+

|a=rtcp-fb:99 nack
pli |
| [[RFC4585](#)] - Indicates support for |

|
|Picture loss Indication and NACK |

+-----+
+-----+

|a=rtcp-fb:99 ccm
fir |
| [[RFC5104](#)] - Full Intra Request-Codec |

|
|Control Message support |

+-----+
+-----+

|a=rtcp-fb:120
nack
| [[RFC4585](#)] - Indicates NACK RTCP feedback|

|
|support |

+-----+
+-----+

|a=rtcp-fb:120 nack
pli |
| [[RFC4585](#)] - Indicates support for |

|
|Picture loss Indication and NACK |

+-----+
+-----+

|a=rtcp-fb:120 ccm
fir |
| [[RFC5104](#)] - Full Intra Request-Codec |

|
|Control Message support |

+-----+
+-----+

|a=extmap:2 urn:ietf:params:rtp-hdext:sdes:mid
|mmusic-sdp-bundle-negotiation|

|[I-D.ietf-

+-----+
+-----+

Table 5: 5.2.2.2 SDP Offer

Answer SDP Contents	
RFC#/Notes	
v=0	
[RFC4566]	
o=- 16833 0 IN IP4 0.0.0.0	
[RFC4566] - Session Origin Information	
s=-	
[RFC4566]	

```

+-----+
+-----+
|t=0
0
|[RFC4566] |

```

```

+-----+
+-----+
|a=group:BUNDLE audio
video | [I-
D.ietf-mmusic-sdp-bundle-negotiation] |

```

```

+-----+
+-----+
|a=group:LS audio
video |
[RFC5888] - Bob agrees to do the same |

```

```

+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice] |

```

```

+-----+
+-----+
|a=ice-
options:ice2
|[RFC8445] |

```

```

+-----+
+-----+
|***** Audio m=line
***** |
***** |

```

```

+-----+
+-----+
|m=audio 49203 UDP/TLS/RTP/SAVPF
109 | [RFC4566]
|

```

```

+-----+
+-----+
|c=IN IP4
203.0.113.77
|[RFC4566] |

```

```
+-----+
+-----+
|
a=mid:audio
|[RFC5888] |
+-----+
+-----+
|a=msid:ma
ta
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (ta) |
+-----+
+-----+
|
a=sendrecv
|[RFC3264] - Bob can send and recv audio |
+-----+
+-----+
|a=rtpmap:109 opus/
48000/2 |
|[RFC7587] - Bob accepts only Opus Codec |
+-----+
+-----+
|a=maxptime:
120
|[RFC4566] |
+-----+
+-----+
|a=ice-
ufrag:c300d85b
|[I-D.ietf-mmusic-ice-sip-sdp] - ICE |
|
|username frag |
+-----+
+-----+
|a=ice-
pwd:de4e99bd291c325921d5d47efbabd9a2
|[I-D.ietf-mmusic-ice-sip-sdp] - ICE |
|
|password |
+-----+
```

```
+-----+
|
a=fingerprint:sha-256
|[RFC8122] - DTLS Fingerprint for SRTP |
|6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08|
```

```
+-----+
|
a=setup:active
|[RFC5763] - Bob is the DTLS client |
```

```
+-----+
|a=tls-
id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31
|[I-D.ietf-mmusic-dtls-sdp] |
```

```
+-----+
|a=rtcp-
mux
|[RFC5761] - Bob can perform RTP/RTCP |
|
|Muxing |
```

```
+-----+
|a=rtcp-mux-
only
|[I-D.ietf-mmusic-mux-exclusive] |
```

```
+-----+
|a=rtcp-
rsize
|[RFC5506] - Bob intends to use reduced |
|
|size RTCP for this session |
```



```
+-----+
|c=IN IP4
203.0.113.77
|[RFC4566]|
```

```
+-----+
|a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|
```

```
+-----+
|
a=mid:video
|[RFC5888]|
```

```
+-----+
|a=msid:ma
tb
|Identifies MediaStream ID (ma) and
|
|MediaStreamTrack ID (tb)|
```

```
+-----+
|
a=sendrecv
|[RFC3264] - Bob can send and recv video |
```

```
+-----+
|a=rtpmap:99
H264/90000
|[RFC6184] - Bob accepts H.264 Video |
|
|Codec. |
```

```
+-----+
|a=fmtp:99 profile-level-id=4d0028;packetization-
mode=1 | [RFC6184]
|
```

```
+-----+
|a=rtcp-fb:99
nack
```

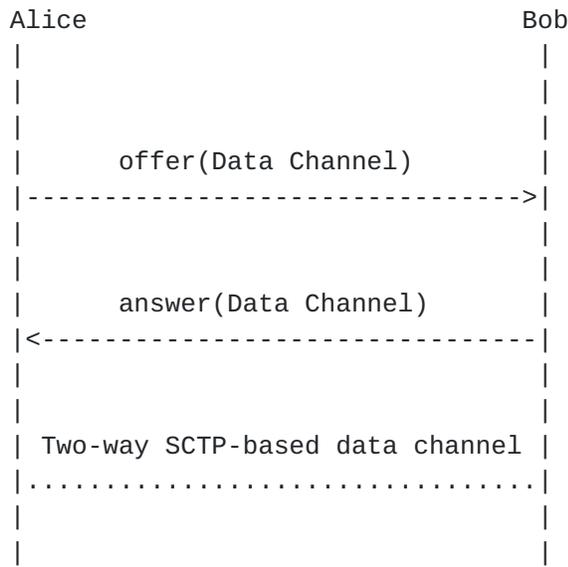
	[RFC4585] - Indicates support for NACK-	
	based RTCP feedback	
+-----+ +-----+		
	a=rtcp-fb:99 nack	
pli		
	[RFC4585] - Indicates support for	
	Picture loss Indication and NACK	
+-----+ +-----+		
	a=rtcp-fb:99 ccm	
fir		
	[RFC5104] - Full Intra Request- Codec	
	Control Message support	
+-----+ +-----+		
	a=extmap:2 urn:ietf:params:rtp-hdext:sdes:mid	
	mmusic-sdp-bundle-negotiation	[I-D.ietf-
+-----+ +-----+		

Table 6: 5.2.2.2 SDP Answer

5.2.3. Data-only Session

This scenario illustrates the SDP negotiated to set up a data-only session based on the SCTP Data Channel, thus enabling use cases such as file transfer or real-time game control, for example.

Two-way Data channel Session



```

+=====
|Offer SDP
Contents
|RFC#/Notes |
+=====
|
v=0
|[RFC4566] |
+-----+
|o=- 20518 0 IN IP4
0.0.0.0 |
|[RFC4566] - Session Origin Information |
+-----+
|
s=-
|[RFC4566] |
+-----+
+-----+

```

```

    |t=0
0
|[RFC4566]
+-----+
+-----+
    |a=group:BUNDLE
data
|[I-D.ietf-mmusic-sdp-bundle-negotiation]
+-----+
+-----+
    |a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice]
+-----+
+-----+
    |a=ice-
options:ice2
|[RFC8445]
+-----+
+-----+
    |***** Application m=line
*****
*****
+-----+
+-----+
    |m=application 54609 UDP/DTLS/SCTP webrtc-
datachannel
|[I-D.ietf-rtcweb-data-
channel]
+-----+
+-----+
    |c=IN IP4
203.0.113.141
|[RFC4566]
+-----+
+-----+

```

```

|
a=mid:data
|[RFC5888]
|

```

```

+-----+
+-----+

```

```

|
a=sendrecv
|[RFC3264] - Alice can send and recv non-|

```

```

|
|media data
|

```

```

+-----+
+-----+

```

```

|a=sctp-port:
5000
|[I-D.ietf-mmusic-sctp-sdp]
|

```

```

+-----+
+-----+

```

```

|a=max-message-size:
100000
|[I-D.ietf-mmusic-sctp-sdp]
|

```

```

+-----+
+-----+

```

```

|
a=setup:actpass
|[RFC5763] - Alice can act as DTLS client|

```

```

|
|or server
|

```

```

+-----+
+-----+

```

```

|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68
|[I-D.ietf-mmusic-dtls-sdp]
|

```

```

+-----+
+-----+

```

```

|a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp] - Session |

```

```

|
|Level ICE parameter
|

```

```

+-----+

```

```

+-----+
|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[I-D.ietf-mmusic-ice-sip-sdp] - Session |
|
|Level ICE parameter |
+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122] - Session DTLS Fingerprint for|
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2|SRTP |
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 192.0.2.4 61665 typ
host |[I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 1 UDP 1694302207 203.0.113.141 54609 typ srflx raddr
192.0.2.4 rport 61665 |[I-D.ietf-mmusic-ice-sip-sdp] |
+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+

```

Table 7: 5.2.3 SDP Offer

```

+=====+
|Answer SDP
Contents
|RFC#/Notes |
+=====+
|
v=0
|[RFC4566] |
+-----+
+-----+

```

|o=- 16833 0 IN IP4
0.0.0.0 |
[RFC4566] - Session Origin Information |

+-----+
+-----+
|
s=-
|[RFC4566] |

+-----+
+-----+
|t=0
0
|[RFC4566] |

+-----+
+-----+
|a=group:BUNDLE
data
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|

+-----+
+-----+
|***** Application m=line
***** |
***** |

+-----+
+-----+

```

|m=application 49203 UDP/DTLS/SCTP webrtc-
datachannel
sdp]

```

|[[I-D.ietf-mmusic-sctp-](#)

```

+-----+
+-----+
|c=IN IP4
203.0.113.77
|[RFC4566]

```

```

+-----+
+-----+
|
a=mid:data
|[RFC5888]

```

```

+-----+
+-----+
|
a=sendrecv
|[RFC3264] - Bob can send and recv non-
|
|media data

```

```

+-----+
+-----+
|a=sctp-port:
5000
|[I-D.ietf-mmusic-sctp-sdp]

```

```

+-----+
+-----+
|a=max-message-size:
100000
|[I-D.ietf-mmusic-sctp-sdp]

```

```

+-----+
+-----+
|
a=setup:active
|[RFC5763] - Bob is the DTLS client

```

```

+-----+
+-----+
|a=tls-
id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31
|[I-D.ietf-mmusic-dtls-sdp]

```

```

+-----+
+-----+
|a=ice-
ufrag:c300d85b
|[I-D.ietf-mmusic-ice-sip-sdp] - Session |
|
|Level ICE username frag          |
+-----+
+-----+
|a=ice-
pwd:de4e99bd291c325921d5d47efbabd9a2
|[I-D.ietf-mmusic-ice-sip-sdp] - Session |
|
|Level ICE password                |
+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122] - Session DTLS Fingerprint for|
|6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08|SRTP          |
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 198.51.100.7 51556 typ
host                               |[I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 1 UDP 1694302207 203.0.113.77 49203 typ srflx raddr
198.51.100.7 rport 51556          |[I-D.ietf-mmusic-ice-sip-sdp]          |
+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice]      |
+-----+
+-----+

```

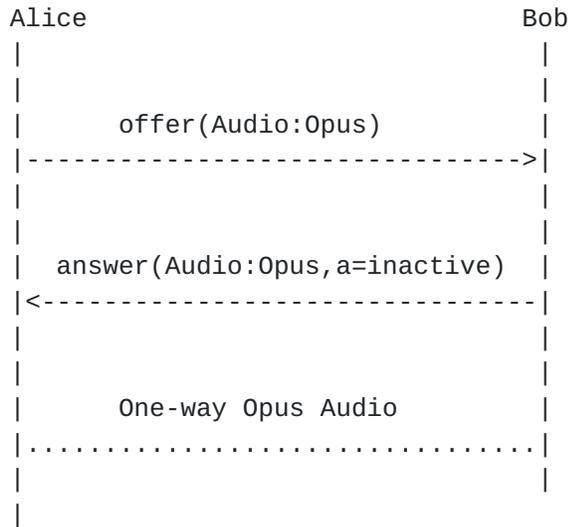
Table 8: 5.2.3 SDP Answer

5.2.4. Audio Call On Hold

Alice calls Bob, but when Bob answers he places Alice on hold by

setting the SDP direction attribute to a=inactive in the answer.

Audio On Hold



=====

| Offer SDP
 Contents
 |RFC#/Notes |

=====

|
 v=0
 |[RFC4566] |

-----+

|o=- 20518 0 IN IP4
 0.0.0.0 |
 [RFC4566] - Session Origin Information |

-----+

|
 s=-
 |[RFC4566] |

-----+

|t=0
 0
 |[RFC4566] |

-----+

-----+

```
|a=group:BUNDLE
audio
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|
```

```
+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice]|
```

```
+-----+
+-----+
|a=ice-
options:ice2
|[RFC8445]|
```

```
+-----+
+-----+
|***** Audio m=line
*****
*****|
```

```
+-----+
+-----+
|m=audio 54609 UDP/TLS/RTP/SAVPF
109|[RFC4566]|
|
```

```
+-----+
+-----+
|c=IN IP4
203.0.113.141
|[RFC4566]|
```

```
+-----+
+-----+
|
a=mid:audio
|[RFC5888]|
```

```
+-----+
+-----+
|a=msid:ma
ta
|Identifies MediaStream ID (ma) and|
|
|MediaStreamTrack ID (ta)|
```

```
+-----+
+-----+
```

|
a=sendrecv
|[RFC3264] - Alice can send and recv |

|
|audio |

+-----+
+-----+

|a=rtpmap:109 opus/
48000/2 |
|[RFC7587] - Opus Codec 48 kHz, 2 |

|
|channels |

+-----+
+-----+

|a=maxptime:
120
|[RFC4566] |

+-----+
+-----+

|a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp] - ICE user|

|
|fragment |

+-----+
+-----+

|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[I-D.ietf-mmusic-ice-sip-sdp] - ICE |

|
|password |

+-----+
+-----+

|
a=fingerprint:sha-256
|[RFC8122] - DTLS Fingerprint for SRTP |
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2| |

+-----+
+-----+

|
a=setup:actpass
|[RFC5763] - Alice can act as DTLS client|

|
|or server |

```
+-----+
+-----+
|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68
|[I-D.ietf-mmusic-dtls-sdp] |
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761] - Alice can perform RTP/RTCP |
|
|Muxing |
+-----+
+-----+
|a=rtcp-mux-
only
|[I-D.ietf-mmusic-mux-exclusive] |
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506] |
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [RFC6464]
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 192.0.2.4 61665 typ
host |[I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 1 UDP 1685987071 203.0.113.141 54609 typ srflx raddr
192.0.2.4 rport 61665 |[I-D.ietf-mmusic-ice-sip-sdp] |
+-----+
```

```

+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+

```

Table 9: 5.2.4 SDP Offer

```

=====
|Answer SDP
Contents
|RFC#/Notes |
=====
|
v=0
|[RFC4566] |
+-----+
+-----+
|o=- 16833 0 IN IP4
0.0.0.0 |
|[RFC4566] - Session Origin Information |
+-----+
+-----+

```

```

|
s=-
|[RFC4566]

```

```

+-----+
+-----+

```

```

|t=0
0
|[RFC4566]

```

```

+-----+
+-----+

```

```

|a=group:BUNDLE
audio
|[I-D.ietf-mmusic-sdp-bundle-negotiation]

```

```

+-----+
+-----+

```

```

|***** Audio m=line
*****
*****

```

```

+-----+
+-----+

```

```

|m=audio 49203 UDP/TLS/RTP/SAVPF
109 | [RFC4566]
|

```

```

+-----+
+-----+

```

```

|c=IN IP4
203.0.113.77
|[RFC4566]

```

```

+-----+
+-----+

```

```

|
a=mid:audio
|[RFC5888]

```

```

+-----+
+-----+

```

```

|a=msid:ma
ta
|Identifies MediaStream ID (ma) and

```

```

|
|MediaStreamTrack ID (ta)

```

```
+-----+
+-----+
|
a=inactive
|[RFC3264] - Bob puts call On Hold |
```

```
+-----+
+-----+
|a=rtpmap:109 opus/
48000/2 |
|[RFC7587] - Bob accepts Opus Codec |
```

```
+-----+
+-----+
|a=maxptime:
120
|[RFC4566] |
```

```
+-----+
+-----+
|a=ice-
ufrag:c300d85b
|[I-D.ietf-mmusic-ice-sip-sdp] - ICE |
|
|username frag |
```

```
+-----+
+-----+
|a=ice-
pwd:de4e99bd291c325921d5d47efbabd9a2
|[I-D.ietf-mmusic-ice-sip-sdp] - ICE |
|
|password |
```

```
+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122] - DTLS Fingerprint for SRTP |
|6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08| |
```

```
+-----+
+-----+
|
a=setup:active
|[RFC5763] - Bob is the DTLS client |
```

```
+-----+
```

```

+-----+
|a=tls-
id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31
|[I-D.ietf-mmusic-dtls-sdp] |
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761] - Bob can perform RTP/RTCP |
|
|Muxing |
+-----+
+-----+
|a=rtcp-mux-
only
|[I-D.ietf-mmusic-mux-exclusive] |
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506] |
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [RFC6464]
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 198.51.100.7 51556 typ
host | [I-D.ietf-mmusic-ice-sip-sdp] -
Host |

```

```

|
|candidate                               |
+-----+
+-----+
|a=candidate:1 1 UDP 1685987071 203.0.113.141 49203 typ srflx raddr
198.51.100.7 rport 51556    |[I-D.ietf-mmusic-ice-sip-sdp] - Server |
|
|Reflexive candidate                     |
+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice]         |
+-----+
+-----+

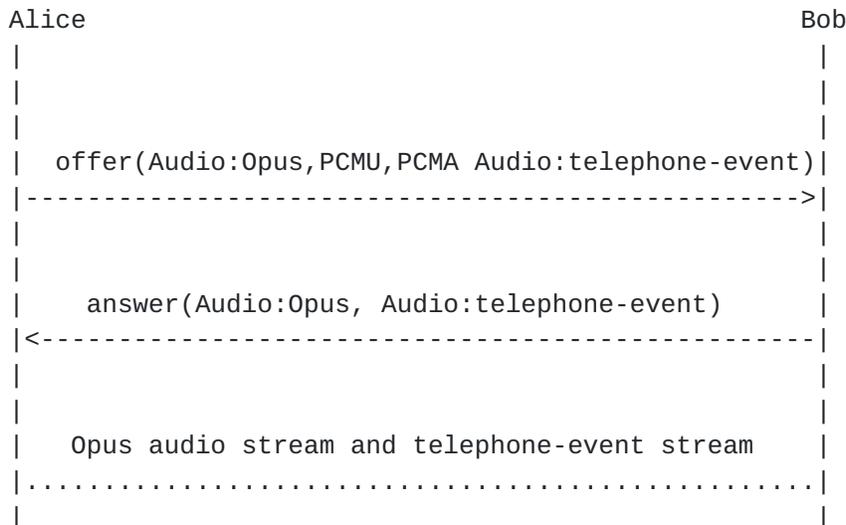
```

Table 10: 5.2.4 SDP Answer

5.2.5. Audio with DTMF Session

In this example, Alice wishes to establish two separate audio streams, one for normal audio and the other for telephone-events. Alice offers the first audio stream with three codecs and the other with [RFC4733] tones (for DTMF). Bob accepts both the audio streams by choosing Opus as the audio codec and telephone-event for the other stream.

Audio Session with DTMF



```
+-----+
| Offer SDP
Contents
| RFC#/Notes |
```

```
+-----+
|
v=0
| [RFC4566] |
```

```
+-----+
+-----+
| o=- 20518 0 IN IP4
0.0.0.0 |
| [RFC4566] - Session Origin Information |
```

```
+-----+
+-----+
|
s=-
| [RFC4566] |
```

```
+-----+
+-----+
| t=0
0
| [RFC4566] |
```

```

+-----+
+-----+
  |a=group:BUNDLE audio
dtmf                                     | [I-
D.ietf-mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
  |a=ice-
options:trickle
| [I-D.ietf-mmusic-trickle-ice]      |
+-----+
+-----+
  |a=ice-
options:ice2
| [RFC8445]                          |
+-----+
+-----+
  |***** Audio m=line
*****
*****
+-----+
+-----+
  |m=audio 54609 UDP/TLS/RTP/SAVPF 109 0
8                                     | [RFC4566]
|
+-----+
+-----+
  |c=IN IP4
203.0.113.141
| [RFC4566]                          |
+-----+
+-----+
  |
a=mid:audio
| [RFC5888]                          |
+-----+
+-----+
  |a=msid:ma
ta
|Identifies MediaStream ID (ma) and  |

```

|
|MediaStreamTrack ID (ta) |

+-----+
+-----+

|
a=sendrecv
|[RFC3264] - Alice can send and recv |

|
|audio |

+-----+
+-----+

|a=rtpmap:109 opus/
48000/2 |
|[RFC7587] - Opus Codec 48 kHz, 2 |

|
|channels |

+-----+
+-----+

|a=rtpmap:0 PCMU/
8000
|[RFC3551] PCMU audio Codec |

+-----+
+-----+

|a=rtpmap:8 PCMA/
8000
|[RFC3551] PCMA audio Codec |

+-----+
+-----+

|a=maxptime:
120
|[RFC4566] |

+-----+
+-----+

|a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp] - ICE user |

|
|fragment |

+-----+
+-----+

|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068

```

|[I-D.ietf-mmusic-ice-sdp] - ICE      |
|
|password parameter                    |
+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122] - DTLS Fingerprint for SRTP |
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2|           |
+-----+
+-----+
|
a=setup:actpass
|[RFC5763] - Alice can act as DTLS client|
|
|or server                            |
+-----+
+-----+
|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68
|[I-D.ietf-mmusic-dtls-sdp]          |
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761] - Alice can perform RTP/RTCP |
|
|Muxing                                |
+-----+
+-----+
|a=rtcp-mux-
only
|[I-D.ietf-mmusic-mux-exclusive]     |

```

```

+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506] |
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [RFC6464]
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|a=candidate:0 1 UDP 2122194687 192.0.2.4 61665 typ
host | [I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 1 UDP 1685987071 203.0.113.141 54609 typ srflx raddr
192.0.2.4 rport 61665 | [I-D.ietf-mmusic-ice-sip-sdp] |
+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|***** DTMF m=line
*****
*****
***** |
+-----+
+-----+
|m=audio 0 UDP/TLS/RTP/SAVPF
126 | [RFC4566]
|
+-----+
+-----+

```

```

    |c=IN IP4
203.0.113.141
|[RFC4566] |
+-----+
+-----+
    |a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
    |
a=mid:dtmf
|[RFC5888] |
+-----+
+-----+
    |a=msid:ma
tb
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (tb) |
+-----+
+-----+
    |
a=sendonly
|[RFC3264] - Alice can send DTMF Events |
+-----+
+-----+
    |a=rtpmap:126 telephone-event/
8000 | [RFC4733]
|
+-----+
+-----+
    |a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation]|
+-----+
+-----+

```

Table 11: 5.2.5 SDP Offer

```

=====
|Answer SDP

```

Contents

|RFC#/Notes |

=====

|
v=0
|[RFC4566] |

+-----+
+-----+

|o=- 16833 0 IN IP4
0.0.0.0 |
|[RFC4566] - Session Origin Information |

+-----+
+-----+

|
s=-
|[RFC4566] |

+-----+
+-----+

|t=0
0
|[RFC4566] |

+-----+
+-----+

|a=group:BUNDLE audio
dtmf | [[I-](#)
[D.ietf-mmusic-sdp-bundle-negotiation](#)]|

```

+-----+
+-----+
|***** Audio m=line
|*****
|*****

```

```

+-----+
+-----+
|m=audio 49203 UDP/TLS/RTP/SAVPF
109
|

```

| [[RFC4566](#)]

```

+-----+
+-----+
|c=IN IP4
203.0.113.77
|[RFC4566]
|

```

```

+-----+
+-----+
|
a=mid:audio
|[RFC5888]
|

```

```

+-----+
+-----+
|a=msid:ma
ta
|Identifies MediaStream ID (ma) and
|
|MediaStreamTrack ID (ta)
|

```

```

+-----+
+-----+
|
a=sendrecv
|[RFC3264] - Bob can send and receive
|
|Opus audio
|

```

```

+-----+
+-----+
|a=rtpmap:109 opus/
48000/2
|[RFC7587] - Bob accepts Opus Codec
|

```

|

|

|

|

|

|

|

|

|

|

|

|

|

|

|

```
+-----+
+-----+
|a=maxptime:
120
|[RFC4566] |
```

```
+-----+
+-----+
|a=ice-
ufrag:c300d85b
|[I-D.ietf-mmusic-ice-sip-sdp] - ICE |
|
|username frag |
```

```
+-----+
+-----+
|a=ice-
pwd:de4e99bd291c325921d5d47efbabd9a2
|[I-D.ietf-mmusic-ice-sip-sdp] - ICE |
|
|password |
```

```
+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122] - Fingerprint for SRTP |
|6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08| |
```

```
+-----+
+-----+
|
a=setup:active
|[RFC5763] - Bob is the DTLS client |
```

```
+-----+
+-----+
|a=tls-
id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31
|[I-D.ietf-mmusic-dtls-sdp] |
```

```
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761] - Bob can perform RTP/RTCP |
```

```
|
```

```

|Muxing on port 49203          |
+-----+
+-----+
|a=rtcp-mux-
only
|[I-D.ietf-mmusic-mux-exclusive] |
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506] - Alice intends to use |
|
|reduced-size RTCP for this session |
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level                               |[RFC6464]
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid                               |[I-D.ietf-
mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=candidate:0 1 UDP 2122194687 198.51.100.7 51556 typ
host                                     |[I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 1 UDP 1685987071 203.0.113.77 49203 typ srflx raddr
198.51.100.7 rport 51556 |[I-D.ietf-mmusic-ice-sip-sdp] |
+-----+
+-----+

```

```

    |a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice] |

```

```

+-----+
+-----+
    |***** DTMF m=line
*****
***** |

```

```

+-----+
+-----+
    |m=audio 0 UDP/TLS/RTP/SAVPF
126 | [RFC4566]
|

```

```

+-----+
+-----+
    |c=IN IP4
203.0.113.77
|[RFC4566] |

```

```

+-----+
+-----+
    |a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation] |

```

```

+-----+
+-----+
    |
a=mid:dtmf
|[RFC5888] |

```

```

+-----+
+-----+
    |a=msid:ma
tb
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (tb) |

```

```

+-----+
+-----+
    |
a=recvonly
|[RFC3264] - Alice can receive DTMF |

```

```

|
|events                                     |
+-----+
+-----+
|a=rtpmap:126 telephone-event/
8000                                         | [RFC4733]
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid                               | [I-D.ietf-
mmusic-sdp-bundle-negotiation]
+-----+
+-----+

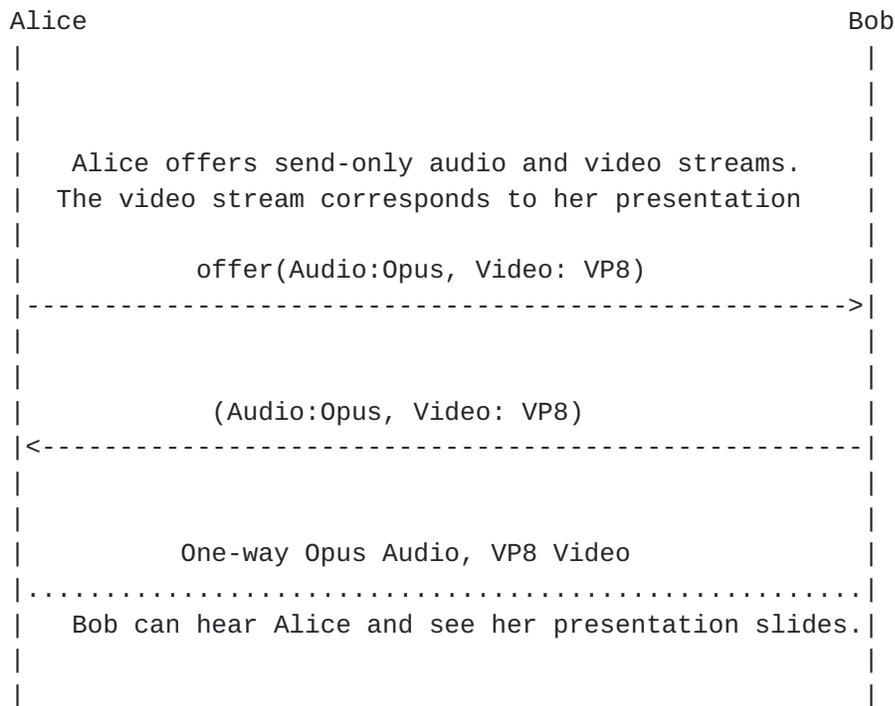
```

Table 12: 5.2.5 SDP Answer

5.2.6. One-way Audio/Video Session - Document Camera

In this scenario Alice and Bob engage in a One-way audio and video session with Bob receiving Alice's audio and her presentation slides as video stream.

One-way Audio & Video Session - Document Camera



=====

```

|Offer SDP
Contents
|RFC#/Notes      |

```

=====

```

|
v=0
|[RFC4566]      |

```

```

+-----+
|o=- 20519 0 IN IP4
0.0.0.0
|[RFC4566]      |

```

```

+-----+
|
s=-
|[RFC4566]      |

```

+-----+

```

    |t=0
0
|[RFC4566]
+-----+
+-----+
    |a=group:BUNDLE audio
video
|[I-
D.ietf-mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
    |a=group:LS audio
video
|[RFC5888]
+-----+
+-----+
    |a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice]
+-----+
+-----+
    |a=ice-
options:ice2
|[RFC8445]
+-----+
+-----+
    |***** Audio m=line
*****
*****
+-----+
+-----+
    |m=audio 54609 UDP/TLS/RTP/SAVPF
109
|[RFC4566]
+-----+
+-----+
    |c=IN IP4
203.0.113.141
|[RFC4566]

```

```

+-----+
+-----+
|
a=mid:audio
|[RFC5888]

```

```

+-----+
+-----+
|a=msid:ma
ta
|Identifies MediaStream ID (ma) and
|
|MediaStreamTrack ID (ta)

```

```

+-----+
+-----+
|
a=sendonly
|[RFC3264] - Send-only audio stream

```

```

+-----+
+-----+
|a=rtpmap:109 opus/
48000/2
|[RFC7587]

```

```

+-----+
+-----+
|a=maxptime:
120
|[RFC4566]

```

```

+-----+
+-----+
|a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp]

```

```

+-----+
+-----+
|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[I-D.ietf-mmusic-ice-sip-sdp]

```

```

+-----+
+-----+
|

```

a=fingerprint:sha-256
|[RFC8122] |
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2| |

+-----+
+-----+

|
a=setup:actpass
|[RFC5763] - Alice can act as DTLS client|

|
|or server |

+-----+
+-----+

|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68
|[I-D.ietf-mmusic-dtls-sdp] |

+-----+
+-----+

|a=rtcp-
mux
|[RFC5761] |

+-----+
+-----+

|a=rtcp-mux-
only
|[I-D.ietf-mmusic-mux-exclusive] |

+-----+
+-----+

|a=rtcp-
rsize
|[RFC5506] |

+-----+
+-----+

|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [RFC6464]
|

+-----+
+-----+

|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation]|

+-----+

```

+-----+
|a=candidate:0 1 UDP 2122194687 203.0.113.141 54609 typ
host | [I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=end-of-
candidates
| [I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
| ***** Video m=line
***** |
***** |
+-----+
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF | [RFC4566]
120 |
|
+-----+
+-----+
|c=IN IP4
203.0.113.141
| [RFC4566] |
+-----+
+-----+
|a=bundle-
only
| [I-D.ietf-mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|
a=mid:video
| [RFC5888] |
+-----+
+-----+

```

```

    |a=msid:ma
tb
|Identifies MediaStream ID (ma) and

```

```

|
|MediaStreamTrack ID (tb)

```

```

+-----+
+-----+

```

```

    |
a=sendonly
|[RFC3264] - Send-only video stream

```

```

+-----+
+-----+

```

```

    |a=rtppmap:120
VP8/90000
|[RFC7741]

```

```

+-----+
+-----+

```

```

    |
a=content:slides
|[RFC4796] - Alice's presentation video

```

```

|
|stream

```

```

+-----+
+-----+

```

```

    |a=rtcp-fb:120
nack
|[RFC4585]

```

```

+-----+
+-----+

```

```

    |a=rtcp-fb:120 nack
pli
|[RFC4585]

```

```

+-----+
+-----+

```

```

    |a=rtcp-fb:120 ccm
fir
|[RFC5104]

```

```

+-----+
+-----+

```

```

    |a=extmap:2 urn:iETF:params:rtp-
hdext:sdes:mid

```

[mmusic-sdp-bundle-negotiation](#) |

+-----+
+-----+

Table 13: 5.2.6 SDP Offer

```
+=====+
| Answer SDP
Contents
|RFC#/Notes |
+-----+
|
v=0
| [RFC4566] |
+-----+
|o=- 16833 0 IN IP4
0.0.0.0 |
| [RFC4566] |
+-----+
|
s=-
| [RFC4566] |
+-----+
|t=0
0
| [RFC4566] |
+-----+
|a=group:BUNDLE audio
video | [I-
D.ietf-mmusic-sdp-bundle-negotiation] |
+-----+
|a=group:LS audio
video |
| [RFC5888] |
+-----+
|a=ice-
```

```
options:trickle
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|a=ice-
options:ice2
|[RFC8445] |
+-----+
+-----+
|***** Audio m=line
***** |
***** |
+-----+
+-----+
|m=audio 49203 UDP/TLS/RTP/SAVPF
109 | [RFC4566]
|
+-----+
+-----+
|c=IN IP4
203.0.113.77
|[RFC4566] |
+-----+
+-----+
|
a=mid:audio
|[RFC5888] |
```

```

+-----+
+-----+
  |a=msid:ma
ta
|Identifies MediaStream ID (ma) and      |
|
|MediaStreamTrack ID (ta)                |
+-----+

```

```

+-----+
+-----+
  |
a=recvonly
|[RFC3264] - Receive-only audio stream  |
+-----+

```

```

+-----+
+-----+
  |a=rtpmap:109 opus/
48000/2
|[RFC7587]
+-----+

```

```

+-----+
+-----+
  |a=maxptime:
120
|[RFC4566]
+-----+

```

```

+-----+
+-----+
  |a=ice-
ufrag:c300d85b
|[I-D.ietf-mmusic-ice-sip-sdp]
+-----+

```

```

+-----+
+-----+
  |a=ice-
pwd:de4e99bd291c325921d5d47efbabd9a2
|[I-D.ietf-mmusic-ice-sip-sdp]
+-----+

```

```

+-----+
+-----+
  |
a=fingerprint:sha-256
|[RFC8122]

```

```

  |6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08|
+-----+

```

```
+-----+
|
a=setup:active
|[RFC5763] - Bob is the DTLS client |
+-----+
+-----+
|a=tls-
id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31
|[I-D.ietf-mmusic-dtls-sdp] |
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761] |
+-----+
+-----+
|a=rtcp-mux-
only
|[I-D.ietf-mmusic-mux-exclusive] |
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [RFC6464]
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 203.0.113.77 49203 typ
host | [I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|***** Video m=line
***** |
```

|

+-----+
+-----+

|m=video 0 UDP/TLS/RTP/SAVPF

120

| [[RFC4566](#)]

|

+-----+
+-----+

|c=IN IP4

203.0.113.77

| [[RFC4566](#)]

|

+-----+
+-----+

|a=bundle-
only

| [[I-D.ietf-mmusic-sdp-bundle-negotiation](#)]

+-----+
+-----+

|

a=mid:video

| [[RFC5888](#)]

|

+-----+
+-----+

|a=msid:ma

tb

|Identifies MediaStream ID (ma) and

|

|

|MediaStreamTrack ID (tb)

|

+-----+
+-----+

|

a=recvonly

| [[RFC3264](#)]

|

+-----+
+-----+

```

    |a=rtpmap:120
    VP8/90000
    |[RFC7741]
+-----+
+-----+
    |
    a=content:slides
    |[RFC4796] - presentation stream
+-----+
+-----+
    |a=rtcp-fb:120
    nack
    |[RFC4585]
+-----+
+-----+
    |a=rtcp-fb:120 nack
    pli
    |[RFC4585]
+-----+
+-----+
    |a=rtcp-fb:120 ccm
    fir
    |[RFC5104]
+-----+
+-----+
    |a=extmap:2 urn:iETF:params:rtp-
    hdext:sdes:mid
    |[I-D.ietf-
    mmusic-sdp-bundle-negotiation]|
+-----+
+-----+

```

Table 14: 5.2.6 SDP Answer

5.2.7. Audio, Video Session with BUNDLE Support Unknown

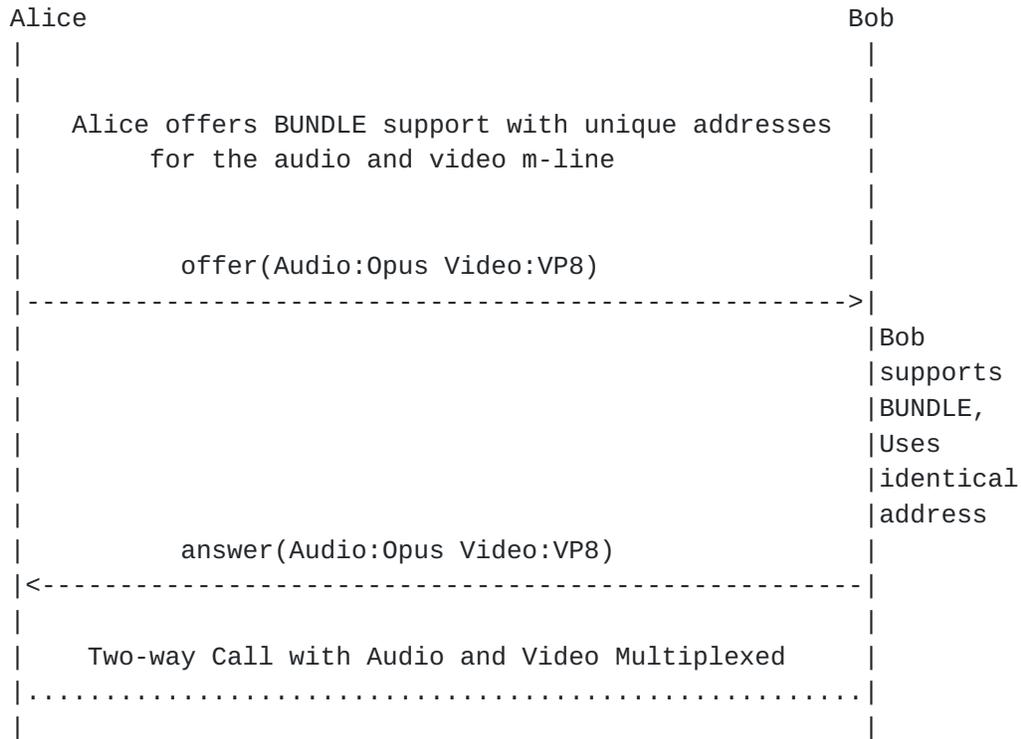
In this example, since Alice is unsure of the Bob's support of the BUNDLE framework, the following steps are performed in order to negotiate and set up a BUNDLE Address for the session.

- * An SDP offer, in which Alice assigns unique addresses to each "m=" line in the BUNDLE group, and requests the answerer to select the offerer's BUNDLE address.

* An SDP answer, in which Bob indicates support for BUNDLE, selects the offerer's BUNDLE address, selects its own BUNDLE address and associates it with each BUNDLED m=line within the BUNDLE group.

Once the offer/answer exchange completes, both Alice and Bob each end up using a single RTP session for both of the media streams.

Two-way Secure Audio and Video with BUNDLE support unknown



```

=====
| Offer SDP
Contents
|RFC#/Notes |
=====
|
v=0
| [RFC4566] |
+-----+
|o=- 20518 0 IN IP4
0.0.0.0 |
| [RFC4566] |
+-----+
|
s=-
| [RFC4566] |
+-----+
+-----+

```

```

    |t=0
0
|[RFC4566]
+-----+
+-----+
    |a=group:BUNDLE audio
video
|[I-
D.ietf-mmusic-sdp-bundle-negotiation]|

|
|Alice supports grouping of m=lines under|

|
|BUNDLE semantics
+-----+
+-----+
    |a=group:LS audio
video
|[RFC5888]
+-----+
+-----+
    |a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice]
+-----+
+-----+
    |a=ice-
options:ice2
|[RFC8445]
+-----+
+-----+
    |***** Audio m=line
*****
*****
+-----+
+-----+
    |m=audio 54609 UDP/TLS/RTP/SAVPF
109
|[RFC4566]
|

```

```

+-----+
+-----+
  |c=IN IP4
203.0.113.141
|[RFC4566] |

```

```

+-----+
+-----+
  |
a=mid:audio
|[RFC5888] Audio m=line part of BUNDLE |

|
|group with a unique port number |

```

```

+-----+
+-----+
  |a=msid:ma
ta
|Identifies MediaStream ID (ma) and |

|
|MediaStreamTrack ID (ta) |

```

```

+-----+
+-----+
  |
a=sendrecv
|[RFC3264] |

```

```

+-----+
+-----+
  |a=rtpmap:109 opus/
48000/2 |
|[RFC7587] |

```

```

+-----+
+-----+
  |a=maxptime:
120
|[RFC4566] |

```

```

+-----+
+-----+
  |a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp] |

```

+-----+
+-----+
|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[[I-D.ietf-mmusic-ice-sip-sdp](#)]|

+-----+
+-----+
|
a=fingerprint:sha-256
|[[RFC8122](#)]|
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2|

+-----+
+-----+
|
a=setup:actpass
|[[RFC5763](#)] - Alice can act as DTLS client|

|
|or server|

+-----+
+-----+
|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68
|[[I-D.ietf-mmusic-dtls-sdp](#)]|

+-----+
+-----+
|a=rtcp-
mux
|[[RFC5761](#)]|

+-----+
+-----+
|a=rtcp:54610 IN IP4
203.0.113.141|
|[[RFC3605](#)] - RTCP port different from RTP|

|
|Port|

+-----+
+-----+
|a=rtcp-
rsize
|[[RFC5506](#)]|

+-----+

```

+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level                                     |[RFC6464]
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid                                     |[I-D.ietf-
music-sdp-bundle-negotiation]|
+-----+
+-----+
|a=candidate:0 1 UDP 2122194687 192.0.2.4 61665 typ
host                                     |[I-D.ietf-mmusic-ice-sip-sdp] -
RTP host|
|
|candidate                               |
+-----+
+-----+
|a=candidate:1 1 UDP 1685987071 203.0.113.141 54609 typ srflx raddr
192.0.2.4 rport 61665 |[I-D.ietf-mmusic-ice-sip-sdp] - RTP |
|
|Server Reflexive candidate               |
+-----+
+-----+
|a=candidate:0 2 UDP 2122194687 192.0.2.4 61666 typ
host                                     |[I-D.ietf-mmusic-ice-sip-sdp] -
RTCP |
|
|host candidate                           |
+-----+
+-----+
|a=candidate:1 2 UDP 1685987071 203.0.113.141 54610 typ srflx raddr
192.0.2.4 rport 61666 |[I-D.ietf-mmusic-ice-sip-sdp] - RTCP |

```

|
|Server Reflexive candidate |

+-----+
+-----+

|***** Video m=line

***** |

+-----+
+-----+

|m=video 62537 UDP/TLS/RTP/SAVPF
120 | [[RFC4566](#)]
|

+-----+
+-----+

|c=IN IP4
203.0.113.141
| [[RFC4566](#)] |

+-----+
+-----+

|
a=mid:video
| [[RFC5888](#)] Video m=line part of the |

|
|Bundle group with a unique port number |

+-----+
+-----+

|a=msid:ma
tb
|Identifies MediaStream ID (ma) and |

|
|MediaStreamTrack ID (tb) |

+-----+
+-----+

|
a=sendrecv
| [[RFC3264](#)] |

+-----+
+-----+

|a=rtpmap:120

VP8/90000

| [[RFC7741](#)] |

+-----+
+-----+

|a=ice-ufrag:
6550074c

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|a=ice-pwd:
74af08a068a28a397a4c3f31747d1ee34

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|
a=fingerprint:sha-256

| [[RFC8122](#)] |

|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2| |

+-----+
+-----+

|
a=setup:actpass

| [[RFC5763](#)] - Alice can act as DTLS client |

|
|or server |

+-----+
+-----+

|a=tls-
id:UKA29UQLTF690JW4WNPNU02Y0GF1FJ0Z

| [[I-D.ietf-mmusic-dtls-sdp](#)] |

+-----+
+-----+

|a=rtcp-
mux

| [[RFC5761](#)] |

+-----+
+-----+

|a=rtcp:62538 IN IP4
203.0.113.141

| [[RFC3605](#)] |

+-----+

```

+-----+
|a=rtcp-
rsize
|[RFC5506] |
+-----+
+-----+
|a=rtcp-fb:120
nack
|[RFC4585] |
+-----+
+-----+
|a=rtcp-fb:120 nack
pli |
|[RFC4585] |
+-----+
+-----+
|a=rtcp-fb:120 ccm
fir |
|[RFC5104] |
+-----+
+-----+
|a=extmap:2 urn:iETF:params:rtp-
hdext:sdes:mid | [I-D.iETF-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|a=candidate:0 1 UDP 2122194687 192.0.2.4 61886 typ
host | [I-D.iETF-mmusic-ice-sip-sdp] -
RTP Host |
|
|candidate |
+-----+
+-----+
|a=candidate:1 1 UDP 1685987071 203.0.113.141 62537 typ srflx raddr
192.0.2.4 rport 61886 | [I-D.iETF-mmusic-ice-sip-sdp] - RTP |

```

```

|
|Server Reflexive candidate          |
+-----+
+-----+
|a=candidate:0 2 UDP 2122194687 192.0.2.4 61888 typ
host                               |[I-D.ietf-mmusic-ice-sip-sdp] -
RTCP    |

|
|host candidate                    |
+-----+
+-----+
|a=candidate:1 2 UDP 1685987071 203.0.113.141 62538 typ srflx raddr
192.0.2.4 rport 61888             |[I-D.ietf-mmusic-ice-sip-sdp] - RTCP    |

|
|Server Reflexive candidate          |
+-----+
+-----+

```

Table 15: 5.2.7 SDP Offer w/BUNDLE

```

+=====+
|Answer SDP
Contents
|RFC#/Notes          |
+=====+
+-----+
|
v=0
|[RFC4566]          |
+-----+
+-----+
|o=- 16833 0 IN IP4
0.0.0.0
[RFC4566]          |
+-----+
+-----+
|
s=-
|[RFC4566]          |

```

```
+-----+
+-----+
|t=0
0
|[RFC4566]
+-----+
+-----+
|a=group:BUNDLE audio
video|[I-
D.ietf-mmusic-sdp-bundle-negotiation]|
|
|Bob supports BUNDLE semantics.
+-----+
+-----+
|a=group:LS audio
video|
|[RFC5888]
+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice]
+-----+
+-----+
|a=ice-
options:ice2
|[RFC8445]
+-----+
+-----+
|***** Audio m=line
*****
*****
+-----+
+-----+
|m=audio 49203 UDP/TLS/RTP/SAVPF
109|[RFC4566]
|
+-----+
+-----+
|c=IN IP4
203.0.113.77
|[RFC4566]
```

```

+-----+
+-----+
|
a=mid:audio
|[RFC5888] Audio m=line part of the |
|
|BUNDLE group |
+-----+
+-----+
|a=msid:ma
ta
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (ta) |
+-----+
+-----+
|
a=sendrecv
|[RFC3264] |
+-----+
+-----+
|a=rtpmap:109 opus/
48000/2 |
|[RFC7587] |
+-----+
+-----+

```

|a=maxptime:

120

| [[RFC4566](#)] |

+-----+
+-----+

|a=ice-

ufrag:c300d85b

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|a=ice-

pwd:de4e99bd291c325921d5d47efbabd9a2

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|
a=fingerprint:sha-256

| [[RFC8122](#)] |

| 6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08 |

+-----+
+-----+

|
a=setup:active

| [[RFC5763](#)] - Bob is the DTLS client |

+-----+
+-----+

|a=tls-

id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31

| [[I-D.ietf-mmusic-dtls-sdp](#)] |

+-----+
+-----+

|a=rtcp-
mux

| [[RFC5761](#)] |

+-----+
+-----+

|a=rtcp-
rsize

| [[RFC5506](#)] |

+-----+
+-----+

```
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level                                     |[RFC6464]
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid                                     |[I-D.ietf-
music-sdp-bundle-negotiation]|
+-----+
+-----+
|a=candidate:0 1 UDP 2122194687 198.51.100.7 49203 typ
host                                     |[I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 1 UDP 1685987071 203.0.113.77 51556 typ srflx raddr
198.51.100.7 rport 49203 |[I-D.ietf-mmusic-ice-sip-sdp] |
+-----+
+-----+
|***** Video m=line
*****
*****
*****
+-----+
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF
120                                     |[RFC4566]
|
+-----+
+-----+
|c=IN IP4
203.0.113.77
|[RFC4566] |
+-----+
+-----+
|a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|
a=mid:video
|[RFC5888] Video m=line part of the |
```

|
|BUNDLE group with the port from audio |

|
|line repeated |

+-----+
+-----+

|a=msid:ma
tb
|Identifies MediaStream ID (ma) and |

|
|MediaStreamTrack ID (tb) |

+-----+
+-----+

|
a=sendrecv
|[RFC3264] |

+-----+
+-----+

|a=rtpmap:120
VP8/90000
|[RFC7741] |

+-----+
+-----+

|a=rtcp-fb:120
nack
|[RFC4585] |

+-----+
+-----+

|a=rtcp-fb:120 nack
pli |
|[RFC4585] |

+-----+
+-----+

```

|a=rtcp-fb:120 ccm
fir
[RFC5104]
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid
mmusic-sdp-bundle-negotiation]|
+-----+
+-----+

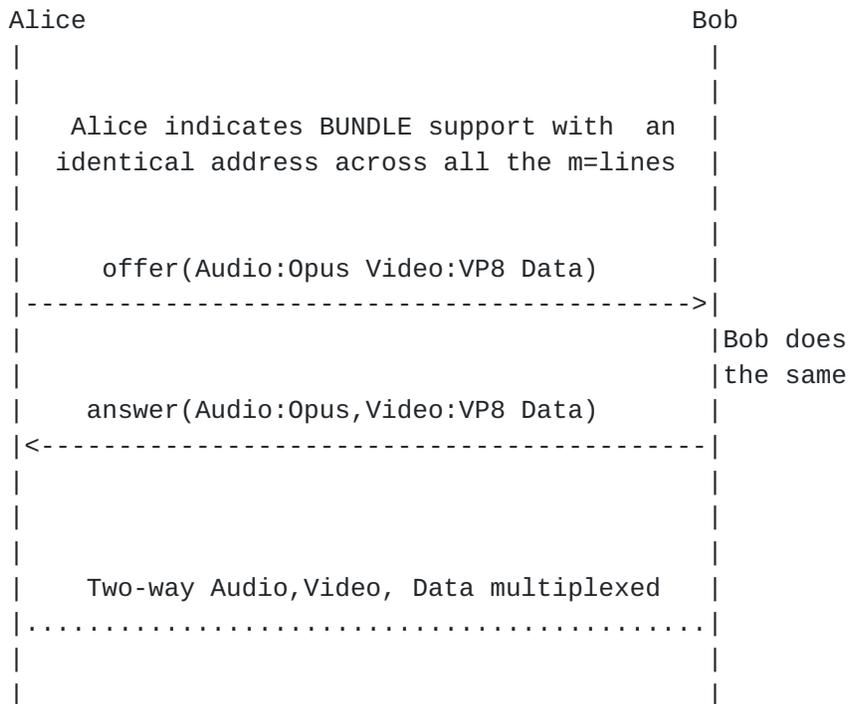
```

Table 16: 5.2.7 SDP Answer w/BUNDLE

5.2.8. Audio, Video, and Data Session

This example shows SDP for negotiating a session with Audio, Video and data streams between Alice and Bob with BUNDLE support known.

Audio,Video, and Data with BUNDLE support known



```

+=====+
|Offer SDP
Contents
|RFC#/Notes
|

```

```

+-----+
|
v=0
|[RFC4566]
+-----+
+-----+
|o=- 20518 0 IN IP4
0.0.0.0
|[RFC4566]
+-----+
+-----+
|
s=-
|[RFC4566]
+-----+
+-----+
|t=0
0
|[RFC4566]
+-----+
+-----+
|a=group:BUNDLE audio video
data
|[I-D.ietf-
mmusic-sdp-bundle-negotiation]|

```

```

+-----+
+-----+
  |a=group:LS audio
video
[RFC5888]

```

```

+-----+
+-----+
  |a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice]

```

```

+-----+
+-----+
  |a=ice-
options:ice2
|[RFC8445]

```

```

+-----+
+-----+
  |***** Audio m=line
*****
*****

```

```

+-----+
+-----+
  |m=audio 54609 UDP/TLS/RTP/SAVPF
109
|
| [RFC4566]

```

```

+-----+
+-----+
  |c=IN IP4
203.0.113.141
|[RFC4566]

```

```

+-----+
+-----+
  |a=msid:ma
ta
|Identifies MediaStream ID (ma) and
|
|MediaStreamTrack ID (ta)

```

```

+-----+
+-----+
  |

```

```
a=mid:audio
|[RFC5888]

+-----+
+-----+
|
a=sendrecv
|[RFC3264]

+-----+
+-----+
|a=rtpmap:109 opus/
48000/2
|[RFC7587]

+-----+
+-----+
|a=maxptime:
120
|[RFC4566]

+-----+
+-----+
|a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp]

+-----+
+-----+
|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[I-D.ietf-mmusic-ice-sip-sdp]

+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122]
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2|

+-----+
+-----+
|
a=setup:actpass
|[RFC5763]

+-----+
+-----+
|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68
```

```

|[I-D.ietf-mmusic-dtls-sdp] |
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761] |
+-----+
+-----+
|a=rtcp-mux-
only
|[I-D.ietf-mmusic-mux-exclusive] |
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506] |
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [RFC6464]
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|a=candidate:0 1 UDP 2122194687 192.0.2.4 61665 typ
host | [I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 1 UDP 1685987071 203.0.113.141 54609 typ srflx raddr
192.0.2.4 rport 61665 | [I-D.ietf-mmusic-ice-sip-sdp] |

```

```

+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice] |

```

```

+-----+
+-----+
|***** Video m=line
*****
*****

```

```

+-----+
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF
120 | [RFC4566]
|

```

```

+-----+
+-----+
|c=IN IP4
203.0.113.141
|[RFC4566] |

```

```

+-----+
+-----+
|a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|

```

```

+-----+
+-----+
|
a=mid:video
|[RFC5888] |

```

```

+-----+
+-----+
|a=msid:ma
tb
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (tb) |

```

```

+-----+
+-----+
|

```

```
a=sendrecv
|[RFC3264] |
+-----+
+-----+
|a=rtpmap:120
VP8/90000
|[RFC7741] |
+-----+
+-----+
|a=rtcp-fb:120
nack
|[RFC4585] |
+-----+
+-----+
|a=rtcp-fb:120 nack
pli |
|[RFC4585] |
+-----+
+-----+
|a=rtcp-fb:120 ccm
fir |
|[RFC5104] |
+-----+
+-----+
|a=extmap:2 urn:iETF:params:rtp-
hdext:sdes:mid |[[I-D.iETF-
mmusic-sdp-bundle-negotiation]]|
+-----+
+-----+
|***** Application m=line
***** |
***** |
+-----+
+-----+
|m=application 0 UDP/DTLS/SCTP webrtc-
datachannel |[[I-D.iETF-rtcweb-
data-channel] |
+-----+
+-----+
|c=IN IP4
203.0.113.141
|[RFC4566] |
```

```

+-----+
+-----+
|a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|
a=mid:data
|[RFC5888]|
+-----+
+-----+
|a=sctp-port:
5000
|[I-D.ietf-mmusic-sctp-sdp]|
+-----+
+-----+
|a=max-message-size:
100000|
|[I-D.ietf-mmusic-sctp-sdp]|
+-----+
+-----+
|
a=sendrecv
|[RFC3264]|
+-----+
+-----+

```

Table 17: 5.2.8 SDP Offer

```

=====
|Answer SDP
Contents
|RFC#/Notes |
=====
|
v=0
|[RFC4566] |
+-----+
+-----+
|o=- 16833 0 IN IP4
0.0.0.0 |
|[RFC4566] - Session Origin Information |
+-----+
+-----+
|
s=-
|[RFC4566] |
+-----+
+-----+
|t=0
0
|[RFC4566] |
+-----+
+-----+
|a=group:BUNDLE audio video
data | [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|a=group:LS audio
video |
|[RFC5888] |
+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|a=ice-

```

options:ice2

| [[RFC8445](#)] |

+-----+
+-----+

| ***** Audio m=line

***** |

+-----+
+-----+

| m=audio 49203 UDP/TLS/RTP/SAVPF
109 | [[RFC4566](#)]
|

+-----+
+-----+

| c=IN IP4
203.0.113.77
| [[RFC4566](#)] |

+-----+
+-----+

| a=msid:ma
ta
| Identifies MediaStream ID (ma) and |
| MediaStreamTrack ID (ta) |

+-----+
+-----+

|
a=mid:audio
| [[RFC5888](#)] |

+-----+
+-----+

|
a=sendrecv
| [[RFC3264](#)] |

+-----+
+-----+

| a=rtpmap:109 opus/
48000/2 |
| [[RFC7587](#)] |

+-----+
+-----+

| a=maxptime:

120

| [[RFC4566](#)] |

+-----+
+-----+

|a=ice-
ufrag:c300d85b
| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|a=ice-
pwd:de4e99bd291c325921d5d47efbabd9a2
| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|
a=fingerprint:sha-256
| [[RFC8122](#)] |
|6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08| |

+-----+
+-----+

|
a=setup:active
| [[RFC5763](#)] |

+-----+
+-----+

|a=tls-
id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31
| [[I-D.ietf-mmusic-dtls-sdp](#)] |

+-----+
+-----+

|a=rtcp-
mux
| [[RFC5761](#)] |

```

+-----+
+-----+
  |a=rtcp-mux-
only
|[I-D.ietf-mmusic-mux-exclusive] |
+-----+
+-----+
  |a=rtcp-
rsize
|[RFC5506] |
+-----+
+-----+
  |a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [RFC6464]
|
+-----+
+-----+
  |a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
  |a=candidate:0 1 UDP 2122194687 198.51.100.7 51556 typ
host | [I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
  |a=candidate:1 1 UDP 1685987071 203.0.113.77 49203 typ srflx raddr
198.51.100.7 rport 51556 | [I-D.ietf-mmusic-ice-sip-sdp] |
+-----+
+-----+
  |a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
  |***** Video m=line
***** |
*****
***** |
+-----+

```

```
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF
120 | [RFC4566]
|
+-----+
+-----+
|c=IN IP4
203.0.113.77
|[RFC4566] |
+-----+
+-----+
|a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|
a=mid:video
|[RFC5888] |
+-----+
+-----+
|a=msid:ma
tb
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (tb) |
+-----+
+-----+
|
a=sendrecv
|[RFC3264] |
+-----+
+-----+
|a=rtpmap:120
VP8/90000
|[RFC7741] |
+-----+
+-----+
|a=rtcp-fb:120
nack
|[RFC4585] |
+-----+
```

```

+-----+
|a=rtcp-fb:120 nack
pli
[RFC4585]
+-----+
+-----+
|a=rtcp-fb:120 ccm
fir
[RFC5104]
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdrext:sdes:mid
| [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|***** Application m=line
*****
*****
*****
+-----+
+-----+
|m=application 0 UDP/DTLS/SCTP webrtc-
datachannel
| [I-D.ietf-mmusic-
sctp-sdp] |
+-----+
+-----+
|c=IN IP4
203.0.113.77
|[RFC4566]
+-----+
+-----+
|a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation] |
+-----+
+-----+

```

```

|
a=mid:data
|[RFC5888]
|
+-----+
+-----+
|a=sctp-port:
5000
|[I-D.ietf-mmusic-sctp-sdp]
|
+-----+
+-----+
|a=max-message-size:
100000
|[I-D.ietf-mmusic-sctp-sdp]
|
+-----+
+-----+
|
a=sendrecv
|[RFC3264]
|
+-----+
+-----+

```

Table 18: 5.2.8 SDP Answer

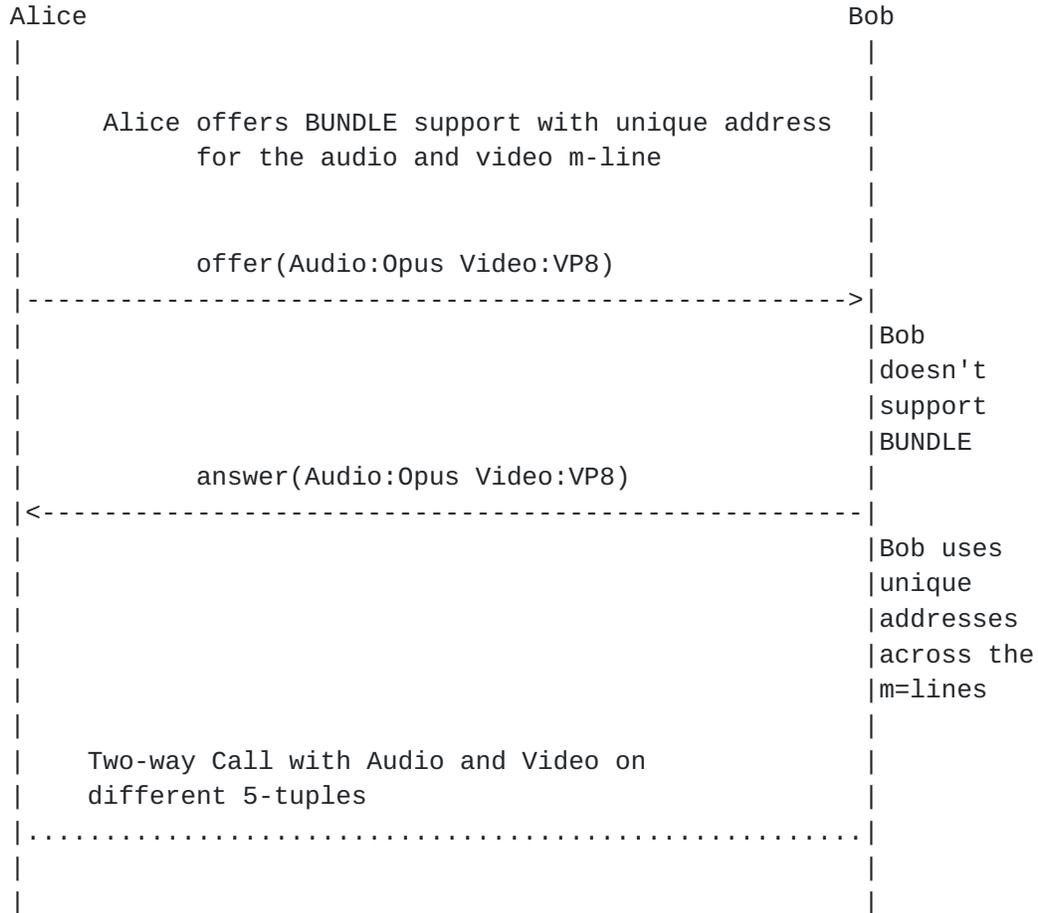
5.2.9. Audio and Video Session with BUNDLE Unsupported

This use case illustrates SDP offer/answer exchange where the far-end (Bob) either doesn't support media bundling or doesn't want to group m=lines over a single 5-tuple.

This is indicated by dropping the "a=group:BUNDLE" line and BUNDLE RTP header extension in the answer SDP.

On successful offer/answer exchange, Alice and Bob each end up using unique 5-tuple for audio and video media streams respectively.

Two-way Secure Audio and Video with BUNDLE Unsupported



```

=====
| Offer SDP
Contents
| RFC#/Notes |
=====
|
v=0
| [RFC4566] |
+-----+
| o=- 20518 0 IN IP4
0.0.0.0 |
| [RFC4566] |
+-----+
+-----+
|
  
```

s=-

| [[RFC4566](#)] |

+-----+
+-----+

| t=0

0

| [[RFC4566](#)] |

+-----+
+-----+

| a=group:BUNDLE audio

video

| [[I-](#)

[D.ietf-mmusic-sdp-bundle-negotiation](#)] |

|
| Alice supports grouping of m=lines under |

|
| BUNDLE semantics |

+-----+
+-----+

| a=group:LS audio

video

|

| [[RFC5888](#)] |

+-----+
+-----+

| a=ice-

options:trickle

| [[I-D.ietf-mmusic-trickle-ice](#)] |

+-----+
+-----+

```

    |a=ice-
options:ice2
|[RFC8445]

```

```

+-----+
+-----+

```

```

    |***** Audio m=line
*****
*****

```

```

+-----+
+-----+

```

```

    |m=audio 54609 UDP/TLS/RTP/SAVPF
109
|[RFC4566]

```

```

+-----+
+-----+

```

```

    |c=IN IP4
203.0.113.141
|[RFC4566]

```

```

+-----+
+-----+

```

```

    |
a=mid:audio
|[RFC5888] Audio m=line part of BUNDLE
|
|group with a unique port number

```

```

+-----+
+-----+

```

```

    |a=msid:ma
ta
|Identifies MediaStream ID (ma) and
|
|MediaStreamTrack ID (ta)

```

```

+-----+
+-----+

```

```

    |
a=sendrecv
|[RFC3264]

```

```

+-----+
+-----+

```

```

    |a=rtpmap:109 opus/

```

```
48000/2 |
[RFC7587] |

+-----+
+-----+
|a=maxptime:
120
|[RFC4566] |

+-----+
+-----+
|a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp] |

+-----+
+-----+
|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[I-D.ietf-mmusic-ice-sip-sdp] |

+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122] |
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2| |

+-----+
+-----+
|
a=setup:actpass
|[RFC5763] - Alice can act as DTLS client|

|
|or server |

+-----+
+-----+
|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68
|[I-D.ietf-mmusic-dtls-sdp] |

+-----+
+-----+
|a=rtcp-
mux
|[RFC5761] |

+-----+
```

```

+-----+
|a=rtcp:55232 IN IP4
203.0.113.141
|[RFC3605] - RTCP port different from RTP|
|
|port
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506]
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level|[RFC6464]
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid|[I-D.ietf-
mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=candidate:0 1 UDP 2122194687 192.0.2.4 61665 typ
host|[I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 1 UDP 1685987071 203.0.113.141 54609 typ srflx raddr
192.0.2.4 rport 61665|[I-D.ietf-mmusic-ice-sip-sdp]|
+-----+
+-----+
|a=candidate:0 2 UDP 2122194687 192.0.2.4 61666 typ
host|[I-D.ietf-mmusic-ice-sip-sdp]
|

```

```

+-----+
+-----+
|a=candidate:1 2 UDP 1685987071 203.0.113.141 55232 typ srflx raddr
192.0.2.4 rport 61666 | [I-D.ietf-mmusic-ice-sip-sdp] |
+-----+
+-----+
|a=end-of-
candidates
| [I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|***** Video m=line
*****
*****
***** |
+-----+
+-----+
|m=video 54332 UDP/TLS/RTP/SAVPF
120 | [RFC4566]
|
+-----+
+-----+
|c=IN IP4
203.0.113.141
| [RFC4566] |
+-----+
+-----+
|
a=mid:video
| [RFC5888] Video m=line part of the |
|
|BUNDLE group with a unique port number |
+-----+
+-----+
|a=msid:ma
tb
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (tb) |
+-----+

```

```
+-----+
|
a=sendrecv
|[RFC3264]
+-----+
+-----+
|a=rtpmap:120
VP8/90000
|[RFC7741]
+-----+
+-----+
|a=ice-ufrag:
7872093
|[I-D.ietf-mmusic-ice-sip-sdp]
+-----+
+-----+
|a=ice-
pwd:ee3474af08a068a28a397a4c3f31747d1
|[I-D.ietf-mmusic-ice-sip-sdp]
+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122]
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2|
+-----+
+-----+
|
a=setup:actpass
|[RFC5763] - Alice can act as DTLS client|
|
|or server
+-----+
+-----+
|a=tls-
id:UKA29UQLTF690JW4WNPNU02Y0GF1FJ0Z
|[I-D.ietf-mmusic-dtls-sdp]
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761]
```

```

+-----+
+-----+
|a=rtcp:60052 IN IP4
203.0.113.141 |
|[RFC3605] |
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506] |
+-----+
+-----+
|a=rtcp-fb:120
nack
|[RFC4585] |
+-----+
+-----+
|a=rtcp-fb:120 nack
pli |
|[RFC4585] |
+-----+
+-----+
|a=rtcp-fb:120 ccm
fir |
|[RFC5104] |
+-----+
+-----+
|a=extmap:2 urn:iETF:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=candidate:0 1 UDP 2122194687 192.0.2.4 71775 typ
host |[I-D.ietf-mmusic-ice-sip-sdp]
|

```

```

+-----+
+-----+
|a=candidate:1 1 UDP 1685987071 203.0.113.141 54332 typ srflx raddr
192.0.2.4 rport 71775 | [I-D.ietf-mmusic-ice-sip-sdp] |
+-----+
+-----+
|a=candidate:0 2 UDP 2122194687 192.0.2.4 71776 typ
host | [I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 2 UDP 1685987071 203.0.113.141 60052 typ srflx raddr
192.0.2.4 rport 71776 | [I-D.ietf-mmusic-ice-sip-sdp] |
+-----+
+-----+
|a=end-of-
candidates
| [I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+

```

Table 19: 5.2.9 SDP Offer w/BUNDLE

```

=====
|Answer SDP
Contents
|RFC#/Notes |
=====
|
v=0
| [RFC4566] |
+-----+
+-----+
|o=- 16833 0 IN IP4
0.0.0.0 |
| [RFC4566] |
+-----+
+-----+
|
s=-

```

```
| [RFC4566] |
+-----+
+-----+
| t=0
0
| [RFC4566] |
+-----+
+-----+
| a=group:LS audio
video |
| [RFC5888] |
+-----+
+-----+
| a=ice-
options:trickle
| [I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
| a=ice-
options:ice2
| [RFC8445] |
+-----+
+-----+
| ***** Audio m=line
*****
***** |
+-----+
+-----+
| m=audio 53214 UDP/TLS/RTP/SAVPF
109 | [RFC4566]
|
+-----+
+-----+
| c=IN IP4
203.0.113.77
| [RFC4566] |
+-----+
+-----+
|
a=mid:audio
| [RFC5888] |
+-----+
```

```

+-----+
|a=msid:ma
ta
|Identifies MediaStream ID |
|
|(ma) and MediaStreamTrack ID |
|
|(ta) |
+-----+
+-----+
|
a=sendrecv
|[RFC3264] |
+-----+
+-----+
|a=rtpmap:109 opus/
48000/2 |
|[RFC7587] |
+-----+
+-----+
|a=maxptime:
120
|[RFC4566] |
+-----+
+-----+

```

```

    |a=ice-
ufrag:c300d85b
|[I-D.ietf-mmusic-ice-sip-sdp]|

```

```

+-----+
+-----+

```

```

    |a=ice-
pwd:de4e99bd291c325921d5d47efbabd9a2
|[I-D.ietf-mmusic-ice-sip-sdp]|

```

```

+-----+
+-----+

```

```

    |
a=fingerprint:sha-256
|[RFC8122]|
    |6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08|

```

```

+-----+
+-----+

```

```

    |
a=setup:active
|[RFC5763] - Bob is the DTLS |

```

```

    |
|client |

```

```

+-----+
+-----+

```

```

    |a=tls-
id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31
|[I-D.ietf-mmusic-dtls-sdp]|

```

```

+-----+
+-----+

```

```

    |a=rtcp-
mux
|[RFC5761]|

```

```

+-----+
+-----+

```

```

    |a=rtcp-
rsize
|[RFC5506]|

```

```

+-----+
+-----+

```

```

    |a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [RFC6464] |

```

```
+-----+
+-----+
|a=candidate:0 1 UDP 2122194687 198.51.100.7 51556 typ
host | [I-D.ietf-mmusic-ice-sip-sdp]|
```

```
+-----+
+-----+
|a=candidate:1 1 UDP 1685987071 203.0.113.77 53214 typ srflx raddr
198.51.100.7 rport 51556 | [I-D.ietf-mmusic-ice-sip-sdp]|
```

```
+-----+
+-----+
|a=candidate:0 2 UDP 2122194687 198.51.100.7 51558 typ
host | [I-D.ietf-mmusic-ice-sip-sdp]|
```

```
+-----+
+-----+
|a=candidate:1 2 UDP 1685987071 203.0.113.77 60065 typ srflx raddr
198.51.100.7 rport 51558 | [I-D.ietf-mmusic-ice-sip-sdp]|
```

```
+-----+
+-----+
|***** Video m=line
***** |
*****|
```

```
+-----+
+-----+
|m=video 58679 UDP/TLS/RTP/SAVPF
120 | [RFC4566]|
```

```
+-----+
+-----+
|c=IN IP4
203.0.113.77
| [RFC4566]|
```

```
+-----+
+-----+
|
a=mid:video
| [RFC5888]|
```

```
+-----+
+-----+
|a=msid:ma
tb
|Identifies MediaStream ID |
|
```

| (ma) and MediaStreamTrack ID |

|
| (tb) |

+-----+
+-----+

|
a=sendrecv
| [[RFC3264](#)] |

+-----+
+-----+

| a=rtpmap:120
VP8/90000
| [[RFC7741](#)] |

+-----+
+-----+

| a=ice-ufrag:
85bc300
| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

| a=ice-pwd:
325921d5d47efbabd9a2de4e99bd291c
| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

| a=fingerprint:sha-256 6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:
35 | [[RFC8122](#)] |
| :DC:B8:5F:64:1A:24:C2:43:F0:A1:58:D0:A1:2C:
19:08
| |

```
+-----+
+-----+
|
a=setup:active
|[RFC5763] - Bob is the DTLS |
|
|client |
+-----+
+-----+
|a=tls-id:
9AIFS8AQ009IXF5D6QUJ7P8BXPEZJ8G
|[I-D.ietf-mmusic-dtls-sdp] |
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761] |
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506] |
+-----+
+-----+
|a=rtcp-fb:120
nack
|[RFC4585] |
+-----+
+-----+
|a=rtcp-fb:120 nack
pli |
|[RFC4585] |
+-----+
+-----+
|a=rtcp-fb:120 ccm
fir |
|[RFC5104] |
+-----+
+-----+
|a=candidate:0 1 UDP 2122194687 198.51.100.7 61556 typ
```

```

host                                     |[I-D.ietf-mmusic-ice-sip-sdp]|

+-----+
+-----+
|a=candidate:1 1 UDP 1685987071 203.0.113.77 58679 typ srflx raddr
198.51.100.7 rport 61556 |[I-D.ietf-mmusic-ice-sip-sdp]|

+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice]|

+-----+
+-----+

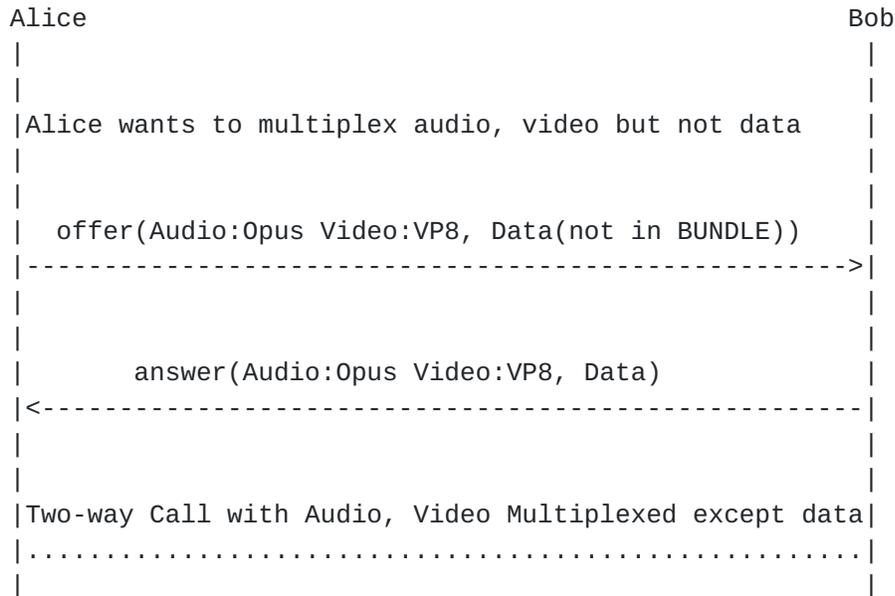
```

Table 20: 5.2.9 SDP Answer without BUNDLE

5.2.10. Audio, Video BUNDLED, but Data Not BUNDLED

This example showcases SDP for negotiating a session with audio, video, and the data streams between Alice and Bob with data stream not being part of the BUNDLE group. This is shown by assigning a unique port for the data media section and not adding the "mid" identification tag to the BUNDLE group.

Audio, Video, with Data (Not in BUNDLE)



=====

```

| Offer SDP
Contents
| RFC#/Notes |

```

=====

```

|
v=0
| [RFC4566] |

```

-----+

```

| o=- 20518 0 IN IP4
0.0.0.0 |
| [RFC4566] |

```

-----+

```

|
s=-
| [RFC4566] |

```

-----+

```

| t=0
0
| [RFC4566] |

```

```
+-----+
+-----+
|a=group:BUNDLE audio
video | [I-D.ietf-mmusic-sdp-bundle-negotiation] |
```

```
|
|Alice wants to BUNDLE only audio and |
|
|video media. |
```

```
+-----+
+-----+
|a=group:LS audio
video |
| [RFC5888] |
```

```
+-----+
+-----+
|a=ice-
options:trickle
| [I-D.ietf-mmusic-trickle-ice] |
```

```
+-----+
+-----+
|a=ice-
options:ice2
| [RFC8445] |
```

```
+-----+
+-----+
|***** Audio m=line
***** |
***** |
```

```
+-----+
+-----+
|m=audio 54609 UDP/TLS/RTP/SAVPF
109 | [RFC4566] |
```

```
+-----+
+-----+
|c=IN IP4
203.0.113.141
| [RFC4566] |
```

```
+-----+
+-----+
|
```

a=mid:audio
|[[RFC5888](#)]

|

+-----+
+-----+

 |a=msid:ma
ta
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (ta) |

+-----+
+-----+

 |
a=sendrecv
| [[RFC3264](#)] |

+-----+
+-----+

 |a=rtpmap:109 opus/
48000/2 |
| [[RFC7587](#)] |

+-----+
+-----+

 |a=maxptime:
120
| [[RFC4566](#)] |

+-----+
+-----+

 |a=ice-ufrag:
074c6550
| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

 |a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

 |
a=fingerprint:sha-256
| [[RFC8122](#)] |
 |19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2| |

+-----+

```
+-----+
|
a=setup:actpass
|[RFC5763]
+-----+
+-----+
|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68
|[I-D.ietf-mmusic-dtls-sdp]
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761]
+-----+
+-----+
|a=rtcp-mux-
only
|[I-D.ietf-mmusic-mux-exclusive]
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506]
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level|[RFC6464]
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid|[I-D.ietf-
mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 192.0.2.4 54609 typ
host|[I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=end-of-
candidates
```

```

|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|***** Video m=line
*****
*****
+-----+
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF
120 | [RFC4566]
|
+-----+
+-----+
|c=IN IP4
203.0.113.141
|[RFC4566] |
+-----+
+-----+
|a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|
a=mid:video
|[RFC5888] |
+-----+
+-----+
|a=msid:ma
tb
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (tb) |
+-----+
+-----+

```

```

|
a=sendrecv
| [RFC3264] |
+-----+
+-----+
|a=rtpmap:120
VP8/90000
| [RFC7741] |
+-----+
+-----+
|a=rtcp-fb:120
nack
| [RFC4585] |
+-----+
+-----+
|a=rtcp-fb:120 nack
pli |
| [RFC4585] |
+-----+
+-----+
|a=rtcp-fb:120 ccm
fir |
| [RFC5104] |
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|***** Application m=line
***** |
***** |
+-----+
+-----+
|m=application 10000 UDP/DTLS/SCTP webrtc-
datachannel | [I-D.ietf-rtcweb-data-
channel] |
+-----+
+-----+
|c=IN IP4

```

203.0.113.141

| [[RFC4566](#)] |

+-----+
+-----+

|
a=mid:data

| [[RFC5888](#)] |

+-----+
+-----+

|a=sctp-port:
5000

| [[I-D.ietf-mmusic-sctp-sdp](#)] |

+-----+
+-----+

|a=max-message-size:
100000

| [[I-D.ietf-mmusic-sctp-sdp](#)] |

+-----+
+-----+

|
a=sendrecv

| [[RFC3264](#)] |

+-----+
+-----+

|
a=setup:actpass

| [[RFC5763](#)] |

+-----+
+-----+

|a=tls-
id:UKA29UQLTF690JW4WNPNU02Y0GF1FJ0Z

| [[I-D.ietf-mmusic-dtls-sdp](#)] |

+-----+
+-----+

|a=ice-ufrag:
89819013

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|a=ice-pwd:
1747d1ee3474af08a068a28a397a4c3f3

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

```

+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122]
|29:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2|
|
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 192.0.2.4 10000 typ
host |[I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice]
|
+-----+
+-----+

```

Table 21: 5.2.10 SDP Offer

```

=====
|Answer SDP
Contents
|RFC#/Notes |
=====
|
v=0
|[RFC4566] |
+-----+
+-----+
|o=- 16833 0 IN IP4
0.0.0.0 |
|[RFC4566] - Session Origin Information |
+-----+
+-----+
|
s=-
|[RFC4566] |
+-----+
+-----+
|t=0
0
|[RFC4566] |
+-----+
+-----+
|a=group:BUNDLE audio
video | [I-
D.ietf-mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|a=group:LS audio
video |
|[RFC5888] |
+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|a=ice-

```

options:ice2

| [[RFC8445](#)] |

+-----+
+-----+

| ***** Audio m=line
***** |

+-----+
+-----+

| m=audio 49203 UDP/TLS/RTP/SAVPF
109 | [[RFC4566](#)]
|

+-----+
+-----+

| c=IN IP4
203.0.113.77
| [[RFC4566](#)] |

+-----+
+-----+

|
a=mid:audio
| [[RFC5888](#)] |

+-----+
+-----+

| a=msid:ma
ta
| Identifies MediaStream ID (ma) and |
| MediaStreamTrack ID (ta) |

+-----+
+-----+

|
a=sendrecv
| [[RFC3264](#)] |

+-----+
+-----+

| a=rtpmap:109 opus/
48000/2 |
| [[RFC7587](#)] |

+-----+
+-----+

| a=maxptime:

120

| [[RFC4566](#)] |

+-----+
+-----+

|a=ice-
ufrag:c300d85b
| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|a=ice-
pwd:de4e99bd291c325921d5d47efbabd9a2
| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|
a=fingerprint:sha-256
| [[RFC8122](#)] |
|6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08| |

+-----+
+-----+

|
a=setup:active
| [[RFC5763](#)] |

+-----+
+-----+

|a=tls-
id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31
| [[I-D.ietf-mmusic-dtls-sdp](#)] |

+-----+
+-----+

|a=rtcp-
mux
| [[RFC5761](#)] |

```

+-----+
+-----+
|a=rtcp-mux-
only
|[I-D.ietf-mmusic-mux-exclusive] |
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506] |
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [RFC6464]
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 198.51.100.7 49203 typ
host | [I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|***** Video m=line
***** |
*****
***** |
+-----+
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF
120 | [RFC4566]
|

```

```
+-----+
+-----+
|c=IN IP4
203.0.113.77
|[RFC4566]|
```

```
+-----+
+-----+
|a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|
```

```
+-----+
+-----+
|
a=mid:video
|[RFC5888]|
```

```
+-----+
+-----+
|a=msid:ma
tb
|Identifies MediaStream ID (ma) and
|
|MediaStreamTrack ID (tb)|
```

```
+-----+
+-----+
|
a=sendrecv
|[RFC3264]|
```

```
+-----+
+-----+
|a=rtpmap:120
VP8/90000
|[RFC7741]|
```

```
+-----+
+-----+
|a=rtcp-fb:120
nack
|[RFC4585]|
```

```
+-----+
+-----+
|a=rtcp-fb:120 nack
pli
|[RFC4585]|
```

```

+-----+
+-----+
|a=rtcp-fb:120 ccm
fir
|[RFC5104]
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdrext:sdes:mid
|[I-D.ietf-
mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|***** Application m=line
*****
*****
+-----+
+-----+
|m=application 20000 UDP/DTLS/SCTP webrtc-
datachannel
|[I-D.ietf-mmusic-sctp-
sdp]
+-----+
+-----+
|c=IN IP4
203.0.113.77
|[RFC4566]
+-----+
+-----+
|
a=mid:data
|[RFC5888]
+-----+
+-----+
|a=sctp-port:
5000
|[I-D.ietf-mmusic-sctp-sdp]
+-----+
+-----+

```

```

    |a=max-message-size:
100000
[I-D.ietf-mmusic-sctp-sdp]

```

```

+-----+
+-----+

```

```

    |
a=setup:active
|[RFC5763]

```

```

+-----+
+-----+

```

```

    |a=tls-id:
9AIFS8AQ009IXF5D6QQUJ7P8BXPEZJ8G
|[I-D.ietf-mmusic-dtls-sdp]

```

```

+-----+
+-----+

```

```

    |
a=sendrecv
|[RFC3264]

```

```

+-----+
+-----+

```

```

    |a=ice-ufrag:
991Ca2a5e
|[I-D.ietf-mmusic-ice-sip-sdp]

```

```

+-----+
+-----+

```

```

    |a=ice-pwd:
921d5d47efbabd9a2de4e99bd291c325
|[I-D.ietf-mmusic-ice-sip-sdp]

```

```

+-----+
+-----+

```

```

    |
a=fingerprint:sha-256
|[RFC8122]
    |7B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08|

```

```

+-----+
+-----+

```

```

    |a=candidate:0 1 UDP 2113667327 198.51.100.7 20000 typ
host
|[I-D.ietf-mmusic-ice-sip-sdp]

```

```

+-----+

```

```

+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+

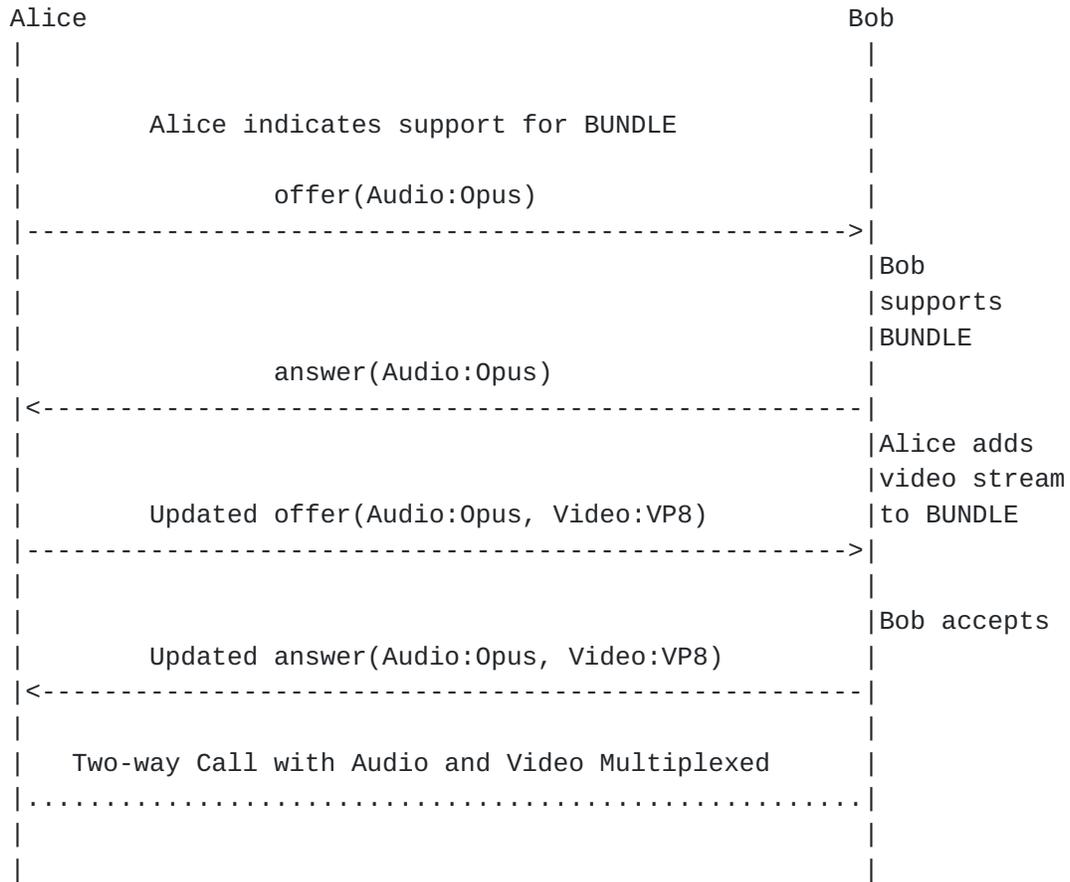
```

Table 22: 5.2.10 SDP Answer

5.2.11. Audio Only, Add Video to BUNDLE

This example involves 2 offer/answer exchanges. The first one is used to negotiate and set up BUNDLE support for audio-only session followed by an updated offer/answer exchange to add video stream to the ongoing session. Also the newly added video stream is BUNDLED with the audio stream.

Audio, Add Video and BUNDLE



```

+=====
| Offer SDP
Contents
|RFC#/Notes      |
+=====
|
v=0
| [RFC4566]      |
+-----+
|o=- 20518 0 IN IP4
0.0.0.0
| [RFC4566]      |
+-----+
|
s=-
  
```

| [[RFC4566](#)] |

+-----+
+-----+

| t=0

0

| [[RFC4566](#)] |

+-----+
+-----+

| a=group:BUNDLE

audio

| [[I-D.ietf-mmusic-sdp-bundle-negotiation](#)] |

|
| Alice adds audio m=line to the BUNDLE |

|
| group |

+-----+
+-----+

| a=ice-

options:trickle

| [[I-D.ietf-mmusic-trickle-ice](#)] |

+-----+
+-----+

| a=ice-

options:ice2

| [[RFC8445](#)] |

+-----+
+-----+

| ***** Audio m=line

```
+-----+
+-----+
  |m=audio 54609 UDP/TLS/RTP/SAVPF
109                                     | [RFC4566]
|
+-----+
+-----+
  |c=IN IP4
203.0.113.141
| [RFC4566] |
+-----+
+-----+
  |
a=mid:audio
| [RFC5888] |
+-----+
+-----+
  |a=msid:ma
ta
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (ta) |
+-----+
+-----+
  |
a=sendrecv
| [RFC3264] |
+-----+
+-----+
  |a=rtpmap:109 opus/
48000/2                               |
| [RFC7587] |
+-----+
+-----+
  |a=maxptime:
120
| [RFC4566] |
+-----+
+-----+
  |a=ice-ufrag:
```

074c6550

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|
a=fingerprint:sha-256
| [[RFC8122](#)] |
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2| |

+-----+
+-----+

|
a=setup:actpass
| [[RFC5763](#)] |

+-----+
+-----+

|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68
| [[I-D.ietf-mmusic-dtls-sdp](#)] |

+-----+
+-----+

|a=rtcp-
mux
| [[RFC5761](#)] |

+-----+
+-----+

|a=rtcp-mux-
only
| [[I-D.ietf-mmusic-mux-exclusive](#)] |

+-----+
+-----+

|a=rtcp-
rsize
| [[RFC5506](#)] |

+-----+
+-----+

|a=extmap:1 urn:ietf:params:rtp-hdrext:ssrc-audio-
level | [[RFC6464](#)] |

```

|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdrext:sdes:mid                                     |[I-D.ietf-
mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 192.0.2.4 61665 typ
host                                               |[I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 1 UDP 694302207 203.0.113.141 54609 typ srflx raddr 192.0.2.4
rport 61665                                       |[I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice]
|
+-----+
+-----+

```

Table 23: 5.2.11 SDP Offer

```

=====
|Answer SDP
Contents
|RFC#/Notes |
=====
|
v=0
|[RFC4566] |
+-----+
+-----+
|o=- 16833 0 IN IP4
0.0.0.0 |
|[RFC4566] - Session Origin Information |
+-----+
+-----+
|
s=-
|[RFC4566] |
+-----+
+-----+
|t=0
0
|[RFC4566] |
+-----+
+-----+
|a=group:BUNDLE
audio
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|a=ice-
options:ice2
|[RFC8445] |
+-----+
+-----+
|***** Audio m=line

```

+-----+
+-----+

|m=audio 49203 UDP/TLS/RTP/SAVPF

109

| [[RFC4566](#)]

|

+-----+
+-----+

|c=IN IP4

203.0.113.77

| [[RFC4566](#)]

+-----+
+-----+

|

a=mid:audio

| [[RFC5888](#)]

+-----+
+-----+

|a=msid:ma

ta

|Identifies MediaStream ID (ma) and

|

|MediaStreamTrack ID (ta)

+-----+
+-----+

|

a=sendrecv

| [[RFC3264](#)]

+-----+
+-----+

|a=rtpmap:109 opus/

48000/2

| [[RFC7587](#)]

+-----+
+-----+

|a=maxptime:

120

| [[RFC4566](#)]

+-----+
+-----+

|a=ice-

```
ufrag:c300d85b
|[I-D.ietf-mmusic-ice-sip-sdp] |
+-----+
+-----+
|a=ice-
pwd:de4e99bd291c325921d5d47efbabd9a2
|[I-D.ietf-mmusic-ice-sip-sdp] |
+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122] |
|6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08| |
+-----+
+-----+
|
a=setup:active
|[RFC5763] |
+-----+
+-----+
|a=tls-
id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31
|[I-D.ietf-mmusic-dtls-sdp] |
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761] |
+-----+
+-----+
|a=rtcp-mux-
only
|[I-D.ietf-mmusic-mux-exclusive] |
```

```

+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506] |
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [RFC6464]
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 198.51.100.7 51556 typ
host | [I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 1 UDP 1694302207 203.0.113.77 49203 typ srflx raddr
198.51.100.7 rport 51556 | [I-D.ietf-mmusic-ice-sip-sdp] |
+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+

```

Table 24: 5.2.10 SDP Answer

```

+-----+
+-----+
|Updated Offer SDP
Contents |
RFC#/Notes |
+-----+
+-----+
|

```

```
v=0
|[RFC4566]
+-----+
+-----+
|o=- 20518 1 IN IP4
0.0.0.0
Version number incremented [RFC4566]
+-----+
+-----+
|
s=-
|[RFC4566]
+-----+
+-----+
|t=0
0
|[RFC4566]
+-----+
+-----+
|a=group:BUNDLE audio
video
|[I-D.ietf-mmusic-sdp-bundle-negotiation]
+-----+
+-----+
|a=group:LS audio
video
|[RFC5888]
+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice]
+-----+
+-----+
|a=ice-
options:ice2
|[RFC8445]
+-----+
+-----+
|***** Audio m=line
*****
*****
```

```
+-----+
+-----+
|m=audio 54609 UDP/TLS/RTP/SAVPF
109 | [RFC4566]
|
```

```
+-----+
+-----+
|c=IN IP4
203.0.113.141
|[RFC4566] |
```

```
+-----+
+-----+
|
a=mid:audio
|[RFC5888] |
```

```
+-----+
+-----+
|a=msid:ma
ta
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (ta) |
```

```
+-----+
+-----+
|
a=sendrecv
|[RFC3264] |
```

```

+-----+
+-----+
  |a=rtpmap:109 opus/
48000/2
|[RFC7587]
+-----+
+-----+
  |a=maxptime:
120
|[RFC4566]
+-----+
+-----+
  |a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp]
+-----+
+-----+
  |a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[I-D.ietf-mmusic-ice-sip-sdp]
+-----+
+-----+
  |
a=fingerprint:sha-256
|[RFC8122]
  |19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2|
+-----+
+-----+
  |
a=setup:actpass
|[RFC5763]
+-----+
+-----+
  |a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68
|[I-D.ietf-mmusic-dtls-sdp]Alice wants to|
|
|use the same DTLS association
+-----+

```

```
+-----+
|a=rtcp-
mux
|[RFC5761] |
+-----+
+-----+
|a=rtcp-mux-
only
|[I-D.ietf-mmusic-mux-exclusive] |
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506] |
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [RFC6464]
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 192.0.2.4 61665 typ
host | [I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 1 UDP 694302207 203.0.113.141 54609 typ srflx raddr 192.0.2.4
rport 61665 | [I-D.ietf-mmusic-ice-sip-sdp] |
+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|***** Video m=line
*****
*****
*****
```

```

+-----+
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF
120 | [RFC4566]
|
+-----+
+-----+
|c=IN IP4
203.0.113.141
|[RFC4566] |
+-----+
+-----+
|a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|
a=mid:video
|[RFC5888] |
+-----+
+-----+
|a=msid:ma
tb
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (tb) |
+-----+
+-----+
|
a=sendrecv
|[RFC3264] |
+-----+
+-----+

```

```

    |a=rtpmap:120
VP8/90000
| [RFC7741] |
+-----+
+-----+
    |a=rtcp-fb:120
nack
| [RFC4585] |
+-----+
+-----+
    |a=rtcp-fb:120 nack
pli |
| [RFC4585] |
+-----+
+-----+
    |a=rtcp-fb:120 ccm
fir |
| [RFC5104] |
+-----+
+-----+
    |a=extmap:2 urn:iETF:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+

```

Table 25: 5.2.11 SDP Updated Offer

```

=====
|Updated Answer SDP
Contents |
RFC#/Notes |
+-----+
+-----+
|
v=0
| [RFC4566] Version number incremented |
+-----+
+-----+
    |o=- 16833 1 IN IP4
0.0.0.0 |
| [RFC4566] - Session Origin Information |

```

```
+-----+
+-----+
|
s=-
|[RFC4566]
+-----+
+-----+
|t=0
0
|[RFC4566]
+-----+
+-----+
|a=group:BUNDLE audio
video|[I-
D.ietf-mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=group:LS audio
video|
|[RFC5888]
+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice]
+-----+
+-----+
|a=ice-
options:ice2
|[RFC8445]
+-----+
+-----+
|***** Audio m=line
*****
*****
+-----+
+-----+
|m=audio 49203 UDP/TLS/RTP/SAVPF
109|[RFC4566]
|
+-----+
+-----+
```

|c=IN IP4
203.0.113.77
|[RFC4566]

+-----+
+-----+

|
a=mid:audio
|[RFC5888]

+-----+
+-----+

|a=msid:ma
ta
|Identifies MediaStream ID (ma) and
|MediaStreamTrack ID (ta)

+-----+
+-----+

|
a=sendrecv
|[RFC3264]

+-----+
+-----+

|a=rtpmap:109 opus/
48000/2
|[RFC7587]

+-----+
+-----+

|a=maxptime:

120

| [[RFC4566](#)] |

+-----+
+-----+

|a=ice-

ufrag:c300d85b

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|a=ice-

pwd:de4e99bd291c325921d5d47efbabd9a2

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|
a=fingerprint:sha-256

| [[RFC8122](#)] |

| 6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08 |

+-----+
+-----+

|
a=setup:active

| [[RFC5763](#)] |

+-----+
+-----+

|a=tls-

id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31

| [[I-D.ietf-mmusic-dtls-sdp](#)] - Bob agrees |

|
|to use the same DTLS association |

+-----+
+-----+

|a=rtcp-

mux

| [[RFC5761](#)] |

+-----+
+-----+

|a=rtcp-mux-

only

|c=IN IP4
203.0.113.77
|[RFC4566]|

+-----+
+-----+
|a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|

+-----+
+-----+
|
a=mid:video
|[RFC5888]|

+-----+
+-----+
|a=msid:ma
tb
|Identifies MediaStream ID (ma) and
|
|MediaStreamTrack ID (tb) |

+-----+
+-----+
|
a=sendrecv
|[RFC3264]|

+-----+
+-----+
|a=rtpmap:120
VP8/90000
|[RFC7741]|

+-----+
+-----+
|a=rtcp-fb:120
nack
|[RFC4585]|

```

+-----+
+-----+
  |a=rtcp-fb:120 nack
pli
[RFC4585]
+-----+
+-----+
  |a=rtcp-fb:120 ccm
fir
[RFC5104]
+-----+
+-----+
  |a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid
mmusic-sdp-bundle-negotiation] | [I-D.ietf-
+-----+
+-----+

```

Table 26: 5.2.11 SDP Updated Answer

5.3. MultiResolution, RTX, FEC Examples

This section provides examples related to multi-source, multi-stream negotiation such as layered coding and simulcast. Further included are a few examples that cover techniques to deal with providing robustness against transmission errors such as FEC and RTX. Also, mechanisms such as FEC and RTX could be envisioned in the above basic scenarios as well.

5.3.1. Send-only Simulcast Session with 2 Cameras and 2 Encodings per Camera

The SDP example below shows an offer/answer exchange with one audio and two video sources (say 2 video cameras). Each of the video sources can be sent at two different resolutions.

One video source corresponds to VP8 encoding, while the other corresponds to H.264 encoding.

The [I-D.ietf-mmusic-rid] framework is used to further constrain the media format encodings and map the payload types (PT) to the 'rid' identifiers.

The [I-D.ietf-mmusic-sdp-simulcast] framework identifies the

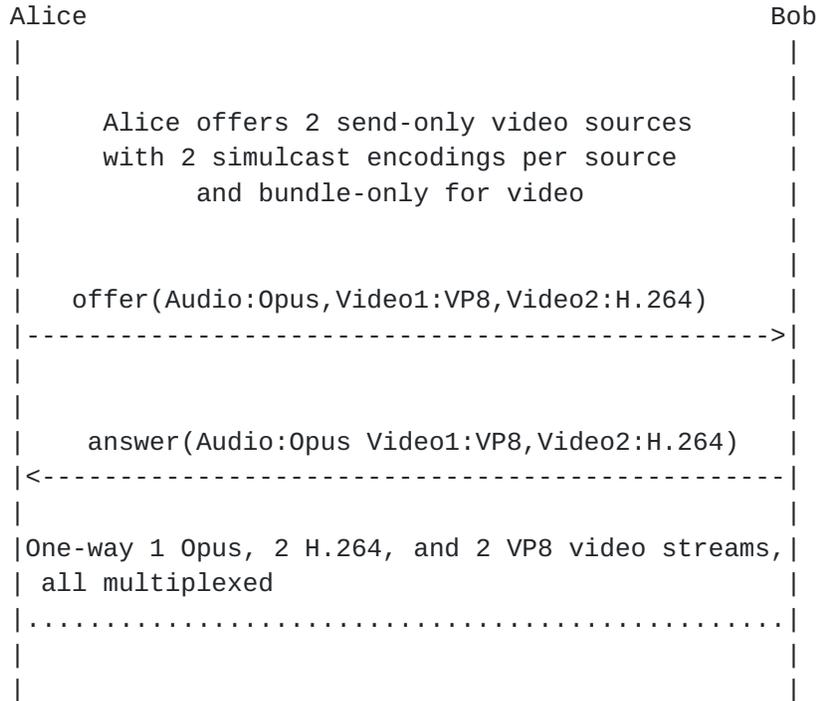
simulcast streams via their 'rid' identifiers.

The bundle-only attribute is used for the video sources in the offer to ensure enabling video sources solely in the context of BUNDLE alone.

The BUNDLE grouping framework enables multiplexing of all 5 Source RTP Streams (1 audio stream + 4 video streams) over a single RTP session.

Also, the audio and one video source RTP stream form a lip sync group while the other video source RTP stream represents non-interactive media data.

One-way Successful Simulcast w/BUNDLE



```

+=====
|Offer SDP
Contents
|RFC#/Notes          |
+=====
|
v=0
|[RFC4566]          |
+-----+
+-----+
|o=- 20519 0 IN IP4
0.0.0.0              |
|[RFC4566]          |
+-----+
+-----+
|
s=-
|[RFC4566]          |
+-----+
+-----+
|t=0

```

```

0
|[RFC4566] |
+-----+
+-----+
|a=group:BUNDLE m0 m1
m2 | [I-
D.ietf-mmusic-sdp-bundle-negotiation]|
|
|Alice supports grouping of m=lines under|
|
|BUNDLE semantics |
+-----+
+-----+
|a=group:LS m0
m1
|[RFC5888] |
+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|a=ice-
options:ice2
|[RFC8445] |
+-----+
+-----+
|***** Audio m=line
***** |
*****
+-----+
+-----+
|m=audio 54609 UDP/TLS/RTP/SAVPF
109 | [RFC4566]
|
+-----+
+-----+

```

```

    |c=IN IP4
203.0.113.141
|[RFC4566]

```

```

+-----+
+-----+

```

```

    |
a=mid:m0
|[RFC5888]

```

```

+-----+
+-----+

```

```

    |a=msid:ma
ta
|Identifies MediaStream ID (ma) and
|
|MediaStreamTrack ID (ta)

```

```

+-----+
+-----+

```

```

    |
a=sendonly
|[RFC3264]

```

```

+-----+
+-----+

```

```

    |a=rtpmap:109 opus/
48000/2
|[RFC7587]

```

```

+-----+
+-----+

```

```

    |a=maxptime:
120
|[RFC4566]

```

```

+-----+
+-----+

```

```

    |a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp]

```

```

+-----+
+-----+

```

```

    |a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[I-D.ietf-mmusic-ice-sip-sdp]

```

```
+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122]
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2|
```

```
+-----+
+-----+
|
a=setup:actpass
|[RFC5763]
```

```
+-----+
+-----+
|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68
|[I-D.ietf-mmusic-dtls-sdp]
```

```
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761]
```

```
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506]
```

```
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level|[RFC6464]
```

```
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid|[I-D.ietf-
mmusic-sdp-bundle-negotiation]
```

```
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 192.0.2.4 61665 typ
host|[I-D.ietf-mmusic-ice-sip-sdp]
```

```
+-----+
```

```
+-----+
|a=candidate:1 1 UDP 694302207 203.0.113.141 54609 typ srflx raddr 192.0.2.4
rport 61665      |[I-D.ietf-mmusic-ice-sip-sdp]      |
+-----+
```

```
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice]      |
+-----+
```

```
+-----+
|***** Video-1 m=line
*****
*****
+-----+
```

```
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF 98
100                                     |bundle-only
video line with port number |
|
|set to zero      |
+-----+
```

```
+-----+
|c=IN IP4
203.0.113.141
|[RFC4566]      |
+-----+
```

```
+-----+
|a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|
+-----+
```

```
+-----+
|
a=mid:m1
|[RFC5888] Video m=line part of BUNDLE |
+-----+
```

|
|group |

+-----+
+-----+

|a=msid:ma
tb
|Identifies MediaStream ID (ma) and |

|
|MediaStreamTrack ID (tb) |

+-----+
+-----+

|
a=sendonly
|[RFC3264] - Send-only video stream |

+-----+
+-----+

|a=rtpmap:98
VP8/90000
|[RFC7741] |

+-----+
+-----+

|a=fmtp:98 max-
fr=30
|[RFC4566] |

+-----+
+-----+

|a=rtpmap:100
VP8/90000
|[RFC7741] |

+-----+
+-----+

|a=fmtp:100 max-
fr=15
|[RFC4566] |

+-----+
+-----+

|a=rtcp-fb:*
nack
|[RFC4585] |

```

+-----+
+-----+
|a=rtcp-fb:* nack
pli
[RFC4585]
+-----+
+-----+
|a=rtcp-fb:* ccm
fir
|[RFC5104]
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdrext:sdes:mid
| [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|a=extmap:3 urn:ietf:params:rtp-hdrext:sdes:rtp-stream-
id
| [I-D.ietf-avtext-rid]
|
+-----+
+-----+
|a=rid:1 send pt=98;max-width=1280;max-
height=720
1:1 rid mapping to|
|
|payload type and specify resolution |
|
|constraints |
+-----+
+-----+
|a=rid:2 send pt=100;max-width=640;max-
height=480
1:1 rid mapping to|
| [I-D.ietf-mmusic-rid]
|
|payload type and specify resolution |
|
|constraints |
+-----+
+-----+
|a=simulcast:send
1;~2

```

[[I-D.ietf-mmusic-sdp-simulcast](#)] Alice |

|
|can send 2 resolutions identified by the|

|
|'rid' identifiers Also, the second |

|
|stream is initially paused. |

+-----+
+-----+

|***** Video-2 m=line

***** |

+-----+
+-----+

|m=video 0 UDP/TLS/RTP/SAVPF 101
102
video line with port number |

|bundle-only

|
|set to zero |

+-----+
+-----+

|c=IN IP4
203.0.113.141
|[[RFC4566](#)] |

+-----+
+-----+

|a=bundle-
only
|[[I-D.ietf-mmusic-sdp-bundle-negotiation](#)] |

+-----+
+-----+

|
a=mid:m2
|[[RFC5888](#)] Video m=line part of BUNDLE |

|
|group |

+-----+
+-----+

|a=msid:ma
tc
|Identifies MediaStream ID (ma) and |

|
|MediaStreamTrack ID (tc) |

+-----+
+-----+

|
a=sendonly
|[RFC3264] - Send only video stream |

+-----+
+-----+

|a=rtpmap:101
H264/90000
|[RFC6184] |

+-----+
+-----+

|a=rtpmap:102
H264/90000
|[RFC6184] |

+-----+
+-----+

|a=fmtp:101 profile-level-id=42401f;packetization-
mode=0 | [RFC6184]Camera-2, Encoding-1
|

+-----+
+-----+

|a=fmtp:102 profile-level-id=42401f;packetization-
mode=1 | [RFC6184]Camera-2, Encoding-2
|

+-----+
+-----+

|a=rtcp-fb:*
nack
|[RFC4585] |

+-----+

```

+-----+
|a=rtcp-fb:* nack
pli |
|[RFC4585] |
+-----+
+-----+
|a=rtcp-fb:* ccm
fir
|[RFC5104] |
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdrext:sdes:mid |[[I-D.ietf-
mmusic-sdp-bundle-negotiation]]|
+-----+
+-----+
|a=extmap:3 urn:ietf:params:rtp-hdrext:sdes:rtp-stream-
id |[I-D.ietf-avtext-rid]
|
+-----+
+-----+
|a=rid:3 send pt=101;max-width=1280;max-height=720;max-
fr=30 |[I-D.ietf-mmusic-rid] 1:1 rid mapping
to|
|
|payload type and specify resolution |
|
|constraints |
+-----+
+-----+
|a=rid:4 send pt=102;max-width=640;max-height=360;max-
fr=15 |[I-D.ietf-mmusic-rid] 1:1 rid
mapping to|
|
|payload type and specify resolution |
|
|constraints |
+-----+
+-----+
|a=simulcast:send
3;4 |
|[I-D.ietf-mmusic-sdp-simulcast] Alice |

```

|
|can send 2 resolutions identified by the|

|
|'rid' identifiers |

+-----+
+-----+

Table 27: 5.3.1 SDP Offer

+=====+
|Answer SDP
Contents
|RFC#/Notes |

+=====+
|
v=0
|[RFC4566] |

+-----+
+-----+
|o=- 20519 0 IN IP4
0.0.0.0 |
|[RFC4566] |

+-----+
+-----+

```

|
s=-
|[RFC4566]

```

```

+-----+
+-----+

```

```

|t=0
0
|[RFC4566]

```

```

+-----+
+-----+

```

```

|a=group:BUNDLE m0 m1
m2
|I-
D.ietf-mmusic-sdp-bundle-negotiation|

```

```

|
|Alice supports grouping of m=lines under|

```

```

|
|BUNDLE semantics
|

```

```

+-----+
+-----+

```

```

|a=group:LS m0
m1
|[RFC5888]

```

```

+-----+
+-----+

```

```

|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice]
|

```

```

+-----+
+-----+

```

```

|a=ice-
options:ice2
|[RFC8445]
|

```

```

+-----+
+-----+

```

```

|***** Audio m=line
*****
*****
|

```

```

+-----+
+-----+

```

```

|m=audio 49203 UDP/TLS/RTP/SAVPF

```

|

+-----+
+-----+

|c=IN IP4
203.0.113.77
| [[RFC4566](#)] |

+-----+
+-----+

|
a=mid:m0
| [[RFC5888](#)] |

+-----+
+-----+

|a=msid:ma
ta
|Identifies MediaStream ID (ma) and |
|MediaStreamTrack ID (ta) |

+-----+
+-----+

|
a=recvonly
| [[RFC3264](#)] |

+-----+
+-----+

|a=rtpmap:109 opus/
48000/2 |
| [[RFC7587](#)] |

+-----+
+-----+

|a=maxptime:
120
| [[RFC4566](#)] |

+-----+
+-----+

|a=ice-
ufrag:c300d85b
| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|a=ice-

pwd:de4e99bd291c325921d5d47efbabd9a2

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|
a=fingerprint:sha-256

| [[RFC8122](#)] |

| 6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08 | |

+-----+
+-----+

|
a=setup:active

| [[RFC5763](#)] |

+-----+
+-----+

|a=tls-
id:CJ6FF9ZMJW7MDRJIR7XVIQM48GE1G31

| [[I-D.ietf-mmusic-dtls-sdp](#)] |

+-----+
+-----+

|a=rtcp-
mux

| [[RFC5761](#)] |

+-----+
+-----+

|a=rtcp-
rsize

| [[RFC5506](#)] |

+-----+
+-----+

|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [[RFC6464](#)]

|

+-----+
+-----+

```

|a=extmap:2 urn:ietf:params:rtp-hdrext:sdes:mid
| [I-D.ietf-mmusic-sdp-bundle-negotiation] |

```

```

+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 198.51.100.7 61665 typ
host | [I-D.ietf-mmusic-ice-sip-sdp]
|

```

```

+-----+
+-----+
|a=candidate:1 1 UDP 694302207 203.0.113.77 49203 typ srflx raddr
198.51.100.7 rport 61665 | [I-D.ietf-mmusic-ice-sip-sdp] |

```

```

+-----+
+-----+
|a=end-of-candidates
| [I-D.ietf-mmusic-trickle-ice] |

```

```

+-----+
+-----+
|***** Video-1 m=line
*****
*****
***** |

```

```

+-----+
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF 98
100 | BUNDLE
accepted |

```

```

+-----+
+-----+
|c=IN IP4
203.0.113.77
| [RFC4566] |

```

```

+-----+
+-----+
|a=bundle-only
| [I-D.ietf-mmusic-sdp-bundle-negotiation] |

```

```

+-----+
+-----+
|
a=mid:m1

```

```

|[RFC5888] Video m=line part of BUNDLE |
|
|group |
+-----+
+-----+
|a=msid:ma
tb
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (tb) |
+-----+
+-----+
|
a=recvonly
|[RFC3264] - receive only video stream |
+-----+
+-----+
|a=rtpmap:98
VP8/90000
|[RFC7741] |
+-----+
+-----+
|a=rtpmap:100
VP8/90000
|[RFC7741] |
+-----+
+-----+
|a=fmtp:98 max-
fr=30
|[RFC4566] |
+-----+
+-----+
|a=fmtp:100 max-
fr=15
|[RFC4566] |
+-----+
+-----+
|a=rtcp-fb:*
nack
|[RFC4585] |
+-----+
+-----+

```

|a=rtcp-fb:* nack
pli |
[RFC4585] |

+-----+
+-----+
|a=rtcp-fb:* ccm
fir
|[RFC5104] |

+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-hdext:sdes:mid | [I-D.ietf-mmusic-sdp-bundle-negotiation] |

+-----+
+-----+
|a=extmap:3 urn:ietf:params:rtp-hdext:sdes:rtp-stream-id | [I-D.ietf-avtext-rid] |

+-----+
+-----+
|a=rid:1 recv pt=98;max-width=1280;max-height=720 | [I-D.ietf-mmusic-rid] |
Bob accepts the |
|
|offered payload format constraints |

+-----+
+-----+
|a=rid:2 recv pt=100;max-width=640;max-height=480 | [I-D.ietf-mmusic-rid] |
Bob accepts the |
|
|offered payload format constraints |

+-----+
+-----+

```

|a=simulcast:recv
1;2
|[I-D.ietf-mmusic-sdp-simulcast] Bob
|
|accepts the offered simulcast streams
|
|and removes the paused state of stream
|
|with 'rid' value 2.

```

```

+-----+
+-----+
|***** Video-2 m=line
*****
*****

```

```

+-----+
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF 101
102 |BUNDLE
accepted

```

```

+-----+
+-----+
|c=IN IP4
203.0.113.77
|[RFC4566]

```

```

+-----+
+-----+
|a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation]

```

```

+-----+
+-----+
|
a=mid:m2
|[RFC5888] Video m=line part of BUNDLE
|
|group

```

```

+-----+
+-----+
|a=msid:ma

```

tc
|Identifies MediaStream ID (ma) and |

|
|MediaStreamTrack ID (tc) |

+-----+
+-----+

|
a=recvonly
|[RFC3264] |

+-----+
+-----+

|a=rtpmap:101
H264/90000
|[RFC6184] |

+-----+
+-----+

|a=rtpmap:102
H264/90000
|[RFC6184] |

+-----+
+-----+

|a=fmtp:101 profile-level-id=42401f;packetization-
mode=1 | [RFC6184]
|

+-----+
+-----+

|a=fmtp:102 profile-level-id=42401f;packetization-
mode=1 | [RFC6184]
|

+-----+
+-----+

|a=rtcp-fb:*
nack
|[RFC4585] |

+-----+
+-----+

|a=rtcp-fb:* nack
pli |
|[RFC4585] |

+-----+
+-----+

|a=rtcp-fb:* ccm

```

fir
|[RFC5104]
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdrext:sdes:mid
|[I-D.ietf-
mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=extmap:3 urn:ietf:params:rtp-hdrext:sdes:rtp-stream-
id
|[I-D.ietf-avtext-rid]
|
+-----+
+-----+
|a=rid:3 recv pt=101;max-width=1280;max-height=720;max-
fr=30
|[I-D.ietf-mmusic-rid] Bob accepts
the |
|
|offered payload format constraints |
+-----+
+-----+
|a=rid:4 recv pt=102;max-width=640;max-height=360;max-
fr=15
|[I-D.ietf-mmusic-rid] Bob accepts
the |
|
|offered payload format constraints |
+-----+
+-----+
|a=simulcast:recv
3;4
|[I-D.ietf-mmusic-sdp-simulcast] Bob
|
|
|accepts the offered simulcast streams. |
+-----+
+-----+

```

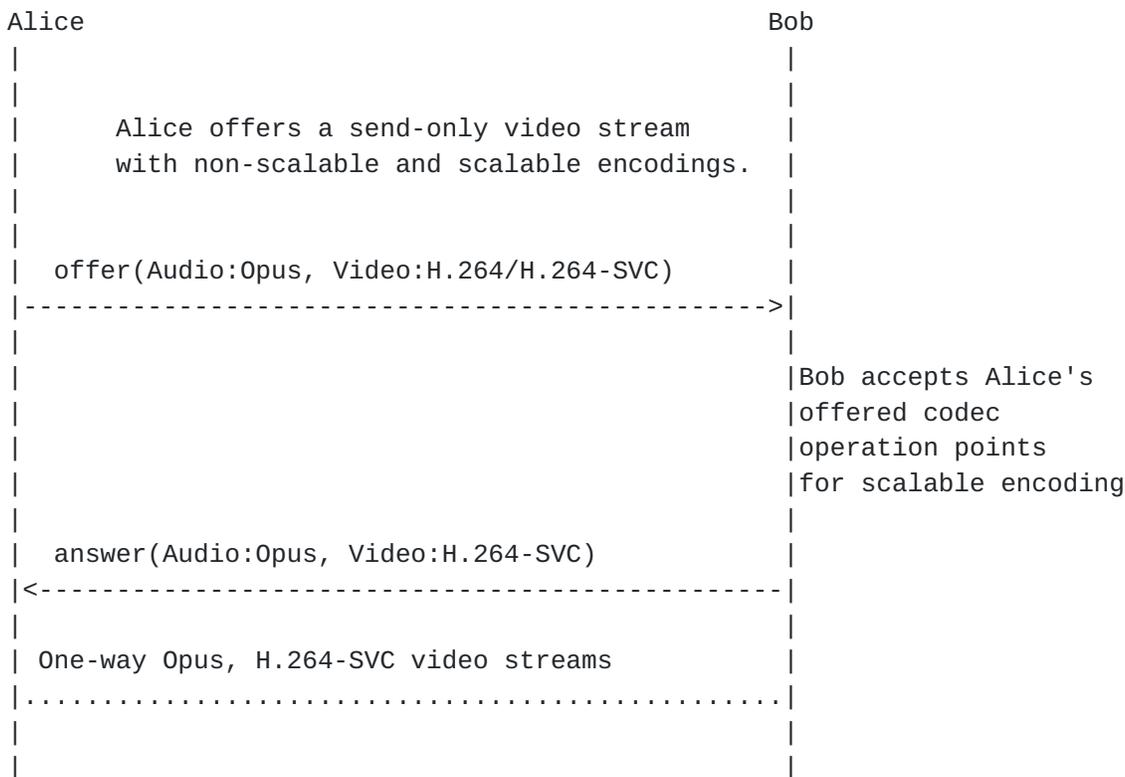
Table 28: 5.3.1 SDP Answer

5.3.2. Successful SVC Video Session

This section shows an SDP offer/answer for a session with an audio and a single video source. The video source is being encoded both as non-scalable and scalable H.264-SVC RTP streams (in the SST mode).

The answerer picks the payload type corresponding to scalable encoding.

SVC Session - 3 Layers w/BUNDLE



+=====	
Offer SDP	
Contents	
RFC#/Notes	
+=====	
v=0	
[RFC4566]	
+-----	
+-----+	

|o=- 20519 0 IN IP4

0.0.0.0

[RFC4566]

+-----+
+-----+

|
s=-

| [RFC4566]

+-----+
+-----+

|t=0

0

| [RFC4566]

+-----+
+-----+

```

    |a=group:BUNDLE m0
m1
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|

```

```

|
|Alice supports grouping of m=lines under|

```

```

|
|BUNDLE semantics |

```

```

+-----+
+-----+

```

```

    |a=group:LS m0
m1
|[RFC5888]|

```

```

+-----+
+-----+

```

```

    |a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice]|

```

```

+-----+
+-----+

```

```

    |a=ice-
options:ice2
|[RFC8445]|

```

```

+-----+
+-----+

```

```

    |***** Audio m=line
*****
*****

```

```

+-----+
+-----+

```

```

    |m=audio 54609 UDP/TLS/RTP/SAVPF
109 | [RFC4566]
|

```

```

+-----+
+-----+

```

```

    |c=IN IP4
203.0.113.141
|[RFC4566]|

```

```

+-----+
+-----+
|

```

```
a=mid:m0
|[RFC5888] Audio m=line part of BUNDLE |
|
|group with a unique port number      |
+-----+
+-----+
|a=msid:ma
ta
|Identifies MediaStream ID (ma) and   |
|
|MediaStreamTrack ID (ta)            |
+-----+
+-----+
|
a=sendonly
|[RFC3264]                             |
+-----+
+-----+
|a=rtpmap:109 opus/
48000/2
|[RFC7587]                             |
+-----+
+-----+
|a=maxptime:
120
|[RFC4566]                             |
+-----+
+-----+
|a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp]        |
+-----+
+-----+
|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[I-D.ietf-mmusic-ice-sip-sdp]        |
+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122]                             |
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
```

05:E9:26:33:E8:70:88:A2|

```
+-----+
+-----+
|
a=setup:actpass
|[RFC5763]|
+-----+
+-----+
|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68
|[I-D.ietf-mmusic-dtls-sdp]|
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761]|
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506]|
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level|[RFC6464]|
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid|[I-D.ietf-
mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 192.0.2.4 61665 typ
host|[I-D.ietf-mmusic-ice-sip-sdp]|
|
```

```

+-----+
+-----+
|a=candidate:1 1 UDP 694302207 203.0.113.141 54609 typ srflx raddr 192.0.2.4
rport 61665 | [I-D.ietf-mmusic-ice-sip-sdp] |

```

```

+-----+
+-----+
|a=end-of-
candidates
| [I-D.ietf-mmusic-trickle-ice] |

```

```

+-----+
+-----+
| ***** Video m=line
***** |
***** |

```

```

+-----+
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF 96
100 |bundle-only
video line with port number |

```

```

|
|set to zero |

```

```

+-----+
+-----+
|c=IN IP4
203.0.113.141
| [RFC4566] |

```

```

+-----+
+-----+
|a=bundle-
only
| [I-D.ietf-mmusic-sdp-bundle-negotiation] |

```

```

+-----+
+-----+
|
a=mid:m1
| [RFC5888] Video m=line part of BUNDLE |

```

```

|
|group |

```

```

+-----+
+-----+

```

```

    |a=msid:ma
tb
|Identifies MediaStream ID (ma) and      |
|
|MediaStreamTrack ID (tb)                |
+-----+
+-----+
    |
a=sendonly
|[RFC3264] - Send only video stream      |
+-----+
+-----+
    |a=rtpmap:96
H264/90000
|[RFC6184]                                |
+-----+
+-----+
    |a=fmtp:96 profile-level-id=4d0028; packetization-mode=1;max-
fs=8040                                |[RFC6184]H.264 Non Scalable      |
+-----+
+-----+
    |a=rtpmap:100 H264-SVC/
90000                                    |
|[RFC6190]                                |
+-----+
+-----+
    |a=fmtp:100 profile-level-id=53001f;packetization-
mode=0                                |[RFC6190] H.264 Scalable
Encoding                                |
+-----+
+-----+
    |a=rtcp-fb:*
nack
|[RFC4585]                                |
+-----+
+-----+
    |a=rtcp-fb:* nack
pli                                    |
|[RFC4585]                                |
+-----+
+-----+
    |a=rtcp-fb:* ccm

```

```

fir
|[RFC5104]
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdrext:sdes:mid
|[I-D.ietf-
mmusic-sdp-bundle-negotiation]|
+-----+
+-----+

```

Table 29: 5.3.2 SDP Offer with SVC

```

=====
|Answer SDP
Contents
|RFC#/Notes
=====
|
v=0
|[RFC4566]
+-----+
+-----+
|o=- 20519 0 IN IP4
0.0.0.0
|[RFC4566]

```

```

+-----+
+-----+
|
s=-
|[RFC4566]

```

```

+-----+
+-----+
|t=0
0
|[RFC4566]

```

```

+-----+
+-----+
|a=group:BUNDLE m0
m1
|[I-D.ietf-mmusic-sdp-bundle-negotiation]

```

```

+-----+
+-----+
|a=group:LS m0
m1
|[RFC5888]

```

```

+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice]

```

```

+-----+
+-----+
|a=ice-
options:ice2
|[RFC8445]

```

```

+-----+
+-----+
|***** Audio m=line
*****
*****

```

```

+-----+
+-----+
|m=audio 49203 UDP/TLS/RTP/SAVPF
109
|

```

+-----+
+-----+
|c=IN IP4
203.0.113.77
|[RFC4566]|

+-----+
+-----+
|
a=mid:m0
|[RFC5888]|

+-----+
+-----+
|a=msid:ma
ta
|Identifies MediaStream ID (ma) and |
|MediaStreamTrack ID (ta) |

+-----+
+-----+
|
a=recvonly
|[RFC3264]|

+-----+
+-----+
|a=rtpmap:109 opus/
48000/2 |
|[RFC7587]|

+-----+
+-----+
|a=maxptime:
120
|[RFC4566]|

+-----+
+-----+
|a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp]|

+-----+
+-----+
|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[I-D.ietf-mmusic-ice-sip-sdp]|

```

+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122]|
|6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08|
+-----+
+-----+
|
a=setup:active
|[RFC5763]|
+-----+
+-----+
|a=tls-
id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31
|[I-D.ietf-mmusic-dtls-sdp]|
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761]|
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506]|
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level|[RFC6464]|
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid|[I-D.ietf-
mmusic-sdp-bundle-negotiation]|

```

```

+-----+
+-----+
|a=candidate:0 1 UDP 2113667326 198.51.100.7 51556 typ
host | [I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 1 UDP 1694302206 203.0.113.77 49203 typ srflx raddr
198.51.100.7 rport 51556 | [I-D.ietf-mmusic-ice-sip-sdp] |
+-----+
+-----+
|a=end-of-
candidates
| [I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|***** Video m=line
***** |
***** |
+-----+
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF
100 | BUNDLE
accepted. |
+-----+
+-----+
|c=IN IP4
203.0.113.77
| [RFC4566] |
+-----+
+-----+
|a=bundle-
only
| [I-D.ietf-mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|
a=mid:m1
| [RFC5888] Video m=line part of BUNDLE |
|

```

```

|group                               |
+-----+
|a=msid:ma
tb
|Identifies MediaStream ID (ma) and  |
|
|MediaStreamTrack ID (tb)           |
+-----+
+-----+
|
a=recvonly
|[RFC3264] - Receive only video stream |
+-----+
+-----+
|a=rtpmap:100 H264-SVC/
90000                                |
|[RFC6190]                            |
+-----+
+-----+
|a=fmtp:100 profile-level-id=53001f;packetization-
mode=0                               |[RFC6190]
|
+-----+
+-----+
|a=rtcp-fb:*
nack
|[RFC4585]                            |
+-----+
+-----+
|a=rtcp-fb:* nack
pli                                  |
|[RFC4585]                            |
+-----+
+-----+
|a=rtcp-fb:* ccm
fir
|[RFC5104]                            |
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid                       |[I-D.ietf-

```

[mmusic-sdp-bundle-negotiation](#)]

+-----+
+-----+

Table 30: 5.3.2 SDP Answer with SVC

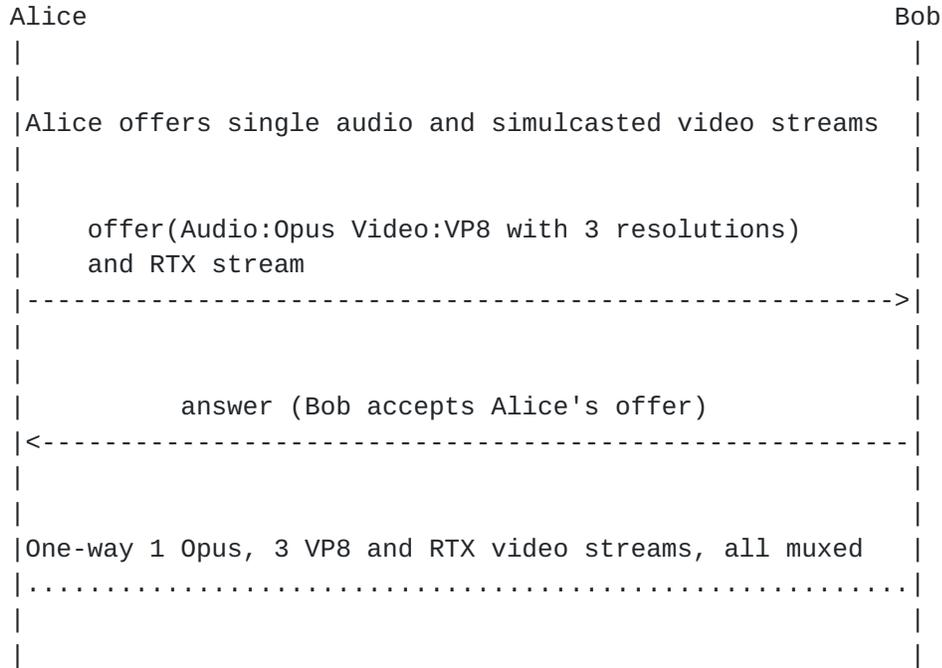
5.3.3. Successful Simulcast Video Session with Retransmission

This section shows an SDP offer/answer exchange for a simulcast scenario with 3 resolutions and has [[RFC4588](#)]-style retransmission flows.

The [[I-D.ietf-mmusic-rid](#)] framework is used to specify all the (3) resolution constraints mapped to a single Payload Type (98).

The [[I-D.ietf-mmusic-sdp-simulcast](#)] framework identifies the simulcast streams via their 'rid' identifiers.

Simulcast Streams with Retransmission



```

+=====
| Offer SDP
Contents
|RFC#/Notes |
+=====
|
v=0
| [RFC4566] |
+-----+
|o=- 20519 0 IN IP4
0.0.0.0 |
| [RFC4566] |
+-----+
|
s=-
| [RFC4566] |
+-----

```

```

+-----+
|t=0
0
|[RFC4566]
+-----+
+-----+
|a=group:BUNDLE m0
m1
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|
|
|Alice supports grouping of m=lines under|
|
|BUNDLE semantics
+-----+
+-----+
|a=group:LS m0
m1
|[RFC5888]
+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice]
+-----+
+-----+
|a=ice-
options:ice2
|[RFC8445]
+-----+
+-----+
|***** Audio m=line
*****
*****
+-----+
+-----+

```

|m=audio 54609 UDP/TLS/RTP/SAVPF

109

| [[RFC4566](#)]

|

+-----+
+-----+

|c=IN IP4
203.0.113.141

| [[RFC4566](#)]

+-----+
+-----+

|
a=mid:m0

| [[RFC5888](#)] Audio m=line part of BUNDLE |

|
|group with a unique port number |

+-----+
+-----+

|a=msid:ma
ta

|Identifies MediaStream ID (ma) and |

|
|MediaStreamTrack ID (ta) |

+-----+
+-----+

|
a=sendonly

| [[RFC3264](#)]

+-----+
+-----+

|a=rtpmap:109 opus/
48000/2

| [[RFC7587](#)]

+-----+
+-----+

|a=maxptime:
120

| [[RFC4566](#)]

+-----+
+-----+

|a=ice-ufrag:

074c6550

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|
a=fingerprint:sha-256

| [[RFC8122](#)] |

|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2| |

+-----+
+-----+

|
a=setup:actpass

| [[RFC5763](#)] |

+-----+
+-----+

|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68

| [[I-D.ietf-mmusic-dtls-sdp](#)] |

+-----+
+-----+

|a=rtcp-
mux

| [[RFC5761](#)] |

+-----+
+-----+

|a=rtcp-
rsize

| [[RFC5506](#)] |

+-----+
+-----+

|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [[RFC6464](#)]

|
+-----+
+-----+

|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid

| [[I-D.ietf-](#)

[mmusic-sdp-bundle-negotiation](#) |

```
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 192.0.2.4 61665 typ
host | [I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 1 UDP 694302207 203.0.113.141 54609 typ srflx raddr 192.0.2.4
rport 61665 | [I-D.ietf-mmusic-ice-sip-sdp] |
+-----+
+-----+
|a=end-of-
candidates
| [I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|***** Video m=line
***** |
***** |
+-----+
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF 98
103 |bundle-only
video line with port number |
|
|set to zero |
+-----+
+-----+
|c=IN IP4
203.0.113.141
| [RFC4566] |
+-----+
+-----+
```

```

    |a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|

```

```

+-----+
+-----+
    |
a=mid:m1
|[RFC5888]|

```

```

+-----+
+-----+
    |a=msid:ma
tb
|Identifies MediaStream ID (ma) and
|
|MediaStreamTrack ID (tb)

```

```

+-----+
+-----+
    |
a=sendonly
|[RFC3264]|

```

```

+-----+
+-----+
    |a=rtpmap:98
VP8/90000
|[RFC7741]|

```

```

+-----+
+-----+
    |a=fmtp:98 max-
fr=30
|[RFC4566]|

```

```

+-----+
+-----+
    |a=rtpmap:103 rtx/
90000
|[RFC4588]|

```

```

+-----+
+-----+
    |a=fmtp:103 apt=98;rtx-
time=200
|[RFC4588]|

```

```

+-----+

```

+-----+
|a=rtcp-fb:*
nack
|[RFC4585]|

+-----+
|a=rtcp-fb:* nack
pli
|[RFC4585]|

+-----+
|a=rtcp-fb:* ccm
fir
|[RFC5104]|

+-----+
|a=extmap:2 urn:iETF:params:rtp-
hdext:sdes:mid | [I-D.iETF-
[mmusic-sdp-bundle-negotiation](#)]|

+-----+
|a=extmap:3 urn:iETF:params:rtp-hdext:sdes:rtp-stream-
id | [I-D.iETF-avtext-rid]
|

+-----+
|a=extmap:4 urn:iETF:params:rtp-hdext:sdes:repaired-rtp-stream-
id | [I-D.iETF-avtext-rid]|

+-----+
|a=rid:1 send pt=98;max-fs=921600;max-
fr=30 | [I-D.iETF-mmusic-rid]
|

+-----+
|a=rid:2 send pt=98;max-fs=614400;max-
fr=15 | [I-D.iETF-mmusic-rid]
|

+-----+
|a=rid:3 send pt=98;max-fs=230400;max-
fr=30 | [I-D.iETF-mmusic-rid]
|

```

+-----+
+-----+
|a=simulcast:send
1;2;3
[I-D.ietf-mmusic-sdp-simulcast] Alice
|
|can send all the simulcast streams
+-----+
+-----+

```

Table 31: 5.3.3 SDP Offer w/Simulcast, RTX

```

+=====+
|Answer SDP
Contents
|RFC#/Notes
+=====+
|
v=0
|[RFC4566]
+-----+
+-----+
|o=- 20519 0 IN IP4
0.0.0.0
[RFC4566]

```

```

+-----+
+-----+
|
s=-
|[RFC4566]

```

```

+-----+
+-----+
|t=0
0
|[RFC4566]

```

```

+-----+
+-----+
|a=group:BUNDLE m0
m1
|[I-D.ietf-mmusic-sdp-bundle-negotiation]

```

```

|
|Bob supports grouping of m=lines under
|
|BUNDLE semantics

```

```

+-----+
+-----+
|a=group:LS m0
m1
|[RFC5888]

```

```

+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice]

```

```

+-----+
+-----+
|a=ice-
options:ice2
|[RFC8445]

```

```

+-----+
+-----+
|***** Audio m=line
*****
*****

```

```
+-----+
+-----+
|m=audio 49203 UDP/TLS/RTP/SAVPF
109 | [RFC4566]
|
+-----+
+-----+
|c=IN IP4
203.0.113.77
|[RFC4566] |
+-----+
+-----+
|
a=mid:m0
|[RFC5888] |
+-----+
+-----+
|a=msid:ma
ta
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (ta) |
+-----+
+-----+
|
a=recvonly
|[RFC3264] |
+-----+
+-----+
|a=rtpmap:109 opus/
48000/2 |
|[RFC7587] |
+-----+
+-----+
|a=maxptime:
120
|[RFC4566] |
+-----+
+-----+
|a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp] |
```

```
+-----+
+-----+
|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[I-D.ietf-mmusic-ice-sip-sdp] |
```

```
+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122] |
|6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08| |
```

```
+-----+
+-----+
|
a=setup:active
|[RFC5763] |
```

```
+-----+
+-----+
|a=tls-
id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31
|[I-D.ietf-mmusic-dtls-sdp] |
```

```
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761] |
```

```
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506] |
```

```
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [RFC6464]
|
```

```

+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdrext:sdes:mid                                     |[I-D.ietf-
mmusic-sdp-bundle-negotiation]|

```

```

+-----+
+-----+
|a=candidate:0 1 UDP 2113667326 198.51.100.7 51556 typ
host                                               |[I-D.ietf-mmusic-ice-sip-sdp]
|

```

```

+-----+
+-----+
|a=candidate:1 1 UDP 1694302206 203.0.113.77 49203 typ srflx raddr
198.51.100.7 rport 51556                         |[I-D.ietf-mmusic-ice-sip-sdp]
|

```

```

+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice]
|

```

```

+-----+
+-----+
|***** Video m=line
*****
*****
|

```

```

+-----+
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF 98
103                                               | BUNDLE
accepted
|

```

```

+-----+
+-----+
|c=IN IP4
203.0.113.77
|[RFC4566]
|

```

```

+-----+
+-----+
|a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|
|

```

```

+-----+

```

```
+-----+
|
a=mid:m1
|[RFC5888] Video m=line part of BUNDLE |
|
|group |
+-----+
+-----+
|a=msid:ma
tb
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (tb) |
+-----+
+-----+
|
a=recvonly
|[RFC3264] |
+-----+
+-----+
|a=rtpmap:98
VP8/90000
|[RFC7741] |
+-----+
+-----+
|a=fmtp:98 max-
fr=30
|[RFC4566] |
+-----+
+-----+
|a=rtpmap:103 rtx/
90000 |
|[RFC4588] |
+-----+
+-----+
|a=fmtp:103 apt=98;rtx-
time=200 |
|[RFC4588] |
+-----+
+-----+
|a=rtcp-fb:*
nack
```

```

| [RFC4585] |
+-----+
+-----+
|a=rtcp-fb:* nack
pli |
| [RFC4585] |
+-----+
+-----+
|a=rtcp-fb:* ccm
fir
| [RFC5104] |
+-----+
+-----+
|a=extmap:2 urn:iETF:params:rtp-
hdrext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|a=extmap:3 urn:iETF:params:rtp-hdrext:sdes:rtp-stream-
id | [I-D.ietf-avtext-rid] |
|
+-----+
+-----+
|a=extmap:4 urn:iETF:params:rtp-hdrext:sdes:repaired-rtp-stream-
id | [I-D.ietf-avtext-rid] |
+-----+
+-----+
|a=rid:1 recv pt=98;max-fs=921600;max-
fr=30 | [I-D.ietf-mmusic-rid] |
|
+-----+
+-----+
|a=rid:2 recv pt=98;max-fs=614400;max-
fr=15 | [I-D.ietf-mmusic-rid] |
|

```

```

+-----+
+-----+
|a=rid:3 recv pt=98;max-fs=230400;max-
fr=30                                     |[I-D.ietf-mmusic-rid]
|
+-----+
+-----+
|a=simulcast:recv
1;2;3                                     |
[I-D.ietf-mmusic-sdp-simulcast] Bob      |
|
|accepts the offered simulcast streams   |
+-----+
+-----+

```

Table 32: 5.3.3 SDP Answer w/Simulcast, RTX

5.3.4. Successful One-way Simulcast Session with 2 resolutions and RTX
 - One resolution rejected

This section shows an SDP offer/answer exchange for a simulcast scenario with two resolutions.

It also showcases where Bob rejects one of the Simulcast Video streams, which results in the rejection of the associated repair stream implicitly.

Simulcast Streams with Retransmission Rejected

```

Alice                                     Bob
|                                         |
|                                         |
|Alice offers single audio and simulcasted video streams |
| with bundle-only for video                       |
|                                         |
|                                         |
|offer(Audio:Opus Video:VP8 with 2 resolutions,RTX Stream)|
|----->|
|                                         |
|                                         |
|Bob accepts 1                                     |
|simulcast,rtx                                   |
|rejects the                                     |
|other                                           |
| answer(Audio:Opus Video:VP8 with 1 res & RTX Stream) |

```

|<-----|
|
|
| One-way audio and video session and its associated |
| RTX stream, all multiplexed |
|.....|
|
|

```

=====
|Offer SDP
Contents
|RFC#/Notes |
=====
|
v=0
| [RFC4566] |
+-----+
+-----+
|o=- 20519 0 IN IP4
0.0.0.0 |
| [RFC4566] |
+-----+
+-----+
|
s=-
| [RFC4566] |
+-----+
+-----+
|t=0
0
| [RFC4566] |
+-----+
+-----+
|a=group:BUNDLE m0
m1 |
| [I-D.ietf-mmusic-sdp-bundle-negotiation] |
|
|Alice supports grouping of m=lines under|
|
|BUNDLE semantics |
+-----+
+-----+
|a=group:LS m0
m1
| [RFC5888] |
+-----+
+-----+
|a=ice-

```

options:trickle
|[[I-D.ietf-mmusic-trickle-ice](#)]

+-----+
+-----+

|a=ice-
options:ice2
|[[RFC8445](#)]

+-----+
+-----+

|***** Audio m=line

+-----+
+-----+

|m=audio 54609 UDP/TLS/RTP/SAVPF
109 | [[RFC4566](#)]
|

+-----+
+-----+

|c=IN IP4
203.0.113.141
|[[RFC4566](#)]

+-----+
+-----+

|
a=mid:m0
|[[RFC5888](#)]

+-----+
+-----+

|a=msid:ma
ta
|Identifies MediaStream ID (ma) and
|
|MediaStreamTrack ID (ta)

+-----+
+-----+

|
a=sendonly
|[[RFC3264](#)]

+-----+
+-----+

|a=rtpmap:109 opus/

48000/2

[RFC7587]

+-----+
+-----+

|a=maxptime:

120

[RFC4566]

+-----+
+-----+

|a=ice-ufrag:

074c6550

[I-D.ietf-mmusic-ice-sdp]

+-----+
+-----+

|a=ice-

pwd:a28a397a4c3f31747d1ee3474af08a068

[I-D.ietf-mmusic-ice-sdp]

+-----+
+-----+

|
a=fingerprint:sha-256

[RFC8122]

|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2|

+-----+
+-----+

|
a=setup:actpass

[RFC5763]

+-----+
+-----+

|a=tls-id:

89J2LRATQ3ULA24G9AHWVR31VJWSLB68

[I-D.ietf-mmusic-dtls-sdp]

```

+-----+
+-----+
|a=rtcp-
mux
|[RFC5761] |
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506] |
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [RFC6464]
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 192.0.2.4 61665 typ
host | [I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 1 UDP 694302207 203.0.113.141 54609 typ srflx raddr 192.0.2.4
rport 61665 | [I-D.ietf-mmusic-ice-sip-sdp] |
+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|***** Video m=line
***** |
*****
***** |
+-----+

```

```
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF 98 100 101
103
with port number |
```

|bundle-only video line

```
|
|set to zero |
```

```
+-----+
+-----+
|c=IN IP4
203.0.113.141
|[RFC4566] |
```

```
+-----+
+-----+
|a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation] |
```

```
+-----+
+-----+
|
a=mid:m1
|[RFC5888] |
```

```
+-----+
+-----+
|a=msid:ma
tb
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (tb) |
```

```
+-----+
+-----+
|
a=sendonly
|[RFC3264] |
```

```
+-----+
+-----+
|a=rtpmap:98
VP8/90000
|[RFC7741] |
```

```
+-----+
+-----+
|a=rtpmap:100
VP8/90000
```

```

| [RFC7741] |
+-----+
+-----+
|a=rtpmap:101 rtx/
90000 |
| [RFC4588] |
+-----+
+-----+
|a=rtpmap:103 rtx/
90000 |
| [RFC4588] |
+-----+
+-----+
|a=fmtp:98 max-fr=30;max-
fs=8040 |
| [RFC4566] |
+-----+
+-----+
|a=fmtp:100 max-fr=15;max-
fs=1200 | [RFC4566]
|
+-----+
+-----+
|a=fmtp:101 apt=98;rtx-
time=200 |
| [RFC4588] |
+-----+
+-----+
|a=fmtp:103 apt=100;rtx-
time=200 |
| [RFC4588] |
+-----+
+-----+
|a=rtcp-fb:*
nack
| [RFC4585] |

```

```

+-----+
+-----+
  |a=rtcp-fb:* nack
pli
[RFC4585]

```

```

+-----+
+-----+
  |a=rtcp-fb:* ccm
fir
|[RFC5104]

```

```

+-----+
+-----+
  |a=extmap:2 urn:ietf:params:rtp-
hdrext:sdes:mid
mmusic-sdp-bundle-negotiation] | [I-D.ietf-

```

```

+-----+
+-----+
  |a=extmap:3 urn:ietf:params:rtp-hdrext:sdes:rtp-stream-
id
|[I-D.ietf-avtext-rid]
|

```

```

+-----+
+-----+
  |a=extmap:4 urn:ietf:params:rtp-hdrext:sdes:repaired-rtp-stream-
id
|[I-D.ietf-avtext-rid]
|

```

```

+-----+
+-----+
  |a=rid:1 send
pt=98
|[I-D.ietf-mmusic-rid] 1:1 mapping
|
|between the PT and the 'rid' identifier |

```

```

+-----+
+-----+
  |a=rid:2 send
pt=100
|[I-D.ietf-mmusic-rid] 1:1 mapping
|
|between the PT and the 'rid' identifier |

```

```

+-----+
+-----+

```

```

    |a=simulcast:send
1;2
[I-D.ietf-mmusic-sdp-simulcast]

```

```

+-----+
+-----+

```

Table 33: 5.3.4 SDP Offer w/Simulcast, RTX

```

+=====+
|Answer SDP
Contents
|RFC#/Notes
+=====+
|
v=0
|[RFC4566]
+-----+
+-----+
|o=- 20519 0 IN IP4
0.0.0.0
|[RFC4566]
+-----+
+-----+
|
s=-
|[RFC4566]
+-----+
+-----+
|t=0
0
|[RFC4566]
+-----+
+-----+
|a=group:BUNDLE m0
m1
|[I-D.ietf-mmusic-sdp-bundle-negotiation]
|
|Bob supports grouping of m=lines under
|
|BUNDLE semantics
+-----+

```

```
+-----+
|a=group:LS m0
m1
|[RFC5888] |
```

```
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice] |
```

```
+-----+
|a=ice-
options:ice2
|[RFC8445] |
```

```
+-----+
|***** Audio m=line
*****
***** |
```

```
+-----+
|m=audio 49203 UDP/TLS/RTP/SAVPF
109 | [RFC4566]
|
```

```
+-----+
+-----+
```

```

    |c=IN IP4
203.0.113.77
|[RFC4566]

```

```

+-----+
+-----+

```

```

    |
a=mid:m0
|[RFC5888]

```

```

+-----+
+-----+

```

```

    |a=msid:ma
ta
|Identifies MediaStream ID (ma) and
|
|MediaStreamTrack ID (ta)

```

```

+-----+
+-----+

```

```

    |
a=recvonly
|[RFC3264]

```

```

+-----+
+-----+

```

```

    |a=rtpmap:109 opus/
48000/2
|[RFC7587]

```

```

+-----+
+-----+

```

```

    |a=maxptime:
120
|[RFC4566]

```

```

+-----+
+-----+

```

```

    |a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp]

```

```

+-----+
+-----+

```

```

    |a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[I-D.ietf-mmusic-ice-sip-sdp]

```

```
+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122]
|6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08|
+-----+
+-----+
|
a=setup:active
|[RFC5763]
+-----+
+-----+
|a=tls-
id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31
|[I-D.ietf-mmusic-dtls-sdp]
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761]
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506]
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level|[RFC6464]
|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid|[I-D.ietf-
mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=candidate:0 1 UDP 2113667326 198.51.100.7 51556 typ
host|[I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
```

```
+-----+
|a=candidate:1 1 UDP 1694302206 203.0.113.77 49203 typ srflx raddr
198.51.100.7 rport 51556 | [I-D.ietf-mmusic-ice-sip-sdp] |
```

```
+-----+
|a=end-of-
candidates
| [I-D.ietf-mmusic-trickle-ice] |
```

```
+-----+
|***** Video m=line
*****
***** |
```

```
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF 98
101 | BUNDLE
accepted |
```

```
+-----+
|c=IN IP4
203.0.113.77
| [RFC4566] |
```

```
+-----+
|a=bundle-
only
| [I-D.ietf-mmusic-sdp-bundle-negotiation] |
```

```
+-----+
|
a=mid:m1
| [RFC5888] |
```

```
+-----+
+-----+
```

```

    |a=msid:ma
tb
|Identifies MediaStream ID (ma) and      |
|
|MediaStreamTrack ID (tb)                |

```

```

+-----+
+-----+

```

```

    |
a=recvonly
|[RFC3264]                                |

```

```

+-----+
+-----+

```

```

    |a=rtpmap:98
VP8/90000
|[RFC7741]                                |

```

```

+-----+
+-----+

```

```

    |a=rtpmap:101 rtx/
90000                                     |
|[RFC4588]                                |

```

```

+-----+
+-----+

```

```

    |a=fmtp:101 apt=98;rtx-
time=200                                 |
|[RFC4588]                                |

```

```

+-----+
+-----+

```

```

    |a=rtcp-fb:*
nack
|[RFC4585]                                |

```

```

+-----+
+-----+

```

```

    |a=rtcp-fb:* nack
pli                                     |
|[RFC4585]                                |

```

```

+-----+
+-----+

```

```

    |a=rtcp-fb:* ccm
fir
|[RFC5104]                                |

```

```

+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdnext:sdes:mid                                     |[I-D.ietf-
mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=extmap:3 urn:ietf:params:rtp-hdnext:sdes:rtp-stream-
id                                               |[I-D.ietf-avtext-rid]
|
+-----+
+-----+
|a=extmap:4 urn:ietf:params:rtp-hdnext:sdes:repaired-rtp-stream-
id                                               |[I-D.ietf-avtext-rid]
|
+-----+
+-----+
|a=rid:1 recv
pt=98
|[I-D.ietf-mmusic-rid]
+-----+
+-----+
|a=simulcast:recv
1
|[I-D.ietf-mmusic-sdp-simulcast] Bob
|
|rejects the second simulcast stream and
|
|the associated rtx stream.
+-----+
+-----+

```

Table 34: 5.3.4 SDP Answer (one Simulcast Rejected)

5.3.5. Simulcast Video Session with Forward Error Correction

This section shows an SDP offer/answer exchange for a simulcast video stream at two resolutions with [\[RFC8627\]](#) based forward error correction mechanisms.

On completion of the offer/answer exchange mechanism, we end up with one audio stream, 2 simulcast video streams, and associated FEC stream(s), all of which are sent over a single 5-tuple.

Simulcast Streams with Forward Error Correction

```

Alice
|
|
|
|Alice offers single audio and simulcasted video streams
|with bundle-only
|
|
|offer(Audio:Opus Video:VP8 with 2 resolutions with FEC Streams)
|----->
|
|
|
|
|
|Bob
|accepts
|Alice's
|offer
|answer(Audio:Opus Video:VP8 with 2 resolutions w/FEC Streams)
|<-----
|
|One-way Audio,Video session with 2 video streams and
| associated FEC stream(s)
|.....
|
|
|

```

```

=====
|Offer SDP
Contents
|RFC#/Notes |
=====
|
v=0
|[RFC4566] |
+-----+
|o=- 20519 0 IN IP4
0.0.0.0 |
|[RFC4566] |
+-----+
|
s=-
|[RFC4566] |

```

```

+-----+
+-----+
|t=0
0
|[RFC4566] |
+-----+
+-----+
|a=group:BUNDLE m0
m1 |
|[I-D.ietf-mmusic-sdp-bundle-negotiation] |
|
|Alice supports grouping of m=lines under|
|
|BUNDLE semantics |
+-----+
+-----+
|a=group:LS m0
m1
|[RFC5888] |
+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|a=ice-
options:ice2
|[RFC8445] |
+-----+
+-----+

```

```

|***** Audio m=line
*****
*****

```

```

+-----+
+-----+

```

```

|m=audio 54609 UDP/TLS/RTP/SAVPF
109 | [RFC4566]
|

```

```

+-----+
+-----+

```

```

|c=IN IP4
203.0.113.141
| [RFC4566]
|

```

```

+-----+
+-----+

```

```

|
a=mid:m0
| [RFC5888]
|

```

```

+-----+
+-----+

```

```

|a=msid:ma
ta
|Identifies MediaStream ID (ma) and
|
|MediaStreamTrack ID (ta)
|

```

```

+-----+
+-----+

```

```

|
a=sendonly
| [RFC3264]
|

```

```

+-----+
+-----+

```

```

|a=rtpmap:109 opus/
48000/2 |
| [RFC7587]
|

```

```

+-----+
+-----+

```

```

|a=maxptime:
120
| [RFC4566]
|

```

```
+-----+
+-----+
|a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp]|
+-----+
+-----+
|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[I-D.ietf-mmusic-ice-sip-sdp]|
+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122]|
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2|
+-----+
+-----+
|
a=setup:actpass
|[RFC5763]|
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761]|
+-----+
+-----+
|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68
|[I-D.ietf-mmusic-dtls-sdp]|
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506]|
+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level|[RFC6464]|
|
+-----+
```

```

+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdrext:sdes:mid                                     |[I-D.ietf-
mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 192.0.2.4 61665 typ
host                                               |[I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 1 UDP 694302207 203.0.113.141 54609 typ srflx raddr 192.0.2.4
rport 61665                                       |[I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice]
|
+-----+
+-----+
|***** Video m=line
*****
*****
|
+-----+
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF 98 100
101                                               |bundle-only video
line with port number |
|
|set to zero
|
+-----+
+-----+
|c=IN IP4
203.0.113.141
|[RFC4566]
|

```

```

+-----+
+-----+
  |a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|

```

```

+-----+
+-----+
  |
a=mid:m1
|[RFC5888] Video m=line part of BUNDLE |
|
|group |

```

```

+-----+
+-----+
  |a=msid:ma
tb
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (tb) |

```

```

+-----+
+-----+
  |
a=sendonly
|[RFC3264] |

```

```

+-----+
+-----+
  |a=rtpmap:98
VP8/90000
|[RFC7741] |

```

```

+-----+
+-----+
  |a=rtpmap:100
VP8/90000
|[RFC7741] |

```

```

+-----+
+-----+
  |a=rtpmap:101 flexfec/
90000
|[RFC8627] |

```

```
+-----+
+-----+
|a=fmtp:98 max-fr=30;max-
fs=8040 |
[RFC4566] |
+-----+
+-----+
|a=fmtp:100 max-fr=15;max-
fs=1200 | [RFC4566]
|
+-----+
+-----+
|a=fmtp:101 repair-
window=200000 |
[RFC8627] |
+-----+
+-----+
|a=rtcp-fb:* nack
pli |
[RFC4585] |
+-----+
+-----+
|a=rtcp-fb:* ccm
fir |
|[RFC5104] |
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|a=extmap:3 urn:ietf:params:rtp-hdext:sdes:rtp-stream-
id | [I-D.ietf-avtext-rid]
|
+-----+
+-----+
|a=extmap:4 urn:ietf:params:rtp-hdext:sdes:repaired-rtp-stream-
id | [I-D.ietf-avtext-rid] |
+-----+
+-----+
|a=rid:1 send
pt=98
```

```

|[I-D.ietf-mmusic-rid] 1:1 mapping      |
|
|between the PT and the 'rid' identifier|
+-----+
+-----+
|a=rid:2 send
pt=100
|[I-D.ietf-mmusic-rid] 1:1 mapping      |
|
|between the PT and the 'rid' identifier|
+-----+
+-----+
|a=simulcast:send
1;2
|[I-D.ietf-mmusic-sdp-simulcast]      |
+-----+
+-----+

```

Table 35: 5.3.5 SDP Offer

```

=====
|Answer SDP
Contents
|RFC#/Notes |
=====
|
v=0
|[RFC4566] |
+-----+
+-----+
|o=- 20519 0 IN IP4
0.0.0.0 |
|[RFC4566] |
+-----+
+-----+
|
s=-
|[RFC4566] |
+-----+
+-----+
|t=0
0
|[RFC4566] |
+-----+
+-----+
|a=group:BUNDLE m0
m1 |
|[I-D.ietf-mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|a=group:LS m0
m1
|[RFC5888] |
+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|a=ice-

```

options:ice2

| [[RFC8445](#)] |

+-----+
+-----+

| ***** Audio m=line
***** |
***** |

+-----+
+-----+

| m=audio 49203 UDP/TLS/RTP/SAVPF
109 | [[RFC4566](#)]
|

+-----+
+-----+

| c=IN IP4
203.0.113.77
| [[RFC4566](#)] |

+-----+
+-----+

|
a=mid:m0
| [[RFC5888](#)] Audio m=line part of BUNDLE |

|
|group with a unique port number |

+-----+
+-----+

| a=msid:ma
ta
|Identifies MediaStream ID (ma) and |

|
|MediaStreamTrack ID (ta) |

+-----+
+-----+

|
a=recvonly
| [[RFC3264](#)] |

+-----+
+-----+

| a=rtpmap:109 opus/
48000/2 |
| [[RFC7587](#)] |

+-----+

```
+-----+
|a=maxptime:
120
|[RFC4566] |
```

```
+-----+
|a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp] |
```

```
+-----+
|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[I-D.ietf-mmusic-ice-sip-sdp] |
```

```
+-----+
|
a=fingerprint:sha-256
|[RFC8122] |
|6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08| |
```

```
+-----+
|
a=setup:active
|[RFC5763] |
```

```
+-----+
|a=tls-
id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31
|[I-D.ietf-mmusic-dtls-sdp] |
```

```
+-----+
+-----+
```

|a=rtcp-
mux
|[RFC5761]

+-----+
+-----+

|a=rtcp-
rsize
|[RFC5506]

+-----+
+-----+

|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level |RFC6464
|

+-----+
+-----+

|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid |I-D.ietf-
mmusic-sdp-bundle-negotiation|

+-----+
+-----+

|a=candidate:0 1 UDP 2113667326 198.51.100.7 51556 typ
host |I-D.ietf-mmusic-ice-sip-sdp|
|

+-----+
+-----+

|a=candidate:1 1 UDP 1694302206 203.0.113.77 49203 typ srflx raddr
198.51.100.7 rport 51556 |I-D.ietf-mmusic-ice-sip-sdp|

+-----+
+-----+

|a=end-of-
candidates
|I-D.ietf-mmusic-trickle-ice|

+-----+
+-----+

|***** Video m=line

+-----+
+-----+

|m=video 0 UDP/TLS/RTP/SAVPF 98 100
101

|BUNDLE

accepted.

|

+-----+
+-----+

|c=IN IP4
203.0.113.77
|[[RFC4566](#)]

|

+-----+
+-----+

|a=bundle-
only
|[[I-D.ietf-mmusic-sdp-bundle-negotiation](#)]

|

+-----+
+-----+

|
a=mid:m1
|[[RFC5888](#)] Video m=line part of BUNDLE

|

|
|group

|

+-----+
+-----+

|a=msid:ma
tb
|Identifies MediaStream ID (ma) and

|

|
|MediaStreamTrack ID (tb)

|

+-----+
+-----+

|
a=recvonly
|[[RFC3264](#)]

|

+-----+
+-----+

|a=rtpmap:98
VP8/90000
|[[RFC7741](#)]

|

+-----+
+-----+

|a=rtpmap:100
VP8/90000
|[[RFC7741](#)]

|

+-----+
+-----+

```

    |a=rtpmap:101 flexfec/
90000
[RFC8627]
+-----+
+-----+
    |a=fmtp:98 max-fr=30;max-
fs=8040
[RFC4566]
+-----+
+-----+
    |a=fmtp:100 max-fr=15;max-
fs=1200
| [RFC4566]
+-----+
+-----+
    |a=fmtp:101 repair-
window=200000
[RFC8627]
+-----+
+-----+
    |a=rtcp-fb:* nack
pli
[RFC4585]
+-----+
+-----+
    |a=rtcp-fb:* ccm
fir
|[RFC5104]
+-----+
+-----+
    |a=extmap:2 urn:ietf:params:rtp-
hdrext:sdes:mid
| [I-D.ietf-
mmusic-sdp-bundle-negotiation]
+-----+
+-----+

```

```

    |a=extmap:3 urn:ietf:params:rtp-hdrext:sdes:rtp-stream-
id                                     |[I-D.ietf-avtext-rid]
|
+-----+
+-----+
    |a=extmap:4 urn:ietf:params:rtp-hdrext:sdes:repaired-rtp-stream-
id                                     |[I-D.ietf-avtext-rid]
|
+-----+
+-----+
    |a=rid:1 recv
pt=98
|[I-D.ietf-mmusic-rid]
|
+-----+
+-----+
    |a=rid:2 recv
pt=100
|[I-D.ietf-mmusic-rid]
|
+-----+
+-----+
    |a=simulcast:recv
1;2
|[I-D.ietf-mmusic-sdp-simulcast]
|
+-----+
+-----+

```

Table 36: 5.3.5 SDP Answer

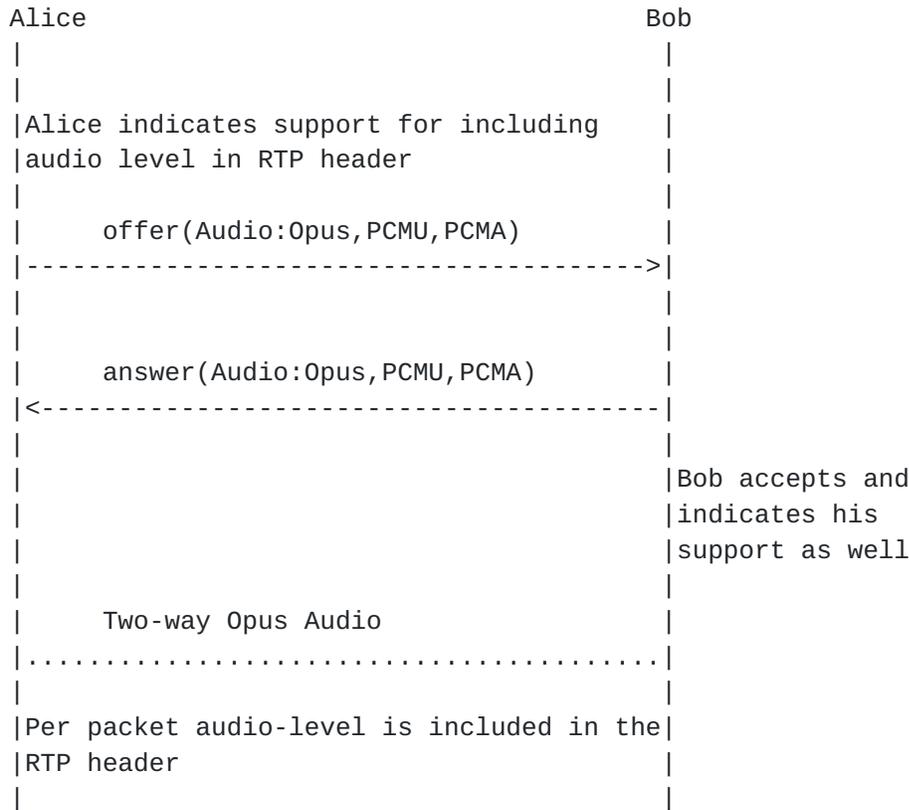
5.4. Others

The examples in this section provide SDP offer/answer exchanges for a variety of scenarios related to RTP Header extensions for conference usages, Legacy Interop scenarios, and more.

5.4.1. Audio Session - Voice Activity Detection

This example shows Alice indicating the support of the RTP header extension to include the audio level of the audio sample carried in the RTP packet.

Two-way Audio with VAD



=====

```

| Offer SDP
Contents
| RFC#/Notes |

```

=====

```

|
v=0
| [RFC4566] |

```

-----+

```

| o=- 20518 0 IN IP4
0.0.0.0 |
| [RFC4566] |

```

-----+

```

|
s=-
| [RFC4566] |

```

```
+-----+
+-----+
|t=0
0
|[RFC4566]|
```

```
+-----+
+-----+
|a=group:BUNDLE
audio
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|
```

```
+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice]|
```

```
+-----+
+-----+
|a=ice-
options:ice2
|[RFC8445]|
```

```
+-----+
+-----+
|***** Audio m=line
*****
*****
```

```
+-----+
+-----+
|m=audio 54609 UDP/TLS/RTP/SAVPF 109 0
8 |[RFC4566]|
|
```

```
+-----+
+-----+
|c=IN IP4
203.0.113.141
|[RFC4566]|
```

```

+-----+
+-----+
|
a=mid:audio
|[RFC5888]

```

```

+-----+
+-----+
|a=msid:ma
ta
|Identifies MediaStream ID (ma) and
|
|MediaStreamTrack ID (ta)

```

```

+-----+
+-----+
|
a=sendrecv
|[RFC3264]

```

```

+-----+
+-----+
|a=rtpmap:109 opus/
48000/2
|[RFC7587]

```

```

+-----+
+-----+
|a=rtpmap:0 PCMU/
8000
|[RFC3551]

```

```

+-----+
+-----+
|a=rtpmap:8 PCMA/
8000
|[RFC3551]

```

```

+-----+
+-----+
|a=maxptime:
120
|[RFC4566]

```

```

+-----+
+-----+
|a=ice-ufrag:

```

074c6550

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|
a=fingerprint:sha-256
| [[RFC8122](#)] |
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2| |

+-----+
+-----+

|
a=setup:actpass

| [[RFC5763](#)] |

+-----+
+-----+

|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68

| [[I-D.ietf-mmusic-dtls-sdp](#)] |

+-----+
+-----+

|a=rtcp-
mux

| [[RFC5761](#)] |

+-----+
+-----+

|a=rtcp-
rsize

| [[RFC5506](#)] |

+-----+
+-----+

|a=rtcp-fb: *
nack

| [[RFC4585](#)] |

+-----+
+-----+

|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [[RFC6464](#)] |

```

|
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdrext:sdes:mid                                     |[I-D.ietf-
mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 192.0.2.4 61665 typ
host                                               |[I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 1 UDP 694302207 203.0.113.141 54609 typ srflx raddr 192.0.2.4
rport 61665                                       |[I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice]
|
+-----+
+-----+

```

Table 37: 5.4.1 SDP Offer

```

=====
|Answer SDP
Contents
|RFC#/Notes |
=====
|
v=0
|[RFC4566] |
+-----+
+-----+
|o=- 16833 0 IN IP4
0.0.0.0 |
|[RFC4566] |
+-----+
+-----+
|
s=-
|[RFC4566] |
+-----+
+-----+
|t=0
0
|[RFC4566] |
+-----+
+-----+
|a=group:BUNDLE
audio
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|a=ice-
options:ice2
|[RFC8445] |
+-----+
+-----+
|***** Audio m=line

```

+-----+
+-----+

|m=audio 49203 UDP/TLS/RTP/SAVPF 109 0

8

| [[RFC4566](#)]

|

+-----+
+-----+

|c=IN IP4

203.0.113.77

| [[RFC4566](#)]

+-----+
+-----+

|

a=mid:audio

| [[RFC5888](#)]

+-----+
+-----+

|a=msid:ma

ta

|Identifies MediaStream ID (ma) and

|

|MediaStreamTrack ID (ta)

+-----+
+-----+

|

a=sendrecv

| [[RFC3264](#)] - Bob can send and recv audio |

+-----+
+-----+

|a=rtpmap:109 opus/

48000/2

| [[RFC7587](#)] - Bob accepts only Opus Codec |

+-----+
+-----+

|a=rtpmap:0 PCMU/

8000

| [[RFC3551](#)] PCMU Audio Codec

+-----+
+-----+

|a=rtpmap:8 PCMA/

8000

| [[RFC3551](#)] PCMA Audio Codec |

+-----+
+-----+

|a=maxptime:

120

| [[RFC4566](#)] |

+-----+
+-----+

|a=ice-

ufrag:c300d85b

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|a=ice-

pwd:de4e99bd291c325921d5d47efbabd9a2

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|

a=fingerprint:sha-256

| [[RFC8122](#)] |

| 6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08 |

+-----+
+-----+

|

a=setup:active

| [[RFC5763](#)] |

+-----+
+-----+

|a=tls-

id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31

| [[I-D.ietf-mmusic-dtls-sdp](#)] |

```

+-----+
+-----+
  |a=rtcp-
mux
|[RFC5761] - Bob can perform RTP/RTCP  |
|
|Muxing on port 49203                    |
+-----+
+-----+
  |a=rtcp-
rsize
|[RFC5506]                               |
+-----+
+-----+
  |a=rtcp-fb:*
nack
|[RFC4585]                               |
+-----+
+-----+
  |a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level                                     |[RFC6464]
|
+-----+
+-----+
  |a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid                           |[I-D.ietf-
music-sdp-bundle-negotiation]|
+-----+
+-----+
  |a=candidate:0 1 UDP 2113667327 198.51.100.7 51556 typ
host                                     |[I-D.ietf-music-ice-sip-sdp]
|
+-----+
+-----+
  |a=candidate:1 1 UDP 1694302207 203.0.113.77 49203 typ srflx raddr
198.51.100.7 rport 51556                |[I-D.ietf-music-ice-sip-sdp]
|
+-----+
+-----+
  |a=end-of-
candidates

```

| [[I-D.ietf-mmusic-trickle-ice](#)] |

+-----+
+-----+

Table 38: 5.4.1 SDP Answer

5.4.2. Audio Conference - Voice Activity Detection

This example of SDP highlights the RTP header RTP header extension that allows RTP-level mixers in audio conferences to deliver information about the audio level of individual participants.

Audio Conference with VAD Support

Alice Alice indicates her interest in audio levels for the contributing sources offer(Audio:Opus,PCMU,PCMA) -----> answer(Audio:Opus,PCMU,PCMA) <----- Two-way Opus Audio audio-levels per CSRCS are included in the RTP header 	Mixer Mixer indicates it can provide audio-levels
--	--

=====

|Offer SDP
 Contents
 |RFC#/Notes |

=====

|
 v=0
 |[RFC4566] |

+-----+
 |o=- 20518 0 IN IP4
 0.0.0.0 |
 |[RFC4566] - Session Origin Information |

+-----+
 |
 s=-
 |[RFC4566] |

+-----+

```

    |t=0
0
|[RFC4566]
+-----+
+-----+
    |a=group:BUNDLE
audio
|[I-D.ietf-mmusic-sdp-bundle-negotiation]
+-----+
+-----+
    |a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice]
+-----+
+-----+
    |a=ice-
options:ice2
|[RFC8445]
+-----+
+-----+
    |***** Audio m=line
*****
*****
+-----+
+-----+
    |m=audio 54609 UDP/TLS/RTP/SAVPF 109 0
8
|[RFC4566]
+-----+
+-----+
    |c=IN IP4
203.0.113.141
|[RFC4566]
+-----+
+-----+
    |
a=mid:audio
|[RFC5888]

```

```

+-----+
+-----+
  |a=msid:ma
ta
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (ta) |
+-----+
+-----+
  |
a=sendrecv
|[RFC3264] - Alice can send and recv |
|
|audio |
+-----+
+-----+
  |a=rtpmap:109 opus/
48000/2 |
|[RFC7587] |
+-----+
+-----+
  |a=rtpmap:0 PCMU/
8000
|[RFC3551] PCMU Audio Codec |
+-----+
+-----+
  |a=rtpmap:8 PCMA/
8000
|[RFC3551] PCMA Audio Codec |
+-----+
+-----+
  |a=maxptime:
120
|[RFC4566] |
+-----+
+-----+
  |a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp] |

```

```
+-----+
+-----+
|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[I-D.ietf-mmusic-ice-sip-sdp] |
```

```
+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122] |
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2| |
```

```
+-----+
+-----+
|
a=setup:actpass
|[RFC5763] |
```

```
+-----+
+-----+
|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68
|[I-D.ietf-mmusic-dtls-sdp] |
```

```
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761] |
```

```
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506] |
```

```
+-----+
+-----+
|a=rtcp-fb:*
nack
|[RFC4585] |
```

```
+-----+
+-----+
|a=extmap:1/recvonly urn:ietf:params:rtp-hdext:csrc-audio-
level | [RFC6465] |
```

```
+-----+
+-----+
```

```

|a=extmap:2 urn:ietf:params:rtp-hdext:ssrc-audio-
level | [RFC6464]
|
+-----+
+-----+
|a=extmap:3 urn:ietf:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 192.0.2.4 61665 typ
host | [I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 1 UDP 694302207 203.0.113.141 54609 typ srflx raddr 192.0.2.4
rport 61665 | [I-D.ietf-mmusic-ice-sip-sdp] |
+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+

```

Table 39: 5.4.2 SDP Offer

```

=====
|Answer SDP
Contents
|RFC#/Notes |
=====
|
v=0
|[RFC4566] |
+-----+
+-----+
|o=- 16833 0 IN IP4
0.0.0.0 |
|[RFC4566] - Session Origin Information |
+-----+
+-----+
|
s=-
|[RFC4566] |
+-----+
+-----+
|t=0
0
|[RFC4566] |
+-----+
+-----+
|a=group:BUNDLE
audio
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|a=ice-
options:trickle
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
|a=ice-
options:ice2
|[RFC8445] |
+-----+
+-----+
|***** Audio m=line

```

+-----+
+-----+

|m=audio 49203 UDP/TLS/RTP/SAVPF 109 0

8

| [[RFC4566](#)]

|

+-----+
+-----+

|c=IN IP4

203.0.113.77

| [[RFC4566](#)]

+-----+
+-----+

|

a=mid:audio

| [[RFC5888](#)]

+-----+
+-----+

|a=msid:ma

ta

|Identifies MediaStream ID (ma) and

|

|MediaStreamTrack ID (ta)

+-----+
+-----+

|

a=sendrecv

| [[RFC3264](#)]

+-----+
+-----+

|a=rtpmap:109 opus/

48000/2

| [[RFC7587](#)]

+-----+
+-----+

|a=rtpmap:0 PCMU/

8000

| [[RFC3551](#)] PCMU Audio Codec

+-----+
+-----+

|a=rtpmap:8 PCMA/

8000

| [[RFC3551](#)] PCMA Audio Codec |

+-----+
+-----+

|a=maxptime:
120

| [[RFC4566](#)] |

+-----+
+-----+

|a=ice-
ufrag:c300d85b

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|a=ice-
pwd:de4e99bd291c325921d5d47efbabd9a2

| [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+

|
a=fingerprint:sha-256

| [[RFC8122](#)] |

|6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08| |

+-----+
+-----+

|
a=setup:active

| [[RFC5763](#)] |

+-----+
+-----+

|a=tls-
id:CJ6FF9ZZMJW7MDRJIR7XVIQM48GE1G31

| [[I-D.ietf-mmusic-dtls-sdp](#)] |

```
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761] |
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506] |
+-----+
+-----+
|a=rtcp-fb:*
nack
|[RFC4585] |
+-----+
+-----+
|a=extmap:1/sendonly urn:ietf:params:rtp-hdext:csrc-audio-
level | [RFC6465] |
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 198.51.100.7 51556 typ
host | [I-D.ietf-mmusic-ice-sip-sdp]
|
+-----+
+-----+
|a=candidate:1 1 UDP 1694302207 203.0.113.77 49203 typ srflx raddr
198.51.100.7 rport 51556 | [I-D.ietf-mmusic-ice-sip-sdp] |
+-----+
+-----+
|a=end-of-
candidates
|[I-D.ietf-mmusic-trickle-ice] |
+-----+
+-----+
```

Table 40: 5.4.2 SDP Answer

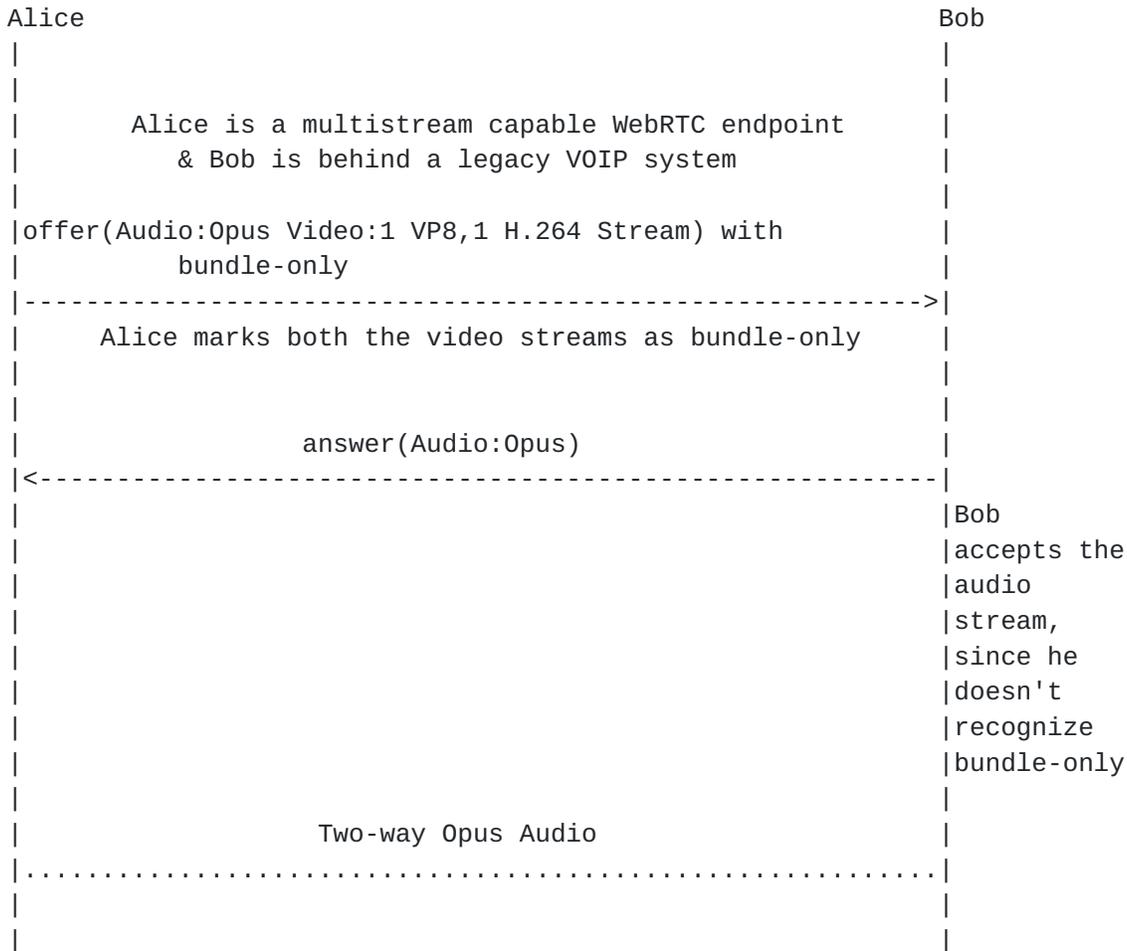
5.4.3. Successful Legacy Interop Fallback with bundle-only

In the scenario described below, Alice is a multi-stream capable WebRTC endpoint, while Bob is a legacy VOIP endpoint. The SDP offer/answer exchange demonstrates successful session setup with fallback to an audio-only stream negotiated via the bundle-only framework between the endpoints. Specifically:

- * The offer from Alice describes 2 cameras via 2 video m=lines with both marked as bundle-only.
- * Bob doesn't recognize the BUNDLE mechanism and since Alice has marked both the video m=lines with port 0, Bob accepts just the audio stream from Alice.

NOTE: Alice is unaware of whether Bob supports the BUNDLE framework. Alice includes separate RTP/RTCP ports and candidate information.

Successful Two-way WebRTC <-> VOIP Interop



```

=====
| Offer SDP
Contents
| RFC#/Notes |
=====
|
v=0
| [RFC4566] |
+-----+
+-----+
| o=- 20519 0 IN IP4
0.0.0.0 |
| [RFC4566] |
+-----+
+-----+
  
```

|
s=-
|[RFC4566] |

+-----+
+-----+

|t=0

0
|[RFC4566] |

+-----+
+-----+

|a=group:BUNDLE m0 m1

m2 | [[I-D.ietf-mmusic-sdp-bundle-negotiation](#)]

|
|Alice supports grouping of m=lines under|

|
|BUNDLE semantics |

+-----+
+-----+

|a=group:LS m0

m1
|[RFC5888] |

+-----+
+-----+

|a=ice-

options:trickle

| [[I-D.ietf-mmusic-trickle-ice](#)] |

```

+-----+
+-----+
|a=ice-
options:ice2
|[RFC8445] |

```

```

+-----+
+-----+
|***** Audio m=line
***** |
***** |

```

```

+-----+
+-----+
|m=audio 54609 UDP/TLS/RTP/SAVPF
109 | [RFC4566]
|

```

```

+-----+
+-----+
|c=IN IP4
203.0.113.141
|[RFC4566] |

```

```

+-----+
+-----+
|
a=mid:m0
|[RFC5888] Audio m=line part of BUNDLE |
|
|group with a unique port number |

```

```

+-----+
+-----+
|a=msid:ma
ta
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (ta) |

```

```

+-----+
+-----+
|
a=sendrecv
|[RFC3264] |

```

```
+-----+
+-----+
|a=rtpmap:109 opus/
48000/2
[RFC7587]
```

```
+-----+
+-----+
|a=maxptime:
120
|[RFC4566]
```

```
+-----+
+-----+
|a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp]
```

```
+-----+
+-----+
|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[I-D.ietf-mmusic-ice-sip-sdp]
```

```
+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122]
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2|
```

```
+-----+
+-----+
|
a=setup:actpass
|[RFC5763]
```

```
+-----+
+-----+
|a=tls-id:
89J2LRATQ3ULA24G9AHWVR31VJWSLB68
|[I-D.ietf-mmusic-dtls-sdp]
```

```
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761]
```

```
+-----+
|a=rtcp:64678 IN IP4
203.0.113.141
[RFC3605]
```

```
+-----+
|a=rtcp-
rsize
|[RFC5506]
```

```
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-
level
|[RFC6464]
```

```
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid
|[I-D.ietf-
mmusic-sdp-bundle-negotiation]
```

```
+-----+
|a=candidate:0 1 UDP 2113667327 192.0.2.4 61665 typ
host
|[I-D.ietf-mmusic-ice-sip-sdp]
```

```
+-----+
|a=candidate:1 1 UDP 694302207 203.0.113.141 54609 typ srflx raddr 192.0.2.4
rport 61665
|[I-D.ietf-mmusic-ice-sip-sdp]
```

```
+-----+
|a=candidate:0 1 UDP 2113667326 192.0.2.4 61667 typ
host
|[I-D.ietf-mmusic-ice-sip-sdp]
```

```
+-----+
+-----+
```

|a=candidate:1 1 UDP 1694302206 203.0.113.141 64678 typ srflx raddr
192.0.2.4 rport 61667 | [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+
|***** Video-1 m=line

***** |

+-----+
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF
98 |bundle-only
video line with port number |

|
|set to zero |

+-----+
+-----+
|c=IN IP4
203.0.113.141
| [[RFC4566](#)] |

+-----+
+-----+
|a=bundle-
only
| [[I-D.ietf-mmusic-sdp-bundle-negotiation](#)] |

+-----+
+-----+
|
a=mid:m1
| [[RFC5888](#)] Video m=line part of BUNDLE |

|
|group |

+-----+
+-----+
|a=msid:ma
tb
|Identifies MediaStream ID (ma) and |

|
|MediaStreamTrack ID (tb) |

+-----+

```
+-----+
|
a=sendrecv
|[RFC3264] |
+-----+
+-----+
|a=rtpmap:98
VP8/90000
|[RFC7741] |
+-----+
+-----+
|a=imageattr:98
[x=1280,y=720]
|[RFC6236] |
+-----+
+-----+
|a=fmtp:98 max-
fr=30
|[RFC4566] |
+-----+
+-----+
|a=rtcp-fb:*
nack
|[RFC4585] |
+-----+
+-----+
|a=rtcp-fb:* nack
pli
|[RFC4585] |
+-----+
+-----+
|a=rtcp-fb:* ccm
fir
|[RFC5104] |
+-----+
+-----+
|a=extmap:2 urn:ietf:params:rtp-
hdext:sdes:mid
|[I-D.ietf-
mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|***** Video-2 m=line
*****
|
```

```

***** |
+-----+
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF |bundle-only
101
video line with port number |

|
|set to zero |
+-----+
+-----+
|c=IN IP4
203.0.113.141
|[RFC4566] |
+-----+
+-----+
|a=bundle-
only
|[I-D.ietf-mmusic-sdp-bundle-negotiation]|
+-----+
+-----+
|
a=mid:m2
|[RFC5888] Video m=line part of BUNDLE |
|
|group |
+-----+
+-----+
|a=msid:ma
tc
|Identifies MediaStream ID (ma) and |
|
|MediaStreamTrack ID (tc) |
+-----+
+-----+

```

```

|
a=sendrecv
| [RFC3264] |
+-----+
+-----+
|a=rtpmap:101
H264/90000
| [RFC6184] |
+-----+
+-----+
|a=fmtp:101 profile-level-id=4d0028;packetization-
mode=1 | [RFC6184]Camera-2,Encoding-1
Resolution |
+-----+
+-----+
|a=rtcp-fb:*
nack
| [RFC4585] |
+-----+
+-----+
|a=rtcp-fb:* nack
pli |
| [RFC4585] |
+-----+
+-----+
|a=rtcp-fb:* ccm
fir
| [RFC5104] |
+-----+
+-----+
|a=extmap:2 urn:iETF:params:rtp-
hdnext:sdes:mid | [I-D.ietf-
mmusic-sdp-bundle-negotiation] |
+-----+
+-----+

```

Table 41: 5.4.3 SDP Simulcast bundle-only

|Answer SDP
Contents

|RFC#/Notes |

+=====

|

v=0

| [[RFC4566](#)] |

+-----

+-----+

|o=- 20519 0 IN IP4

0.0.0.0 |

| [[RFC4566](#)] |

+-----

+-----+

|

s=-

| [[RFC4566](#)] |

+-----

+-----+

|t=0

0

| [[RFC4566](#)] |

+-----

+-----+

|***** Audio m=line

***** |

+-----

+-----+

|m=audio 49203 UDP/TLS/RTP/SAVPF

109

| [[RFC4566](#)] |

|

+-----

+-----+

|c=IN IP4

203.0.113.141

| [[RFC4566](#)] |

+-----

+-----+

|a=rtcp:60065 IN IP4

203.0.113.141 |

| [[RFC3605](#)] |

+-----

+-----+

|
a=sendrecv
|[RFC3264] |

+-----+
+-----+
|a=rtpmap:109 opus/
48000/2 |
|[RFC7587] |

+-----+
+-----+
|a=maxptime:
120
|[RFC4566] |

+-----+
+-----+
|a=ice-
ufrag:c300d85b
|[I-D.ietf-mmusic-ice-sip-sdp]|

+-----+
+-----+
|a=ice-
pwd:de4e99bd291c325921d5d47efbabd9a2
|[I-D.ietf-mmusic-ice-sip-sdp]|

+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122] |

|6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:
24:C2:43:F0:A1:58:D0:A1:2C:19:08|

+-----+
+-----+
|
a=setup:active
|[RFC5763]|

+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506]|

+-----+
+-----+
|a=extmap:1 urn:ietf:params:rtp-hdrext:ssrc-audio-
level|[RFC6464]|

+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 198.51.100.7 51556 typ
host|[I-D.ietf-mmusic-ice-sip-sdp]|

+-----+
+-----+
|a=candidate:1 1 UDP 694302207 203.0.113.77 49203 typ srflx raddr
198.51.100.7 rport 51556|[I-D.ietf-mmusic-ice-sip-sdp]|

+-----+
+-----+
|a=candidate:0 2 UDP 2113667326 198.51.100.7 51558 typ
host|[I-D.ietf-mmusic-ice-sip-sdp]|

+-----+
+-----+
|a=candidate:1 2 UDP 1694302206 203.0.113.77 60065 typ srflx raddr
198.51.100.7 rport 51558|[I-D.ietf-mmusic-ice-sip-sdp]|

+-----+
+-----+
|***** Video m=line

*****|

+-----+
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF

```

98                                     |Bob doesn't
recognize bundle-|

|
|only and hence the m=line is |

|
|rejected implicitly due to  |

|
|port 0                       |

+-----+
+-----+
|***** Video m=line
*****
*****|
+-----+
+-----+
|m=video 0 UDP/TLS/RTP/SAVPF
101                                     |Bob doesn't
recognize bundle-|

|
|only and hence the m=line is |

|
|rejected implicitly due to  |

|
|port 0                       |

+-----+
+-----+

```

Table 42: 5.4.3 SDP Answer

5.4.4. Legacy Interop with RTP/AVP profile

In the scenario described below, Alice is a legacy endpoint that sends an [\[RFC3264\]](#) offer with RTP/AVP-based audio and video descriptions along with a DTLS fingerprint and RTCP feedback information.

On the other hand, Bob, being a WebRTC endpoint, follows the procedures in section 5.1.2 of [\[I-D.ietf-rtcweb-jsep\]](#) and accepts the Alice's offer for a DTLS-SRTP-based session with RTCP feedback.


```
+-----+
|
s=-
|[RFC4566] |
+-----+
+-----+
|t=0
0
|[RFC4566] |
+-----+
+-----+
|a=ice-ufrag:
074c6550
|[I-D.ietf-mmusic-ice-sip-sdp]|
+-----+
+-----+
|a=ice-
pwd:a28a397a4c3f31747d1ee3474af08a068
|[I-D.ietf-mmusic-ice-sip-sdp]|
+-----+
+-----+
|a=rtcp-
rsize
|[RFC5506] |
+-----+
+-----+
```

```

|***** Audio m=line
*****
*****|

```

```

+-----+
+-----+

```

```

|m=audio 54732 RTP/AVP
109
|[RFC4566]Alice includes RTP/|

```

```

|
|AVP audio stream description|

```

```

+-----+
+-----+

```

```

|c=IN IP4
203.0.113.141
|[RFC4566]|

```

```

+-----+
+-----+

```

```

|
a=fingerprint:sha-256
|[RFC8122]|
|19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:
05:E9:26:33:E8:70:88:A2|

```

```

+-----+
+-----+

```

```

|a=rtpmap:109 opus/
48000
|

```

```

+-----+
+-----+

```

```

|a=ptime:
20
|

```

```

+-----+
+-----+

```

```

|
a=sendrecv
|[RFC3264]|

```

```

+-----+
+-----+

```

```

|a=rtcp-
mux

```

| [[RFC5761](#)] Alice still includes |

|
| RTP/RTCP Mux support |

+-----+
+-----+
| a=rtcp:64678 IN IP4
203.0.113.141 |
| [[RFC3605](#)] |

+-----+
+-----+
| a=candidate:0 1 UDP 2113667327 192.0.2.4 54732 typ
host | [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+
| a=candidate:1 1 UDP 694302207 203.0.113.141 54732 typ srflx raddr 192.0.2.4
rport 54732 | [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+
| a=candidate:0 2 UDP 2113667326 192.0.2.4 64678 typ
host | [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+
| a=candidate:1 2 UDP 1694302206 203.0.113.141 64678 typ srflx raddr
192.0.2.4 rport 64678 | [[I-D.ietf-mmusic-ice-sip-sdp](#)] |

+-----+
+-----+
| ***** Video m=line
***** |
| ***** |

+-----+
+-----+
| m=video 62445 RTP/AVP
120 |
| [[RFC4566](#)] Alice includes RTP/ |

|
| AVP video stream description |

+-----+
+-----+
| c=IN IP4
203.0.113.141 |
| [[RFC4566](#)] |

```
+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122]
|DC:B8:5F:64:1A:24:C2:43:F0:A1:58:D0:A1:2C:19:08:6B:8B:F0:65:5F:
78:E2:51:3B:AC:6F:F3:3F:46:1B:35|

```

```
+-----+
+-----+
|a=rtpmap:120
VP8/90000
|[RFC7741]

```

```
+-----+
+-----+
|
a=sendrecv
|[RFC3264]

```

```
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761]Alice intends to
|
|perform RTP/RTCP Mux
|

```

```
+-----+
+-----+
|a=rtcp:54721 IN IP4
203.0.113.141
|[RFC3605]

```

```
+-----+
+-----+
```

```

|a=candidate:0 1 UDP 2113667327 192.0.2.4 62445 typ
host                                     |[I-D.ietf-mmusic-ice-sip-sdp]|

```

```

+-----+
+-----+
|a=candidate:1 1 UDP 1694302207 203.0.113.141 62537 typ srflx raddr
192.0.2.4 rport 62445                |[I-D.ietf-mmusic-ice-sip-sdp]|

```

```

+-----+
+-----+
|a=candidate:0 2 UDP 2113667326 192.0.2.4 54721 typ
host                                     |[I-D.ietf-mmusic-ice-sip-sdp]|

```

```

+-----+
+-----+
|a=candidate:1 2 UDP 1694302206 203.0.113.141 54721 typ srflx raddr
192.0.2.4 rport 54721                |[I-D.ietf-mmusic-ice-sip-sdp]|

```

```

+-----+
+-----+
|a=rtcp-fb:120 nack
pli                                     |
[RFC4585] Alice indicates             |
|                                       |
|support for Picture Loss              |
|                                       |
|Indication and NACK RTCP              |
|                                       |
|feedback                               |

```

```

+-----+
+-----+
|a=rtcp-fb:120 ccm
fir                                     |
[RFC5104]                               |

```

Table 43: 5.4.5 SDP Offer

```

=====
|Answer SDP
Contents
|RFC#/Notes                             |

```

```
+-----+
|
v=0
|[RFC4566] |
+-----+
+-----+
|o=- 16833 0 IN IP4
0.0.0.0 |
|[RFC4566] |
+-----+
+-----+
|
s=-
|[RFC4566] |
+-----+
+-----+
|t=0
0
|[RFC4566] |
+-----+
+-----+
|***** Audio m=line
***** |
*****|
+-----+
+-----+
|m=audio 49203 RTP/AVP
109 |
|[RFC4566] Bob accepts RTP/ |
|
|AVP-based audio stream |
+-----+
+-----+
|c=IN IP4
203.0.113.77
|[RFC4566] |
+-----+
+-----+
|a=rtpmap:109 opus/
48000
| |
+-----+
```

```
+-----+
|aptime:
20
|
```

```
+-----+
|
a=sendrecv
|[RFC3264]|
```

```
+-----+
|a=ice-
ufrag:c300d85b
|[I-D.ietf-mmusic-ice-sip-sdp]|
```

```
+-----+
|a=ice-
pwd:de4e99bd291c325921d5d47efbabd9a2
|[I-D.ietf-mmusic-ice-sip-sdp]|
```

```
+-----+
|
a=fingerprint:sha-256
|[RFC8122]|
```

|BB:05:2F:70:9F:04:A9:0E:05:E9:26:33:E8:70:88:A2:19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04|

+-----+
+-----+
|a=rtcp-
mux
|[RFC5761]|

+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 198.51.100.7 49203 typ
host |[I-D.ietf-mmusic-ice-sip-sdp]|

+-----+
+-----+
|a=candidate:1 1 UDP 1694302207 203.0.113.77 49203 typ srflx raddr
198.51.100.7 rport 49203 |[I-D.ietf-mmusic-ice-sip-sdp]|

+-----+
+-----+
|***** Video m=line

*****|

+-----+
+-----+
|m=video 63130 RTP/AVP
120
|[RFC4566] Bob accepts RTP/
|
|AVP-based video stram|

+-----+
+-----+
|c=IN IP4
203.0.113.77
|[RFC4566]|

+-----+
+-----+
|a=rtpmap:120
VP8/90000
|[RFC7741]|

+-----+
+-----+
|

```
a=sendrecv
|[RFC3264] |
+-----+
+-----+
|a=ice-
ufrag:e39091na
|[I-D.ietf-mmusic-ice-sip-sdp]|
+-----+
+-----+
|a=ice-
pwd:dbc325921d5dd29e4e99147efbabd9a2
|[I-D.ietf-mmusic-ice-sip-sdp]|
+-----+
+-----+
|
a=fingerprint:sha-256
|[RFC8122] |
|BB:0A:0E:05:E9:26:33:E8:70:88:A2:2F:70:9F:04:19:E2:1C:3B:4B:9F:81:56:2F:
70:9F:04:F4:A5:A8:D8 | |
+-----+
+-----+
|a=rtcp-
mux
|[RFC5761] |
+-----+
+-----+
|a=candidate:0 1 UDP 2113667327 198.51.100.7 63130 typ
host |[I-D.ietf-mmusic-ice-sip-sdp]|
+-----+
+-----+
|a=candidate:1 1 UDP 1694302207 203.0.113.77 63130 typ srflx raddr
198.51.100.7 rport 63130 |[I-D.ietf-mmusic-ice-sip-sdp]|
+-----+
+-----+
|a=rtcp-fb:120 nack
pli |
|[RFC4585] |
+-----+
+-----+
|a=rtcp-fb:120 ccm
fir |
|[RFC5104] |
```

+-----+
+-----+

Table 44: 5.4.5 SDP Answer

6. IANA Considerations

This document requires no actions from IANA.

7. Security Considerations

The IETF has published separate documents [[I-D.ietf-rtcweb-security-arch](#)] [[I-D.ietf-rtcweb-security](#)] describing the security architecture for WebRTC as a whole.

In addition, since the SDP offer and answer messages can contain private information about addresses and sessions to be established between parties, if this information needs to be kept private, some security mechanism (using the TLS transport, for example) in the protocol used to carry the offers and answers must be used.

8. Acknowledgments

We would like to thank Justin Uberti, Chris Flo, Paul Kyzivat, Nils Ohlmeier, Flemming Andreason, Magnus Westerlund for their detailed review and inputs. Thanks to Adam Roach for providing a syntax validation script to help highlight syntax and formatting errors.

Thanks to experts at IESG for careful review and feedback.

Thanks to Peter Yee for a detailed Genart review and suggestions.

9. Change Log

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

Changes from [draft-ietf-rtcweb-sdp-11](#)

- * Address Magnus Westerlund Review comments.
- * Remove reference to [RFC5245](#) and use ice-sip-sdp instead.
- * Add an ice2 example for [RFC8445](#).

Changes from [draft-ietf-rtcweb-sdp-09](#)

- * Review feedback incorporated from Flemming Andreason in [Section 5.4](#)

Changes from [draft-ietf-rtcweb-sdp-08](#)

- * Fixed formatting and syntax issues pointed out by Adam Roach's validator script. List of issues are here: <https://github.com/fluffy/ietf/issues?q=is%3Aissue+is%3Aclosed>
- * Align examples to match latest bundle specification as pointed by Christer Holmberg

Changes from [draft-ietf-rtcweb-sdp-07](#)

- * Incorporate review from Nils.

Changes from [draft-ietf-rtcweb-sdp-06](#)

- * Keep Alive Version.

Changes from [draft-ietf-rtcweb-sdp-05](#)

- * Title change.

Changes from [draft-ietf-rtcweb-sdp-04](#)

- * Add IPv6 Example.
- * Add a=rtcp-mux-only and fix a=rtcp in examples.
- * Fix Idnits.
- * Add Security Considerations section.

Changes from [draft-ietf-rtcweb-sdp-02](#) to [draft-ietf-rtcweb-sdp-04](#)

- * Alignment with JSEP-19.
- * Added a=identity example.
- * Added a=dtls-id, a=group:LS in the examples.
- * Added Appendix section to capture list of checklists for the attributes.
- * Removed SSRC lines to match JSEP-19.
- * Closed open issues on a=fingerprint, a=rtcp and a=rtcp-mux-only from ietf96 to reflect JSEP-19.
- * Simplified Inter-op example

Changes from [draft-ietf-rtcweb-sdp-02](#)

- * Version increment to avoid expiry

Changes from [draft-ietf-rtcweb-sdp-01](#)

- * Complete face-lift

- * Added visual markers around m=lines to indicate their type, added spacing between tables for aiding readers
- * Updated table names to indicate offer vs answer
- * Attempted to align to latest versions of SCTP, BUNDLE, MSID drafts
- * Added mid header extensions to all the lines
- * Harmonized BUNDLE semantics and conventions updated.

Changes from [draft-ietf-rtcweb-sdp-00](#)

- * Updated Simulcast/FEC/RTX examples to use RID framework
- * Fixed BUNDLE references for a=bundle-only

Changes from [draft-nandakumar-rtcweb-sdp-08](#)

- * Fixed typos
- * Moved to a WG version

Changes from [draft-nandakumar-rtcweb-sdp-06](#) and [draft-nandakumar-rtcweb-sdp-07](#)

- * Added clarification on Call-Flow diagram usage
- * More cleanups

Changes from [draft-nandakumar-rtcweb-sdp-05](#)

- * Added Ascii chart for all the SDP Eexamples
- * Improved text and updated SDP Examples for Simulcast and FEC
- * Fixed MediaStream ID Semantics SDP Errors

Changes from [draft-nandakumar-rtcweb-sdp-04](#)

- * Interim version of the draft to avert expiry
- * Corrected placement of c= line as per [RFC4566](#)
- * Updated simulcast SDP to reflect [draft-westerlund-avtcore-rtp-simulcast-04](#)

Changes from [draft-nandakumar-rtcweb-sdp-03](#)

- * Aligned more closely with JSEP version -05
- * Added Conventions to help readability
- * Add more examples to clarify BUNDLE use cases

Changes from [draft-nandakumar-rtcweb-sdp-02](#)

- * Major refactoring was done to group the examples in to categories
- * SDP was updated through out to reflect JSEP-04 style of defining attributes per m=line than at the session level.
- * Added 8 new examples.
- * Updated references for Trickle, Unified Plan
- * Add section to explain the syntax conventions followed in the examples.

Changes from [draft-nandakumar-rtcweb-sdp-01](#)

- * Updated references to OPUS RTP Payload Specification.
- * Updated BUNDLE examples based on the latest [draft-ietf-mmusic-sdp-bundle-negotiation](#).
- * Added examples for multiple audio and video flows based on Unified Plan.
- * Added new examples for RTX and FEC streams
- * Updated Simulcast and SVC examples

Changes from [draft-nandakumar-rtcweb-sdp-00](#)

- * Fixed editorial comments on the mailing list.
- * Updated Data-channel SDP information based on [draft-ietf-mmusic-sctp-sdp](#).
- * Updated BUNDLE examples based on [draft-ietf-mmusic-sdp-bundle-negotiation](#).
- * Added examples for few more BUNDLE variants
- * Added new examples for Simulcast and SVC

10. Informative References

- [RFC3264] Rosenberg, J. and H. Schulzrinne, "An Offer/Answer Model with Session Description Protocol (SDP)", [RFC 3264](#), DOI 10.17487/RFC3264, June 2002, <<https://www.rfc-editor.org/info/rfc3264>>.
- [RFC4566] Handley, M., Jacobson, V., and C. Perkins, "SDP: Session Description Protocol", [RFC 4566](#), DOI 10.17487/RFC4566, July 2006, <<https://www.rfc-editor.org/info/rfc4566>>.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.
- [RFC5506] Johansson, I. and M. Westerlund, "Support for Reduced-Size Real-Time Transport Control Protocol (RTCP): Opportunities and Consequences", [RFC 5506](#), DOI 10.17487/RFC5506, April 2009, <<https://www.rfc-editor.org/info/rfc5506>>.
- [RFC3551] Schulzrinne, H. and S. Casner, "RTP Profile for Audio and Video Conferences with Minimal Control", STD 65, [RFC 3551](#), DOI 10.17487/RFC3551, July 2003, <<https://www.rfc-editor.org/info/rfc3551>>.
- [RFC4796] Hautakorpi, J. and G. Camarillo, "The Session Description Protocol (SDP) Content Attribute", [RFC 4796](#), DOI 10.17487/RFC4796, February 2007, <<https://www.rfc-editor.org/info/rfc4796>>.
- [RFC5761] Perkins, C. and M. Westerlund, "Multiplexing RTP Data and Control Packets on a Single Port", [RFC 5761](#), DOI 10.17487/RFC5761, April 2010, <<https://www.rfc-editor.org/info/rfc5761>>.
- [RFC5763] Fischl, J., Tschofenig, H., and E. Rescorla, "Framework for Establishing a Secure Real-time Transport Protocol (SRTP) Security Context Using Datagram Transport Layer Security (DTLS)", [RFC 5763](#), DOI 10.17487/RFC5763, May 2010, <<https://www.rfc-editor.org/info/rfc5763>>.
- [RFC5104] Wenger, S., Chandra, U., Westerlund, M., and B. Burman, "Codec Control Messages in the RTP Audio-Visual Profile with Feedback (AVPF)", [RFC 5104](#), DOI 10.17487/RFC5104, February 2008, <<https://www.rfc-editor.org/info/rfc5104>>.

- [RFC4585] Ott, J., Wenger, S., Sato, N., Burmeister, C., and J. Rey, "Extended RTP Profile for Real-time Transport Control Protocol (RTCP)-Based Feedback (RTP/AVPF)", [RFC 4585](#), DOI 10.17487/RFC4585, July 2006, <<https://www.rfc-editor.org/info/rfc4585>>.
- [RFC4588] Rey, J., Leon, D., Miyazaki, A., Varsa, V., and R. Hakenberg, "RTP Retransmission Payload Format", [RFC 4588](#), DOI 10.17487/RFC4588, July 2006, <<https://www.rfc-editor.org/info/rfc4588>>.
- [RFC5888] Camarillo, G. and H. Schulzrinne, "The Session Description Protocol (SDP) Grouping Framework", [RFC 5888](#), DOI 10.17487/RFC5888, June 2010, <<https://www.rfc-editor.org/info/rfc5888>>.
- [RFC6236] Johansson, I. and K. Jung, "Negotiation of Generic Image Attributes in the Session Description Protocol (SDP)", [RFC 6236](#), DOI 10.17487/RFC6236, May 2011, <<https://www.rfc-editor.org/info/rfc6236>>.
- [RFC6184] Wang, Y.-K., Even, R., Kristensen, T., and R. Jesup, "RTP Payload Format for H.264 Video", [RFC 6184](#), DOI 10.17487/RFC6184, May 2011, <<https://www.rfc-editor.org/info/rfc6184>>.
- [RFC6190] Wenger, S., Wang, Y.-K., Schierl, T., and A. Eleftheriadis, "RTP Payload Format for Scalable Video Coding", [RFC 6190](#), DOI 10.17487/RFC6190, May 2011, <<https://www.rfc-editor.org/info/rfc6190>>.
- [RFC3550] Schulzrinne, H., Casner, S., Frederick, R., and V. Jacobson, "RTP: A Transport Protocol for Real-Time Applications", STD 64, [RFC 3550](#), DOI 10.17487/RFC3550, July 2003, <<https://www.rfc-editor.org/info/rfc3550>>.
- [RFC3261] Rosenberg, J., Schulzrinne, H., Camarillo, G., Johnston, A., Peterson, J., Sparks, R., Handley, M., and E. Schooler, "SIP: Session Initiation Protocol", [RFC 3261](#), DOI 10.17487/RFC3261, June 2002, <<https://www.rfc-editor.org/info/rfc3261>>.
- [RFC3605] Huitema, C., "Real Time Control Protocol (RTCP) attribute in Session Description Protocol (SDP)", [RFC 3605](#), DOI 10.17487/RFC3605, October 2003, <<https://www.rfc-editor.org/info/rfc3605>>.

- [RFC4733] Schulzrinne, H. and T. Taylor, "RTP Payload for DTMF Digits, Telephony Tones, and Telephony Signals", [RFC 4733](#), DOI 10.17487/RFC4733, December 2006, <<https://www.rfc-editor.org/info/rfc4733>>.
- [RFC6464] Lennox, J., Ed., Ivov, E., and E. Marocco, "A Real-time Transport Protocol (RTP) Header Extension for Client-to-Mixer Audio Level Indication", [RFC 6464](#), DOI 10.17487/RFC6464, December 2011, <<https://www.rfc-editor.org/info/rfc6464>>.
- [RFC6465] Ivov, E., Ed., Marocco, E., Ed., and J. Lennox, "A Real-time Transport Protocol (RTP) Header Extension for Mixer-to-Client Audio Level Indication", [RFC 6465](#), DOI 10.17487/RFC6465, December 2011, <<https://www.rfc-editor.org/info/rfc6465>>.
- [RFC7587] Spittka, J., Vos, K., and JM. Valin, "RTP Payload Format for the Opus Speech and Audio Codec", [RFC 7587](#), DOI 10.17487/RFC7587, June 2015, <<https://www.rfc-editor.org/info/rfc7587>>.
- [RFC7656] Lennox, J., Gross, K., Nandakumar, S., Salgueiro, G., and B. Burman, Ed., "A Taxonomy of Semantics and Mechanisms for Real-Time Transport Protocol (RTP) Sources", [RFC 7656](#), DOI 10.17487/RFC7656, November 2015, <<https://www.rfc-editor.org/info/rfc7656>>.
- [RFC7741] Westin, P., Lundin, H., Glover, M., Uberti, J., and F. Galligan, "RTP Payload Format for VP8 Video", [RFC 7741](#), DOI 10.17487/RFC7741, March 2016, <<https://www.rfc-editor.org/info/rfc7741>>.
- [RFC7826] Schulzrinne, H., Rao, A., Lanphier, R., Westerlund, M., and M. Stiemerling, Ed., "Real-Time Streaming Protocol Version 2.0", [RFC 7826](#), DOI 10.17487/RFC7826, December 2016, <<https://www.rfc-editor.org/info/rfc7826>>.
- [RFC8122] Lennox, J. and C. Holmberg, "Connection-Oriented Media Transport over the Transport Layer Security (TLS) Protocol in the Session Description Protocol (SDP)", [RFC 8122](#), DOI 10.17487/RFC8122, March 2017, <<https://www.rfc-editor.org/info/rfc8122>>.
- [RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in [RFC 2119](#) Key Words", [BCP 14](#), [RFC 8174](#), DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/info/rfc8174>>.

- [RFC8445] Keranen, A., Holmberg, C., and J. Rosenberg, "Interactive Connectivity Establishment (ICE): A Protocol for Network Address Translator (NAT) Traversal", [RFC 8445](#), DOI 10.17487/RFC8445, July 2018, <<https://www.rfc-editor.org/info/rfc8445>>.
- [RFC8627] Zanaty, M., Singh, V., Begen, A., and G. Mandyam, "RTP Payload Format for Flexible Forward Error Correction (FEC)", [RFC 8627](#), DOI 10.17487/RFC8627, July 2019, <<https://www.rfc-editor.org/info/rfc8627>>.
- [I-D.ietf-mmusic-sdp-bundle-negotiation]
Holmberg, C., Alvestrand, H., and C. Jennings, "Negotiating Media Multiplexing Using the Session Description Protocol (SDP)", Work in Progress, Internet-Draft, [draft-ietf-mmusic-sdp-bundle-negotiation-54](#), 14 December 2018, <<http://www.ietf.org/internet-drafts/draft-ietf-mmusic-sdp-bundle-negotiation-54.txt>>.
- [I-D.ietf-mmusic-sdp-simulcast]
Burman, B., Westerlund, M., Nandakumar, S., and M. Zanaty, "Using Simulcast in SDP and RTP Sessions", Work in Progress, Internet-Draft, [draft-ietf-mmusic-sdp-simulcast-14](#), 5 March 2019, <<http://www.ietf.org/internet-drafts/draft-ietf-mmusic-sdp-simulcast-14.txt>>.
- [I-D.ietf-mmusic-rid]
Roach, A., "RTP Payload Format Restrictions", Work in Progress, Internet-Draft, [draft-ietf-mmusic-rid-15](#), 15 May 2018, <<http://www.ietf.org/internet-drafts/draft-ietf-mmusic-rid-15.txt>>.
- [I-D.ietf-mmusic-ice-sip-sdp]
Petit-Huguenin, M., Nandakumar, S., Holmberg, C., Keranen, A., and R. Shpount, "Session Description Protocol (SDP) Offer/Answer procedures for Interactive Connectivity Establishment (ICE)", Work in Progress, Internet-Draft, [draft-ietf-mmusic-ice-sip-sdp-39](#), 13 August 2019, <<http://www.ietf.org/internet-drafts/draft-ietf-mmusic-ice-sip-sdp-39.txt>>.
- [I-D.ietf-rtcweb-jsep]
Uberti, J., Jennings, C., and E. Rescorla, "JavaScript Session Establishment Protocol", Work in Progress, Internet-Draft, [draft-ietf-rtcweb-jsep-26](#), 27 February 2019, <<http://www.ietf.org/internet-drafts/draft-ietf-rtcweb-jsep-26.txt>>.

[I-D.ietf-mmusic-trickle-ice]

Ivov, E., Rescorla, E., and J. Uberti, "Trickle ICE: Incremental Provisioning of Candidates for the Interactive Connectivity Establishment (ICE) Protocol", Work in Progress, Internet-Draft, [draft-ietf-mmusic-trickle-ice-02](http://www.ietf.org/internet-drafts/draft-ietf-mmusic-trickle-ice-02), 15 January 2015, <<http://www.ietf.org/internet-drafts/draft-ietf-mmusic-trickle-ice-02.txt>>.

[I-D.ietf-mmusic-msid]

Alvestrand, H., "WebRTC MediaStream Identification in the Session Description Protocol", Work in Progress, Internet-Draft, [draft-ietf-mmusic-msid-17](http://www.ietf.org/internet-drafts/draft-ietf-mmusic-msid-17), 13 December 2018, <<http://www.ietf.org/internet-drafts/draft-ietf-mmusic-msid-17.txt>>.

[I-D.ietf-mmusic-sctp-sdp]

Holmberg, C., Shpount, R., Loreto, S., and G. Camarillo, "Session Description Protocol (SDP) Offer/Answer Procedures For Stream Control Transmission Protocol (SCTP) over Datagram Transport Layer Security (DTLS) Transport.", Work in Progress, Internet-Draft, [draft-ietf-mmusic-sctp-sdp-26](http://www.ietf.org/internet-drafts/draft-ietf-mmusic-sctp-sdp-26), 20 April 2017, <<http://www.ietf.org/internet-drafts/draft-ietf-mmusic-sctp-sdp-26.txt>>.

[I-D.ietf-rtcweb-data-channel]

Jesup, R., Loreto, S., and M. Tuexen, "WebRTC Data Channels", Work in Progress, Internet-Draft, [draft-ietf-rtcweb-data-channel-13](http://www.ietf.org/internet-drafts/draft-ietf-rtcweb-data-channel-13), 4 January 2015, <<http://www.ietf.org/internet-drafts/draft-ietf-rtcweb-data-channel-13.txt>>.

[I-D.ietf-mmusic-mux-exclusive]

Holmberg, C., "Indicating Exclusive Support of RTP/RTCP Multiplexing using SDP", Work in Progress, Internet-Draft, [draft-ietf-mmusic-mux-exclusive-12](http://www.ietf.org/internet-drafts/draft-ietf-mmusic-mux-exclusive-12), 5 May 2017, <<http://www.ietf.org/internet-drafts/draft-ietf-mmusic-mux-exclusive-12.txt>>.

[I-D.ietf-mmusic-dtls-sdp]

Holmberg, C. and R. Shpount, "Session Description Protocol (SDP) Offer/Answer Considerations for Datagram Transport Layer Security (DTLS) and Transport Layer Security (TLS)", Work in Progress, Internet-Draft, [draft-ietf-mmusic-dtls-sdp-32](http://www.ietf.org/internet-drafts/draft-ietf-mmusic-dtls-sdp-32), 29 October 2017, <<http://www.ietf.org/internet-drafts/draft-ietf-mmusic-dtls-sdp-32.txt>>.

[I-D.ietf-rtcweb-security-arch]

Rescorla, E., "WebRTC Security Architecture", Work in Progress, Internet-Draft, [draft-ietf-rtcweb-security-arch-20](http://www.ietf.org/internet-drafts/draft-ietf-rtcweb-security-arch-20), 22 July 2019, <<http://www.ietf.org/internet-drafts/draft-ietf-rtcweb-security-arch-20.txt>>.

[I-D.ietf-rtcweb-security]

Rescorla, E., "Security Considerations for WebRTC", Work in Progress, Internet-Draft, [draft-ietf-rtcweb-security-12](http://www.ietf.org/internet-drafts/draft-ietf-rtcweb-security-12), 5 July 2019, <<http://www.ietf.org/internet-drafts/draft-ietf-rtcweb-security-12.txt>>.

[I-D.ietf-avtext-rid]

Roach, A., Nandakumar, S., and P. Thatcher, "RTP Stream Identifier Source Description (SDS)", Work in Progress, Internet-Draft, [draft-ietf-avtext-rid-09](http://www.ietf.org/internet-drafts/draft-ietf-avtext-rid-09), 6 October 2016, <<http://www.ietf.org/internet-drafts/draft-ietf-avtext-rid-09.txt>>.

[WebRTC]

W3C, "WebRTC 1.0: Real-time Communication Between Browsers", <<http://dev.w3.org/2011/webrtc/editor/webrtc.html>> .

Appendix A. Appendix

A.1. JSEP SDP Attributes Checklist

This section compiles a high-level checklist of the required SDP attributes to be verified against the examples defined in this specification. The goal here is to ensure that the examples are compliant with the rules defined in [section 5](#) of the [\[I-D.ietf-rtcweb-jsep\]](#) specification.

A.1.1. Common Checklist

This subsection lists SDP attributes that mostly apply at the session level.

- * v=0 MUST be the first SDP line.
- * o= line MUST follow with values '-' for username, a 64-bit value for session id and dummy values for 'nettype', 'addrtype', and 'unicast-address' (for example: IN IP4 0.0.0.0).
- * o= line MUST have the session version incremented in the case of subsequent offers.
- * s= MUST be the third line and have the value of '-'.

- * t= line MUST follow with the values for 'start-time' and 'stop-time' set to zeroes.
- * a=identity line MUST be included at the session level if WebRTC Identity mechanism is being used.
- * a=ice-options:trickle MUST be present at the session level in all offers and answers when supported.
- * a=ice-options:ice3 MUST be present at the session level in all offers and answers when supported.

A.1.2. RTP Media Description Checklist

The following set of checklist items apply to RTP audio and video media descriptions.

- * The media description's port value MUST either be set to the dummy value of '9' or MUST use the port from the default candidate, if available.
- * The media description's proto value MUST be 'UDP/TLS/RTP/SAVPF' for JSEP offers.
- * The JSEP answerer MUST support any combination of "RTP/[S]AVP[F]" for interoperability scenarios as defined in section 5 of [\[I-D.ietf-rtcweb-jsep\]](#)
- * c= line MUST be the first line in a media description. A dummy value of 'IN IP 0.0.0.0' is set if there are no candidates gathered or its value MUST match the default candidate.
- * a=mid attribute MUST be included.
- * One of a=sendrecv/a=sendonly/a=recvonly/a=inactive SDP direction attributes MUST be present.
- * a=rtpmap and a=fmtp attributes per primary, retransmission, and forward error correction media format MUST be included.
- * a=rtcp-fb lines for each supported feedback mechanism MUST be included when using RTP with feedback.
- * a=imageattr can be optionally present for video media descriptions.

- * a=msid line MUST be included for all the media senders identifying the MediaStreamTrack (i.e., when a=sendonly/a=sendrecv attribute is present).
- * a=extmap line identifying the RTP MID header extension" MUST be present.
- * a=extmap line for other supported RTP header extensions MUST be included.
- * a=rid line 'per encoding' with the direction of 'send' MUST be included when further constraining the media format or multiple encodings per media format is needed.
- * a=simulcast line MUST be present if there exists more than one 'a=rid' lines for the media senders.
- * a=bundle-only attribute MUST be present for media descriptions that are impacted by various bundle policies (such as max-bundle/balanced)
- * For media descriptions that aren't "a=bundle-only" and that have unique address, the following attributes MUST be present:
 - a=ice-ufrag and a=ice-pwd
 - a=fingerprint
 - a=setup with value 'actpass' in the offers and a value of 'active'/'passive' in the answerer.
 - a=tls-id
 - a=rtcp
 - a=rtcp-mux
 - For offerers requiring RTCP to be multiplexed, 'a=rtcp-mux-only' line
 - a=rtcp-rsize
- * a=group:BUNDLE line with all the 'mid' identifiers part of the BUNDLE group is included at the session-level.
- * a=group:LS session level attribute MUST be included with the 'mid' identifiers that are part of the same lip sync group.

A.1.3. Data Channel Media Description checklist

If a data channel is required, an 'application' type media description MUST be included with the following properties:

- * Media description's proto value MUST be 'UDP/DTLS/SCTP' in the JSEP offers.
- * A JSEP answerer MUST support reception of 'UDP/DTLS/SCTP'/'TCP/DTLS/SCTP'/'DTLS/SCTP' for backward compatibility reasons.
- * A value of 'webrtc-datachannel' MUST be used for the media description 'fmt' value.
- * a=mid line MUST be present.
- * a=sctp-port with an SCTP port number MUST be included.
- * a=max-message-size MAY be included, if appropriate.

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