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S. Nandakumar
C. Jennings
Cisco
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SDP for the WebRTC
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Abstract

The Web Real-Time Communication [[WebRTC](#)] working group is charged to provide protocol support for direct interactive rich communication using audio, video and data between two peers' web browsers. Within the WebRTC framework, Session Description protocol (SDP) [[RFC4566](#)] is used for negotiating session capabilities between the peers. Such a negotiation happens based on the SDP Offer/Answer exchange mechanism described in [[RFC3264](#)].

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 SDP examples provided in this document is still a work in progress, but it aims to align closest to the evolving standards work.

Status of This Memo

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1. Introduction

Javascript Session Exchange Protocol(JSEP) [[I-D.ietf-rtcweb-jsep](#)] specifies a generic protocol needed to generate [[RFC3264](#)] Offers and Answers negotiated between the WebRTC peers for setting up, updating and tearing down a WebRTC session. For this purpose, SDP is used to construct [[RFC3264](#)] Offers/Answers 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](#) provides 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", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [[RFC2119](#)].

3. SDP and the 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 multimedia sessions, which can contain audio, video, whiteboard, fax, modem, and other streams. SDP provides a general purpose, standard representation to describe various aspects of multimedia session 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.

As of today SDP is widely used in the context of Session Initiation Protocol [[RFC3261](#)], Real-time Transport Protocol [[RFC3550](#)] and Real-time Streaming Protocol applications [[RFC2326](#)].

Below figure introduces 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.



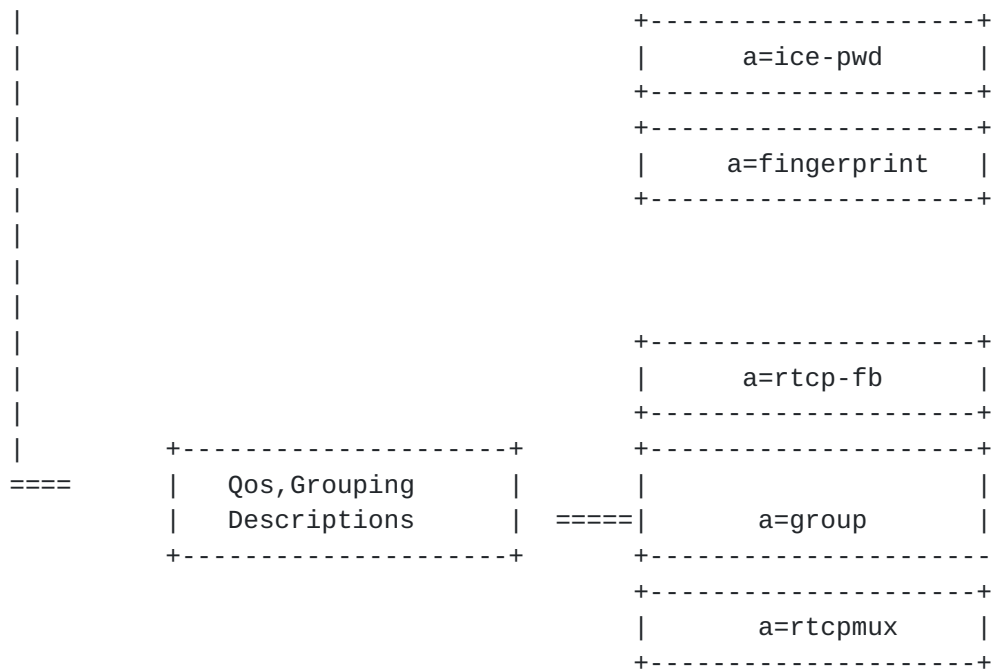


Figure 1: Semantic Components of SDP

[WebRTC] proposes JavaScript application to fully specify and control the signaling plane of a multimedia session 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 participant's intention and capabilities required to successfully negotiate a session.

4. Offer/Answer and the WebRTC

This section introduces 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 [\[RFC3264\]](#) for specific details on the protocol operation.

The Offer/Answer [[RFC3264](#)] model specifies rule for the bilateral exchange of Session Description Protocol (SDP) messages for creation of multimedia streams. It defines protocol with involved participants exchanging desired session characteristics from each others perspective constructed as SDP 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 guarantees a common view of the multimedia session between the participants.

At any time, either participant MAY generate a new SDP offer that updates the session in progress.

With in the context of WebRTC, the Offer/Answer model defines the state-machinery for WebRTC peers to negotiate session descriptions between them during the initial setup stages as well as for eventual session updates. Javascript Session Establishment Protocol 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 details such as list of media formats to be sent/received, bandwidth information, crypto parameters, transport parameters, for example.

5. WebRTC Session Description Examples

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

- o It has zero or more Audio only, Video only or Audio/Video RTP Sessions,
- o MAY contain zero or more non-media data sessions,
- o All the sessions are secured with DTLS-SRTP,
- o Supports NAT traversal using ICE mechanism,
- o Provides RTCP based feedback mechanisms,
- o Sessions can be over IPv4-only, IPv6-only, dual-stack based clients.

5.1. Some Conventions

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

- o In all the examples, Alice and Bob are assumed to be the WebRTC peers.
- o [[I-D.ietf-mmusic-sdp-bundle-negotiation](#)] support for multiplexing several media streams over a single underlying transport is assumed by default unless explicitly specified otherwise.
- o Call-flow diagrams that accompany the use-cases capture only the prominent aspects of the system behavior and intentionally is not detailed to improve readability.
- o Eventhough the call-flow diagrams shows 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 confirm to the [[I-D.ietf-rtcweb-jsep](#)] API specification.
- o 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.
 - * Any SDP line that is indented (compared to the initial line in the SDP block) is a continuation of the preceding line. The line break and indent are to be interpreted as a single space character.
 - * 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, an ASCII 13 followed by an ASCII 10).
- o 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.
- o 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)
- * SRTP Setup framework parameters (a=setup)
- * RTCP attribute (a=rtcp)
- * RTP header extension indicating audio-levels from client to the mixer

For more details, readers are recommended to refer to [\[I-D.ietf-rtcweb-jsep\]](#) specification.

- o The term "Session" is used rather loosely in this document to refer to either a "Communication Session" or a "RTP Session" or a "RTP Stream" depending on the context.
- o 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.
- o In the actual use the values that represent SSRCS, ICE candidate foundations, WebRTC Mediastream and MediaStreamTrack Ids shall be much larger and random than the ones shown in the examples.

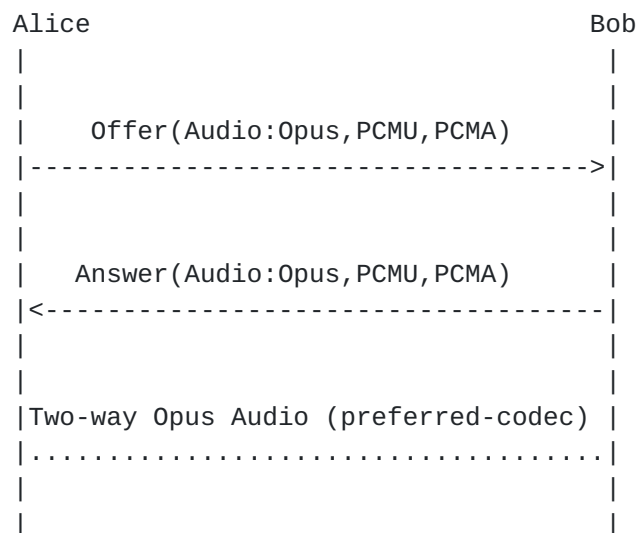
[OPEN ISSUE-1]: SDP Examples for Data Channel, Simulcast, SVC are still being discussed and doesn't represent the final solution.

[5.2.](#) Basic Examples

[5.2.1.](#) Audio Only Session

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

2-Way Audio Only Session



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=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE audio	[I-D.ietf-mmusic-sdp-bundle-negotiation]
m=audio 54609 UDP/TLS/RTP/SAVPF 109 0 8	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=rtcp-mux	[RFC5761] - Alice can perform RTP/RTCP Muxing
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605] - Port for RTCP data
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus] - Opus Codec 48khz, 2 channels
a=ptime:60	[I-D.ietf-payload-rtp-opus] - Opus packetization of 60ms
a=rtpmap:0 PCMU/8000	[RFC3551] PCMU Audio Codec
a=rtpmap:8 PCMA/8000	[RFC3551] PCMA Audio Codec
a=extmap:1 urn:ietf:params:rtp-	[RFC6464] Alice supports RTP

hdrext:ssrc-audio-level	header extension to indicate
	audio levels
a=sendrecv	[RFC3264] - Alice can send and
	recv audio
a=setup:actpass	[RFC4145] - Alice can perform
	DTLS before Answer arrives
a=fingerprint:sha-1 99:41:49:83:	[RFC5245] - DTLS Fingerprint
4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d	for SRTP
: 1f:66:79:a8:07	
a=ice-ufrag:074c6550	[RFC5245] - ICE user fragment
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245] - ICE password
474af08a068	
a=candidate:0 1 UDP 2122194687	[RFC5245] - RTP Host Candidate
192.168.1.4 54609 typ host	
a=candidate:0 2 UDP 2122194687	[RFC5245] - RTCP Host
192.168.1.4 54609 typ host	Candidate
a=candidate:1 1 UDP 1685987071	[RFC5245] - RTP Server
24.23.204.141 64678 typ srflx	Reflexive ICE Candidate
raddr 192.168.1.4 rport 54609	
a=candidate:1 2 UDP 1685987071	[RFC5245] - RTCP Server
24.23.204.141 64678 typ srflx	Reflexive Candidate
raddr 192.168.1.4 rport 54609	
a=rtcp-fb:109 nack	[RFC5104] - Indicates NACK
	RTCP feedback support
a=ssrc:12345	[RFC5576]
cname:EocUG1f0fcg/yvY7	
a=rtcp-rsize	[RFC5506] - Alice intends to
	use reduced size RTCP for this
	session
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
+-----+-----+	

Table 1: 5.2.1 SDP Offer

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=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE audio	[I-D.ietf-mmusic-sdp-bundle-ne
	gotiation]
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]
109 0 8	
c=IN IP4 98.248.92.77	[RFC4566]

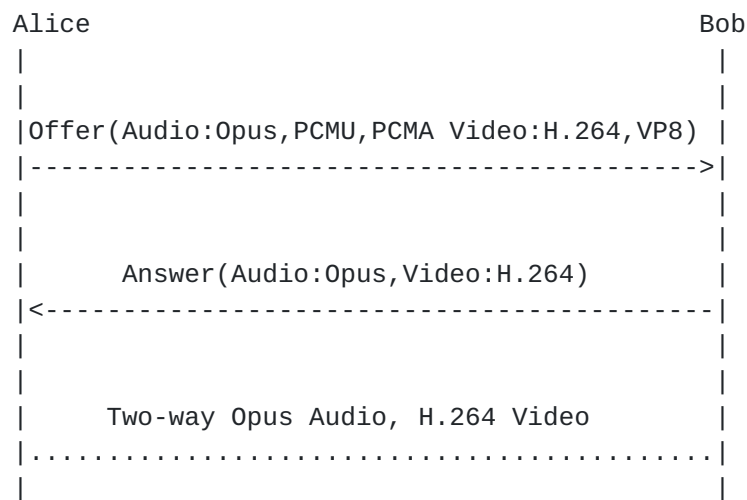
a=mid:audio	[RFC5888]	
a=msid:ma ta	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (ta)	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
	Opus Codec	
a=ptime:60	[I-D.ietf-payload-rtp-opus]	
	Packetization of 60ms	
a=rtpmap:0 PCMU/8000	[RFC3551] PCMU Audio Codec	
a=rtpmap:8 PCMA/8000	[RFC3551] PCMA Audio Codec	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464] Bob supports audio	
hdext:ssrc-audio-level	level RTP header extension as	
	well	
a=sendrecv	[RFC3264] - Bob can send and	
	recv audio	
a=setup:active	[RFC4145] - Bob carries out	
	DTLS Handshake in parallel	
a=rtcp-mux	[RFC5761] - Bob can perform	
	RTP/RTCP Muxing on port 49203	
a=fingerprint:sha-1 c9:c7:70:9d:	[RFC5245] - DTLS Fingerprint	
1f:66:79:a8:07:99:41:49:83:4a:	for SRTP	
97:0e:1f:ef:6d:f7		
a=ice-ufrag:05067423	[RFC5245] - ICE user fragment	
a=ice-pwd:1747d1ee3474a28a397a4c	[RFC5245] - ICE password	
3f3af08a068	parameter	
a=candidate:0 1 UDP 2122194687	[RFC5245] - RTP/RTCP Host ICE	
192.168.1.7 49203 typ host	Candidate	
a=candidate:1 1 UDP 1685987071	[RFC5245] - RTP/RTCP Server	
98.248.92.77 60654 typ srflx	Reflexive ICE Candidate	
raddr 192.168.1.7 rport 49203		
a=rtcp-fb:109 nack	[RFC5104] - Indicates NACK	
	RTCP feedback support	
a=ssrc:54321	[RFC5576]	
cname:NWs1ao1HmN4Xa5/yvY7		
a=rtcp-rsize	[RFC5506] - Bob intends to use	
	reduced size RTCP for this	
	session	
a=ice-options:trickle	[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.

2-Way Audio, Video Session



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=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-negotiation]
m=audio 54609 UDP/TLS/RTP/SAVPF 109 0 8	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=rtcp-mux	[RFC5761] - Alice can perform RTP/RTCP Muxing
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605] - Port for RTCP data
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus] - Opus Codec 48khz, 2 channels
a=ptime:60	[I-D.ietf-payload-rtp-opus] - Opus packetization of 60ms
a=rtpmap:0 PCMU/8000	[RFC3551] PCMU Audio Codec
a=rtpmap:8 PCMA/8000	[RFC3551] PCMA Audio Codec
a=extmap:1 urn:ietf:params:rtp-hdrext:ssrc-audio-level	[RFC6464]

a=sendrecv	[RFC3264] - Alice can send and
	recv audio
a=setup:actpass	[RFC4145] - Alice can perform
	DTLS before Answer arrives
a=ice-ufrag:074c6550	[RFC5245] - ICE user fragment
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245] - ICE password
474af08a068	parameter
a=fingerprint:sha-1 99:41:49:83:	[RFC5245] - DTLS Fingerprint
4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d	for SRTP
: 1f:66:79:a8:07	
a=candidate:0 1 UDP 2122194687	[RFC5245] - RTP Host Candidate
192.168.1.4 54609 typ host	
a=candidate:0 2 UDP 2122194687	[RFC5245] - RTCP Host
192.168.1.4 54609 typ host	Candidate
a=candidate:1 1 UDP 1685987071	[RFC5245] - RTP Server
24.23.204.141 64678 typ srflx	Reflexive ICE Candidate
raddr 192.168.1.4 rport 54609	
a=candidate:1 2 UDP 1685987071	[RFC5245] - RTCP Server
24.23.204.141 64678 typ srflx	Reflexive Candidate.
raddr 192.168.1.4 rport 54609	
a=rtcp-fb:109 nack	[RFC5104] - Indicates NACK
	RTCP feedback support
a=ssrc:12345	[RFC5576]
cname:EocUG1f0fcg/yvY7	
a=rtcp-rsize	[RFC5506] - Alice intends to
	use reduced size RTCP for this
	session
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
m=video 54609 UDP/TLS/RTP/SAVPF	[RFC4566]
99 120	
c=IN IP4 24.23.204.141	[RFC4566]
a=mid:video	[RFC5888]
a=msid:ma tb	Identifies RTCMediaStream ID
	(ma) and RTCMediaStreamTrack
	ID (tb)
a=rtcp-mux	[RFC5761] - Alice can perform
	RTP/RTCP Muxing
a=rtcp:54609 IN IP4	[RFC3605] - Port for RTCP data
24.23.204.141	
a=rtpmap:99 H264/90000	[RFC3984] - H.264 Video Codec
a=fmtp:99 profile-level-	[RFC3984]
id=4d0028;packetization-mode=1	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8] - VP8
	video codec
a=sendrecv	[RFC3264] - Alice can send and
	recv video
a=setup:actpass	[RFC4145] - Alice can perform
	DTLS before Answer arrives

a=ice-ufrag:074c6550	[RFC5245] - ICE user fragment	
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245] - ICE password	
474af08a068	parameter	
a=fingerprint:sha-1 99:41:49:83:	[RFC5245] - DTLS Fingerprint	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:	for SRTP	
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2122194687	[RFC5245] - RTP Host ICE	
192.168.1.4 54609 typ host	Candidate	
a=candidate:0 2 UDP 2122194687	[RFC5245] - RTCP Host	
192.168.1.4 54609 typ host	Candidate	
a=candidate:1 1 UDP 1685987071	[RFC5245] - RTP Server	
24.23.204.141 64678 typ srflx	Reflexive ICE Candidate	
raddr 192.168.1.4 rport 54609		
a=candidate:1 2 UDP 1685987071	[RFC5245] - RTCP Server	
24.23.204.141 64678 typ srflx	Reflexive Candidate	
raddr 192.168.1.4 rport 54609		
a=rtcp-fb:99 nack	[RFC5104] - Indicates NACK	
	RTCP feedback support	
a=rtcp-fb:99 nack pli	[RFC5104] - 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	[RFC5104] - Indicates NACK	
	RTCP feedback support	
a=rtcp-fb:120 nack pli	[RFC5104] - Indicates support	
	for Picture loss Indication	
	and NACK	
a=rtcp-fb:120 ccm fir	[RFC5104] - Full Intra Frame	
	Request-Codec Control Message	
	support	
a=ssrc:1366781083	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=rtcp-rsize	[RFC5506] - Alice intends to	
	use reduced size RTCP for this	
	session	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
+-----+		

Table 3: 5.2.2 SDP Offer

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=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]	
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-ne	
	gotiation]	
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
109		
c=IN IP4 98.248.92.77	[RFC4566]	
a=mid:audio	[RFC5888]	
a=msid:ma ta	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (ta)	
a=rtcp-mux	[RFC5761] - Bob can perform	
	RTP/RTCP Muxing	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus] -	
	Bob accepts only Opus Codec	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=ptime:60	[I-D.ietf-payload-rtp-opus]	
a=sendrecv	[RFC3264] - Bob can send and	
	recv audio	
a=setup:active	[RFC4145] - Bob carries out	
	DTLS Handshake in parallel	
a=ice-ufrag:c300d85b	[RFC5245] - ICE username frag	
a=ice-pwd:de4e99bd291c325921d5d4	[RFC5245] - ICE password	
7efbabd9a2		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245] - DTLS Fingerprint	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:	for SRTP	
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 3618095783	[RFC5245] - RTP/RTCP Host ICE	
192.168.1.7 49203 typ host	Candidate	
a=candidate:1 1 UDP 565689203	[RFC5245] - RTP/RTCP Server	
98.248.92.77 60065 typ srflx	Reflexive ICE Candidate	
raddr 192.168.1.7 rport 49203		
a=ssrc:1366788312	[RFC5576]	
cname:1f0fcgEocUG/yvY7		
a=rtcp-rsize	[RFC5506] - Bob intends to use	
	reduced size RTCP for this	
	session	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
m=video 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
99		
c=IN IP4 98.248.92.77	[RFC4566]	
a=mid:video	[RFC5888]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=rtpmap:99 H264/90000	[RFC3984] - Bob accepts H.264	

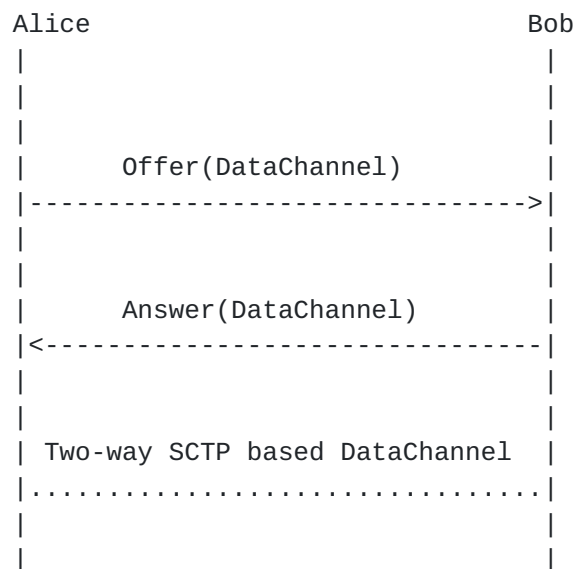
a=fmtp:99 profile-level-id=4d0028;packetization-mode=1	Video Codec.
a=rtcp-mux	[RFC3984]
a=sendrecv	[RFC5761] - Bob can perform RTP/RTCP Muxing
a=setup:active	[RFC3264] - Bob can send and recv video
a=ice-ufrag:c300d85b	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245] - ICE username frag
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] - ICE password
a=candidate:0 1 UDP 2113667327 192.168.1.7 49203 typ host	[RFC5245] - DTLS Fingerprint for SRTP
a=candidate:1 1 UDP 1694302207 98.248.92.77 60065 typ srflx raddr 192.168.1.7 rport 49203	[RFC5245] - Host ICE Candidate for Opus Stream
[RFC5245] - Server Reflexive Candidate for the Second Host Candidate	[RFC5245] - Server Reflexive ICE Candidate for the above host candidate
[RFC5104] - Indicates support for NACK based RTCP feedback	a=rtcp-fb:99 nack
[RFC5104] - Indicates support for Picture loss Indication and NACK	a=rtcp-fb:99 nack pli
[RFC5104] - Full Intra Frame Request- Codec Control Message support	a=rtcp-fb:99 ccm fir
[RFC5576]	a=ssrc:3229706345
[RFC5506] - Bob intends to use reduced size RTCP for this session	cname:Q/Nws1ao1HmN4Xa5
[I-D.ietf-mmusic-trickle-ice]	a=rtcp-rsize
	a=ice-options:trickle

Table 4: 5.2.2 SDP Answer

5.2.3. Data Only Session

This scenario illustrates SDP negotiated to setup a data-only session based on SCTP Data Channel, thus enabling use-cases such as file-transfer for example.

2-Way DataChannel Session



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-ufrag:074c6550	[RFC5245] - Session Level ICE parameter
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245] - Session Level ICE parameter
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] - Session DTLS Fingerprint for SRTP
m=application 56966 DTLS/SCTP 5000	[I-D.ietf-rtcweb-data-channel]
c=IN IP4 24.23.204.141	[RFC4566]
a=mid:data	[RFC5888]
a=sctpmap:5000 webrtc-DataChannel	[I-D.ietf-mmusic-sctp-sdp]
streams=16;label="channel 1";subprotocol="chat";	
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=sendrecv	[RFC3264] - Alice can send and recv non-media data
a=candidate:0 1 UDP 2113667327 192.168.1.7 56966 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 24.23.204.141 56966 typ srflx	[RFC5245]
raddr 192.168.1.7 rport 56966	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]

Table 5: 5.2.3 SDP Offer

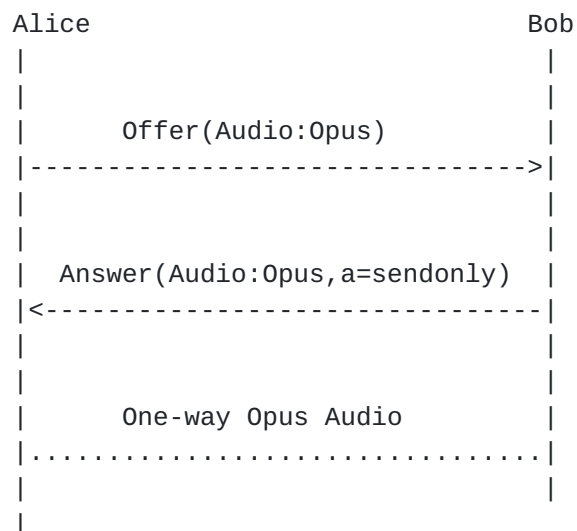
SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE data	[I-D.ietf-mmusic-sdp-bundle-negotiation]
m=application 55700 DTLS/SCTP 5000	[I-D.ietf-mmusic-sctp-sdp]
c=IN IP4 98.248.92.771	[RFC4566]
a=mid:data	[RFC5888]
a=sctpmap:5000 webrtc-DataChannel:5000	[I-D.ietf-mmusic-sctp-sdp]
streams=1;label="channel 1";subprotocol="chat";	
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=sendrecv	[RFC3264] - Bob can send and recv non-media data
a=ice-ufrag:c300d85b	[RFC5245] - Session Level ICE username frag
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245] - Session Level ICE password
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] - Session DTLS Fingerprint for SRTP
a=candidate:0 1 UDP 2113667327 192.168.1.7 55700 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 98.248.92.77 55700 typ srflx	[RFC5245]
raddr 192.168.1.7 rport 55700	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]

Table 6: 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=sendonly in the Answer.

Audio On Hold



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=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE audio	[I-D.ietf-mmusic-sdp-bundle-negotiation]
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=rtcp-mux	[RFC5761] - Alice can perform RTP/RTCP Muxing
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605] - Port for RTCP data
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus] - Opus Codec 48khz, 2 channels
a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-level	[RFC6464]
a=ptime:20	[I-D.ietf-payload-rtp-opus] - Opus packetization of 20ms
a=sendrecv	[RFC3264] - Alice can send and recv audio

a=setup:actpass	[RFC4145] - Alice can perform	
	DTLS before Answer arrives	
a=ice-ufrag:074c6550	[RFC5245] - ICE user fragment	
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245] - ICE password	
474af08a068		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245] - DTLS Fingerprint	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:	for SRTP	
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:0 2 UDP 2113667327	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 54609		
a=candidate:1 2 UDP 1685987071	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 54609		
a=rtcp-fb:109 nack	[RFC5104] - Indicates NACK	
	RTCP feedback support	
a=ssrc:3229706345	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=rtcp-rsize	[RFC5506]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
+-----+-----+		

Table 7: 5.2.4 SDP Offer

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=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE audio	[I-D.ietf-mmusic-sdp-bundle-negotiation]
m=audio 49203 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 98.248.92.77	[RFC4566]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus] - Bob accepts Opus Codec
a=extmap:1 urn:ietf:params:rtp-hdrext:ssrc-audio-level	[RFC6464]
a=ptime:20	[I-D.ietf-payload-rtp-opus]
a=sendonly	[RFC3264] - Bob puts call On Hold
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761] - Bob can perform RTP/RTCP Muxing
a=ice-ufrag:c300d85b	[RFC5245] - ICE username frag
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245] - ICE password
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] - DTLS Fingerprint for SRTP
a=candidate:0 1 UDP 2122194687 192.168.1.7 49203 typ host	[RFC5245]
a=candidate:1 1 UDP 1685987071 98.248.92.77 49203 typ srflx raddr 192.168.1.7 rport 49203	[RFC5245]
a=ssrc:1366781083	[RFC5576]
cname:EocUG1f0fcg/yvY7	
a=rtcp-rsize	[RFC5506]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]

Table 8: 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 first audio stream with three codecs and the other with [\[RFC2833\]](#) 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

```

Alice                                     Bob
|                                       |
|                                       |
| Offer(Audio:Opus,PCMU,PCMA Audio:telephone-event)|
|----->|
|                                       |
| Answer(Audio:Opus, Audio:telephone-event) |
|<-----|
|                                       |
| Opus audio stream and telephone-event stream |
|.....|
|                                       |

```

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=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE audio dtmf	[I-D.ietf-mmusic-sdp-bundle-negotiation]
m=audio 54609 UDP/TLS/RTP/SAVPF 109 0 8	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605] - Port for RTCP data

a=rtcp-mux	[RFC5761] - Alice can perform	
	RTP/RTCP Muxing	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus] -	
	Opus Codec 48khz, 2 channels	
a=ptime:20	[I-D.ietf-payload-rtp-opus] -	
	Opus packetization of 20ms	
a=rtpmap:0 PCMU/8000	[RFC3551] PCMU Audio Codec	
a=rtpmap:8 PCMA/8000	[RFC3551] PCMA Audio Codec	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=sendrecv	[RFC3264] - Alice can send and	
	recv audio	
a=setup:actpass	[RFC4145] - Alice can perform	
	DTLS before Answer arrives	
a=ice-ufrag:074c6550	[RFC5245] - ICE user fragment	
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245] - ICE password	
474af08a068	parameter	
a=fingerprint:sha-1 99:41:49:83:	[RFC5245] - DTLS Fingerprint	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:	for SRTP	
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:0 2 UDP 2122194687	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 54609		
a=candidate:1 2 UDP 1685987071	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 54609		
a=rtcp-fb:109 nack	[RFC5104] - Indicates NACK	
	RTCP feedback support	
a=ssrc:3229706345	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=rtcp-rsize	[RFC5506]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
m=audio 54609 UDP/TLS/RTP/SAVPF	[RFC4566]	
126		
c=IN IP4 24.23.204.141	[RFC4566]	
a=mid:dtmf	[RFC5888]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=rtcp-mux	[RFC5761]	
a=rtcp:54609 IN IP4	[RFC3605] - Port for RTCP data	
24.23.204.141		
a=rtpmap:126 telephone-	[RFC2833]	
event/8000		

a=sendonly	[RFC3264] - Alice can send	
	DTMF Events	
a=setup:actpass	[RFC4145] - Alice can perform	
	DTLS before Answer arrives	
a=ice-ufrag:074c6550	[RFC5245] - ICE user fragment	
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245] - ICE password	
474af08a068	parameter	
a=fingerprint:sha-1 99:41:49:83:	[RFC5245] - DTLS Fingerprint	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d	for SRTP	
: 1f:66:79:a8:07		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:0 2 UDP 2122194687	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 54609		
a=candidate:1 2 UDP 1685987071	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 54609		
a=rtcp-fb:109 nack	[RFC5104] - Indicates NACK	
	RTCP feedback support	
a=ssrc:9032206345	[RFC5576]	
cname:L/N9lk1ao1HmN4Xa5		
a=rtcp-rsize	[RFC5506]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
+-----+-----+-----+		

Table 9: 5.2.5 SDP Offer

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=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]	
a=group:BUNDLE audio dtmf	[I-D.ietf-mmusic-sdp-bundle-ne	
	gotiation]	
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
109		
c=IN IP4 98.248.92.77	[RFC4566]	
a=mid:audio	[RFC5888]	
a=msid:ma ta	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (ta)	

a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus] -
	Bob accepts Opus Codec
a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-level	[RFC6464]
a=ptime:20	[I-D.ietf-payload-rtp-opus]
a=sendrecv	[RFC3264] - Bob can send and
	receive Opus audio
a=setup:active	[RFC4145] - Bob carries out
	DTLS Handshake in parallel
a=rtcp-mux	[RFC5761] - Bob can perform
	RTP/RTCP Muxing on port 49203
a=ice-ufrag:c300d85b	[RFC5245] - ICE username frag
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245] - ICE password
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] - Fingerprint for
	SRTP
a=candidate:0 1 UDP 2122194687 192.168.1.7 49203 typ host	[RFC5245]
a=candidate:1 1 UDP 1685987071 98.248.92.77 49203 typ srflx	[RFC5245]
raddr 192.168.1.7 rport 49203	
a=ssrc:0634322975	[RFC5576]
cname:Q/o1HmN4XNws1aa5	
a=rtcp-rsize	[RFC5506] - Alice intends to
	use reduced size RTCP for this
	session
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
m=audio 49203 UDP/TLS/RTP/SAVPF 126	[RFC4566]
c=IN IP4 98.248.92.77	[RFC4566]
a=mid:dtmf	[RFC5888]
a=msid:ma tb	Identifies RTCMediaStream ID
	(ma) and RTCMediaStreamTrack
	ID (tb)
a=rtpmap:126 telephone-event/8000	[RFC2833]
a=recvonly	[RFC3264] - Alice can receive
	DTMF events
a=setup:active	[RFC4145] - Bob carries out
	DTLS Handshake in parallel
a=rtcp-mux	[RFC5761] - Alice can perform
	RTP/RTCP Muxing on port 54690
a=ice-ufrag:c300d85b	[RFC5245] - ICE username frag
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245] - ICE password
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d	[RFC5245] - Fingerprint for
	SRTP

: 1f:66:79:a8:07		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.7 49203 typ host		
a=candidate:1 1 UDP 1694302207	[RFC5245]	
98.248.92.77 49203 typ srflx		
raddr 192.168.1.7 rport 49203		
a=ssrc:6345903220	[RFC5576]	
cname:L/k1aN9lo1HmN4Xa5		
a=rtcp-rsize	[RFC5506] - Alice intends to	
	use reduced size RTCP for this	
	session	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
+-----+	+-----+	+-----+

Table 10: 5.2.5 SDP Answer

5.2.6. One Way Audio/Video Session - Document Camera

In this scenario Alice and Bob engage in a 1 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

Alice	Bob
Alice Offers sendonly audio and video streams.	
The video stream corresponds to her presentation	
Offer(Audio:Opus, Video: VP8)	
----->	
(Audio:Opus, Video: VP8)	
<-----	
One-way Opus Audio, VP8 Video	
.....	
Bob can hear Alice and see her presentation slides.	

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-negotiation]
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=rtcp-mux	[RFC5761]
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605] - Port for RTCP data
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=extmap:1 urn:ietf:params:rtp-hdrext:ssrc-audio-level	[RFC6464]
a=ptime:20	[I-D.ietf-payload-rtp-opus]
a=sendonly	[RFC3264] - Send only audio stream
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2122194687 24.23.204.141 54609 typ host	[RFC5245]
a=candidate:0 2 UDP 2122194687 24.23.204.141 54609 typ host	[RFC5104]
a=rtcp-fb:109 nack	[RFC5104]
a=ssrc:6345903220	[RFC5576]
cname:L/k1aN9lo1HmN4Xa5	
a=rtcp-rsize	[RFC5506]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
m=video 54609 UDP/TLS/RTP/SAVPF 120	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=mid:video	[RFC5888]
a=msid:ma tb	Identifies RTCMediaStream ID

	(ma) and RTCMediaStreamTrack
	ID (tb)
a=rtcp-mux	[RFC5761]
a=rtcp:54609 IN IP4	[RFC3605] - Port for RTCP data
24.23.204.141	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]
a=content:slides	[RFC4796] -Alice's
	presentation video stream
a=sendonly	[RFC3264] - Send only video
	stream
a=setup:actpass	[RFC4145] - Alice can perform
	DTLS before Answer arrives
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]
474af08a068	
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]
4a:97:0e:1f:ef:6d:f7:c9:c7:70:	
9d:1f:66:79:a8:07	
a=candidate:0 1 UDP 2113667327	[RFC5245]
24.23.204.141 54609 typ host	
a=candidate:0 2 UDP 2113667326	[RFC5104]
24.23.204.141 54609 typ host	
a=rtcp-fb:120 nack	[RFC5104]
a=rtcp-fb:120 nack pli	[RFC5104]
a=rtcp-fb:120 ccm fir	[RFC5104]
a=ssrc:3429951804	[RFC5576]
cname:Q/Nws1ao1HmN4Xa5	
a=rtcp-rsize	[RFC5506]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]

Table 11: 5.2.6 SDP Offer

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-negotiation]
m=audio 49203 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 98.248.92.77	[RFC4566]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID

	(ma) and RTCMediaStreamTrack	
	ID (ta)	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=ptime:20	[I-D.ietf-payload-rtp-opus]	
a=recvonly	[RFC3264] - Receive only audio	
	stream	
a=setup:active	[RFC4145] - Bob carries out	
	DTLS Handshake in parallel	
a=rtcp-mux	[RFC5761]	
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-pwd:de4e99bd291c325921d5d4	[RFC5245]	
7efbabd9a2		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d		
: 1f:66:79:a8:07		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
98.248.92.77 49203 typ host		
a=ssrc:9513429804	[RFC5576]	
cname:Q/o1HmNws1aN4Xa5		
a=rtcp-rsize	[RFC5506]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
m=video 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
120		
c=IN IP4 98.248.92.77	[RFC4566]	
a=mid:video	[RFC5888]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=content:slides	[RFC4796]	
a=recvonly	[RFC3264] - Receive Only	
	Alice's presentation stream	
a=setup:active	[RFC4145] - Bob carries out	
	DTLS Handshake in parallel	
a=rtcp-mux	[RFC5761]	
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-pwd:de4e99bd291c325921d5d4	[RFC5245]	
7efbabd9a2		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
98.248.92.77 49203 typ host		
a=ssrc:1366781083	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=rtcp-rsize	[RFC5506]	

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

Table 12: 5.2.6 SDP Answer

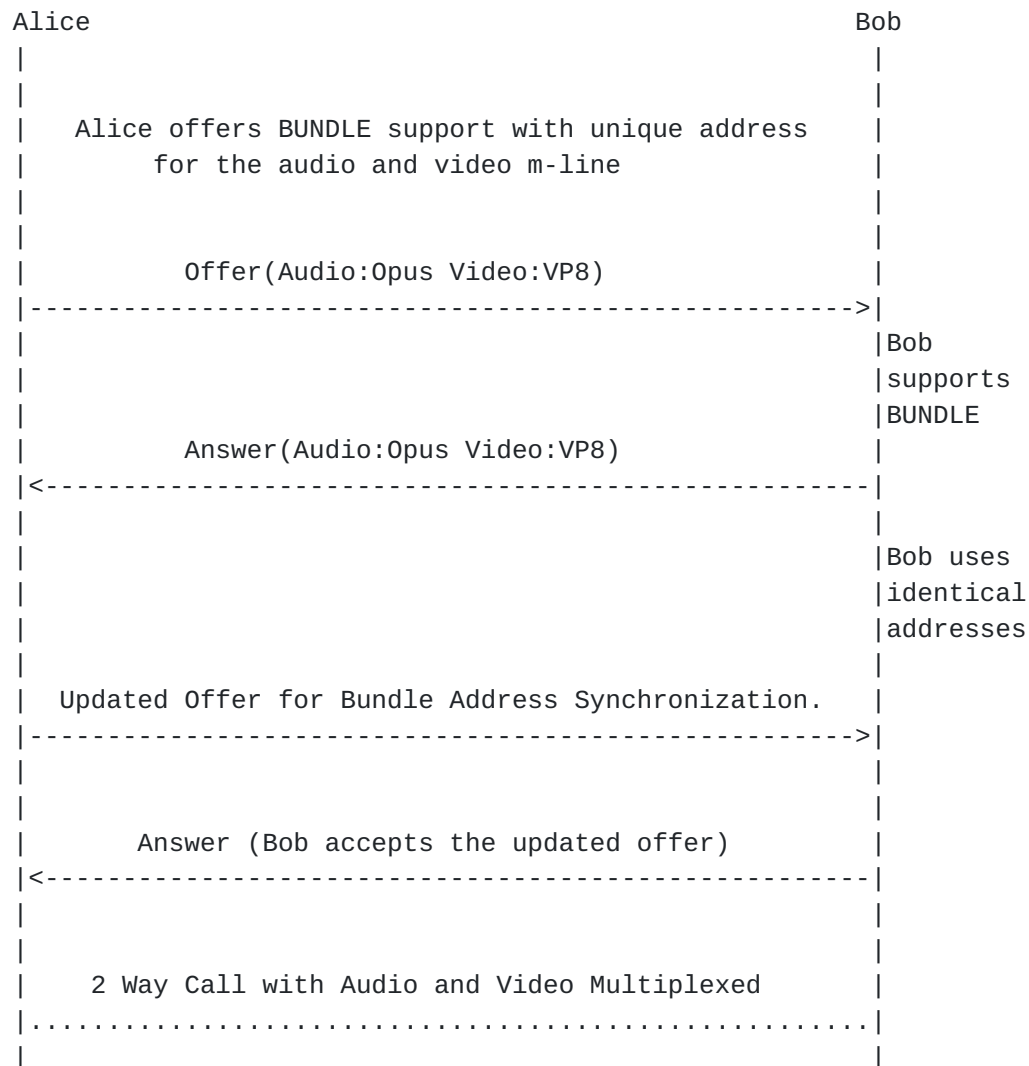
5.2.7. Audio, Video Session with BUNDLE Support Unknown

In this example, since Alice is unsure of the Bob's support of the BUNDLE framework, following 3 step procedures are performed in order to negotiate and setup a BUNDLE Address for the session

- o An SDP Offer, in which the Alice assigns unique addresses to each "m=" line in the BUNDLE group, and requests the Answerer to select the Offerer's BUNDLE address.
- o An SDP Answer, in which the Bob indicates its support for BUNDLE, and assigns its own BUNDLE address for the BUNDLED m= lines.
- o A subsequent SDP Offer from Alice, which is used to perform BUNDLE Address Synchronization (BAS).

Once the Offer/Answer exchange completes, both Alice and Bob each end up using single RTP Session for both the Media Streams.

Two-Way Secure Audio, Video with BUNDLE support unknown



SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-notation] Alice supports grouping of m=lines under BUNDLE semantics
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]

c=IN IP4 24.23.204.141	[RFC4566]	
a=mid:audio	[RFC5888]	Audio m=line part of
		BUNDLE group with a unique
		port number
a=msid:ma ta		Identifies RTCMediaStream ID
		(ma) and RTCMediaStreamTrack
		ID (ta)
a=rtcp-mux	[RFC5761]	
a=rtcp:54609 IN IP4	[RFC3605]	
24.23.204.141		
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=ptime:20	[I-D.ietf-payload-rtp-opus]	
a=sendrecv	[RFC3264]	
a=setup:actpass	[RFC4145]	- Alice can perform
		DTLS before Answer arrives
a=ssrc:11111	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]	
474af08a068		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:0 2 UDP 2122194687	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 54609		
a=candidate:1 2 UDP 1685987071	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 54609		
a=rtcp-fb:109 nack	[RFC5104]	
a=rtcp-rsize	[RFC5506]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
m=video 62537 UDP/TLS/RTP/SAVPF	[RFC4566]	
120		
c=IN IP4 24.23.204.141	[RFC4566]	
a=mid:video	[RFC5888]	Video m=line part of
		the Bundle group with a unique
		port number
a=msid:ma tb		Identifies RTCMediaStream ID
		(ma) and RTCMediaStreamTrack
		ID (tb)
a=rtcp-mux	[RFC5761]	

a=rtcp:62537 IN IP4	[RFC3605] - Port for RTCP data	
24.23.204.141		
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=sendrecv	[RFC3264]	
a=setup:actpass	[RFC4145] - Alice can perform	
	DTLS before Answer arrives	
a=ssrc:22222	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=ice-ufrag:6550074c	[RFC5245]	
a=ice-pwd:74af08a068a28a397a4c3f	[RFC5245]	
31747d1ee34		
a=fingerprint:sha-1 1f:ef:6d:f7:	[RFC5245]	
c9:c7:70:9d:1f:66:99:41:49:83:		
4a:97:0e79:a8:07		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.4 62537 typ host		
a=candidate:0 2 2122194687	[RFC5245]	
192.168.1.4 62537 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
24.23.204.141 62537 typ srflx		
raddr 192.168.1.4 rport 62537		
a=candidate:1 2 UDP 1685987071	[RFC5245]	
24.23.204.141 62537 typ srflx		
raddr 192.168.1.4 rport 62537		
a=rtcp-fb:120 nack	[RFC5104]	
a=rtcp-fb:120 nack pli	[RFC5104]	
a=rtcp-fb:120 ccm fir	[RFC5104]	
a=rtcp-rsize	[RFC5506]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
+-----+-----+-----+		

Table 13: 5.2.7 SDP Offer w/BUNDLE

SDP Contents	RFC#/Notes	
+-----+-----+-----+		
v=0	[RFC4566]	
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566]	
s=-	[RFC4566]	
t=0 0	[RFC4566]	
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]	
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-ne	
	gotiation] Bob supports BUNDLE	
	semantics.	
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
109		
c=IN IP4 98.248.92.77	[RFC4566]	
a=msid:ma ta	Identifies RTCMediaStream ID	

	(ma) and RTCMediaStreamTrack	
	ID (ta)	
a=mid:audio	[RFC5888] Audio m=line part of	
	the BUNDLE group	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=ptime:20	[I-D.ietf-payload-rtp-opus]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdxext:ssrc-audio-level		
a=sendrecv	[RFC3264]	
a=setup:active	[RFC4145] - Bob carries out	
	DTLS Handshake in parallel	
a=rtcp-fb:109 nack	[RFC5104]	
a=rtcp-mux	[RFC5761]	
a=ssrc:33333	[RFC5576]	
cname:Q/1HmN4Xa5Nws1ao		
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-pwd:de4e99bd291c325921d5d4	[RFC5245]	
7efbabd9a2		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.7 49203 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
98.248.92.77 49203 typ srflx		
raddr 192.168.1.7 rport 49203		
a=rtcp-rsize	[RFC5506]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
m=video 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
120		
c=IN IP4 98.248.92.77	[RFC4566]	
a=mid:video	[RFC5888] Video m=line part of	
	the BUNDLE group with the port	
	from audio line repeated	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=sendrecv	[RFC3264]	
a=setup:active	[RFC4145] - Bob carries out	
	DTLS Handshake in parallel	
a=rtcp-mux	[RFC5761]	
a=ssrc:44444	[RFC5576]	
cname:Q/2AqlmN4Xa5Nws		
a=ice-ufrag:85bc300d	[RFC5245]	
a=ice-pwd:bd2de4e9991c325921d5d4	[RFC5245]	
7efbabd9a2		
a=fingerprint:sha-1 41:49:83:4a:	[RFC5245]	


```
| 99:97:0e:1f:ef:6d:f7:c9:c7:70: |  
| 9d:1f:66:79:a8:07 |  
| a=candidate:0 1 UDP 2122194687 | [RFC5245]  
| 192.168.1.7 49203 typ host |  
| a=candidate:1 1 UDP 1685987071 | [RFC5245]  
| 98.248.92.77 49203 typ srflx |  
| raddr 192.168.1.7 rport 49203 |  
| a=rtcp-fb:120 nack | [RFC5104]  
| a=rtcp-fb:120 nack pli | [RFC5104]  
| a=rtcp-fb:120 ccm fir | [RFC5104]  
| a=rtcp-rsize | [RFC5506]  
| a=ice-options:trickle | [I-D.ietf-mmusic-trickle-ice]  
+-----+-----+
```

Table 14: 5.2.7 SDP Answer w/BUNDLE

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-negotiation]
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=mid:audio	[RFC5888] - Port number finalized as Bundle Address.
a=rtcp-mux	[RFC5761]
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-level	[RFC6464]
a=ptime:20	[I-D.ietf-payload-rtp-opus]
a=sendrecv	[RFC3264]
a=setup:actpass	[RFC4145]
a=ssrc:11111	[RFC5576]
cname:EocUG1f0fcg/yvY7	
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]

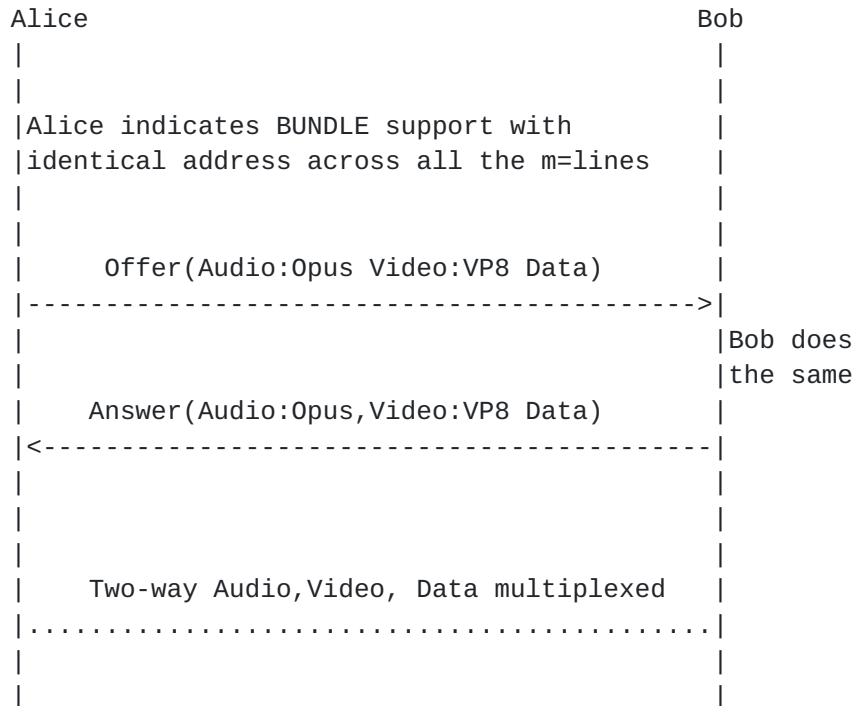
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 54609		
a=rtcp-fb:109 nack	[RFC5104]	
a=rtcp-rsize	[RFC5506]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
m=video 54609 UDP/TLS/RTP/SAVPF	[RFC4566]	
120		
c=IN IP4 24.23.204.141	[RFC4566]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=mid:video	[RFC5888]	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=sendrecv	[RFC3264]	
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=ssrc:22222	[RFC5576]	
cname:Q/NWslao1HmN4Xa5		
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]	
474af08a068		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 54609		
a=rtcp-fb:120 nack	[RFC5104]	
a=rtcp-fb:120 nack pli	[RFC5104]	
a=rtcp-fb:120 ccm fir	[RFC5104]	
a=rtcp-rsize	[RFC5506]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
+-----+-----+		

Table 15: 5.2.7 SDP Offer for BAS

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,Data with BUNDLE support known



SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE audio video data	[I-D.ietf-mmusic-sdp-bundle-negotiation]
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=rtcp:54609 IN IP4	[RFC3605]

24.23.204.141		
a=mid:audio	[RFC5888]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=extmap:1 urn:ietf:params:rtp-hdrext:ssrc-audio-level	[RFC6464]	
a=ptime:20	[I-D.ietf-payload-rtp-opus]	
a=sendrecv	[RFC3264]	
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]	
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]	
a=candidate:0 1 UDP 2122194687 192.168.1.4 54609 typ host	[RFC5245]	
a=candidate:0 2 UDP 2122194687 192.168.1.4 64678 typ host	[RFC5245]	
a=candidate:1 1 UDP 1685987071 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]	
a=candidate:1 2 UDP 1685987071 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]	
a=rtcp-fb:109 nack	[RFC5104]	
a=ssrc:11111	[RFC5576]	
cname:Q/Nws1ao1HmN4Xa5		
a=rtcp-rsize	[RFC5506]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
m=video 54609 UDP/TLS/RTP/SAVFP 120	[RFC4566]	
c=IN IP4 24.23.204.141	[RFC4566]	
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)	
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]	
a=mid:video	[RFC5888]	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=sendrecv	[RFC3264]	
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]	
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:	[RFC5245]	

9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:0 2 UDP 2122194687	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 54609		
a=candidate:1 2 UDP 1685987071	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 54609		
a=rtcp-fb:120 nack	[RFC5104]	
a=rtcp-fb:120 nack pli	[RFC5104]	
a=rtcp-fb:120 ccm fir	[RFC5104]	
a=ssrc:22222	[RFC5576]	
cname:Q/aoNws11HmN4Xa5		
a=rtcp-rsize	[RFC5506]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
m=application 54609 DTLS/SCTP	[I-D.ietf-rtcweb-data-channel]	
5000		
c=IN IP4 24.23.204.141	[RFC4566]	
a=mid:data	[RFC5888]	
a=sctpmap:5000 webrtc-	[I-D.ietf-mmusic-sctp-sdp]	
DataChannel		
streams=1;label="channel 1";		
subprotocol="chat";		
a=sendrecv	[RFC3264]	
a=setup:actpass	[RFC4145]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]	
474af08a068		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 54609		
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
+-----+-----+		

Table 16: 5.2.8 SDP Offer

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=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]	
a=group:BUNDLE audio video data	[I-D.ietf-mmusic-sdp-bundle-ne	
	gotiation]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
	Bob's trickle support support	
	is indicated at the session	
	level	
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
109		
c=IN IP4 98.248.92.77	[RFC4566]	
a=msid:ma ta	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (ta)	
a=mid:audio	[RFC5888]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=ptime:20	[I-D.ietf-payload-rtp-opus]	
a=sendrecv	[RFC3264]	
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-fb:109 nack	[RFC5104]	
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-pwd:de4e99bd291c325921d5d4	[RFC5245]	
7efbabd9a2		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.7 49203 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
98.248.92.77 49203 typ srflx		
raddr 192.168.1.7 rport 49203		
a=ssrc:33333	[RFC5576]	
cname:L/aoNws11HmN4Xa5		
a=rtcp-rsize	[RFC5506]	
m=video 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
120		
c=IN IP4 98.248.92.77	[RFC4566]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=mid:video	[RFC5888]	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	

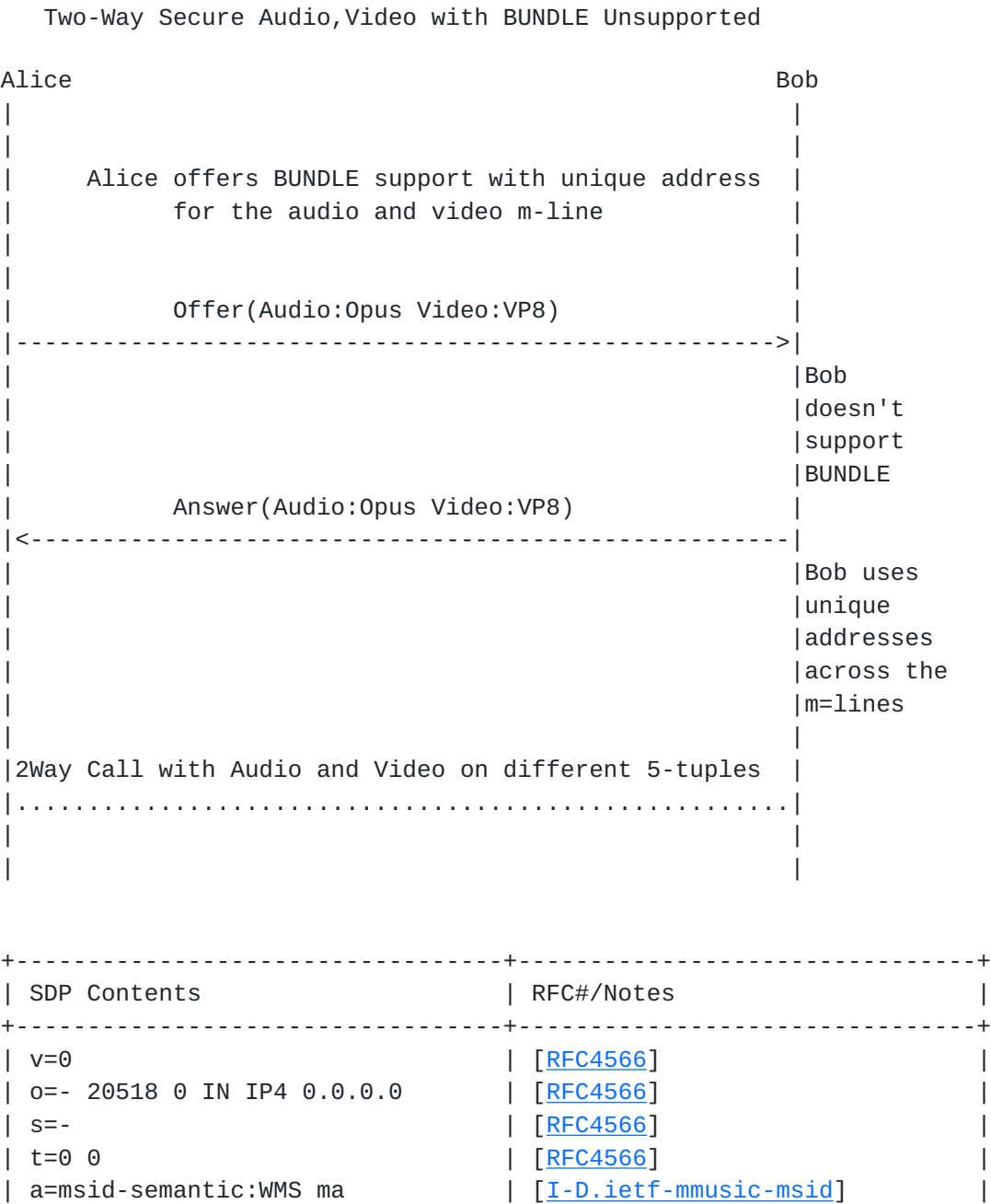
a=sendrecv	[RFC3264]	
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-pwd:de4e99bd291c325921d5d4	[RFC5245]	
7efbabd9a2		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.7 49203 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
98.248.92.77 49203 typ srflx		
raddr 192.168.1.7 rport 49203		
a=rtcp-fb:120 nack	[RFC5104]	
a=rtcp-fb:120 nack pli	[RFC5104]	
a=rtcp-fb:120 ccm fir	[RFC5104]	
a=ssrc:44444	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=rtcp-rsize	[RFC5506]	
m=application 49203 DTLS/SCTP	[I-D.ietf-mmusic-sctp-sdp]	
5000		
c=IN IP4 98.248.92.771	[RFC4566]	
a=mid:data	[RFC5888]	
a=sctpmmap:5000 webrtc-	[I-D.ietf-mmusic-sctp-sdp]	
DataChannel		
streams=16;label="channel 1";		
subprotocol="chat";		
a=setup:active	[RFC4145]	
a=sendrecv	[RFC3264]	
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-pwd:de4e99bd291c325921d5d4	[RFC5245]	
7efbabd9a2		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.7 49203 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
98.248.92.77 49203 typ srflx		
raddr 192.168.1.7 rport 49203		
+-----+-----+-----+		

Table 17: 5.2.8 SDP Answer

5.2.9. Audio, 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.

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



a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-ne
	gotiation] Alice supports
	grouping of m=lines under
	BUNDLE semantics
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
m=audio 55232 UDP/TLS/RTP/SAVPF	[RFC4566]
109	
c=IN IP4 24.23.204.141	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID
	(ma) and RTCMediaStreamTrack
	ID (ta)
a=mid:audio	[RFC5888] Audio m=line part of
	BUNDLE group with a unique
	port number
a=rtcp:55232 IN IP4	[RFC3605]
24.23.204.141	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]
hdext:ssrc-audio-level	
aptime:20	[I-D.ietf-payload-rtp-opus]
a=setup:actpass	[RFC4145] - Alice can perform
	DTLS before Answer arrives
a=sendrecv	[RFC3264]
a=rtcp-mux	[RFC5761]
a=rtcp-fb:109 nack	[RFC5104]
a=ssrc:11111	[RFC5576]
cname:EocUG1f0fcg/yvY7	
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]
474af08a068	
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]
4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d	
: 1f:66:79:a8:07	
a=candidate:0 1 UDP 2122194687	[RFC5245]
192.168.1.4 55232 typ host	
a=candidate:0 2 UDP 2122194687	[RFC5245]
192.168.1.4 55232 typ host	
a=candidate:1 1 UDP 1685987071	[RFC5245]
24.23.204.141 55232 typ srflx	
raddr 192.168.1.4 rport 55232	
a=candidate:1 2 UDP 1685987071	[RFC5245]
24.23.204.141 55232 typ srflx	
raddr 192.168.1.4 rport 55232	
a=rtcp-rsize	[RFC5506]
m=video 54332 UDP/TLS/RTP/SAVPF	[RFC4566]
120	
c=IN IP4 24.23.204.141	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID

	(ma) and RTCMediaStreamTrack
	ID (tb)
a=mid:video	[RFC5888] Video m=line part of
	the BUNDLE group with a unique
	port number
a=rtcp:54332 IN IP4	[RFC3605]
24.23.204.141	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]
a=sendrecv	[RFC3264]
a=setup:actpass	[RFC4145] - Alice can perform
	DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=ssrc:22222	[RFC5576]
cname:yvY7/EocUG1f0fcg	
a=ice-ufrag:7872093	[RFC5245]
a=ice-pwd:ee3474af08a068a28a397a	[RFC5245]
4c3f31747d1	
a=fingerprint:sha-1 6d:f7:c9:c7:	[RFC5245]
70:9d:1f:66:79:a8:07:99:41:	
49:83:4a:97:0e:1f:ef	
a=candidate:0 1 UDP 2122194687	[RFC5245]
192.168.1.4 54332 typ host	
a=candidate:0 2 2122194687	[RFC5245]
192.168.1.4 54332 typ host	
a=candidate:1 1 UDP 1685987071	[RFC5245]
24.23.204.141 54332 typ srflx	
raddr 192.168.1.4 rport 54332	
a=candidate:1 2 UDP 1685987071	[RFC5245]
24.23.204.141 54332 typ srflx	
raddr 192.168.1.4 rport 54332	
a=rtcp-fb:120 nack	[RFC5104]
a=rtcp-fb:120 nack pli	[RFC5104]
a=rtcp-fb:120 ccm fir	[RFC5104]
a=rtcp-rsize	[RFC5506]
+-----+-----	

Table 18: 5.2.9 SDP Offer w/BUNDLE

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]

m=audio 53214 UDP/TLS/RTP/SAVPF 109	[RFC4566]	
c=IN IP4 98.248.92.77	[RFC4566]	
a=msid:ma ta	Identifies RTCMediaStream	
	ID (ma) and	
	RTCMediaStreamTrack ID	
	(ta)	
a=rtcp:60065 IN IP4 98.248.92.77	[RFC3605]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opu	
	s]	
a=extmap:1 urn:ietf:params:rtp-hdext	[RFC6464]	
:ssrc-audio-level		
a=ptime:20	[I-D.ietf-payload-rtp-opu	
	s]	
a=setup:active	[RFC4145] - Bob carries	
	out DTLS Handshake in	
	parallel	
a=sendrecv	[RFC3264]	
a=rtcp-fb:109 nack	[RFC5104]	
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-	[RFC5245]	
pwd:de4e99bd291c325921d5d47efbabd9a2		
a=fingerprint:sha-1 99:41:49:83:4a:97	[RFC5245]	
:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.7 53214 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
98.248.92.77 53214 typ srflx raddr		
192.168.1.7 rport 53214		
a=candidate:0 2 UDP 2122194687	[RFC5245]	
192.168.1.7 60065 typ host		
a=candidate:1 2 UDP 1685987071	[RFC5245]	
98.248.92.77 60065 typ srflx raddr		
192.168.1.7 rport 60065		
a=rtcp-rsize	[RFC5506]	
m=video 58679 UDP/TLS/RTP/SAVPF 120	[RFC4566]	
c=IN IP4 98.248.92.77	[RFC4566]	
a=msid:ma tb	Identifies RTCMediaStream	
	ID (ma) and	
	RTCMediaStreamTrack ID	
	(tb)	
a=rtcp:56507 IN IP4 98.248.92.77	[RFC3605]	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=setup:active	[RFC4145] - Bob carries	
	out DTLS Handshake in	
	parallel	
a=sendrecv	[RFC3264]	
a=ice-ufrag:85bC300	[RFC5245]	

a=ice-	[RFC5245]	
pwd:325921d5d47efbabd9a2de4e99bd291c		
a=fingerprint:sha-1 9d:1f:66:79:a8:07	[RFC5245]	
:99:41:49:83:4a:97:0e:1f:		
ef:6d:f7:c9:c7:70		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.7 58679 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
98.248.92.77 58679 typ srflx raddr		
192.168.1.7 rport 58679		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.7 56507 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
98.248.92.77 56507 typ srflx raddr		
192.168.1.7 rport 58679		
a=rtcp-fb:120 nack	[RFC5104]	
a=rtcp-fb:120 nack pli	[RFC5104]	
a=rtcp-fb:120 ccm fir	[RFC5104]	
a=rtcp-rsize	[RFC5506]	
+-----+-----+-----+		

Table 19: 5.2.9 SDP Answer without BUNDLE

5.2.10. Audio, Video BUNDLED, but Data (Not BUNDLED)

This example show-cases SDP for negotiating a session with Audio, Video and data streams between Alice and Bob with data stream not being part of the BUNDLE group. This is shown by assigning unique port for data media sections.

Audio, Video, with Data (Not in BUNDLE)

Alice	Bob
Alice wants to multiplex audio, video but not data	
Offer(Audio:Opus Video:VP8, Data(not in BUNDLE))	
----->	
Answer(Audio:Opus Video:VP8, Data)	
<-----	
2 Way Call with Audio, Video Multiplexed except data	
.....	

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-negotiation] Alice wants to BUNDLE only audio and video media.
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]
a=mid:audio	[RFC5888]
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=extmap:1 urn:ietf:params:rtp-hdrext:ssrc-audio-level	[RFC6464]
a=ptime:20	[I-D.ietf-payload-rtp-opus]

a=sendrecv	[RFC3264]	
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]	
474af08a068		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:0 2 UDP 2113667326	[RFC5245]	
192.168.1.4 54609 typ host		
a=rtcp-fb:109 nack	[RFC5104]	
a=ssrc:11111	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=rtcp-rsize	[RFC5506]	
m=video 54609 UDP/TLS/RTP/SAVPF	[RFC4566]	
120		
c=IN IP4 24.23.204.141	[RFC4566]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=rtcp:54609 IN IP4	[RFC3605]	
24.23.204.141		
a=mid:video	[RFC5888]	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=sendrecv	[RFC3264]	
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]	
474af08a068		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:0 2 UDP 2113667326	[RFC5245]	
192.168.1.4 54609 typ host		
a=rtcp-fb:120 nack	[RFC5104]	
a=rtcp-fb:120 nack pli	[RFC5104]	
a=rtcp-fb:120 ccm fir	[RFC5104]	
a=ssrc:22222	[RFC5576]	
cname:Q/aoNws11HmN4Xa5		
a=rtcp-rsize	[RFC5506]	
m=application 10000 DTLS/SCTP	[I-D.ietf-rtcweb-data-channel]	
5000		

c=IN IP4 24.23.204.141	[RFC4566]	
a=mid:data	[RFC5888]	
a=sctpmap:5000 webrtc-	[I-D.ietf-mmusic-sctp-sdp]	
DataChannel		
streams=16;label="channel 1";		
subprotocol="chat";		
a=sendrecv	[RFC3264]	
a=setup:actpass	[RFC4145]	
a=ice-ufrag:89819013	[RFC5245]	
a=ice-pwd:1747d1ee3474af08a068a2	[RFC5245]	
8a397a4c3f3		
a=fingerprint:sha-1 0e:1f:ef:6d:	[RFC5245]	
f7:c9:c7:70:99:41:49:83:4a:97:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 10000 typ host		
+-----+-----+-----+		

Table 20: 5.2.10 SDP Offer

SDP Contents	RFC#/Notes	
+-----+-----+-----+		
v=0	[RFC4566]	
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin	
s=-	[RFC4566]	
t=0 0	[RFC4566]	
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]	
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-negotiation]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
109		
c=IN IP4 98.248.92.77	[RFC4566]	
a=msid:ma ta	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (ta)	
a=mid:audio	[RFC5888]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-level	[RFC6464]	
a=ptime:20	[I-D.ietf-payload-rtp-opus]	
a=sendrecv	[RFC3264]	
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-fb:109 nack	[RFC5104]	
a=ice-ufrag:c300d85b	[RFC5245]	

a=ice-pwd:de4e99bd291c325921d5d4	[RFC5245]	
7efbabd9a2		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:		
70:9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.7 49203 typ host		
a=ssrc:33333	[RFC5576]	
cname:L/aoNws11HmN4Xa5		
a=rtcp-rsize	[RFC5506]	
m=video 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
120		
c=IN IP4 98.248.92.771	[RFC4566]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=mid:video	[RFC5888]	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=sendrecv	[RFC3264]	
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-pwd:de4e99bd291c325921d5d4	[RFC5245]	
7efbabd9a2		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.7 49203 typ host		
a=rtcp-fb:120 nack	[RFC5104]	
a=rtcp-fb:120 nack pli	[RFC5104]	
a=rtcp-fb:120 ccm fir	[RFC5104]	
a=ssrc:44444	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=rtcp-rsize	[RFC5506]	
m=application 20000 DTLS/SCTP	[I-D.ietf-mmusic-sctp-sdp]	
5000		
c=IN IP4 98.248.92.77	[RFC4566]	
a=mid:data	[RFC5888]	
a=sctpmap:5000 webrtc-	[I-D.ietf-mmusic-sctp-sdp]	
DataChannel		
streams=1;label="channel 1";		
subprotocol="chat";		
a=setup:active	[RFC4145]	
a=sendrecv	[RFC3264]	
a=ice-ufrag:991Ca2a5e	[RFC5245]	
a=ice-pwd:921d5d47efbabd9a2de4e9	[RFC5245]	
9bd291c325		


```

| a=fingerprint:sha-1 6d:f7:c9:c7: | [RFC5245] |
| 70:9d:1f:66:79:a8:07:99:41:49: | |
| 83:4a:97:0e:1f:ef | |
| a=candidate:0 1 UDP 2113667327 | [RFC5245] |
| 192.168.1.7 20000 typ host | |
+-----+-----+

```

Table 21: 5.2.10 SDP Answer

5.2.11. Audio Only, Add Video to BUNDLE

This example involves 2 Offer/Answer exchanges. First one setting up 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 Only , Add Video and BUNDLE

```

Alice                                                     Bob
|                                                         |
|                                                         |
|   Alice indicates support for BUNDLE                     |
|                                                         |
|   Offer(Audio:Opus)                                       |
|----->|
|                                                         |
|                                                         |
|   Answer(Audio:Opus)                                     |
|<-----|
|                                                         |
|   Updated Offer(Audio:Opus, Video:VP8)                   |
|----->|
|                                                         |
|   Updated Answer(Audio:Opus, Video:VP8)                 |
|<-----|
|   2Way Call with Audio and Video Multiplexed             |
|.....|
|                                                         |

```

```

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

```


SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE audio	[I-D.ietf-mmusic-sdp-bundle-negotiation] Alice wants to BUNDLE only audio and video media.
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=rtcp:64678 IN IP4 24.23.204.141	[RFC3605]
a=mid:audio	[RFC5888]
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-level	[RFC6464]
a=ptime:20	[I-D.ietf-payload-rtp-opus]
a=sendrecv	[RFC3264]
a=setup:actpass	[RFC4145]
a=rtcp-mux	[RFC5761]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
a=rtcp-fb:109 nack	[RFC5104]
a=ssrc:11111	[RFC5576]
cname:Q/NWs1ao1HmN4Xa5	
a=rtcp-rsize	[RFC5506]

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

Table 22: 5.2.11 SDP Offer

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=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE audio	[I-D.ietf-mmusic-sdp-bundle-negotiation]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
m=audio 49203 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 98.248.92.77	[RFC4566]
a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-level	[RFC6464]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=rtcp:60065 IN IP4 98.248.92.77	[RFC3605]
a=mid:audio	[RFC5888]
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=ptime:20	[I-D.ietf-payload-rtp-opus]
a=sendrecv	[RFC3264]
a=setup:active	[RFC4145]
a=rtcp-mux	[RFC5761]
a=rtcp-fb:109 nack	[RFC5104]
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.7 49203 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 98.248.92.77 49203 typ srflx	[RFC5245]
raddr 192.168.1.7 rport 49203	
a=ssrc:33333	[RFC5576]
cname:L/aoNws11HmN4Xa5	
a=rtcp-rsize	[RFC5506]

Table 23: 5.2.10 SDP Answer

SDP Contents	RFC#/Notes
--------------	------------

+-----+-----+	
v=1	Version number incremented
	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-ne
	gotiation] Alice wants to
	BUNDLE only audio and video
	media.
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
m=audio 54609 UDP/TLS/RTP/SAVPF	[RFC4566]
109	
c=IN IP4 24.23.204.141	[RFC4566]
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]
hdext:ssrc-audio-level	
a=msid:ma ta	Identifies RTCMediaStream ID
	(ma) and RTCMediaStreamTrack
	ID (ta)
a=rtcp:64678 IN IP4	[RFC3605]
24.23.204.141	
a=mid:audio	[RFC5888]
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=ptime:20	[I-D.ietf-payload-rtp-opus]
a=sendrecv	[RFC3264]
a=setup:actpass	[RFC4145]
a=rtcp-mux	[RFC5761]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]
474af08a068	
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]
4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d	
: 1f:66:79:a8:07	
a=candidate:0 1 UDP 2113667327	[RFC5245]
192.168.1.4 54609 typ host	
a=candidate:1 1 UDP 694302207	[RFC5245]
24.23.204.141 54609 typ srflx	
raddr 192.168.1.4 rport 54609	
a=candidate:0 2 UDP 2113667326	[RFC5245]
192.168.1.4 64678 typ host	
a=candidate:1 2 UDP 1694302206	[RFC5245]
24.23.204.141 64678 typ srflx	
raddr 192.168.1.4 rport 64678	
a=rtcp-fb:109 nack	[RFC5104]
a=ssrc:11111	[RFC5576]
cname:Q/NWs1ao1HmN4Xa5	
a=rtcp-rsize	[RFC5506]

m=video 54609 UDP/TLS/RTP/SAVPF	[RFC4566]	
120		
c=IN IP4 24.23.204.141	[RFC4566]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=rtcp:64678 IN IP4	[RFC3605]	
24.23.204.141		
a=mid:video	[RFC5888]	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=sendrecv	[RFC3264]	
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]	
474af08a068		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:1 1 UDP 694302207	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 54609		
a=candidate:0 2 UDP 2113667326	[RFC5245]	
192.168.1.4 64678 typ host		
a=candidate:1 2 UDP 1694302206	[RFC5245]	
24.23.204.141 64678 typ srflx		
raddr 192.168.1.4 rport 64678		
a=rtcp-fb:120 nack	[RFC5104]	
a=rtcp-fb:120 nack pli	[RFC5104]	
a=rtcp-fb:120 ccm fir	[RFC5104]	
a=ssrc:22222	[RFC5576]	
cname:Q/aoNws11HmN4Xa5		
a=rtcp-rsize	[RFC5506]	
+-----+-----+		

Table 24: 5.2.11 SDP Updated Offer

SDP Contents	RFC#/Notes	
+-----+-----+		
v=1	[RFC4566] Version number	
	incremented	
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin	
	Information	
s=-	[RFC4566]	
t=0 0	[RFC4566]	

a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]	
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-ne	
	gotiation]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
109		
c=IN IP4 98.248.92.77	[RFC4566]	
a=msid:ma ta	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (ta)	
a=rtcp:60065 IN IP4 98.248.92.77	[RFC3605]	
a=mid:audio	[RFC5888]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=ptime:20	[I-D.ietf-payload-rtp-opus]	
a=sendrecv	[RFC3264]	
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-fb:109 nack	[RFC5104]	
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-pwd:de4e99bd291c325921d5d4	[RFC5245]	
7efbabd9a2		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.7 49203 typ host		
a=candidate:1 1 UDP 1694302207	[RFC5245]	
98.248.92.77 49203 typ srflx		
raddr 192.168.1.7 rport 49203		
a=ssrc:33333	[RFC5576]	
cname:L/aoNws11HmN4Xa5		
a=rtcp-rsize	[RFC5506]	
m=video 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
120		
c=IN IP4 98.248.92.77	[RFC4566]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=rtcp:60065 IN IP4 98.248.92.77	[RFC3605]	
a=mid:video	[RFC5888]	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=sendrecv	[RFC3264]	
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-pwd:de4e99bd291c325921d5d4	[RFC5245]	

7efbabd9a2		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.7 49203 typ host		
a=candidate:1 1 UDP 1694302207	[RFC5245]	
98.248.92.77 49203 typ srflx		
raddr 192.168.1.7 rport 49203		
a=rtcp-fb:120 nack	[RFC5104]	
a=rtcp-fb:120 nack pli	[RFC5104]	
a=rtcp-fb:120 ccm fir	[RFC5104]	
a=ssrc:44444	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=rtcp-rsize	[RFC5506]	
+-----+-----+-----+		

Table 25: 5.2.11 SDP Updated Answer

5.3. MultiResolution, RTX, FEC Examples

This section deals with scenarios related to multi-source, multi-stream negotiation such as layered coding, simulcast, along with techniques that deal with providing robustness against transmission errors such as FEC and RTX. Also to note, mechanisms such as FEC and RTX could be envisioned in the above basic scenarios as well.

5.3.1. Sendonly Simulcast Session with 2 cameras and 2 encodings per camera

The SDP below shows Offer/Answer exchange with one audio and two video sources. Each of the video source can be sent at two different resolutions.

One video source corresponds to VP8 encoding, while the other corresponds to H.264 encoding.

bundle-only framework is used along with BUNDLE grouping framework to enable multiplexing of all the 5 streams (1 audio stream + 4 video streams) over a single RTP Session.

1 Way Successful Simulcast w/BUNDLE

```

Alice                                     Bob
|                                         |
|                                         |
|   Alice offers 2 sendonly video sources   |
|   with 2 simulcast encodings per source   |
|   and bundle-only for video               |
|                                         |
|   Offer(Audio:Opus,Video1:VP8,Video2:H.264) |
|----->|
|                                         |
|   Answer(Audio:Opus Video1:VP8,Video2:H.264) |
|<-----|
|One-Way 1 Opus, 2 H.264 and 2 VP8 video streams, |
| all multiplexed                               |
|.....|
|                                         |

```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE m0 m1 m2	[I-D.ietf-mmusic-sdp-bundle -negotiation] Alice supports grouping of m=lines under BUNDLE semantics
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ic e]
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=rtcp:64678 IN IP4 24.23.204.141	[RFC3605]
a=mid:m0	[RFC5888]
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]

a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdrext:ssrc-audio-level		
a=ptime:20	[I-D.ietf-payload-rtp-opus]	
a=sendonly	[RFC3264]	
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-fb:109 nack	[RFC5104]	
a=ssrc:11111 C90a1EocUG1f0fcg	[RFC5576]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3474	[RFC5245]	
af08a068		
a=fingerprint:sha-1 99:41:49:83:4a:	[RFC5245]	
97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:1 1 UDP 694302207	[RFC5245]	
24.23.204.141 54609 typ srflx raddr		
192.168.1.4 rport 54609		
a=candidate:0 2 UDP 2113667326	[RFC5245]	
192.168.1.4 64678 typ host		
a=candidate:1 2 UDP 1694302206	[RFC5245]	
24.23.204.141 64678 typ srflx raddr		
192.168.1.4 rport 64678		
a=rtcp-rsize	[RFC5506]	
m=video 0 UDP/TLS/RTP/SAVPF 98 100	bundle-only video line with	
	port number set to zero	
c=IN IP4 24.23.204.141	[RFC4566]	
a=msid:ma tb	Identifies RTCMediaStream	
	ID (ma) and	
	RTCMediaStreamTrack ID (tb)	
a=rtcp:64678 IN IP4 24.23.204.141	[RFC3605]	
a=mid:m1	[RFC5888] Video m=line part	
	of BUNDLE group	
a=rtpmap:98 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:100 VP8/90000	[I-D.ietf-payload-vp8]	
a=imageattr:98 [x=1280,y=720]	[RFC6236] Camera-1, Encoding-	
	1 Resolution	
a=fmtp:98 max-fr=30	[RFC4566]	
a=imageattr:100 [x=640,y=480]	[RFC6236]	
	Camera-1, Encoding-2	
	Resolution	
a=fmtp:100 max-fr=15	[RFC4566]	
a=simulcast: send 98;100	[I-D.ietf-mmusic-sdp-simulc	
	ast] Alice can send 2	
	resolutions	
a=ssrc:12345	[RFC5576] [RFC7022]	
cname:axzo1278npDlAzM73	Camera-1, Encoding-1 SSRC	

a=ssrc:45678	with Session CNAME
cname:axzo1278npDlAzM73	[RFC5576] [RFC7022]
	Camera-1,Encoding-2 SSRC
a=sendonly	with Session CNAME
	[RFC3264] - Send only video
a=rtcp-mux	stream
a=bundle-only	[RFC5761]
a=rtcp-fb:98 nack	[UNIFIED-PLAN]
a=rtcp-fb:98 nack pli	[RFC5104]
a=rtcp-fb:98 ccm fir	[RFC5104]
a=rtcp-fb:100 nack	[RFC5104]
a=rtcp-fb:100 nack pli	[RFC5104]
a=rtcp-fb:100 ccm fir	[RFC5104]
a=rtcp-rsize	[RFC5506]
m=video 0 UDP/TLS/RTP/SAVPF 101 102	bundle-only video line with
	port number set to zero
c=IN IP4 24.23.204.141	[RFC4566]
a=msid:ma tc	Identifies RTCMediaStream
	ID (ma) and
a=rtcp:64678 IN IP4 24.23.204.141	RTCMediaStreamTrack ID (tc)
a=mid:m2	[RFC3605]
	[RFC5888] Video m=line part
a=rtpmap:101 H264/90000	of BUNDLE group
a=rtpmap:102 H264/90000	[RFC3984]
a=fmtp:101 profile-level-id=4d0028	[RFC3984]
;packetization-mode=1;max-fr=30	[RFC3984]Camera-2,Encoding-
a=fmtp:102 profile-level-id=4d0028	1 Resolution
;packetization-mode=1;max-fr=15	[RFC3984]Camera-2,Encoding-
a=simulcast: send 101;102	2 Resolution
	[I-D.ietf-mmusic-sdp-simulc
a=ssrc:67890	ast]
cname:axzo1278npDlAzM73	[RFC5576] [RFC7022]
	Camera-2,Encoding-1 SSRC
a=ssrc:56789	with Session CNAME
cname:axzo1278npDlAzM73	[RFC5576] [RFC7022]
	Camera-2,Encoding-2 SSRC
a=sendonly	with Session CNAME
	[RFC3264] - Send only video
a=rtcp-mux	stream
a=bundle-only	[RFC5761]
a=rtcp-fb:101 nack	[UNIFIED-PLAN]
a=rtcp-fb:101 nack pli	[RFC5104]
a=rtcp-fb:101 ccm fir	[RFC5104]
a=rtcp-fb:102 nack	[RFC5104]
a=rtcp-fb:102 nack pli	[RFC5104]
a=rtcp-fb:102 ccm fir	[RFC5104]

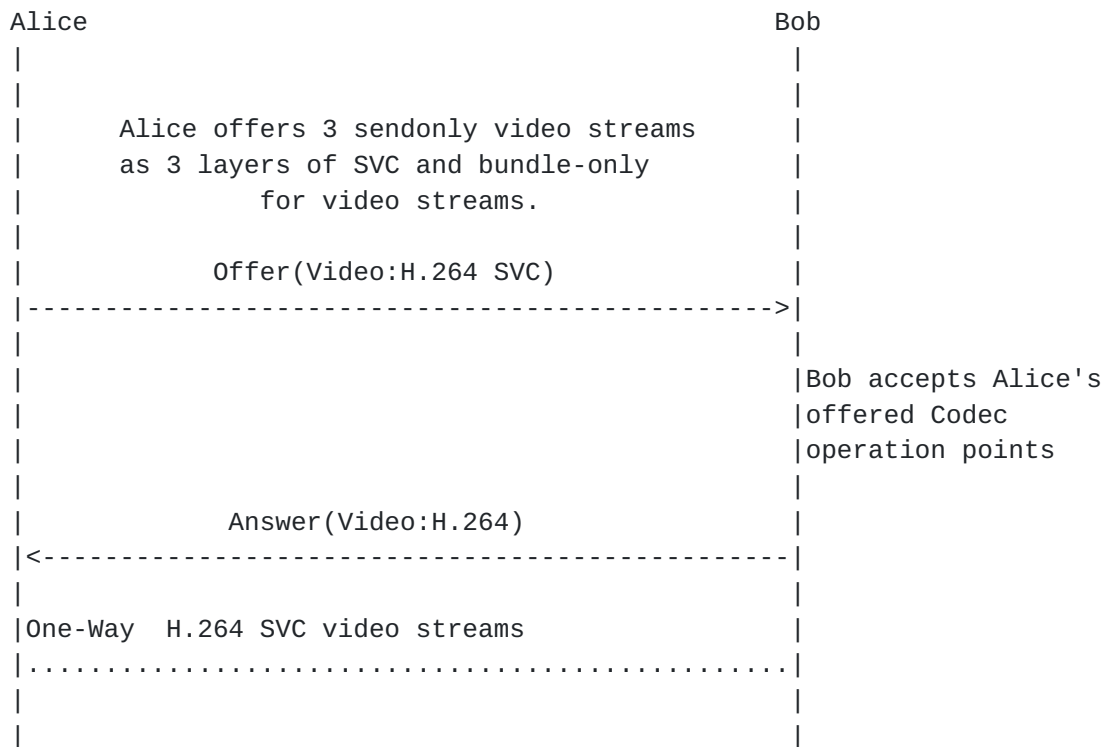
a=rtcp-rsize	[RFC5506]	
+-----+-----+		

Table 26: 5.3.1 SDP 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=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE m0 m1 m2	[I-D.ietf-mmusic-sdp-bundle
	-negotiation] Alice
	supports grouping of
	m=lines under BUNDLE
	semantics
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ic
	e]
m=audio 49203 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 98.248.92.77	[RFC4566]
a=rtcp:60065 IN IP4 98.248.92.77	[RFC3605]
a=mid:m0	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream
	ID (ma) and
	RTCMediaStreamTrack ID (ta)
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-level	[RFC6464]
a=rtcp-fb:109 nack	[RFC5104]
a=ptime:20	[I-D.ietf-payload-rtp-opus]
a=recvonly	[RFC3264]
a=setup:active	[RFC4145]
a=rtcp-mux	[RFC5761]
a=ssrc:2222	[RFC5576]
cname:y8/C90a1EocUG1f0fcg	
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 2 UDP 2113667327 192.168.1.7 49203 typ host	[RFC5245]
a=candidate:1 2 UDP 694302207 98.248.92.77 49203 typ srflx raddr 192.168.1.4 rport 49203	[RFC5245]

a=rtcp-rsize	[RFC5506]	
m=video 49203 UDP/TLS/RTP/SAVPF 98	BUNDLE accepted with port	
100	repeated from the audio	
	port	
c=IN IP4 98.248.92.77	[RFC4566]	
a=msid:ma tb	Identifies RTCMediaStream	
	ID (ma) and	
	RTCMediaStreamTrack ID (tb)	
a=rtcp:60065 IN IP4 98.248.92.77	[RFC3605]	
a=mid:m1	[RFC5888] Video m=line part	
	of BUNDLE group	
a=rtpmap:98 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:100 VP8/90000	[I-D.ietf-payload-vp8]	
a=imageattr:98 [x=1280,y=720]	[RFC6236] Camera-1, Encoding-	
	1 Resolution	
a=fmtp:98 max-fr=30	[RFC4566]	
a=imageattr:100 [x=640,y=480]	[RFC6236]	
	Camera-1, Encoding-2	
	Resolution	
a=fmtp:100 max-fr=15	[RFC4566]	
a=recvonly	[RFC3264] - receive only	
	video stream	
a=simulcast: recv 98;100	[I-D.ietf-mmusic-sdp-simulc	
	ast]	
a=ssrc:54321	[RFC5576]	
cname:y8/C90a1EocUG1f0fcg		
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-pwd:de4e99bd291c325921d5d47ef	[RFC5245]	
babd9a2		
a=fingerprint:sha-1 99:41:49:83:4a:	[RFC5245]	
97:0e:1f:ef:6d:f7:c9:c7:70:9d:		
1f:66:79:a8:07		
a=candidate:0 2 UDP 2113667326	[RFC5245]	
192.168.1.7 60065 typ host		
a=candidate:1 2 UDP 1694302206	[RFC5245]	
98.248.92.77 60065 typ srflx raddr		
192.168.1.4 rport 60065		
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5576]	
a=bundle-only	[UNIFIED-PLAN]	
a=rtcp-rsize	[RFC5506]	
m=video 54609 UDP/TLS/RTP/SAVPF 101	BUNDLE accepted with port	
102	repeated from the audio	
	port	
c=IN IP4 98.248.92.77	[RFC4566]	
a=rtcp:56503 IN IP4 98.248.92.77	[RFC3605]	
a=msid:ma tc	Identifies RTCMediaStream	
	ID (ma) and	

SVC Session - 3 Layers w/BUNDLE



SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE m0 m1	[I-D.ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=rtcp:64678 IN IP4 24.23.204.141	[RFC3605]
a=mid:m0	[RFC5888] Audio m=line part of

	BUNDLE group with a unique	
	port number	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdnext:ssrc-audio-level		
a=ptime:20	[I-D.ietf-payload-rtp-opus]	
a=sendonly	[RFC3264]	
a=rtcp-fb:109 nack	[RFC5104]	
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3-	[RFC5245]	
474af08a068		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:1 1 UDP 694302207	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 54609		
a=candidate:0 2 UDP 2113667326	[RFC5245]	
192.168.1.4 64678 typ host		
a=candidate:1 2 UDP 1694302206	[RFC5245]	
24.23.204.141 64678 typ srflx		
raddr 192.168.1.4 rport 64678		
a=ssrc:67890	[RFC5576]	
cname:axzo1278npDlAzM73		
a=rtcp-rsize	[RFC5506]	
m=video 0 UDP/TLS/RTP/SAVPF 96	bundle-only video line with	
97 100	port number set to zero	
c=IN IP4 24.23.204.141	[RFC4566]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tc)	
a=rtcp:64678 IN IP4	[RFC3605]	
24.23.204.141		
a=mid:m1	[RFC5888] Audio m=line part of	
	BUNDLE group	
a=msid:ma tb		
a=rtpmap:96 H264/90000	[RFC3984]	
a=fmtp:96 profile-level-	[RFC3984] H.264 Layer 1	
id=4d0028; packetization-mode=1		
;max-fr=30;max-fs=8040		
a=rtpmap:97 H264/90000	[RFC3984]	
a=fmtp:97 profile-level-	[RFC3984] H.264 Layer 2	
id=4d0028;packetization-mode=1;		
max-fr=15;max-fs=1200		

a=rtpmap:100 H264-SVC/90000	[RFC3984]	
a=fmtp:100 profile-level-	[RFC3984]	
id=4d0028;packetization-mode=1;		
max-fr=30;max-fs=8040		
a=depend:100 lay m1:96,97;	[RFC5583]Layer 3 dependent on	
	layers 1 and 2	
a=sendonly	[RFC3264] - Send only video	
	stream	
a=rtcp-mux	[RFC5761]	
a=bundle-only	[UNIFIED-PLAN]	
a=ssrc:1732846380	[RFC5576]	
cname:axzo1278npDlAzM73		
a=ssrc:1732846381	[RFC5576]	
cname:axzo1278npDlAzM73		
a=ssrc:1732846382	[RFC5576]	
cname:axzo1278npDlAzM73		
a=rtcp-fb:* nack	[RFC5104]	
a=rtcp-fb:* nack pli	[RFC5104]	
a=rtcp-fb:* ccm fir	[RFC5104]	
a=rtcp-rsize	[RFC5506]	
+-----+		

Table 28: 5.3.2 SDP Offer with SVC

SDP Contents	RFC#/Notes	
+-----+		
v=0	[RFC4566]	
o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]	
s=-	[RFC4566]	
t=0 0	[RFC4566]	
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]	
a=group:BUNDLE m0 m1	[I-D.ietf-mmusic-sdp-bundle-negotiation]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
109		
c=IN IP4 98.248.92.77	[RFC4566]	
a=msid:ma ta	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (ta)	
a=rtcp:60065 IN IP4 98.248.92.77	[RFC3605]	
a=mid:m0	[RFC5888]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=ptime:20	[I-D.ietf-payload-rtp-opus]	
a=rtcp-fb:109 nack	[RFC5104]	

a=recvonly	[RFC3264]	
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]	
474af08a068		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 2 UDP 2113667326	[RFC5245]	
192.168.1.7 60065 typ host		
a=candidate:1 2 UDP 1694302206	[RFC5245]	
98.248.92.77 60065 typ srflx		
raddr 192.168.1.5 rport 60065		
a=rtcp-rsize	[RFC5506]	
m=video 54609 UDP/TLS/RTP/SAVPF	BUNDLE accepted Bundle address	
96 100	same as audio m=line.	
c=IN IP4 98.248.92.77	[RFC4566]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=rtcp:56503 IN IP4 98.248.92.77	[RFC3605]	
a=mid:m1	[RFC5888] Video m=line part of	
	BUNDLE group	
a=rtpmap:96 H264/90000	[RFC3984]	
a=fmtp:96 profile-level-	[RFC3984] H.264 Layer 1	
id=4d0028;packetization-mode=1;		
max-fr=30;max-fs=8040		
a=rtpmap:100 H264-SVC/90000	[RFC3984]	
a=fmtp:100 profile-level-	[RFC3984]	
id=4d0028;packetization-mode=1;		
max-fr=30;max-fs=8040		
a=depend:100 lay m1:96;	[RFC5583] Bob chooses 2 Codec	
	Operation points	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]	
474af08a068		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 2 UDP 2113667326	[RFC5245]	
192.168.1.5 64678 typ host		
a=candidate:1 2 UDP 1694302206	[RFC5245]	
24.23.204.142 64678 typ srflx		
raddr 192.168.1.5 rport 64678		
a=recvonly	[RFC3264] - Receive only video	
	stream	
a=setup:active	[RFC4145]	

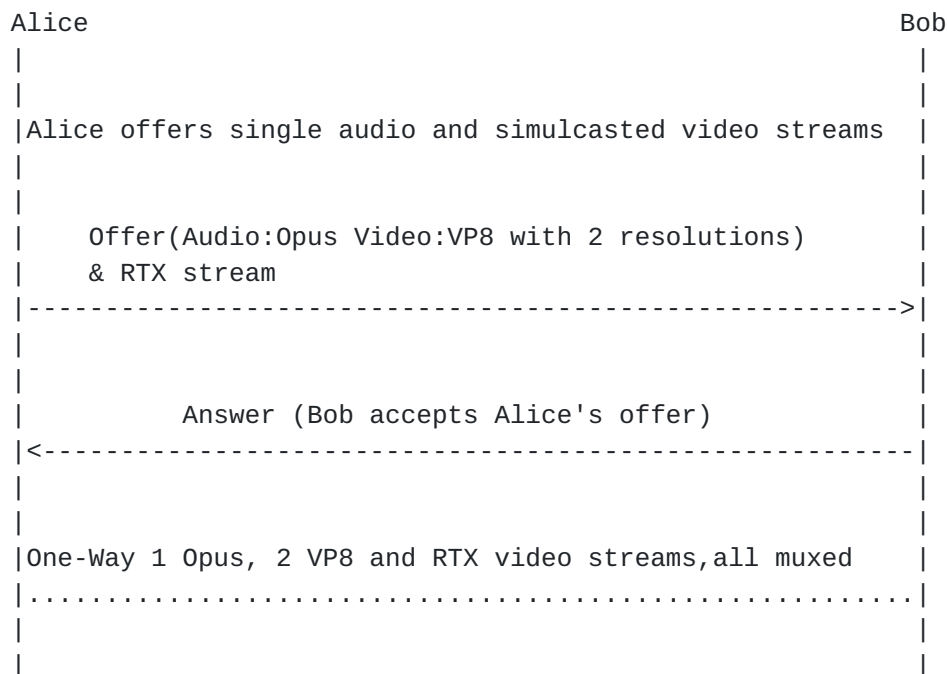
a=rtcp-mux	[RFC5761]	
a=bundle-only	[UNIFIED-PLAN]	
a=ssrc:4638117328	[RFC5576]	
cname:axzo1278npDlAzM73		
a=rtcp-rsize	[RFC5506]	
+-----+-----+-----+		

Table 29: 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 2 two resolutions and has [[RFC4588](#)] style retransmission flows.

Simulcast Streams with Retransmission



SDP Contents	RFC#/Notes	
+-----+-----+-----+		
v=0	[RFC4566]	
o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]	
s=-	[RFC4566]	
t=0 0	[RFC4566]	
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]	

a=group:BUNDLE m0 m1	[I-D.ietf-mmusic-sdp-bundle-ne
	gotiation] Alice supports
	grouping of m=lines under
	BUNDLE semantics
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
m=audio 54609 UDP/TLS/RTP/SAVPF	[RFC4566]
109	
c=IN IP4 24.23.204.141	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID
	(ma) and RTCMediaStreamTrack
	ID (ta)
a=rtcp:64678 IN IP4	[RFC3605]
24.23.204.141	
a=mid:m0	[RFC5888] Audio m=line part of
	BUNDLE group with a unique
	port number
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]
hdext:ssrc-audio-level	
aptime:20	[I-D.ietf-payload-rtp-opus]
a=rtcp-fb:109 nack	[RFC5104]
a=sendonly	[RFC3264]
a=setup:actpass	[RFC4145]
a=rtcp-mux	[RFC5761]
a=ssrc:11111	[RFC5576]
cname:EocUG1f0fcg/yvY7	
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]
474af08a068	
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]
4a:97:0e:1f:ef:6d:f7:c9:c7:	
70:9d:1f:66:79:a8:07	
a=candidate:0 1 UDP 2113667327	[RFC5245]
192.168.1.4 54609 typ host	
a=candidate:1 1 UDP 694302207	[RFC5245]
24.23.204.141 54609 typ srflx	
raddr 192.168.1.4 rport 54609	
a=candidate:0 2 UDP 2113667326	[RFC5245]
192.168.1.4 64678 typ host	
a=candidate:1 2 UDP 1694302206	[RFC5245]
24.23.204.141 64678 typ srflx	
raddr 192.168.1.4 rport 64678	
a=rtcp-rsize	[RFC5506]
m=video 0 UDP/TLS/RTP/SAVPF 98	bundle-only video line with
100 101 103	port number set to zero
c=IN IP4 24.23.204.141	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID
	(ma) and RTCMediaStreamTrack

	ID (tb)	
a=rtcp:64678 IN IP4	[RFC3605]	
24.23.204.141		
a=mid:m1	[RFC5888]	
a=rtpmap:98 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:100 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:101 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:103 VP8/90000	[I-D.ietf-payload-vp8]	
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=3000	[RFC4588]	
a=fmtp:103 apt=100;rtx-time=3000	[RFC4588]	
a=simulast: send 98;100	[I-D.ietf-mmusic-sdp-simulcast]	
	]	
a=ssrc-group:FID 12345 34567	[RFC5888]	
a=ssrc-group:FID 78990 90887	[RFC5888]	
a=ssrc:12345	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=ssrc:78990	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=ssrc:34567	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=ssrc:90887	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=sendonly	[RFC3264]	
a=rtcp-mux	[RFC5761]	
a=bundle-only	[UNIFIED-PLAN]	
a=rtcp-fb:* nack	[RFC5104]	
a=rtcp-fb:* nack pli	[RFC5104]	
a=rtcp-fb:* ccm fir	[RFC5104]	
a=rtcp-rsize	[RFC5506]	
+-----+	+-----+	+-----+

Table 30: 5.3.3 SDP Offer w/Simulcast, RTX

	SDP Contents	RFC#/Notes	
+-----+	+-----+	+-----+	+-----+
	v=0	[RFC4566]	
	o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]	
	s=-	[RFC4566]	
	t=0 0	[RFC4566]	
	a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]	
	a=group:BUNDLE m0 m1	[I-D.ietf-mmusic-sdp-bundle-ne]	
		gotiation] Alice supports	
		grouping of m=lines under	
		BUNDLE semantics	
	a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	

m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
109		
c=IN IP4 98.248.92.77	[RFC4566]	
a=msid:ma ta	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (ta)	
a=rtcp:60065 IN IP4 98.248.92.77	[RFC3605]	
a=mid:m0	[RFC5888]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdrext:ssrc-audio-level		
a=ptime:20	[I-D.ietf-payload-rtp-opus]	
a=rtcp-fb:109 nack	[RFC5104]	
a=recvonly	[RFC3264]	
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=ssrc:33333	[RFC5576]	
cname:L/HmN4Xa5Nws1ao1		
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]	
474af08a068		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 2 UDP 2113667326	[RFC5245]	
192.168.1.7 64678 typ host		
a=candidate:1 2 UDP 1694302206	[RFC5245]	
98.248.92.77 64678 typ srflx		
raddr 192.168.1.7 rport 60065		
a=rtcp-rsize	[RFC5506]	
m=video 49203 UDP/TLS/RTP/SAVPF	BUNDLE accepted with Bundle	
98 100 101 103	address identical to audio	
	m-line	
c=IN IP4 98.248.92.77	[RFC4566]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=rtcp:60065 IN IP4 98.248.92.77	[RFC3605]	
a=mid:m1	[RFC5888] Video m=line part of	
	BUNDLE group	
a=rtpmap:98 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:100 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:101 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:103 VP8/90000	[I-D.ietf-payload-vp8]	
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=3000	[RFC4588]	
a=fmtp:103 apt=100;rtx-time=3000	[RFC4588]	

a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]	
474af08a068		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:		
70:9d:1f:66:79:a8:07		
a=candidate:0 2 UDP 2113667326	[RFC5245]	
192.168.1.7 60065 typ host		
a=candidate:1 2 UDP 1694302206	[RFC5245]	
98.248.92.772 60065 typ srflx		
raddr 192.168.1.7 rport 60065		
a=simulcast: recv 98;100	[I-D.ietf-mmusic-sdp-simulcast	
	]	
a=recvonly	[RFC3264]	
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=bundle-only	[UNIFIED-PLAN]	
a=rtcp-fb:* nack	[RFC5104]	
a=rtcp-fb:* nack pli	[RFC5104]	
a=rtcp-fb:* ccm fir	[RFC5104]	
a=rtcp-rsize	[RFC5506]	
+-----+-----+-----+		

Table 31: 5.3.3 SDP Answer w/Simulcast, RTX

5.3.4. Successful 1-way Simulcast Sessio with 2 resolutions and RTX - One resolution rejected

This section shows an SDP Offer/Answer exchange for a simulcast scenario with 2 two resolutions.

It also showcases when Bob rejects one of the Simulcast Video Stream 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) |
| <-----|
|                                                         |
|                                                         |
| 1-way audio, video session and its associated RTX stream, |
| all multiplexed                                         |
| .....|
|                                                         |
|                                                         |

```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE m0 m1	[I-D.ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=rtcp:64678 IN IP4	[RFC3605]

24.23.204.141		
a=mid:m0	[RFC5888]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=extmap:1 urn:ietf:params:rtp-hdrext:ssrc-audio-level	[RFC6464]	
aptime:20	[I-D.ietf-payload-rtp-opus]	
a=rtcp-fb:109 nack	[RFC5104]	
a=sendonly	[RFC3264]	
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=ssrc:11111	[RFC5576]	
cname:LP/NWs1ao1HmN4Xa5		
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]	
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]	
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]	
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx	[RFC5245]	
raddr 192.168.1.4 rport 54609		
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]	
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx	[RFC5245]	
raddr 192.168.1.4 rport 64678		
a=rtcp-rsize	[RFC5506]	
m=video 0 UDP/TLS/RTP/SAVPF 98 100 101 103	bundle-only video line with port number set to zero	
c=IN IP4 24.23.204.141	[RFC4566]	
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)	
a=rtcp:64678 IN IP4 24.23.204.141	[RFC3605]	
a=mid:m1	[RFC5888]	
a=rtpmap:98 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:100 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:101 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:103 VP8/90000	[I-D.ietf-payload-vp8]	
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=3000	[RFC4588]	
a=fmtp:103 apt=100;rtx-time=3000	[RFC4588]	
a=simulcast: send 98;100	[I-D.ietf-mmusic-sdp-simulcast]	
	]	

a=ssrc-group:FID 12345 34567	[RFC5888]	
a=ssrc-group:FID 78990 90887	[RFC5888]	
a=ssrc:12345	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=ssrc:78990	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=ssrc:34567	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=ssrc:90887	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=sendonly	[RFC3264]	
a=rtcp-mux	[RFC5761]	
a=bundle-only	[UNIFIED-PLAN]	
a=rtcp-fb:* nack	[RFC5104]	
a=rtcp-fb:* nack pli	[RFC5104]	
a=rtcp-fb:* ccm fir	[RFC5104]	
a=rtcp-rsize	[RFC5506]	
+-----+-----+		

Table 32: 5.3.4 SDP Offer w/Simulcast, RTX

SDP Contents	RFC#/Notes	
+-----+-----+		
v=0	[RFC4566]	
o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]	
s=-	[RFC4566]	
t=0 0	[RFC4566]	
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]	
a=group:BUNDLE m0 m1	[I-D.ietf-mmusic-sdp-bundle-ne	
	gotiation] Alice supports	
	grouping of m=lines under	
	BUNDLE semantics	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
109		
c=IN IP4 98.248.92.77	[RFC4566]	
a=msid:ma ta	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (ta)	
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]	
a=mid:m0	[RFC5888]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=ptime:20	[I-D.ietf-payload-rtp-opus]	
a=recvonly	[RFC3264]	
a=setup:active	[RFC4145]	

a=rtcp-mux	[RFC5761]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 98.248.92.77 60065 typ srflx raddr 192.168.1.7 rport 60065	[RFC5245]
a=rtcp-rsize	[RFC5506]
m=video 49203 UDP/TLS/RTP/SAVPF 98 101	BUNDLE accepted with Bundle address identical to audio m-line
c=IN IP4 98.248.92.77	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
a=rtcp:60065 IN IP4 98.248.92.77	[RFC3605]
a=mid:m1	[RFC5888]
a=rtpmap:98 VP8/90000	[I-D.ietf-payload-vp8]
a=rtpmap:101 VP8/90000	[I-D.ietf-payload-vp8]
a=fmtp:98 max-fr=30;max-fs=8040	[RFC4566]
a=fmtp:101 apt=98;rtx-time=3000	[RFC4588]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 98.248.92.77 60065 typ srflx raddr 192.168.1.5 rport 60065	[RFC5245]
a=simulcast: recv 98	[I-D.ietf-mmusic-sdp-simulcast] Bob accepts only one simulcast resolution
a=ssrc:54321	[RFC5576]
cname:Nws1ao1HmN4Xa5	
a=recvonly	[RFC3264]
a=setup:active	[RFC4145]
a=rtcp-mux	[RFC5761]
a=bundle-only	[UNIFIED-PLAN]
a=rtcp-rsize	[RFC5506]

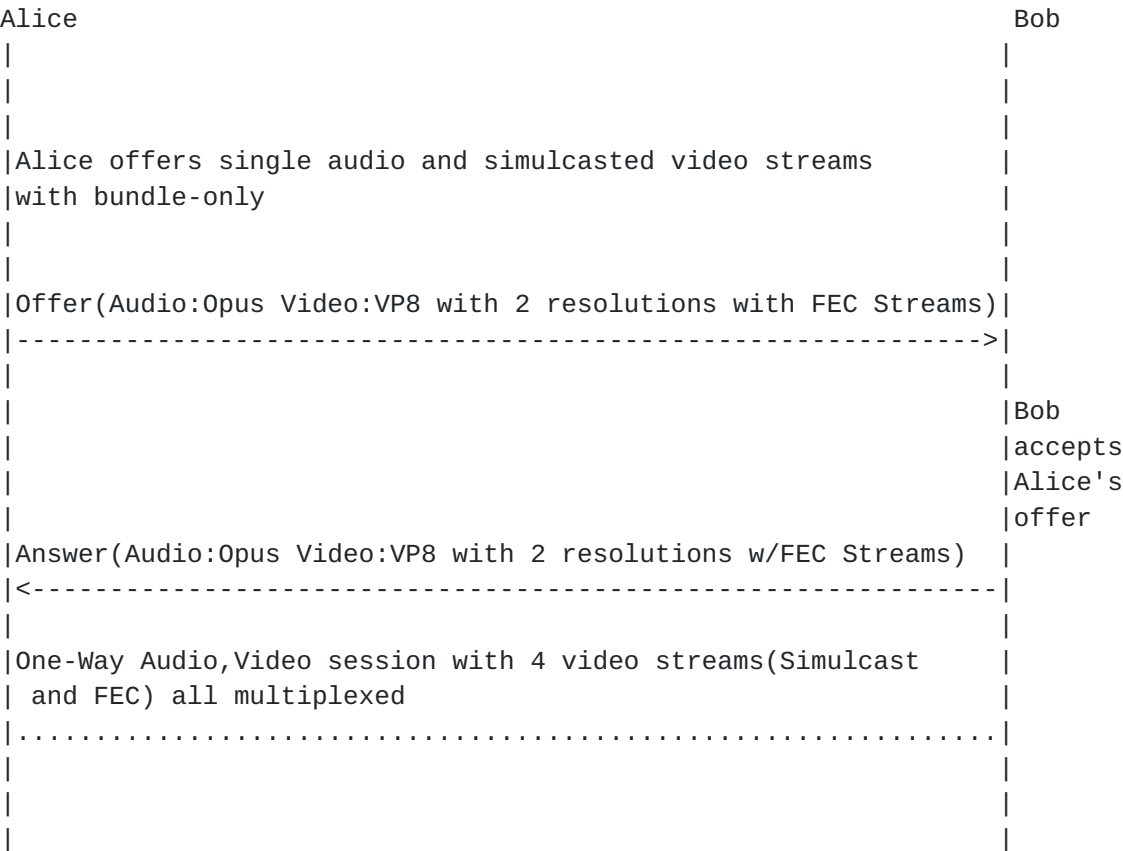
Table 33: 5.3.4 SDP Answer no Simulcast

5.3.5. Simulcast Video Session with Forward Error Correction

This section shows an SDP Offer/Answer exchange for Simulcast video stream at two resolutions and has [RFC5956] style FEC flows.

On completion of the Offer/Answer exchange mechanism we end up one audio stream, 2 simulcast video streams and 2 associated FEC streams are sent over a single 5-tuple.

Simulcast Streams with Forward Error Correction



SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]

a=group:BUNDLE m0 m1	[I-D.ietf-mmusic-sdp-bundle-ne
	gotiation] Alice supports
	grouping of m=lines under
	BUNDLE semantics
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
m=audio 54609 UDP/TLS/RTP/SAVPF	[RFC4566]
109	
c=IN IP4 24.23.204.141	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID
	(ma) and RTCMediaStreamTrack
	ID (ta)
a=rtcp:64678 IN IP4	[RFC3605]
24.23.204.141	
a=mid:m0	[RFC5888]
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]
hdext:ssrc-audio-level	
a=ptime:20	[I-D.ietf-payload-rtp-opus]
a=rtcp-fb:109 nack	[RFC5104]
a=sendonly	[RFC3264]
a=setup:actpass	[RFC4145]
a=rtcp-mux	[RFC5761]
a=ssrc:11111	[RFC5576]
cname:Q/NWslao1HmN4Xa5	
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]
474af08a068	
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]
4a:97:0e:1f:ef:6d:f7:c9:c7:70:	
9d:1f:66:79:a8:07	
a=candidate:0 1 UDP 2113667327	[RFC5245]
192.168.1.4 54609 typ host	
a=candidate:1 1 UDP 694302207	[RFC5245]
24.23.204.141 54609 typ srflx	
raddr 192.168.1.4 rport 54609	
a=candidate:0 2 UDP 2113667326	[RFC5245]
192.168.1.4 64678 typ host	
a=candidate:1 2 UDP 1694302206	[RFC5245]
24.23.204.141 64678 typ srflx	
raddr 192.168.1.4 rport 64678	
a=rtcp-rsize	[RFC5506]
m=video 0 UDP/TLS/RTP/SAVPF 98	bundle-only video line with
100 101 103	port number set to zero
c=IN IP4 24.23.204.141	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID
	(ma) and RTCMediaStreamTrack
	ID (tb)
a=rtcp:64678 IN IP4	[RFC3605]

24.23.204.141		
a=mid:m1	[RFC5888] Video m=line part of	
	BUNDLE group	
a=rtpmap:98 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:100 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:101 1d-interleaved-	[RFC5956]	
parityfec/90000		
a=rtpmap:103 1d-interleaved-	[RFC5956]	
parityfec/90000		
a=fmtp:98 max-fr=30;max-fs=8040	[RFC4566]	
a=fmtp:100 max-fr=15;max-fs=1200	[RFC4566]	
a=fmtp:101 L=5; D=10; repair-	[RFC5956]	
window=200000		
a=fmtp:103 L=5; D=10; repair-	[RFC5956]	
window=200000		
a=simulcast: send 98;100	[I-D.ietf-mmusic-sdp-simulcast	
	]	
a=depend:98 fec m1:101	TBD	
a=depend:100 fec m1:103	TBD	
a=ssrc-group:FEC-FR 12345 34567	[RFC5888]	
a=ssrc-group:FEC-FR 78990 90887	[RFC5888]	
a=ssrc:12345	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=ssrc:78990	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=ssrc:34567	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=ssrc:90887	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=sendonly	[RFC3264]	
a=rtcp-mux	[RFC5761]	
a=bundle-only	[UNIFIED-PLAN]	
a=rtcp-fb:* nack	[RFC5104]	
a=rtcp-fb:* nack pli	[RFC5104]	
a=rtcp-fb:* ccm fir	[RFC5104]	
a=rtcp-rsize	[RFC5506]	
+-----+-----+		

Table 34: 5.3.5 SDP 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=msid-semantic:WMS m0	[I-D.ietf-mmusic-msid]	

a=group:BUNDLE m0 m1	[I-D.ietf-mmusic-sdp-bundle-ne
	gotiation]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]
109	
c=IN IP4 98.248.92.77	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID
	(ma) and RTCMediaStreamTrack
	ID (ta)
a=rtcp:60065 IN IP4 98.248.92.77	[RFC3605]
a=mid:m0	[RFC5888] Audio m=line part of
	BUNDLE group with a unique
	port number
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]
hdext:ssrc-audio-level	
a=ptime:20	[I-D.ietf-payload-rtp-opus]
a=rtcp-fb:109 nack	[RFC5104]
a=recvonly	[RFC3264]
a=setup:active	[RFC4145]
a=rtcp-mux	[RFC5761]
a=ssrc:33333	[RFC5576]
cname:Y9/cZke09JAtp198	
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]
474af08a068	
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]
4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d	
: 1f:66:79:a8:07	
a=candidate:0 2 UDP 2113667326	[RFC5245]
192.168.1.7 60065 typ host	
a=candidate:1 2 UDP 1694302206	[RFC5245]
98.248.92.77 60065 typ srflx	
raddr 192.168.1.7 rport 60065	
a=rtcp-rsize	[RFC5506]
m=video 49203 UDP/TLS/RTP/SAVPF	BUNDLE accepted with Bundle
98 100 101 103	Address identical to audio
	m=line.
c=IN IP4 98.248.92.77	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID
	(ma) and RTCMediaStreamTrack
	ID (tb)
a=rtcp:60065 IN IP4 98.248.92.77	[RFC3605]
a=mid:m1	[RFC5888] Video m=line part of
	BUNDLE group
a=rtpmap:98 VP8/90000	[I-D.ietf-payload-vp8]
a=rtpmap:100 VP8/90000	[I-D.ietf-payload-vp8]
a=rtpmap:101 1d-interleaved-	[RFC5956]

parityfec/90000		
a=rtpmap:103 1d-interleaved-	[RFC5956]	
parityfec/90000		
a=fmtp:98 max-fr=30;max-fs=8040	[RFC4566]	
a=fmtp:100 max-fr=15;max-fs=1200	[RFC4566]	
a=fmtp:101 L=5; D=10; repair-	[RFC5956]	
window=200000		
a=fmtp:103 L=5; D=10; repair-	[RFC5956]	
window=200000		
a=simulcast: recv 98;100	[I-D.ietf-mmusic-sdp-simulcast	
	]	
a=depend:98 fec m1:101	TBD	
a=depend:100 fec m1:103	TBD	
a=recvonly	[RFC3264]	
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=bundle-only	[UNIFIED-PLAN]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]	
474af08a068		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 2 UDP 2113667326	[RFC5245]	
192.168.1.7 60065 typ host		
a=candidate:1 2 UDP 1694302206	[RFC5245]	
98.248.92.77 60065 typ srflx		
raddr 192.168.1.7 rport 60065		
a=rtcp-fb:* nack	[RFC5104]	
a=rtcp-fb:* nack pli	[RFC5104]	
a=rtcp-fb:* ccm fir	[RFC5104]	
a=rtcp-rsize	[RFC5506]	
+-----+-----+		

Table 35: 5.3.5 SDP Answer

5.4. Others

The examples in the section provide SDP for a variety of scenarios related to RTP Header extension, 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.

2-Way Audio with VAD

Alice	Bob
Alice indicates support for including	
audio level in RTP header	
Offer(Audio:Opus, PCMU, PCMA)	
----->	
Answer(Audio:Opus, PCMU, PCMA)	
<-----	
	Bob accepts and
	indicates his
	support as well
Two way Opus Audio	
.....	
Per packet audio-level is included in the	
RTP header	

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE audio	[I-D.ietf-mmusic-sdp-bundle-negotiation]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
m=audio 54609 UDP/TLS/RTP/SAVPF	[RFC4566]
109 0 8	
c=IN IP4 24.23.204.141	[RFC4566]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=rtcp:64678 IN IP4	[RFC3605]
24.23.204.141	

a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdrext:ssrc-audio-level		
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=ptime:20	[I-D.ietf-payload-rtp-opus]	
a=rtpmap:0 PCMU/8000	[RFC3551]	
a=rtpmap:0 PCMA/8000	[RFC3551]	
a=sendrecv	[RFC3264]	
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]	
474af08a068		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:		
70:9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:1 1 UDP 694302207	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 54609		
a=candidate:0 2 UDP 2113667326	[RFC5245]	
192.168.1.4 64678 typ host		
a=candidate:1 2 UDP 1694302206	[RFC5245]	
24.23.204.141 64678 typ srflx		
raddr 192.168.1.4 rport 64678		
a=rtcp-fb:* nack	[RFC5104]	
a=ssrc:11111	[RFC5576]	
cname:QCL/1HmN4Xa5CClapa		
a=rtcp-rsize	[RFC5506]	
+-----+-----+		

Table 36: 5.4.1 SDP Offer

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=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]	
a=group:BUNDLE audio	[I-D.ietf-mmusic-sdp-bundle-ne	
	gotiation]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
109 0 98		
c=IN IP4 98.248.92.77	[RFC4566]	

a=mid:audio	[RFC5888]	
a=msid:ma ta	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (ta)	
a=rtcp:60065 IN IP4 98.248.92.77	[RFC3605]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus] -	
	Bob accepts only Opus Codec	
a=ptime:20	[I-D.ietf-payload-rtp-opus]	
a=rtpmap:0 PCMU/8000	[RFC3551] PCMU Audio Codec	
a=rtpmap:0 PCMA/8000	[RFC3551] PCMA Audio Codec	
a=rtcp-fb:* nack	[RFC5104]	
a=sendrecv	[RFC3264] - Bob can send and	
	recv audio	
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761] - Bob can perform	
	RTP/RTCP Muxing on port 49203	
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-pwd:de4e99bd291c325921d5d4	[RFC5245]	
7efbabd9a2		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.7 49203 typ host		
a=candidate:1 1 UDP 1694302207	[RFC5245]	
98.248.92.77 49203 typ srflx		
raddr 192.168.1.7 rport 49203		
a=ssrc:1732846380	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=rtcp-rsize	[RFC5506]	
+-----+-----+-----+		

Table 37: 5.4.1 SDP Answer

5.4.2. Audio Conference - Voice Activity Detection

This example shows SDP for 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	Mixer
Alice indicates her interest to audio	
levels for the contributing sources	
Offer(Audio:Opus, PCMU, PCMA)	
----->	
Answer(Audio:Opus, PCMU, PCMA)	
<-----	
	Mixer indicates
	it can provide
	audio-levels
Two way Opus Audio	
.....	
Audio-levels per CSRCS is included in the	
RTP header	

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=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE audio	[I-D.ietf-mmusic-sdp-bundle-negotiation]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
m=audio 54609 UDP/TLS/RTP/SAVPF 109 0 8	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=rtcp:64678 IN IP4 24.23.204.141	[RFC3605]
a=extmap:1/recvonly	[RFC6465]

urn:ietf:params:rtp-hdext:csrc-		
audio-level		
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
aptime:20	[I-D.ietf-payload-rtp-opus]	
a=rtpmap:0 PCMU/8000	[RFC3551] PCMU Audio Codec	
a=rtpmap:0 PCMA/8000	[RFC3551] PCMA Audio Codec	
a=rtcp-fb:* nack	[RFC5104]	
a=sendrecv	[RFC3264] - Alice can send and	
	recv audio	
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3	[RFC5245]	
474af08a068		
a=fingerprint:sha-1 99:41:49:83:	[RFC5245]	
4a:97:0e:1f:ef:6d:f7:c9:c7:70:		
9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 54609 typ host		
a=candidate:1 1 UDP 694302207	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 54609		
a=candidate:0 2 UDP 2113667326	[RFC5245]	
192.168.1.4 64678 typ host		
a=candidate:1 2 UDP 1694302206	[RFC5245]	
24.23.204.141 64678 typ srflx		
raddr 192.168.1.4 rport 64678		
a=ssrc:11111	[RFC5576]	
cname:QCL/1HmN4Xa5CClapa		
a=rtcp-rsize	[RFC5506]	
+-----+-----+-----+		

Table 38: 5.4.2 SDP Offer

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=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE audio	[I-D.ietf-mmusic-sdp-bundle-negotiation]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
m=audio 49203 UDP/TLS/RTP/SAVPF 109 0 98	[RFC4566]
c=IN IP4 98.248.92.77	[RFC4566]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=rtcp:60065 IN IP4 98.248.92.77	[RFC3605]
a=extmap:1/sendonly	[RFC6465]
urn:ietf:params:rtp-hdrext:csrc-audio-level	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=ptime:20	[I-D.ietf-payload-rtp-opus]
a=rtpmap:0 PCMU/8000	[RFC3551] PCMU Audio Codec
a=rtpmap:0 PCMA/8000	[RFC3551] PCMA Audio Codec
a=rtcp-fb:* nack	[RFC5104]
a=sendrecv	[RFC3264]
a=setup:active	[RFC4145]
a=rtcp-mux	[RFC5761]
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.7 49203 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 98.248.92.77 49203 typ srflx	[RFC5245]
raddr 192.168.1.7 rport 49203	
a=ssrc:2222 cname:HmN4Xa5CC/lapa	[RFC5576]
a=rtcp-rsize	[RFC5506]

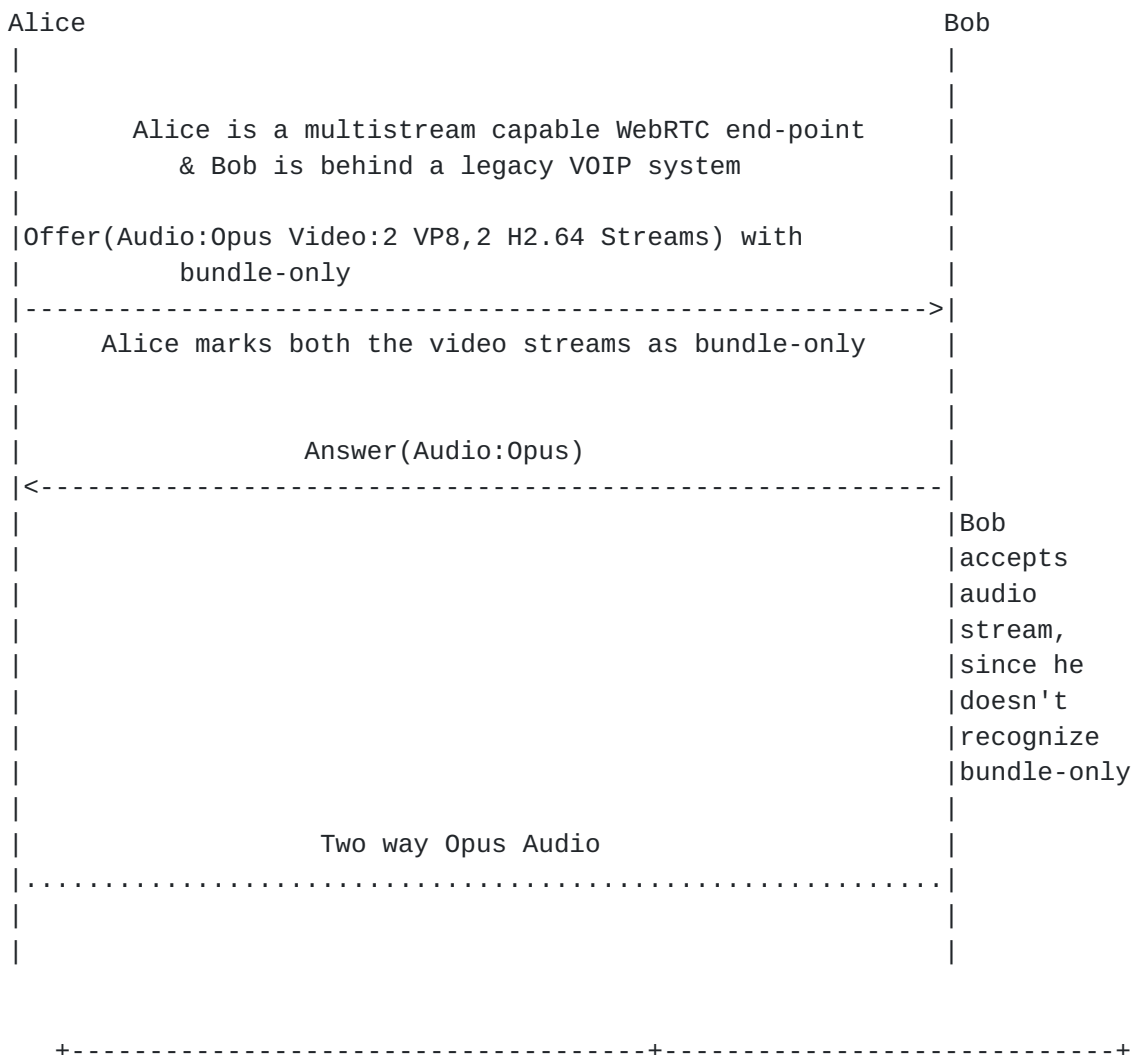
Table 39: 5.4.2 SDP Answer

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 end-point. The SDP Offer/Answer exchange demonstrates successful session setup with fallback to audio only stream negotiated via bundle-only framework between the end-points. Specifically,

- o Offer from Alice describes 2 cameras via 2 video m=lines with both marked as bundle-only.
- o Since Bob doesnot recognize either the BUNDLE mechanism or the bundle-only attribute, he accepts only the audio stream from Alice.

Successful 2-Way WebRTC <-> VOIP Interop



SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=msid-semantic:WMS ma	[I-D.ietf-mmusic-msid]
a=group:BUNDLE m0 m1 m2	[I-D.ietf-mmusic-sdp-bundle
	-negotiation] Alice
	supports grouping of
	m=lines under BUNDLE
	semantics
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ic
	e]
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=rtcp:64678 IN IP4 24.23.204.141	[RFC3605]
a=mid:m0	[RFC5888] Audio m=line part
	of BUNDLE group with a
	unique port number
a=msid:ma ta	Identifies RTCMediaStream
	ID (ma) and
	RTCMediaStreamTrack ID (ta)
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]
hdnext:ssrc-audio-level	
a=ptime:20	[I-D.ietf-payload-rtp-opus]
a=rtcp-fb:109 nack	[RFC5104]
a=sendrecv	[RFC3264]
a=setup:actpass	[RFC4145]
a=rtcp-mux	[RFC5761]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474	[RFC5245]
af08a068	
a=fingerprint:sha-1 99:41:49:83:4a:	[RFC5245]
97:0e:1f:ef:6d:f7:c9:c7:70:	
9d:1f:66:79:a8:07	
a=candidate:0 1 UDP 2113667327	[RFC5245]
192.168.1.4 54609 typ host	
a=candidate:1 1 UDP 694302207	[RFC5245]
24.23.204.141 54609 typ srflx raddr	
192.168.1.4 rport 54609	
a=candidate:0 2 UDP 2113667326	[RFC5245]
192.168.1.4 64678 typ host	
a=candidate:1 2 UDP 1694302206	[RFC5245]
24.23.204.141 64678 typ srflx raddr	
192.168.1.4 rport 64678	
a=ssrc:11111	[RFC5576]E

cname:axzo1278npDlAzM73		
a=rtcp-rsize	[RFC5506]	
m=video 0 UDP/TLS/RTP/SAVPF 98 100	bundle-only video line with	
	port number set to zero	
c=IN IP4 24.23.204.141	[RFC4566]	
a=rtcp:64678 IN IP4 24.23.204.141	[RFC3605]	
a=mid:m1	[RFC5888] Video m=line part	
	of BUNDLE group	
a=msid:ma tb	Identifies RTCMediaStream	
	ID (ma) and	
	RTCMediaStreamTrack ID (tb)	
a=rtpmap:98 VP8/90000	[I-D.ietf-payload-vp8]	
a=imageattr:98 [x=1280,y=720]	[RFC6236]	
a=fmtp:98 max-fr=30	[RFC4566]	
a=ssrc:12345	[RFC5576]	
cname:axzo1278npDlAzM73		
a=bundle-only	[UNIFIED-PLAN]	
a=sendrecv	[RFC3264]	
a=rtcp-rsize	[RFC5506]	
m=video 0 UDP/TLS/RTP/SAVPF 101 103	bundle-only video line with	
	port number set to zero	
c=IN IP4 24.23.204.141	[RFC4566]	
a=rtcp:64678 IN IP4 24.23.204.141	[RFC3605]	
a=mid:m2	[RFC5888] Video m=line part	
	of BUNDLE group	
a=msid:ma tc	Identifies RTCMediaStream	
	ID (ma) and	
	RTCMediaStreamTrack ID (tc)	
a=rtpmap:101 H264/90000	[RFC3984]	
a=rtpmap:103 H264/90000	[RFC3984]	
a=fmtp:101 profile-level-id=4d0028	[RFC3984] Camera-2, Encoding-	
;packetization-mode=1;max-fr=30	1 Resolution	
a=ssrc:67890	[RFC5576]	
cname:axzo1278npDlAzM73		
a=bundle-only	[UNIFIED-PLAN]	
a=sendrecv	[RFC3264]	
a=rtcp-rsize	[RFC5506]	
+-----+		

Table 40: 5.4.3 SDP Simulcast bundle-only

SDP Contents	RFC#/Notes	
v=0	[RFC4566]	
o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]	
s=-	[RFC4566]	
t=0 0	[RFC4566]	

m=audio 49203 UDP/TLS/RTP/SAVPF 109	[RFC4566]	
c=IN IP4 24.23.204.141	[RFC4566]	
a=rtcp:60065 IN IP4 24.23.204.141	[RFC3605]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-	
	opus]	
a=extmap:1 urn:ietf:params:rtp-hdext	[RFC6464]	
:ssrc-audio-level		
a=ptime:20	[I-D.ietf-payload-rtp-	
	opus]	
a=rtcp-fb:109 nack	[RFC5104]	
a=sendrecv	[RFC3264]	
a=setup:active	[RFC4145]	
a=ice-ufrag:ufrag:c300d85b	[RFC5245]	
a=ice-	[RFC5245]	
pwd:de4e99bd291c325921d5d47efbabd9a2		
a=fingerprint:sha-1	[RFC5245]	
99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:		
70:9d:1f:66:79:a8:07		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.7 49203 typ host		
a=candidate:1 1 UDP 694302207	[RFC5245]	
98.248.92.77 49203 typ srflx raddr		
192.168.1.7 rport 49203		
a=candidate:0 2 UDP 2113667326	[RFC5245]	
192.168.1.7 60065 typ host		
a=candidate:1 2 UDP 1694302206	[RFC5245]	
98.248.92.77 60065 typ srflx raddr		
192.168.1.7 rport 60065		
a=rtcp-rsize	[RFC5506]	
m=video 0 UDP/TLS/RTP/SAVPF 98 100	Bob doesn't recognize	
	bundle-only and hence	
	rejects the video	
	stream	
c=IN IP4 98.248.92.77	[RFC4566]	
a=rtpmap:98 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:100 VP8/90000	[I-D.ietf-payload-vp8]	
a=imageattr:98 [x=1280,y=720]	[RFC6236]	
a=fmtp:98 max-fr=30	[RFC4566]	
m=video 0 UDP/TLS/RTP/SAVPF 98 100	Bob doesn't recognize	
	bundle-only and hence	
	rejects the video	
	stream	
c=IN IP4 98.248.92.77	[RFC4566]	
a=rtpmap:101 H264/90000	[RFC3984]	
a=fmtp:101 profile-level-id=4d0028	[RFC3984]	Camera-2,Enco
;packetization-mode=1;max-fr=30	ding-1 Resolution	

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

Table 41: 5.4.3 SDP Answer

5.4.4. Legacy Interop with RTP/AVP profile

In this section, we attempt to provide session descriptions showcasing inter-operability between a WebRTC end-point and a Legacy VOIP end-point. The ideas included in here are not fully baked into the standards and might be controversial in nature. The hope here is to demonstrate a plausible SDP composition to enhance seamless inter-operability between the aforementioned communication systems.

In the scenario described below, Alice is a legacy end-point which sends [[RFC3264](#)] Offer with two sets of media descriptions per media type.

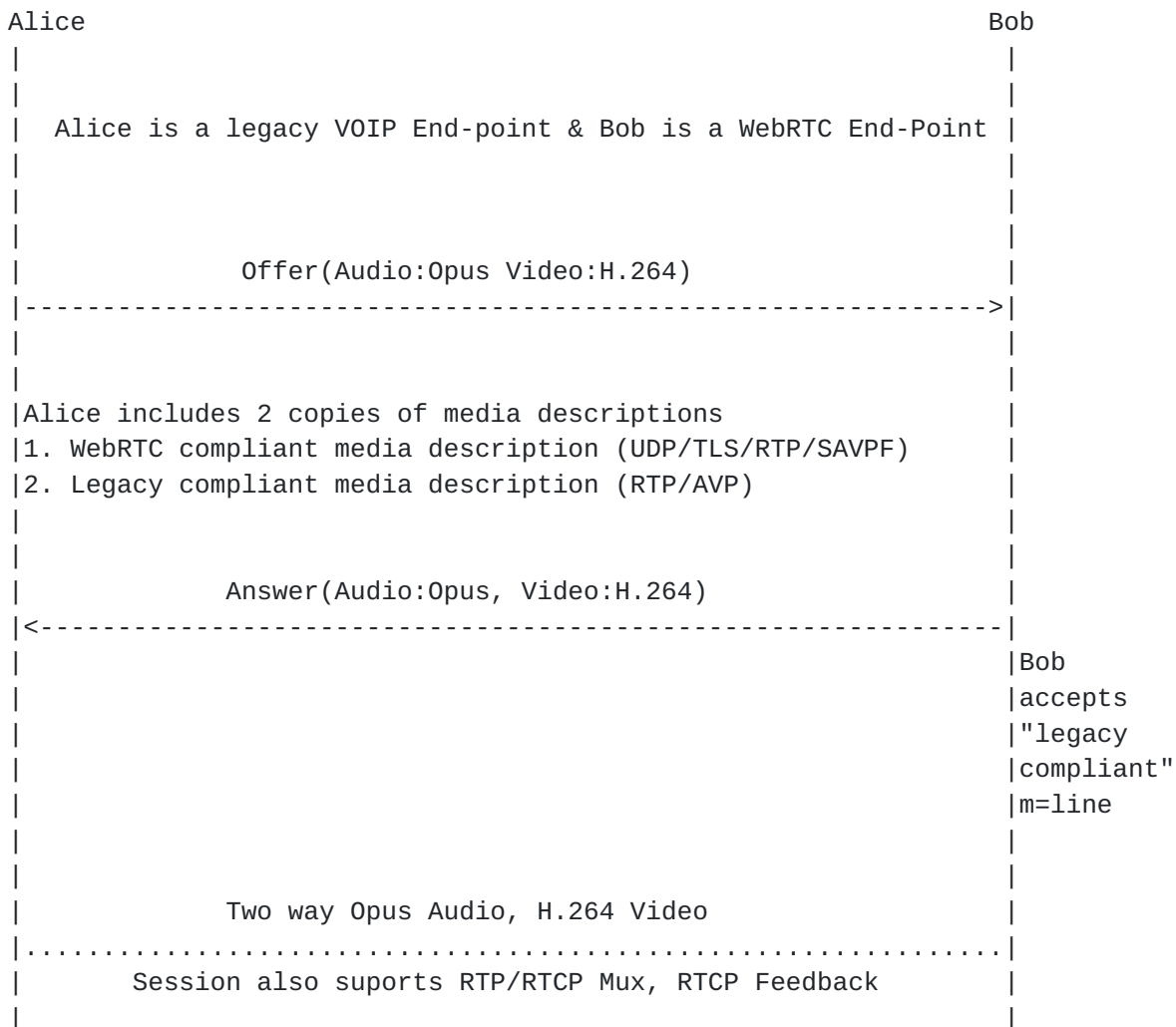
One set that corresponds to [[WebRTC](#)] compliant UDP/TLS/RTP/SAVPF based audio and video descriptions.

Another set with RTP/AVP based audio and video descriptions for the legacy Interop purposes.

Also to note, Alice includes session level DTLS information and media level RTCP feedback information as applicable to both the sets of media descriptions

On the other hand, Bob being a WebRTC end-point, recognizes accepts the media descriptions with RTP/AVP profile. The security and feedback requirements for the session are either handled by a intermediate gateway or with some combination of Alice's capabilities and the intermediate gateway.

Successful 2-Way WebRTC <-> VOIP Interop



SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:e f:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=rtcp-rsize	[RFC5506]
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:109 opus/48000	

a=ptime:20		
a=sendrecv	[RFC3264]	
a=rtcp-mux	[RFC5761]	
a=candidate:0 1 UDP 2113667327 192.168.1.4	[RFC5245]	
54609 typ host		
a=candidate:1 1 UDP 694302207 24.23.204.141	[RFC5245]	
54609 typ srflx raddr 192.168.1.4 rport 54609		
a=candidate:0 2 UDP 2113667326 192.168.1.4	[RFC5245]	
64678 typ host		
a=candidate:1 2 UDP 1694302206 24.23.204.141	[RFC5245]	
64678 typ srflx raddr 192.168.1.4 rport 64678		
a=rtcp-fb:109 nack	[RFC5104]	
m=video 62537 UDP/TLS/RTP/SAVPF 120	[RFC4566]	
c=IN IP4 24.23.204.141	[RFC4566]	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload	
	-vp8]	
a=sendrecv	[RFC3264]	
a=rtcp-mux	[RFC5761]	
a=candidate:0 1 UDP 2113667327 192.168.1.4	[RFC5245]	
62537 typ host		
a=candidate:1 1 UDP 1694302207 24.23.204.141	[RFC5245]	
62537 typ srflx raddr 192.168.1.4 rport 62537		
a=candidate:0 2 2113667326 192.168.1.4 54721	[RFC5245]	
typ host		
a=candidate:1 2 UDP 1694302206 24.23.204.141	[RFC5245]	
54721 typ srflx raddr 192.168.1.4 rport 54721		
a=rtcp-fb:120 nack pli	[RFC5104]	
a=rtcp-fb:120 ccm fir	[RFC5104]	
-----	These set of	
	media	
	descriptions are	
	for Legacy Inter-	
	op purposes	
m=audio 54732 RTP/AVP 109	[RFC4566] Alice	
	includes RTP/AVP	
	audio stream	
	description	
c=IN IP4 24.23.204.141	[RFC4566]	
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:7	[RFC5245]	
f:7d:f9:c9:c7:70:9d:1f:66:79:a8:07		
a=rtpmap:109 opus/48000		
a=ptime:20		
a=sendrecv	[RFC3264]	
a=rtcp-mux	[RFC5761] Alice	
	still includes	
	RTP/RTCP Mux	
	support	
a=candidate:0 1 UDP 2113667327 192.168.1.4	[RFC5245]	

54732 typ host		
a=candidate:1 1 UDP 694302207 24.23.204.141	[RFC5245]	
54732 typ srflx raddr 192.168.1.4 rport 54732		
a=candidate:0 2 UDP 2113667326 192.168.1.4	[RFC5245]	
64678 typ host		
a=candidate:1 2 UDP 1694302206 24.23.204.141	[RFC5245]	
64678 typ srflx raddr 192.168.1.4 rport 64678		
a=rtcp-fb:109 nack	[RFC5104]	She adds
		her intent for
		NACK RTCP
		feedback support
m=video 62445 RTP/AVP 120	[RFC4566]	Alice
		includes RTP/AVP
		video stream
		description
c=IN IP4 24.23.204.141	[RFC4566]	
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:e	[RFC5245]	
f:7d:f7:c9:c7:70:9d:1f:66:79:a8:07		
a=rtmap:120 VP8/90000	[I-D.ietf-payload	
	-vp8]	
a=sendrecv	[RFC3264]	
a=rtcp-mux	[RFC5761]	Alice
		intends to
		perform RTP/RTCP
	Mux	
a=candidate:0 1 UDP 2113667327 192.168.1.4	[RFC5245]	
62445 typ host		
a=candidate:1 1 UDP 1694302207 24.23.204.141	[RFC5245]	
62537 typ srflx raddr 192.168.1.4 rport 62445		
a=candidate:0 2 2113667326 192.168.1.4 54721	[RFC5245]	
typ host		
a=candidate:1 2 UDP 1694302206 24.23.204.141	[RFC5245]	
54721 typ srflx raddr 192.168.1.4 rport 54721		
a=rtcp-fb:120 nack pli	[RFC5104]	Alice
		indicates support
		for Picture loss
		Indication and
		NACK RTCP
		feedback
a=rtcp-fb:120 ccm fir	[RFC5104]	

Table 42: 5.4.5 SDP Offer

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:e f:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
m=audio 49203 RTP/AVP 109	[RFC4566] Bob accepts RTP/AVP based audio stream
c=IN IP4 98.248.92.77	[RFC4566]
a=rtpmap:109 opus/48000	
a=ptime:20	
a=sendrecv	[RFC3264]
a=candidate:0 1 UDP 2113667327 192.168.1.7 49203 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 98.248.92.77 49203 typ srflx raddr 192.168.1.7 rport 49203	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 98.248.92.77 60065 typ srflx raddr 192.168.1.7 rport 60065	[RFC5245]
m=video 63130 RTP/SAVP 120	[RFC4566] Bob accepts RTP/AVP based video stram
c=IN IP4 98.248.92.771	[RFC4566]
a=rtpmap:120 VP8/90000	[I-D.ietf-payload -vp8]
a=sendrecv	[RFC3264]
a=candidate:0 1 UDP 2113667327 192.168.1.7 63130 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 98.248.92.77 63130 typ srflx raddr 192.168.1.7 rport 63130	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 56607 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 98.248.92.77 56607 typ srflx raddr 192.168.1.7 rport 56607	[RFC5245]

Table 43: 5.4.5 SDP Answer

6. IANA Considerations

This document requires no actions from IANA.

7. Acknowledgments

We would like to thanks Justin Uberti, Chris Flo for their detailed review and inputs.

8. Change Log

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

Changes from [draft-nandakumar-rtcweb-sdp-06](#) and [draft-nandakumar-rtcweb-sdp-07](#)

- o Added clarification on Call-Flow diagram usage
- o More cleanups

Changes from [draft-nandakumar-rtcweb-sdp-05](#)

- o Added Ascii chart for all the SDP Eaxamples
- o Improved text and updated SDP Examples for Simulcast and FEC
- o Fixed MediaStream ID Semantics SDP Errors

Changes from [draft-nandakumar-rtcweb-sdp-04](#)

- o Interim version of the draft to avert expiry
- o Corrected placement of c= line as per [RFC4566](#)
- o Updated simulcast SDP to reflect [draft-westerlund-avtcore-rtp-simulcast-04](#)

Changes from [draft-nandakumar-rtcweb-sdp-03](#)

- o Aligned more closely with JSEP version -05
- o Added Conventions to help readability
- o Add more examples to clarify BUNDLE use-cases

Changes from [draft-nandakumar-rtcweb-sdp-02](#)

- o Major refactoring was done to group the examples in to categories

- o SDP was updated through out to reflect JSEP-04 style of defining attributes per m=line than at the session level.
- o Added 8 new examples.
- o Updated references for Trickle, Unified Plan
- o Add section to explain the syntax conventions followed in the examples.

Changes from [draft-nandakumar-rtcweb-sdp-01](#)

- o Updated references to OPUS RTP Payload Specification.
- o Updated BUNDLE examples based on the latest [draft-ietf-mmusic-sdp-bundle-negotiation](#).
- o Added examples for multiple audio and video flows based on Unified Plan.
- o Added new examples for RTX and FEC streams
- o Updated Simulcast and SVC examples

Changes from [draft-nandakumar-rtcweb-sdp-00](#)

- o Fixed editorial comments on the mailing list.
- o Updated Data-channel SDP information based on [draft-ietf-mmusic-sctp-sdp](#).
- o Updated BUNDLE examples based on [draft-ietf-mmusic-sdp-bundle-negotiation](#).
- o Added examples for few more BUNDLE variants
- o Added new examples for Simulcast and SVC

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Authors' Addresses

Suhas Nandakumar
Cisco
170 West Tasman Drive
San Jose, CA 95134
USA

Email: snandaku@cisco.com

Cullen Jennings
Cisco
170 West Tasman Drive
San Jose, CA 95134
USA

Phone: +1 408 421-9990
Email: fluffy@cisco.com

