

Network Working Group
Internet-Draft
Intended status: Informational
Expires: January 8, 2017

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July 7, 2016

SDP for the WebRTC
draft-ietf-rtcweb-sdp-02

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.



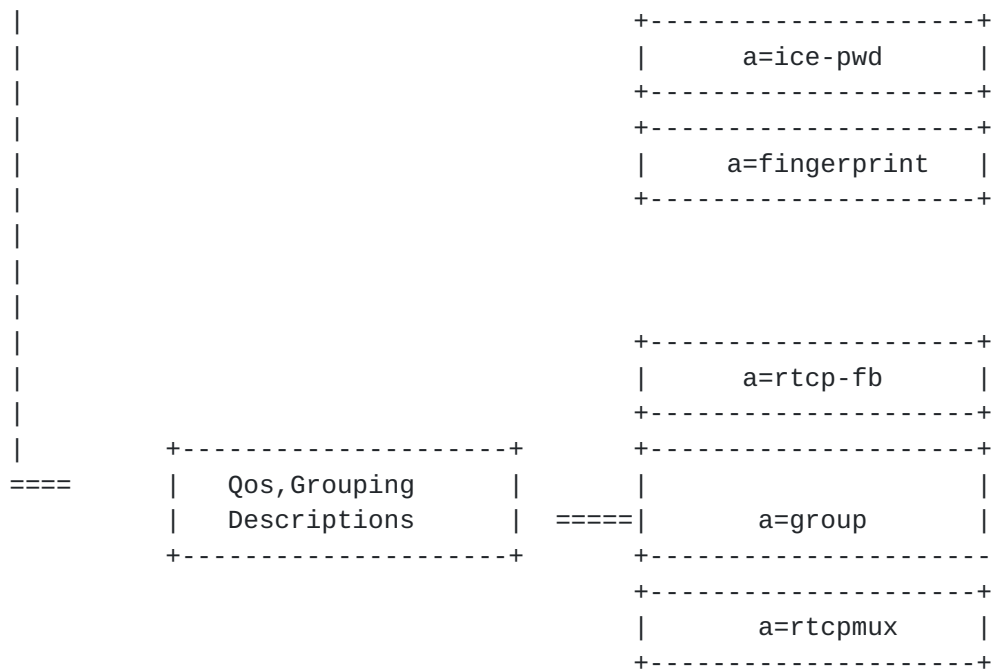


Figure 1: Semantic Components of SDP

[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 It is assumed that for most of the examples, the support for [\[I-D.ietf-mmusic-sdp-bundle-negotiation\]](#) is established apriori either out-of-band or as a consequence of successful Offer/Answer negotiation between Alice and Bob, unless explicitly stated 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.
 - * Visual markers/Empty lines in any SDP example are inserted to make functional divisions in the SDP clearer, and are not actually part of the SDP syntax.
 - * 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.
 - * 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 specific details, readers must refer to [[I-D.ietf-rtcweb-jsep](#)] specification.

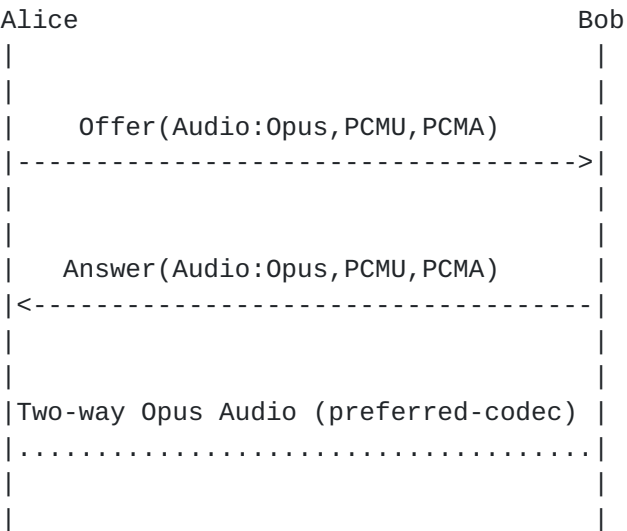
- o The term "Session" is used rather loosely in this document to refer to either a "Communication Session" or a "RTP Session" or a "RTP Stream" depending on the context.
- o Payload type 109 is usually used for OPUS, 0 for PCMU, 8 for PCMA, 99 for H.264 and 120 for VP8 in most of the examples to maintain uniformity.
- o The IP Address:Port combinations '192.168.1.4:61665' (host) and '24.23.204.141:54609' (Server Reflexive) is typically used for Alice.
- o The IP Address:Port combinations '192.168.1.7:51556' (host) and '98.248.92.77:49203' (Server Reflexive) is typically used for Bob.
- o SSRC cname 'cname:EocUG1f0fcg/yvY7' applies to Alice and the cname 'cname:Q/NWs1ao1HmN4Xa5' corresponds to Bob.
- o The SSRCs values '12345', '56789' and '11111' till '66666' usually represent Alice's RTP Streams and the values '54321', '98765' and '77777' till '99999' represent Bob's RTP Streams.
- o In the actual use the values that represent SSRCs, ICE candidate foundations, WebRTC Mediastream and MediaStreamTrack Ids shall be much larger and/or random than the ones shown in the examples.

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



Offer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio	[I-D.ietf-mmusic-sdp-bundle-negotiation]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
***** Audio m=line *****	*****
m=audio 54609 UDP/TLS/RTP/SAVPF 109 0 8	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=rtcp:60065 IN IP4 24.23.204.141	[RFC3605]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=sendrecv	[RFC3264] - Alice can send

a=rtpmap:109 opus/48000/2	and recv audio
a=rtpmap:0 PCMU/8000	[I-D.ietf-payload-rtp-opus] -
a=rtpmap:8 PCMA/8000	Opus Codec 48khz, 2 channels
a=maxptime:120	[RFC3551] PCMU Audio Codec
a=ice-ufrag:074c6550	[RFC3551] PCMA Audio Codec
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC4566]
74af08a068	[RFC5245] - ICE user fragment
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245] - ICE password
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73	[RFC5245] - DTLS Fingerprint
:04 :BB:05:2F:70:9F:04:A9:0E:05:E	for SRTP
9:26:33:E8:70:88:A2	
a=setup:actpass	[RFC4145] - Alice can perform
a=rtcp-mux	DTLS before Answer arrives
a=rtcp-rsize	[RFC5761] - Alice can perform
a=rtcp-fb:109 nack	RTP/RTCP Muxing
a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-level	[RFC5506] - Alice intends to
a=extmap:2 urn:ietf:params:rtp-hdext:sdes:mid	use reduced size RTCP for
a:ssrc:12345	this session
cname:EocUG1f0fcg/yvY7	[RFC5104] - Indicates NACK
a=candidate:0 1 UDP 2122194687	RTCP feedback support
192.168.1.4 61665 typ host	[RFC6464] Alice supports RTP
a=candidate:1 1 UDP 1685987071	header extension to indicate
24.23.204.141 54609 typ srflx	audio levels
raddr 192.168.1.4 rport 61665	[I-D.ietf-mmusic-sdp-bundle-negotiation]
a=candidate:0 2 UDP 2122194687	[RFC5576] - Alice's audio
192.168.1.4 61667 typ host	stream SSRC.
a=candidate:1 2 UDP 1685987071	[RFC5245] - RTP Host
24.23.204.141 60065 typ srflx	Candidate
raddr 192.168.1.4 rport 61667	[RFC5245] - RTP Server
a=end-of-candidates	Reflexive ICE Candidate
	[RFC5245] - RTCP Host
	Candidate
	[RFC5245] - RTCP Server
	Reflexive ICE Candidate
	[I-D.ietf-mmusic-trickle-ice]

Table 1: 5.2.1 SDP Offer

Answer SDP Contents	RFC#/Notes

v=0	[RFC4566]	
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin	
s=-	[RFC4566]	
t=0 0	[RFC4566]	
a=group:BUNDLE audio	[I-D.ietf-mmusic-sdp-bundle-negotiation]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
***** Audio m=line *****	*****	
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
109 0 8		
c=IN IP4 98.248.92.77	[RFC4566]	
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]	
a=mid:audio	[RFC5888]	
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)	
a=sendrecv	[RFC3264] - Bob can send and recv audio	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus] Opus Codec	
a=rtpmap:0 PCMU/8000	[RFC3551] PCMU Audio Codec	
a=rtpmap:8 PCMA/8000	[RFC3551] PCMA Audio Codec	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:05067423	[RFC5245] - ICE user fragment	
a=ice-pwd:1747d1ee3474a28a397a4c3f3af08a068	[RFC5245] - ICE password parameter	
a=fingerprint:sha-256 6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:24:C2:43:F0:A1:58:D0:A1:2C:19:08	[RFC5245] - DTLS Fingerprint for SRTP	
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=rtcp-rsize	[RFC5506] - Bob intends to use reduced size RTCP for this session	
a=rtcp-fb:109 nack	[RFC5104] - Indicates NACK RTCP feedback support	
a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-level	[RFC6464] Bob supports audio level RTP header extension as well	
a=extmap:2 urn:ietf:params:rtp-hdext:sdes:mid	[I-D.ietf-mmusic-sdp-bundle-negotiation]	
a=ssrc:54321	[RFC5576] - Bob's audio stream SSRC.	
cname:Q/NWs1ao1HmN4Xa5		
a=candidate:0 1 UDP 2122194687	[RFC5245] - RTP/RTCP Host ICE	

192.168.1.7 51556 typ host	Candidate	
a=candidate:1 1 UDP 1685987071	[RFC5245] - RTP/RTCP Server	
98.248.92.77 49203 typ srflx	Reflexive ICE Candidate	
raddr 192.168.1.7 rport 51556		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	

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

Table 2: 5.2.1 SDP Answer

5.2.2. Audio/Video Session

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

2-Way Audio,Video Session

Alice	Bob
Offer(Audio:Opus,PCMU,PCMA Video:H.264,VP8)	
----->	
Answer(Audio:Opus,Video:H.264)	
<-----	
Two-way Opus Audio, H.264 Video	
.....	

+-----+	+-----+	+-----+
Offer SDP Contents	RFC#/Notes	
+-----+	+-----+	+-----+
v=0	[RFC4566]	
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin	
	Information	
s=-	[RFC4566]	
t=0 0	[RFC4566]	
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-negotiation]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
***** Audio m=line *****	*****	
m=audio 54609 UDP/TLS/RTP/SAVPF	[RFC4566]	
109 0 8		

c=IN IP4 24.23.204.141	[RFC4566]	
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]	
a=mid:audio	[RFC5888]	
a=msid:ma ta	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (ta)	
a=sendrecv	[RFC3264] - Alice can send	
	and recv audio	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus] -	
	Opus Codec 48khz, 2 channels	
a=rtpmap:0 PCMU/8000	[RFC3551] PCMU Audio Codec	
a=rtpmap:8 PCMA/8000	[RFC3551] PCMA Audio Codec	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:074c6550	[RFC5245] - ICE user fragment	
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245] - ICE password	
74af08a068	parameter	
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245] - DTLS Fingerprint	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73	for SRTP	
:04		
:BB:05:2F:70:9F:0		
4:A9:0E:05:E9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145] - Alice can perform	
	DTLS before Answer arrives	
a=rtcp-mux	[RFC5761] - Alice can perform	
	RTP/RTCP Muxing	
a=rtcp-rsize	[RFC5506] - Alice intends to	
	use reduced size RTCP for	
	this session	
a=rtcp-fb:109 nack	[RFC5104] - Indicates NACK	
	RTCP feedback support	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:12345	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=candidate:0 1 UDP 2122194687	[RFC5245] - RTP/RTCP Host	
192.168.1.4 61665 typ host	Candidate	
a=candidate:1 1 UDP 1685987071	[RFC5245] - RTP/RTCP Server	
24.23.204.141 54609 typ srflx	Reflexive ICE Candidate	
raddr 192.168.1.4 rport 61665		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
***** Video m=line *****	*****	
m=video 54609 UDP/TLS/RTP/SAVPF	[RFC4566]	
99 120		
c=IN IP4 24.23.204.141	[RFC4566]	
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]	
a=mid:video	[RFC5888]	
a=msid:ma tb	Identifies RTCMediaStream ID	

	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=sendrecv	[RFC3264] - Alice can send	
	and recv video	
a=rtpmap:99 H264/90000	[RFC3984] - H.264 Video Codec	
a=fmtp:99 profile-level-id=4d0028	[RFC3984]	
;packetization-mode=1		
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8] - VP8	
	video codec	
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245] - DTLS Fingerprint	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73	for SRTP	
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145] - Alice can perform	
	DTLS before Answer arrives	
a=rtcp-mux	[RFC5761] - Alice can perform	
	RTP/RTCP Muxing	
a=rtcp-rsize	[RFC5506] - Alice intends to	
	use reduced size RTCP for	
	this session	
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=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:56789	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
+-----+	+-----+	+-----+

Table 3: 5.2.2 SDP Offer

+-----+	+-----+	+-----+
Answer 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=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-negotiation]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
***** Audio m=line *****	*****	
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
109		
c=IN IP4 98.248.92.77	[RFC4566]	
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]	
a=mid:audio	[RFC5888]	
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)	
a=sendrecv	[RFC3264] - Bob can send and recv audio	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus] - Bob accepts only Opus Codec	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:c300d85b	[RFC5245] - ICE username frag	
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245] - ICE password	
a=fingerprint:sha-256 6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:24:C2:43:F0:A1:58:D0:A1:2C:19:08	[RFC5245] - DTLS Fingerprint for SRTP	
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel	
a=rtcp-mux	[RFC5761] - Bob can perform RTP/RTCP Muxing	
a=rtcp-rsize	[RFC5506] - Bob intends to use reduced size RTCP for this session	
a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-level	[RFC6464]	
a=extmap:2 urn:ietf:params:rtp-hdext:sdes:mid	[I-D.ietf-mmusic-sdp-bundle-negotiation]	
a=ssrc:54321	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=candidate:0 1 UDP 3618095783 192.168.1.7 49203 typ host	[RFC5245] - RTP/RTCP Host ICE Candidate	
a=candidate:1 1 UDP 565689203 98.248.92.77 49203 typ srflx	[RFC5245] - RTP/RTCP Server Reflexive ICE Candidate	
raddr 192.168.1.7 rport 51556		

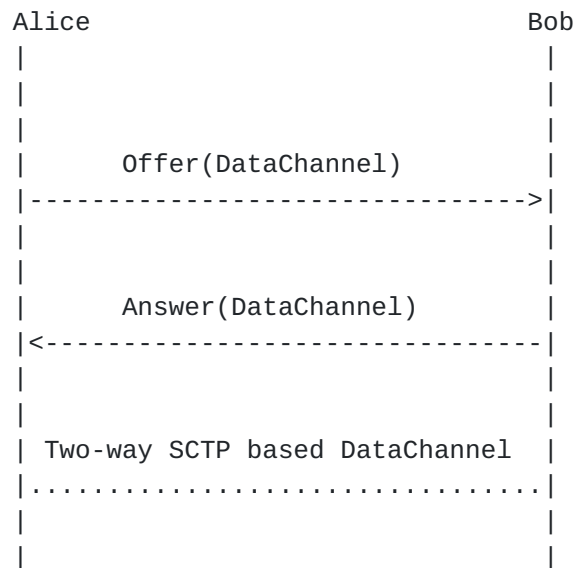
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
***** Video m=line *****	*****	
m=video 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
99		
c=IN IP4 98.248.92.77	[RFC4566]	
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]	
a=mid:video	[RFC5888]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=sendrecv	[RFC3264] - Bob can send and	
	recv video	
a=rtpmap:99 H264/90000	[RFC3984] - Bob accepts H.264	
	Video Codec.	
a=fmtp:99 profile-level-id=4d0028	[RFC3984]	
;packetization-mode=1		
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245] - DTLS Fingerprint	
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B	for SRTP	
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A		
1:58:D0:A1:2C:19:08		
a=setup:active	[RFC4145] - Bob carries out	
	DTLS Handshake in parallel	
a=rtcp-mux	[RFC5761] - Bob can perform	
	RTP/RTCP Muxing	
a=rtcp-rsize	[RFC5506] - Bob intends to	
	use reduced size RTCP for	
	this session	
a=rtcp-fb:99 nack	[RFC5104] - Indicates support	
	for NACK based RTCP feedback	
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=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:98765	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
+-----+	+-----+	+-----+

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



Offer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE data	[I-D.ietf-mmusic-sdp-bundle-negotiation]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
***** Application m=line	*****
m=application 54609 UDP/DTLS/SCTP webrtc-datachannel	[I-D.ietf-rtcweb-data-channel]
c=IN IP4 24.23.204.141	[RFC4566]
a=mid:data	[RFC5888]
a=sendrecv	[RFC3264] - Alice can send and recv non-media data
a=sctp-port:5000	[I-D.ietf-mmusic-sctp-sdp]
a=max-message-size:100000	[I-D.ietf-mmusic-sctp-sdp]
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=connection:new	[RFC4145]
a=ice-ufrag:074c6550	[RFC5245] - Session Level ICE parameter
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245] - Session Level ICE parameter
a=fingerprint:sha-256 19:E2:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04:BB:05:2F:70:9F:04:A9:0E:05:E9:26:33:E8:70:88:A2	[RFC5245] - Session DTLS Fingerprint for SRTP
a=candidate:0 1 UDP 2113667327 192.168.1.4 61665 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 24.23.204.141 54609 typ srflx	[RFC5245]
raddr 192.168.1.4 rport 61665	
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]

Table 5: 5.2.3 SDP Offer

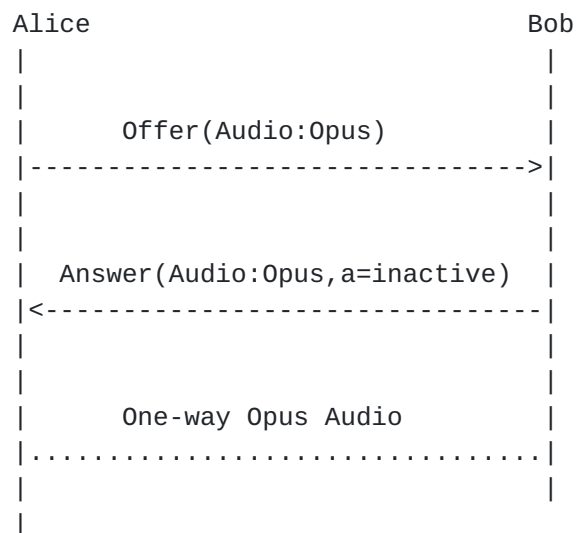
Answer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE data	[I-D.ietf-mmusic-sdp-bundle-negotiation]
***** Application m=line *****	*****
m=application 49203 UDP/DTLS/SCTP webrtc-datachannel	[I-D.ietf-mmusic-sctp-sdp]
c=IN IP4 98.248.92.771	[RFC4566]
a=mid:data	[RFC5888]
a=sendrecv	[RFC3264] - Bob can send and recv non-media data
a=sctp-port:5000	[I-D.ietf-mmusic-sctp-sdp]
a=max-message-size:100000	[I-D.ietf-mmusic-sctp-sdp]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=ice-ufrag:c300d85b	[RFC5245] - Session Level ICE username frag
a=ice-pwd:de4e99bd291c325921d5d47 efbabd9a2	[RFC5245] - Session Level ICE password
a=fingerprint:sha-256 6B:8B:F0:65 :5F:78:E2:51:3B:AC:6F:F3:3F:46:1B :35 :DC:B8:5F:64:1A:24:C2:43:F0:A 1:58:D0:A1:2C:19:08	[RFC5245] - Session DTLS Fingerprint for SRTP
a=candidate:0 1 UDP 2113667327 192.168.1.7 51556 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 98.248.92.77 49203 typ srflx	[RFC5245]
raddr 192.168.1.7 rport 51556	
a=end-of-candidates	[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=inactive in the Answer.

Audio On Hold



Offer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio	[I-D.ietf-mmusic-sdp-bundle-negotiation]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
***** Audio m=line *****	*****
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=sendrecv	[RFC3264] - Alice can send and recv audio
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus] - Opus Codec 48khz, 2 channels
a=maxptime:120	[RFC4566]
a=ice-ufrag:074c6550	[RFC5245] - ICE user fragment
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245] - ICE password
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245] - DTLS Fingerprint

:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73	for SRTP	
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145] - Alice can perform	
	DTLS before Answer arrives	
a=rtcp-mux	[RFC5761] - Alice can perform	
	RTP/RTCP Muxing	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104] - Indicates NACK	
	RTCP feedback support	
a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-level	[RFC6464]	
a=extmap:2 urn:ietf:params:rtp-hdext:sdes:mid	[I-D.ietf-mmusic-sdp-bundle-negotiation]	
a=ssrc:12345	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=candidate:0 1 UDP 2113667327 192.168.1.4 61665 typ host	[RFC5245]	
a=candidate:1 1 UDP 1685987071 24.23.204.141 54609 typ srflx	[RFC5245]	
raddr 192.168.1.4 rport 61665		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
+-----+-----+-----+		

Table 7: 5.2.4 SDP Offer

Answer SDP Contents		RFC#/Notes
+-----+-----+-----+		
v=0		[RFC4566]
o=- 16833 0 IN IP4 0.0.0.0		[RFC4566] - Session Origin
		Information
s=-		[RFC4566]
t=0 0		[RFC4566]
a=group:BUNDLE audio		[I-D.ietf-mmusic-sdp-bundle-negotiation]
***** Audio m=line *****		*****
m=audio 49203 UDP/TLS/RTP/SAVPF 109		[RFC4566]
c=IN IP4 98.248.92.77		[RFC4566]
a=rtcp:49203 IN IP4 24.23.204.141		[RFC3605]
a=mid:audio		[RFC5888]
a=msid:ma ta		Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=inactive		[RFC3264] - Bob puts call On Hold

a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus] -	
	Bob accepts Opus Codec	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:c300d85b	[RFC5245] - ICE username frag	
a=ice-pwd:de4e99bd291c325921d5d47	[RFC5245] - ICE password	
efbabd9a2		
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245] - DTLS Fingerprint	
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B	for SRTP	
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A		
1:58:D0:A1:2C:19:08		
a=setup:active	[RFC4145] - Bob carries out	
	DTLS Handshake in parallel	
a=rtcp-mux	[RFC5761] - Bob can perform	
	RTP/RTCP Muxing	
a=rtcp-rsize	[RFC5506]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:54321	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=candidate:0 1 UDP 2113667327	[RFC5245] - Host candidate	
192.168.1.7 51556 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245] - Server Reflexive	
24.23.204.141 49203 typ srflx	candidate	
raddr 192.168.1.7 rport 51556		
a=end-of-candidates	[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 |
|.....|
|                                         |

```

Offer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio dtmf	[I-D.ietf-mmusic-sdp-bundle-negotiation]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
***** Audio m=line *****	*****
m=audio 54609 UDP/TLS/RTP/SAVPF 109 0 8	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=sendrecv	[RFC3264] - Alice can send and recv audio
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus] - Opus Codec 48khz, 2 channels
a=rtpmap:0 PCMU/8000	[RFC3551] PCMU Audio Codec
a=rtpmap:8 PCMA/8000	[RFC3551] PCMA Audio Codec
a=maxptime:120	[RFC4566]
a=ice-ufrag:074c6550	[RFC5245] - ICE user fragment
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245] - ICE password

74af08a068	parameter	
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245] - DTLS Fingerprint	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73	for SRTP	
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145] - Alice can perform	
	DTLS before Answer arrives	
a=rtcp-mux	[RFC5761] - Alice can perform	
	RTP/RTCP Muxing	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104] - Indicates NACK	
	RTCP feedback support	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:12345	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.4 61665 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 61665		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
***** DTMF m=line *****	*****	
m=audio 54609 UDP/TLS/RTP/SAVPF	[RFC4566]	
126		
c=IN IP4 24.23.204.141	[RFC4566]	
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]	
a=mid:dtmf	[RFC5888]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=sendonly	[RFC3264] - Alice can send	
	DTMF Events	
a=rtpmap:126 telephone-event/8000	[RFC2833]	
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245] - DTLS Fingerprint	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73	for SRTP	
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145] - Alice can perform	
	DTLS before Answer arrives	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104] - Indicates NACK	
	RTCP feedback support	
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	

a=ssrc:56789	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
+-----+		

Table 9: 5.2.5 SDP Offer

Answer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio dtmf	[I-D.ietf-mmusic-sdp-bundle-negotiation]
***** Audio m=line *****	*****
m=audio 49203 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 98.248.92.77	[RFC4566]
a=rtcp:49203 IN IP4 24.23.204.141	[RFC3605]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=sendrecv	[RFC3264] - Bob can send and receive Opus audio
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus] - Bob accepts Opus Codec
a=maxptime:120	[RFC4566]
a=ice-ufrag:c300d85b	[RFC5245] - ICE username frag
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245] - ICE password
a=fingerprint:sha-256 6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:24:C2:43:F0:A1:58:D0:A1:2C:19:08	[RFC5245] - Fingerprint for SRTP
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=rtcp-rsize	[RFC5506] - Alice intends to use reduced size RTCP for this session
a=extmap:1 urn:ietf:params:rtp-hdrext:ssrc-audio-level	[RFC6464]

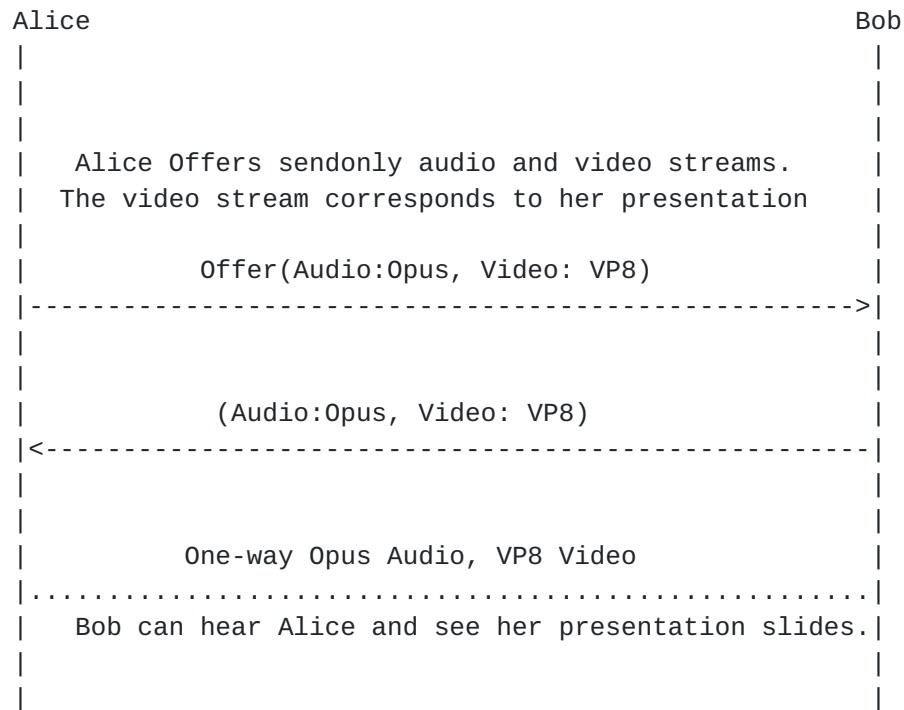
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n
hdnext:sdes:mid	egotiation]
a=ssrc:54321	[RFC5576]
cname:Q/NWs1ao1HmN4Xa5	
a=candidate:0 1 UDP 2122194687	[RFC5245]
192.168.1.7 51556 typ host	
a=candidate:1 1 UDP 1685987071	[RFC5245]
98.248.92.77 49203 typ srflx	
raddr 192.168.1.7 rport 51556	
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]
***** DTMF m=line *****	*****
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]
126	
c=IN IP4 98.248.92.77	[RFC4566]
a=rtcp:49203 IN IP4 24.23.204.141	[RFC3605]
a=mid:dtmf	[RFC5888]
a=msid:ma tb	Identifies RTCMediaStream ID
	(ma) and RTCMediaStreamTrack
	ID (tb)
a=recvonly	[RFC3264] - Alice can receive
	DTMF events
a=rtpmap:126 telephone-event/8000	[RFC2833]
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245] - Fingerprint for
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B	SRTP
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A	
1:58:D0:A1:2C:19:08	
a=setup:active	[RFC4145] - Bob carries out
	DTLS Handshake in parallel
a=rtcp-mux	[RFC5761]
a=rtcp-rsize	[RFC5506] - Bob intends to
	use reduced size RTCP for
	this session
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n
hdnext:sdes:mid	egotiation]
a=ssrc:98765	[RFC5576]
cname:Q/NWs1ao1HmN4Xa5	
+-----+-----+-----+-----+-----+	

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



Offer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-negotiation]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
***** Audio m=line *****	*****
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=sendonly	[RFC3264] - Send only audio stream
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=maxptime:120	[RFC4566]

a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245]	
74af08a068		
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145] - Alice can perform	
	DTLS before Answer arrives	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:12345	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
24.23.204.141 54609 typ host		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
***** Video m=line *****	*****	
m=video 54609 UDP/TLS/RTP/SAVPF	[RFC4566]	
120		
c=IN IP4 24.23.204.141	[RFC4566]	
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]	
a=mid:video	[RFC5888]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=sendonly	[RFC3264] - Send only video	
	stream	
a=rtppmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=content:slides	[RFC4796] -Alice's	
	presentation video stream	
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145] - Alice can perform	
	DTLS before Answer arrives	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:120 nack	[RFC5104]	
a=rtcp-fb:120 nack pli	[RFC5104]	
a=rtcp-fb:120 ccm fir	[RFC5104]	
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	

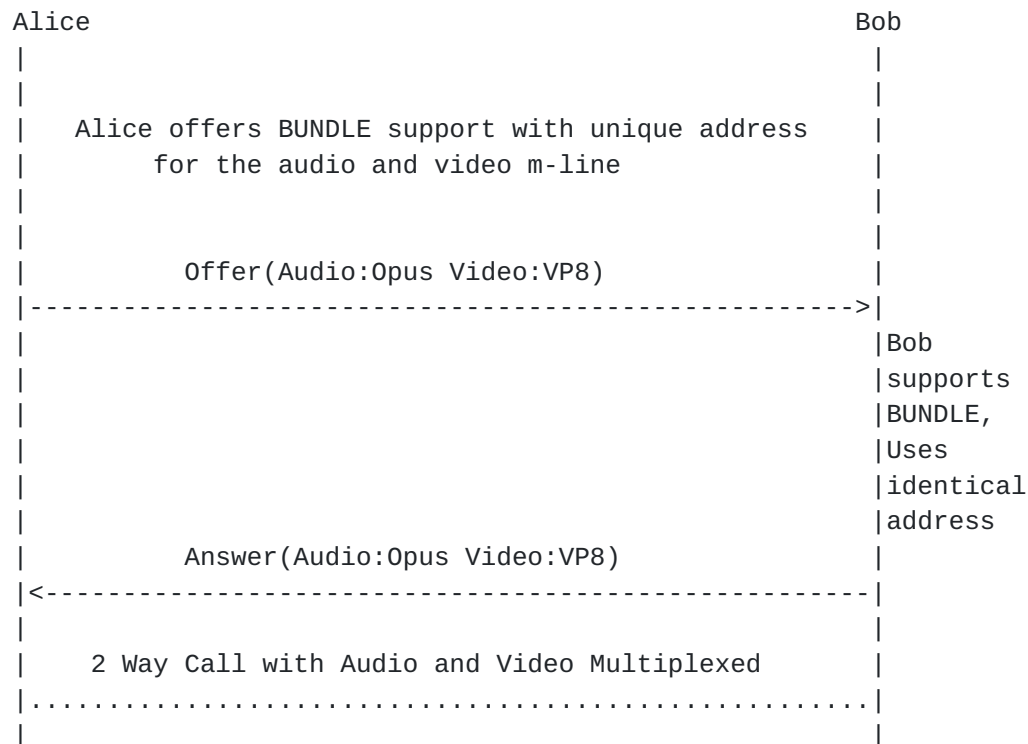
a=ssrc:56789	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
+-----+		

Table 11: 5.2.6 SDP Offer

Answer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-negotiation]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
***** Audio m=line *****	*****
m=audio 49203 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 98.248.92.77	[RFC4566]
a=rtcp:49203 IN IP4 24.23.204.141	[RFC3605]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=recvonly	[RFC3264] - Receive only audio stream
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=maxptime:120	[RFC4566]
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245]
a=fingerprint:sha-256 6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:24:C2:43:F0:A1:58:D0:A1:2C:19:08	[RFC5245]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761]
a=rtcp-rsize	[RFC5506]
a=rtcp-fb:109 nack	[RFC5104]
a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-level	[RFC6464]
a=extmap:2 urn:ietf:params:rtp-hdext:sdes:mid	[I-D.ietf-mmusic-sdp-bundle-negotiation]
a=ssrc:54321	[RFC5576]
cname:Q/Nws1ao1HmN4Xa5	

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



Offer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
***** Audio m=line *****	*****
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=rtcp:54610 IN IP4 24.23.204.141	[RFC3605] - RTCP port different from RTP Port

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=sendrecv	[RFC3264]
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=maxptime:120	[RFC4566]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245]
74af08a068	
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73	
:04 :BB:05:2F:70:9F:04:A9:0E:05:E	
9:26:33:E8:70:88:A2	
a=setup:actpass	[RFC4145] - Alice can perform
	DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=rtcp-rsize	[RFC5506]
a=rtcp-fb:109 nack	[RFC5104]
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]
hdext:ssrc-audio-level	
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n
hdext:sdes:mid	egotiation]
a=ssrc:12345	[RFC5576]
cname:EocUG1f0fcg/yvY7	
a=candidate:0 1 UDP 2122194687	[RFC5245] - RTP host
192.168.1.4 61665 typ host	candidate
a=candidate:1 1 UDP 1685987071	[RFC5245] - RTP Server
24.23.204.141 54609 typ srflx	Reflexive candidate
raddr 192.168.1.4 rport 61665	
a=candidate:0 2 UDP 2122194687	[RFC5245] - RTCP host
192.168.1.4 61666 typ host	candidate
a=candidate:1 2 UDP 1685987071	[RFC5245] - RTCP Server
24.23.204.141 54610 typ srflx	Reflexive candidate
raddr 192.168.1.4 rport 61666	
***** Video m=line *****	*****
m=video 62537 UDP/TLS/RTP/SAVPF	[RFC4566]
120	
c=IN IP4 24.23.204.141	[RFC4566]
a=rtcp:62538 IN IP4 24.23.204.141	[RFC3605]
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=sendrecv	[RFC3264]	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=ice-ufrag:6550074c	[RFC5245]	
a=ice-pwd:74af08a068a28a397a4c3f3	[RFC5245]	
1747d1ee34		
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145] - Alice can perform	
	DTLS before Answer arrives	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:120 nack	[RFC5104]	
a=rtcp-fb:120 nack pli	[RFC5104]	
a=rtcp-fb:120 ccm fir	[RFC5104]	
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:56789	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=candidate:0 1 UDP 2122194687	[RFC5245] - RTP Host	
192.168.1.4 61886 typ host	candidate	
a=candidate:1 1 UDP 1685987071	[RFC5245] - RTP Server	
24.23.204.141 62537 typ srflx	Reflexive candidate	
raddr 192.168.1.4 rport 61886		
a=candidate:0 2 2122194687	[RFC5245] - RTCP host	
192.168.1.4 61888 typ host	candidate	
a=candidate:1 2 UDP 1685987071	[RFC5245] - RTCP Server	
24.23.204.141 62538 typ srflx	Reflexive candidate	
raddr 192.168.1.4 rport 61888		
+-----+-----+-----+		

Table 13: 5.2.7 SDP Offer w/BUNDLE

Answer SDP Contents	RFC#/Notes	
+-----+-----+-----+		
v=0	[RFC4566]	
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566]	
s=-	[RFC4566]	
t=0 0	[RFC4566]	
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-n	
	egotiation] Bob supports	
	BUNDLE semantics.	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
***** Audio m=line *****	*****	
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	

109		
c=IN IP4 98.248.92.77	[RFC4566]	
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]	
a=mid:audio	[RFC5888]	Audio m=line part
		of the BUNDLE group
a=msid:ma ta		Identifies RTCMediaStream ID
		(ma) and RTCMediaStreamTrack
		ID (ta)
a=sendrecv	[RFC3264]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-pwd:de4e99bd291c325921d5d47	[RFC5245]	
efbabd9a2		
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245]	
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B		
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A		
1:58:D0:A1:2C:19:08		
a=setup:active	[RFC4145]	- Bob carries out
		DTLS Handshake in parallel
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:54321	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
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 51556 typ srflx		
raddr 192.168.1.7 rport 49203		
***** Video m=line *****	*****	
m=video 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
120		
c=IN IP4 98.248.92.77	[RFC4566]	
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]	
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=sendrecv	[RFC3264]	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245]	

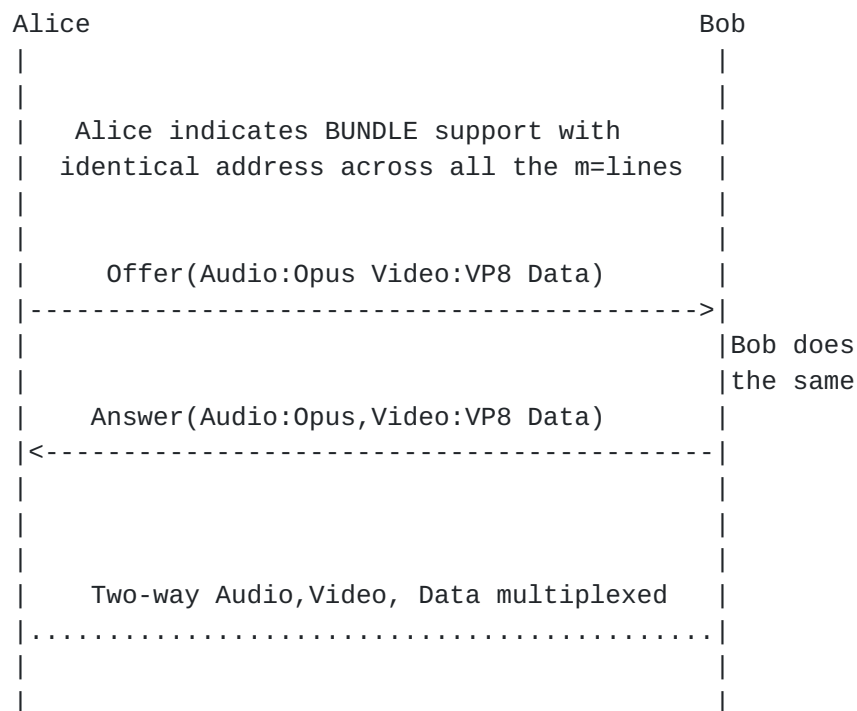
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B	
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A	
1:58:D0:A1:2C:19:08	
a=setup:active	[RFC4145] - Bob carries out
	DTLS Handshake in parallel
a=rtcp-mux	[RFC5761]
a=rtcp-rsize	[RFC5506]
a=rtcp-fb:120 nack	[RFC5104]
a=rtcp-fb:120 nack pli	[RFC5104]
a=rtcp-fb:120 ccm fir	[RFC5104]
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n
hdnext:sdes:mid	egotiation]
a=ssrc:98765	[RFC5576]
cname:Q/NWS1ao1HmN4Xa5	
+-----+-----+	

Table 14: 5.2.7 SDP Answer w/BUNDLE

5.2.8. Audio, Video and Data Session

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

Audio,Video,Data with BUNDLE support known



Offer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio video data	[I-D.ietf-mmusic-sdp-bundle-negotiation]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
***** Audio m=line *****	*****
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=mid:audio	[RFC5888]
a=sendrecv	[RFC3264]
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=maxptime:120	[RFC4566]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245]

74af08a068		
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:12345	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.4 61665 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 61665		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
***** Video m=line *****	*****	
m=video 54609 UDP/TLS/RTP/SAVPF	[RFC4566]	
120		
c=IN IP4 24.23.204.141	[RFC4566]	
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]	
a=mid:video	[RFC5888]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=sendrecv	[RFC3264]	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:120 nack	[RFC5104]	
a=rtcp-fb:120 nack pli	[RFC5104]	
a=rtcp-fb:120 ccm fir	[RFC5104]	
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:56789	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
***** Application m=line	*****	

m=application 54609 UDP/DTLS/SCTP	[I-D.ietf-rtcweb-data-channel	
webrtc-datachannel	]	
c=IN IP4 24.23.204.141	[RFC4566]	
a=mid:data	[RFC5888]	
a=sctp-port:5000	[I-D.ietf-mmusic-sctp-sdp]	
a=max-message-size:100000	[I-D.ietf-mmusic-sctp-sdp]	
a=sendrecv	[RFC3264]	
a=setup:actpass	[RFC4145]	
a=connection:new	[RFC4145]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245]	
74af08a068		
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
+-----+	+-----+	+-----+

Table 15: 5.2.8 SDP Offer

Answer SDP Contents	RFC#/Notes	
+-----+	+-----+	+-----+
v=0	[RFC4566]	
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin	
	Information	
s=-	[RFC4566]	
t=0 0	[RFC4566]	
a=group:BUNDLE audio video data	[I-D.ietf-mmusic-sdp-bundle-n	
	egotiation]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
***** Audio m=line *****	*****	
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
109		
c=IN IP4 98.248.92.77	[RFC4566]	
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]	
a=msid:ma ta	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (ta)	
a=mid:audio	[RFC5888]	
a=sendrecv	[RFC3264]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-pwd:de4e99bd291c325921d5d47	[RFC5245]	
efbabd9a2		
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245]	

:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B	
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A	
1:58:D0:A1:2C:19:08	
a=setup:active	[RFC4145]
a=rtcp-mux	[RFC5761]
a=rtcp-rsize	[RFC5506]
a=rtcp-fb:109 nack	[RFC5104]
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]
hdext:ssrc-audio-level	
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n
hdext:sdes:mid	egotiation]
a=ssrc:54321	[RFC5576]
cname:Q/NWs1ao1HmN4Xa5	
a=candidate:0 1 UDP 2122194687	[RFC5245]
192.168.1.7 51556 typ host	
a=candidate:1 1 UDP 1685987071	[RFC5245]
98.248.92.77 49203 typ srflx	
raddr 192.168.1.7 rport 51556	
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]
***** Video m=line *****	*****
m=video 49203 UDP/TLS/RTP/SAVPF	[RFC4566]
120	
c=IN IP4 98.248.92.77	[RFC4566]
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]
a=mid:video	[RFC5888]
a=msid:ma tb	Identifies RTCMediaStream ID
	(ma) and RTCMediaStreamTrack
	ID (tb)
a=sendrecv	[RFC3264]
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245]
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B	
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A	
1:58:D0:A1:2C:19:08	
a=setup:active	[RFC4145]
a=rtcp-mux	[RFC5761]
a=rtcp-rsize	[RFC5506]
a=rtcp-fb:120 nack	[RFC5104]
a=rtcp-fb:120 nack pli	[RFC5104]
a=rtcp-fb:120 ccm fir	[RFC5104]
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n
hdext:sdes:mid	egotiation]
a=ssrc:98765	[RFC5576]
cname:Q/NWs1ao1HmN4Xa5	
***** Application m=line	*****

m=application 49203 UDP/DTLS/SCTP	[I-D.ietf-mmusic-sctp-sdp]
webrtc-datachannel	

c=IN IP4 98.248.92.771	[RFC4566]	
a=mid:data	[RFC5888]	
a=sctp-port:5000	[I-D.ietf-mmusic-sctp-sdp]	
a=max-message-size:100000	[I-D.ietf-mmusic-sctp-sdp]	
a=setup:active	[RFC4145]	
a=sendrecv	[RFC3264]	
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245]	
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B		
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A		
1:58:D0:A1:2C:19:08		
+-----+-----+-----+		

Table 16: 5.2.8 SDP Answer

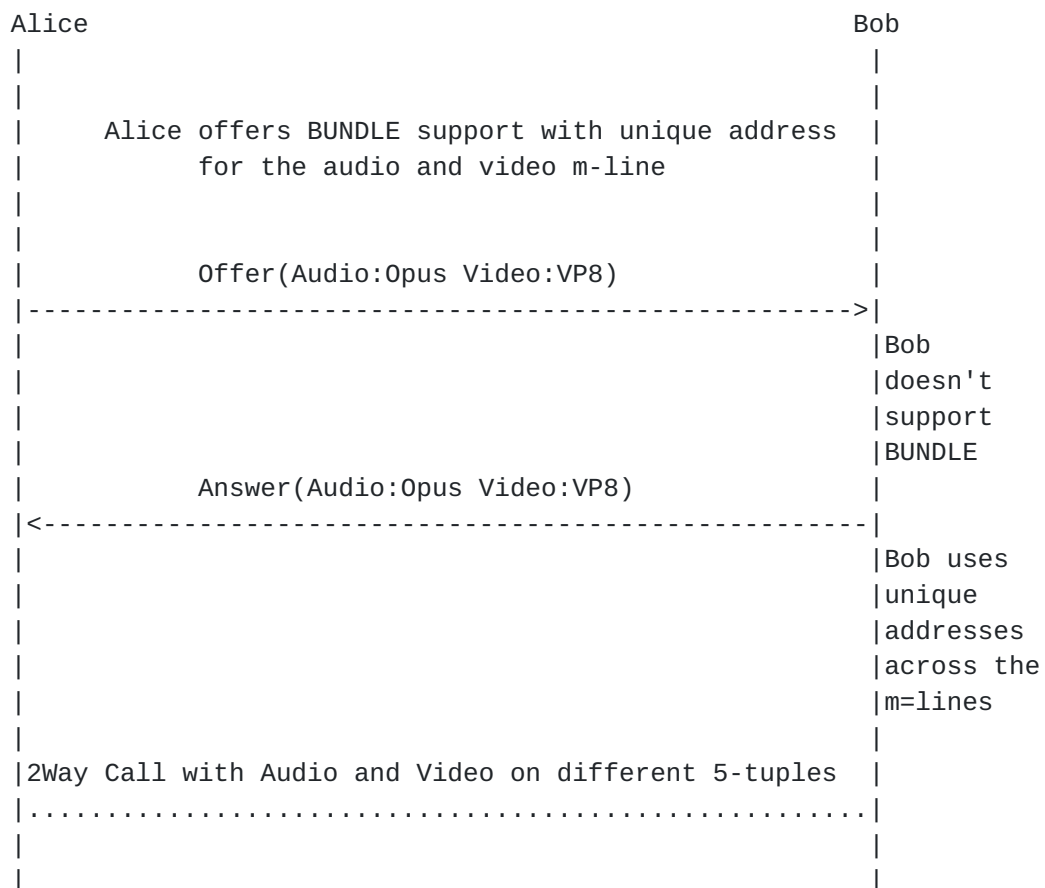
5.2.9. Audio, Video Session with BUNDLE Unsupported

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.

The same is indicated by dropping the "a=group:BUNDLE" line and BUNDLE RTP header extension in the Answer SDP.

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

Two-Way Secure Audio, Video with BUNDLE Unsupported



Offer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
***** Audio m=line *****	*****
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=rtcp:55232 IN IP4 24.23.204.141	[RFC3605] - RTCP port different from RTP port
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=sendrecv	[RFC3264]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245]	
74af08a068		
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145] - Alice can perform	
	DTLS before Answer arrives	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:12345	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.4 61665 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 61665		
a=candidate:0 2 UDP 2122194687	[RFC5245]	
192.168.1.4 61666 typ host		
a=candidate:1 2 UDP 1685987071	[RFC5245]	
24.23.204.141 55232 typ srflx		
raddr 192.168.1.4 rport 61666		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
***** Video m=line *****	*****	
m=video 54332 UDP/TLS/RTP/SAVPF	[RFC4566]	
120		
c=IN IP4 24.23.204.141	[RFC4566]	
a=rtcp:60052 IN IP4 24.23.204.141	[RFC3605]	
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=sendrecv	[RFC3264]	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=ice-ufrag:7872093	[RFC5245]	
a=ice-pwd:ee3474af08a068a28a397a4	[RFC5245]	
c3f31747d1		
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145] - Alice can perform	
	DTLS before Answer arrives	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:120 nack	[RFC5104]	
a=rtcp-fb:120 nack pli	[RFC5104]	
a=rtcp-fb:120 ccm fir	[RFC5104]	
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:56789	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.4 71775 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
24.23.204.141 54332 typ srflx		
raddr 192.168.1.4 rport 71775		
a=candidate:0 2 2122194687	[RFC5245]	
192.168.1.4 71776 typ host		
a=candidate:1 2 UDP 1685987071	[RFC5245]	
24.23.204.141 60052 typ srflx		
raddr 192.168.1.4 rport 71776		
+-----+-----+		

Table 17: 5.2.9 SDP Offer w/BUNDLE

Answer SDP Contents	RFC#/Notes	
+-----+-----+		
v=0	[RFC4566]	
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566]	
s=-	[RFC4566]	
t=0 0	[RFC4566]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle	
	-ice]	
***** Audio m=line *****	*****	

m=audio 53214 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=msid:ma ta	Identifies	
	RTCMediaStream ID (ma)	
	and RTCMediaStreamTrack	
	ID (ta)	
a=sendrecv	[RFC3264]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-op	
	us]	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-	[RFC5245]	
pwd:de4e99bd291c325921d5d47efbabd9a2		
a=fingerprint:sha-256 6B:8B:F0:65:5F:7	[RFC5245]	
8:E2:51:3B:AC:6F:F3:3F:46:1B:35 :DC:B8		
:5F:64:1A:24:C2:43:F0:A1:58:D0:A1:2C:1		
9:08		
a=setup:active	[RFC4145] - Bob carries	
	out DTLS Handshake in	
	parallel	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-hdext	[RFC6464]	
:ssrc-audio-level		
a=ssrc:54321 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]	
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.7 51556 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
98.248.92.77 53214 typ srflx raddr		
192.168.1.7 rport 51556		
a=candidate:0 2 UDP 2122194687	[RFC5245]	
192.168.1.7 51558 typ host		
a=candidate:1 2 UDP 1685987071	[RFC5245]	
98.248.92.77 60065 typ srflx raddr		
192.168.1.7 rport 51558		
***** Video m=line *****	*****	

m=video 58679 UDP/TLS/RTP/SAVPF 120	[RFC4566]	
c=IN IP4 98.248.92.77	[RFC4566]	
a=rtcp:56507 IN IP4 98.248.92.77	[RFC3605]	
a=msid:ma tb	Identifies	
	RTCMediaStream ID (ma)	
	and RTCMediaStreamTrack	
	ID (tb)	
a=sendrecv	[RFC3264]	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=ice-ufrag:85bC300	[RFC5245]	
a=ice-	[RFC5245]	
pwd:325921d5d47efbabd9a2de4e99bd291c		

a=fingerprint:sha-256 6B:8B:F0:65:5F:7	[RFC5245]	
8:E2:51:3B:AC:6F:F3:3F:46:1B:35 :DC:B8		
:5F:64:1A:24:C2:43:F0:A1:58:D0:A1:2C:1		
9:08		
a=setup:active	[RFC4145] - Bob carries	
	out DTLS Handshake in	
	parallel	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:120 nack	[RFC5104]	
a=rtcp-fb:120 nack pli	[RFC5104]	
a=rtcp-fb:120 ccm fir	[RFC5104]	
a=ssrc:98765 cname:Q/Nws1ao1HmN4Xa5	[RFC5576]	
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.7 61556 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
98.248.92.77 58679 typ srflx raddr		
192.168.1.7 rport 61556		
a=candidate:0 1 UDP 2122194687	[RFC5245]	
192.168.1.7 61558 typ host		
a=candidate:1 1 UDP 1685987071	[RFC5245]	
98.248.92.77 56507 typ srflx raddr		
192.168.1.7 rport 61558		
+-----+-----+-----+		

Table 18: 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 section and not adding the "mid" identification tag to the BUNDLE group.

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	
.....	

+-----+ Offer SDP Contents RFC#/Notes +-----+	
v=0	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-negotiation] Alice wants to BUNDLE only audio and video media.
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
***** Audio m=line *****	*****
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=sendrecv	[RFC3264]
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=maxptime:120	[RFC4566]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245]

74af08a068		
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:12345	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 54609 typ host		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
***** Video m=line *****	*****	
m=video 54609 UDP/TLS/RTP/SAVPF	[RFC4566]	
120		
c=IN IP4 24.23.204.141	[RFC4566]	
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]	
a=mid:video	[RFC5888]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=sendrecv	[RFC3264]	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:120 nack	[RFC5104]	
a=rtcp-fb:120 nack pli	[RFC5104]	
a=rtcp-fb:120 ccm fir	[RFC5104]	
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:56789	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
***** Application m=line	*****	

m=application 10000 UDP/DTLS/SCTP	[I-D.ietf-rtcweb-data-channel	
webrtc-datachannel	]	
c=IN IP4 24.23.204.141	[RFC4566]	

a=mid:data	[RFC5888]	
a=sctp-port:5000	[I-D.ietf-mmusic-sctp-sdp]	
a=max-message-size:100000	[I-D.ietf-mmusic-sctp-sdp]	
a=sendrecv	[RFC3264]	
a=setup:actpass	[RFC4145]	
a=connection:new	[RFC4145]	
a=ice-ufrag:89819013	[RFC5245]	
a=ice-pwd:1747d1ee3474af08a068a28	[RFC5245]	
a397a4c3f3		
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 10000 typ host		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
+-----+		

Table 19: 5.2.10 SDP Offer

Answer SDP Contents	RFC#/Notes	
+-----+		
v=0	[RFC4566]	
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin	
	Information	
s=-	[RFC4566]	
t=0 0	[RFC4566]	
a=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-negotiation]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
***** Audio m=line *****	*****	
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
109		
c=IN IP4 98.248.92.77	[RFC4566]	
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]	
a=mid:audio	[RFC5888]	
a=msid:ma ta	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (ta)	
a=sendrecv	[RFC3264]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-pwd:de4e99bd291c325921d5d47	[RFC5245]	
efbabd9a2		
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245]	

:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B	
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A	
1:58:D0:A1:2C:19:08	
a=setup:active	[RFC4145]
a=rtcp-mux	[RFC5761]
a=rtcp-rsize	[RFC5506]
a=rtcp-fb:109 nack	[RFC5104]
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]
hdext:ssrc-audio-level	
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n
hdext:sdes:mid	egotiation]
a=ssrc:54321	[RFC5576]
cname:Q/NWs1ao1HmN4Xa5	
a=candidate:0 1 UDP 2113667327	[RFC5245]
192.168.1.7 49203 typ host	
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]
***** Video m=line *****	*****
m=video 49203 UDP/TLS/RTP/SAVPF	[RFC4566]
120	
c=IN IP4 98.248.92.771	[RFC4566]
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]
a=mid:video	[RFC5888]
a=msid:ma tb	Identifies RTCMediaStream ID
	(ma) and RTCMediaStreamTrack
	ID (tb)
a=sendrecv	[RFC3264]
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245]
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B	
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A	
1:58:D0:A1:2C:19:08	
a=setup:active	[RFC4145]
a=rtcp-mux	[RFC5761]
a=rtcp-rsize	[RFC5506]
a=rtcp-fb:120 nack	[RFC5104]
a=rtcp-fb:120 nack pli	[RFC5104]
a=rtcp-fb:120 ccm fir	[RFC5104]
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n
hdext:sdes:mid	egotiation]
a=ssrc:98765	[RFC5576]
cname:Q/NWs1ao1HmN4Xa5	
***** Application m=line	*****

m=application 20000 UDP/DTLS/SCTP	[I-D.ietf-mmusic-sctp-sdp]
webrtc-datachannel	
c=IN IP4 98.248.92.77	[RFC4566]
a=mid:data	[RFC5888]
a=sctp-port:5000	[I-D.ietf-mmusic-sctp-sdp]

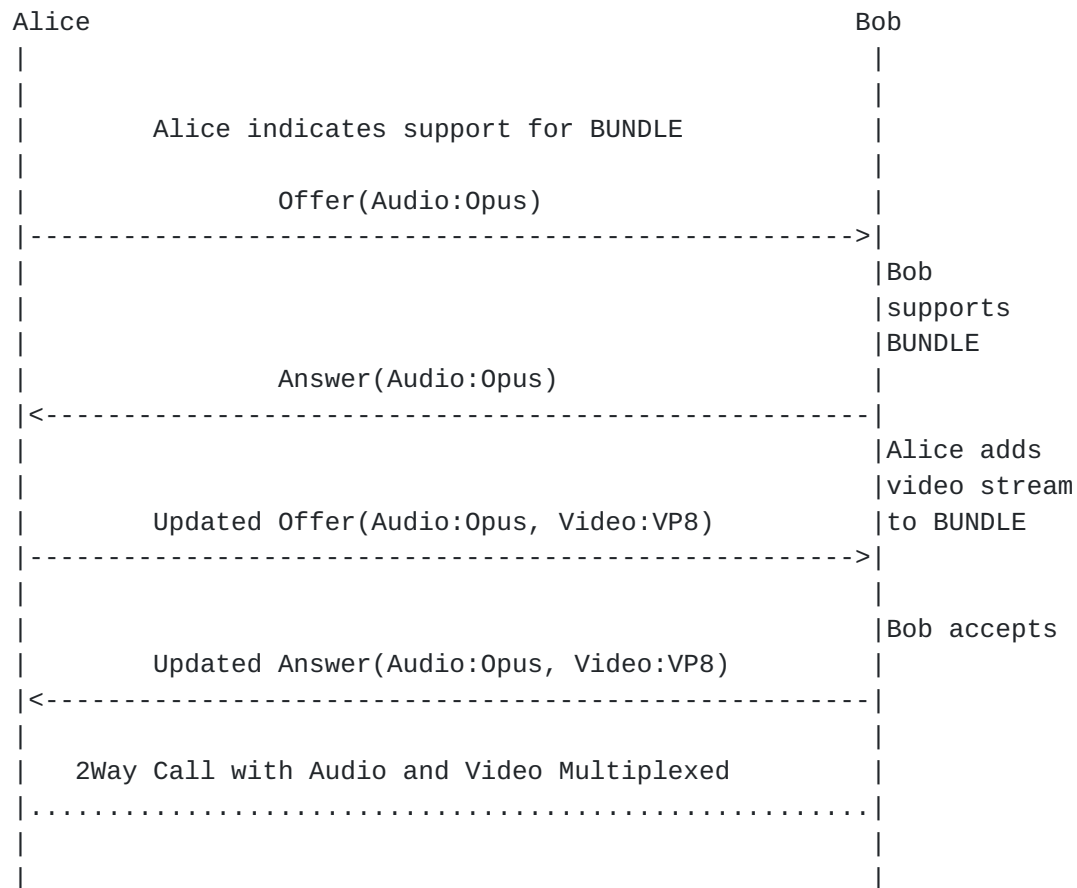
a=max-message-size:100000	[I-D.ietf-mmusic-sctp-sdp]	
a=setup:active	[RFC4145]	
a=sendrecv	[RFC3264]	
a=ice-ufrag:991Ca2a5e	[RFC5245]	
a=ice-pwd:921d5d47efbabd9a2de4e99	[RFC5245]	
bd291c325		
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245]	
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B		
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A		
1:58:D0:A1:2C:19:08		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.7 20000 typ host		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
+-----+	+-----+	+-----+

Table 20: 5.2.10 SDP Answer

5.2.11. Audio Only, Add Video to BUNDLE

This example involves 2 Offer/Answer exchanges. First one is used to negotiate and setup BUNDLE support for Audio-only session followed by an updated Offer/Answer exchange to add video stream to the ongoing session. Also the newly added video stream is BUNDLED with the audio stream.

Audio Only , Add Video and BUNDLE



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

	ID (ta)	
a=sendrecv	[RFC3264]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245]	
74af08a068		
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:12345	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 61665 typ host		
a=candidate:1 1 UDP 694302207	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 61665		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
+-----+		+-----+

Table 21: 5.2.11 SDP Offer

+-----+		+-----+
Answer SDP Contents	RFC#/Notes	
+-----+	+-----+	+-----+
v=0	[RFC4566]	
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin	
	Information	
s=-	[RFC4566]	
t=0 0	[RFC4566]	
a=group:BUNDLE audio	[I-D.ietf-mmusic-sdp-bundle-n	
	egotiation]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
***** Audio m=line *****	*****	
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
109		
c=IN IP4 98.248.92.77	[RFC4566]	
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]	

a=mid:audio	[RFC5888]	
a=msid:ma ta	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (ta)	
a=sendrecv	[RFC3264]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-pwd:de4e99bd291c325921d5d47	[RFC5245]	
efbabd9a2		
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245]	
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B		
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A		
1:58:D0:A1:2C:19:08		
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:54321	[RFC5576]	
cname:Q/NWslao1HmN4Xa5		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.7 51556 typ host		
a=candidate:1 1 UDP 1694302207	[RFC5245]	
98.248.92.77 49203 typ srflx		
raddr 192.168.1.7 rport 51556		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
+-----+-----+		

Table 22: 5.2.10 SDP Answer

Updated Offer 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=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-n	
	egotiation]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
***** Audio m=line *****	*****	
m=audio 54609 UDP/TLS/RTP/SAVPF	[RFC4566]	

109		
c=IN IP4 24.23.204.141	[RFC4566]	
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]	
a=mid:audio	[RFC5888]	
a=msid:ma ta	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (ta)	
a=sendrecv	[RFC3264]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245]	
74af08a068		
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:12345	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 61665 typ host		
a=candidate:1 1 UDP 694302207	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 61665		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
***** Video m=line *****	*****	
m=video 54609 UDP/TLS/RTP/SAVPF	[RFC4566]	
120		
c=IN IP4 24.23.204.141	[RFC4566]	
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]	
a=mid:video	[RFC5888]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=sendrecv	[RFC3264]	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		

a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:120 nack	[RFC5104]	
a=rtcp-fb:120 nack pli	[RFC5104]	
a=rtcp-fb:120 ccm fir	[RFC5104]	
a=extmap:2 urn:ietf:params:rtp-hdrext:sdes:mid	[I-D.ietf-mmusic-sdp-bundle-negotiation]	
a=ssrc:56789	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
+-----+		

Table 23: 5.2.11 SDP Updated Offer

Updated Answer 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=group:BUNDLE audio video	[I-D.ietf-mmusic-sdp-bundle-negotiation]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
***** Audio m=line *****	*****	
m=audio 49203 UDP/TLS/RTP/SAVPF 109	[RFC4566]	
c=IN IP4 98.248.92.77	[RFC4566]	
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]	
a=mid:audio	[RFC5888]	
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)	
a=sendrecv	[RFC3264]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245]	
a=fingerprint:sha-256 6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:24:C2:43:F0:A1:58:D0:A1:2C:19:08	[RFC5245]	
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	

a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-hdrext:ssrc-audio-level	[RFC6464]	
a=extmap:2 urn:ietf:params:rtp-hdrext:sdes:mid	[I-D.ietf-mmusic-sdp-bundle-negotiation]	
a=ssrc:54321	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=candidate:0 1 UDP 2113667327 192.168.1.7 51556 typ host	[RFC5245]	
a=candidate:1 1 UDP 1694302207 98.248.92.77 49203 typ srflx raddr 192.168.1.7 rport 51556	[RFC5245]	
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
***** Video m=line *****	*****	
m=video 49203 UDP/TLS/RTP/SAVPF 120	[RFC4566]	
c=IN IP4 98.248.92.77	[RFC4566]	
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]	
a=mid:video	[RFC5888]	
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)	
a=sendrecv	[RFC3264]	
a=rtpmap:120 VP8/90000	[I-D.ietf-payload-vp8]	
a=fingerprint:sha-256 6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:24:C2:43:F0:A1:58:D0:A1:2C:19:08	[RFC5245]	
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:120 nack	[RFC5104]	
a=rtcp-fb:120 nack pli	[RFC5104]	
a=rtcp-fb:120 ccm fir	[RFC5104]	
a=extmap:2 urn:ietf:params:rtp-hdrext:sdes:mid	[I-D.ietf-mmusic-sdp-bundle-negotiation]	
a=ssrc:98765	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
+-----+	+-----+	+-----+

Table 24: 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.

[I-D.ietf-mmusic-rid] framework is used to further constrain the media format encodings and map the payload types (PT) to the 'rid' identifiers.

[I-D.ietf-mmusic-sdp-simulcast] framework identifies the simulcast streams via their 'rid' identifiers.

bundle-only attribute is used for the video sources in the Offer to ensure enabling video sources in the context of BUNDLE alone.

BUNDLE grouping framework enables 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	
.....	

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

a=sendonly	[RFC3264]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3474	[RFC5245]	
af08a068		
a=fingerprint:sha-256 19:E2:1C:3B:4	[RFC5245]	
B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04		
:BB:05:2F:70:9F:04:A9:0E:05:E9:26:3		
3:E8:70:88:A2		
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle	
hdext:sdes:mid	-negotiation]	
a=ssrc:11111 cname:EocUG1f0fcg/yvY7	[RFC5576]	
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 61665 typ host		
a=candidate:1 1 UDP 694302207	[RFC5245]	
24.23.204.141 54609 typ srflx raddr		
192.168.1.4 rport 61665		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ic	
	e]	
***** Video-1 m=line *****	*****	
	**	
m=video 0 UDP/TLS/RTP/SAVPF 98 100	bundle-only video line with	
	port number set to zero	
c=IN IP4 24.23.204.141	[RFC4566]	
a=bundle-only	[I-D.ietf-mmusic-sdp-bundle	
	-negotiation]	
a=rtcp:54609 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=sendonly	[RFC3264] - Send only video	
	stream	
a=rtpmap:98 VP8/90000	[I-D.ietf-payload-vp8]	
a=fmtp:98 max-fr=30	[RFC4566]	
a=rtpmap:100 VP8/90000	[I-D.ietf-payload-vp8]	
a=fmtp:100 max-fr=15	[RFC4566]	
a=fingerprint:sha-256 19:E2:1C:3B:4	[RFC5245]	
B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04		
:BB:05:2F:70:9F:04:A9:0E:05:E9:26:3		

3:E8:70:88:A2		
a=setup:actpass		[RFC4145]
a=rtcp-mux		[RFC5761]
a=rtcp-mux-only		[I-D.ietf-mmusic-mux-exclus
		ive]
a=rtcp-rsize		[RFC5506]
a=rtcp-fb:* nack		[RFC5104]
a=rtcp-fb:* nack pli		[RFC5104]
a=rtcp-fb:* ccm fir		[RFC5104]
a=extmap:2 urn:ietf:params:rtp-		[I-D.ietf-mmusic-sdp-bundle
hdext:sdes:mid		-negotiation]
a=ssrc:22222 cname:EocUG1f0fcg/yvY7		[RFC5576] [RFC7022]
		Camera-1,Encoding-1 SSRC
		with Session CNAME
a=ssrc:33333 cname:EocUG1f0fcg/yvY7		[RFC5576] [RFC7022]
		Camera-1,Encoding-2 SSRC
		with Session CNAME
a=rid:1 send pt=98;max-width=1280		[I-D.ietf-mmusic-rid] 1:1
;max-height=720;		rid mapping to payload type
		and specify resolution
		constraints
a=rid:2 send pt=100;max-width=640		[I-D.ietf-mmusic-rid] 1:1
;max-height=480;		rid mapping to payload type
		and specify resolution
		constraints
a=simulcast: send 1;~2		[I-D.ietf-mmusic-sdp-simulc
		ast] Alice can send 2
		resolutions identified by
		the 'rid' identifiers Also,
		the second stream is
		initially paused.
***** Video-2 m=line *****		*****
		**
m=video 0 UDP/TLS/RTP/SAVPF 101 102		bundle-only video line with
		port number set to zero
c=IN IP4 24.23.204.141		[RFC4566]
a=bundle-only		[I-D.ietf-mmusic-sdp-bundle
		-negotiation]
a=rtcp:54609 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=sendonly		[RFC3264] - Send only video
		stream
a=rtpmap:101 H264/90000		[RFC3984]
a=rtpmap:102 H264/90000		[RFC3984]

a=fmtp:101 profile-level-id=42401f	[RFC3984] Camera-2, Encoding-	
;packetization-mode=0;max-fr=30	1	
a=fmtp:102 profile-level-id=42401f	[RFC3984] Camera-2, Encoding-	
;packetization-mode=1;max-fr=15	2	
a=fingerprint:sha-256 19:E2:1C:3B:4	[RFC5245]	
B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04		
:BB:05:2F:70:9F:04:A9:0E:05:E9:26:3		
3:E8:70:88:A2		
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-mux-only	[I-D.ietf-mmusic-mux-exclus	
	ive]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:* nack	[RFC5104]	
a=rtcp-fb:* nack pli	[RFC5104]	
a=rtcp-fb:* ccm fir	[RFC5104]	
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle	
hdext:sdes:mid	-negotiation]	
a=ssrc:44444 cname:EocUG1f0fcg/yvY7	[RFC5576] [RFC7022]	
	Camera-2, Encoding-1 SSRC	
	with Session CNAME	
a=ssrc:55555 cname:EocUG1f0fcg/yvY7	[RFC5576] [RFC7022]	
	Camera-2, Encoding-2 SSRC	
	with Session CNAME	
a=rid:3 send pt=101;max-width=1280	[I-D.ietf-mmusic-rid] 1:1	
;max-height=720;	rid mapping to payload type	
	and specify resolution	
	constraints	
a=rid:4 send pt=102;max-width=640	[I-D.ietf-mmusic-rid] 1:1	
;max-height=360;	rid mapping to payload type	
	and specify resolution	
	constraints	
a=simulcast: send 3;4	[I-D.ietf-mmusic-sdp-simulc	
	ast] Alice can send 2	
	resolutions identified by	
	the 'rid' identifiers	
+-----+		

Table 25: 5.3.1 SDP Offer

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

a=group:BUNDLE m0 m1 m2	[I-D.ietf-mmusic-sdp-bundle
	-negotiation] Alice
	supports grouping of
	m=lines under BUNDLE
	semantics
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ic
	e]
***** Audio m=line *****	*****
	**
m=audio 49203 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 98.248.92.77	[RFC4566]
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]
a=mid:m0	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream
	ID (ma) and
	RTCMediaStreamTrack ID (ta)
a=recvonly	[RFC3264]
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=rtcp-fb:109 nack	[RFC5104]
a=maxptime:120	[RFC4566]
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47ef	[RFC5245]
babd9a2	
a=fingerprint:sha-256 6B:8B:F0:65:5	[RFC5245]
F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35	
:DC:B8:5F:64:1A:24:C2:43:F0:A1:58:D	
0:A1:2C:19:08	
a=setup:active	[RFC4145]
a=rtcp-mux	[RFC5761]
a=rtcp-rsize	[RFC5506]
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]
hdext:ssrc-audio-level	
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle
hdext:sdes:mid	-negotiation]
a=ssrc:77777 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
a=candidate:0 1 UDP 2113667327	[RFC5245]
192.168.1.7 61665 typ host	
a=candidate:1 1 UDP 694302207	[RFC5245]
98.248.92.77 49203 typ srflx raddr	
192.168.1.4 rport 61665	
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ic
	e]
***** Video-1 m=line *****	*****
	**
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=rtcp:49203 IN IP4 98.248.92.77	[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=recvonly	[RFC3264]	- receive only
		video stream
a=rtpmap:98 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:100 VP8/90000	[I-D.ietf-payload-vp8]	
a=fmtp:98 max-fr=30	[RFC4566]	
a=fmtp:100 max-fr=15	[RFC4566]	
a=fingerprint:sha-256 6B:8B:F0:65:5	[RFC5245]	
F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35		
:DC:B8:5F:64:1A:24:C2:43:F0:A1:58:D		
0:A1:2C:19:08		
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5576]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:* nack	[RFC5104]	
a=rtcp-fb:* nack pli	[RFC5104]	
a=rtcp-fb:* ccm fir	[RFC5104]	
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle]	
hdext:sdes:mid	-negotiation]	
a=ssrc:88888 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]	- SSRC associated
		with the receiver report
		from Bob
a=rid:1 recv pt=98;max-width=1280	[I-D.ietf-mmusic-rid]	Bob
;max-height=720;		accepts the offered payload
		format constraints
a=rid:2 recv pt=100;max-width=640	[I-D.ietf-mmusic-rid]	Bob
;max-height=480;		accepts the offered payload
		format constraints
a=simulcast: recv 1;2	[I-D.ietf-mmusic-sdp-simulc]	ast] Bob accepts the
		offered simulcast streams
		and removes the paused
		state of stream with 'rid'
		value 2.
***** Video-2 m=line *****	*****	
	**	
m=video 49203 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:49203 IN IP4 98.248.92.77	[RFC3605]	
a=mid:m2	[RFC5888]	Video m=line part
		of BUNDLE group

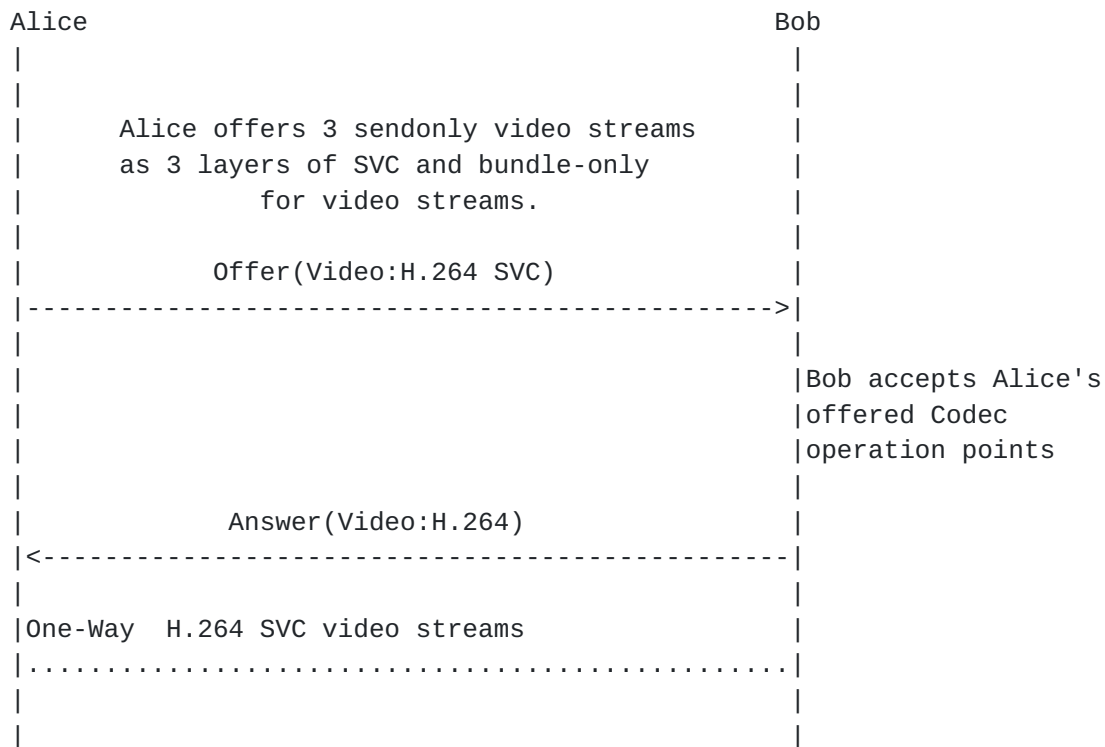
a=msid:ma tc	Identifies RTCMediaStream	
	ID (ma) and	
	RTCMediaStreamTrack ID (tc)	
a=recvonly	[RFC3264]	
a=rtpmap:101 H264/90000	[RFC3984]	
a=rtpmap:102 H264/90000	[RFC3984]	
a=fmtp:101 profile-level-id=42401f	[RFC3984]	
;packetization-mode=1;max-fr=30		
a=fmtp:102 profile-level-id=42401f	[RFC3984]	
;packetization-mode=1;max-fr=15		
a=fingerprint:sha-256 6B:8B:F0:65:5	[RFC5245]	
F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35		
:DC:B8:5F:64:1A:24:C2:43:F0:A1:58:D		
0:A1:2C:19:08		
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5576]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:* nack	[RFC5104]	
a=rtcp-fb:* nack pli	[RFC5104]	
a=rtcp-fb:* ccm fir	[RFC5104]	
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle	
hdrext:sdes:mid	-negotiation]	
a=ssrc:99999 cname:Q/NWs1ao1HmN4Xa5	[RFC5576] - SSRC associated	
	with the receiver report	
	from Bob	
a=rid:3 recv pt=101;max-width=1280	[I-D.ietf-mmusic-rid] Bob	
;max-height=720;	accepts the offered payload	
	format constraints	
a=rid:4 recv pt=102;max-width=640	[I-D.ietf-mmusic-rid] Bob	
;max-height=360;	accepts the offered payload	
	format constraints	
a=simulcast: recv 3;4	[I-D.ietf-mmusic-sdp-simulc	
	ast] Bob accepts the	
	offered simulcast streams.	
+-----+-----+-----+		

Table 26: 5.3.1 SDP Answer

5.3.2. Successful SVC Video Session

This section shows an SDP Offer/Answer for a session with an audio and a single video source. The video source is encoded as layered coding at 3 different resolutions based on [[RFC5583](#)]. The video m=line shows 3 streams with last stream (payload 100) dependent on streams with payload 96 and 97 for decoding.

SVC Session - 3 Layers w/BUNDLE



Offer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE m0 m1	[I-D.ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
***** Audio m=line *****	*****
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=rtcp:54609 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=sendonly	[RFC3264]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245]	
74af08a068		
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:11111	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 61665 typ host		
a=candidate:1 1 UDP 694302207	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 61665		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
***** Video m=line *****	*****	
m=video 0 UDP/TLS/RTP/SAVPF 96 97	bundle-only video line with	
100	port number set to zero	
c=IN IP4 24.23.204.141	[RFC4566]	
a=bundle-only	[I-D.ietf-mmusic-sdp-bundle-n	
	egotiation]	
a=rtcp:54609 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 (tc)	
a=sendonly	[RFC3264] - Send only video	
	stream	
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-id=4d0028	[RFC3984] H.264 Layer 2	
;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=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73	
:04 :BB:05:2F:70:9F:04:A9:0E:05:E	
9:26:33:E8:70:88:A2	
a=setup:actpass	[RFC4145]
a=rtcp-mux	[RFC5761]
a=rtcp-rsize	[RFC5506]
a=rtcp-fb:* nack	[RFC5104]
a=rtcp-fb:* nack pli	[RFC5104]
a=rtcp-fb:* ccm fir	[RFC5104]
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n
hdext:sdes:mid	egotiation]
a=ssrc:22222	[RFC5576]
cname:EocUG1f0fcg/yvY7	
a=ssrc:33333	[RFC5576]
cname:EocUG1f0fcg/yvY7	
a=ssrc:44444	[RFC5576]
cname:EocUG1f0fcg/yvY7	
+-----+	

Table 27: 5.3.2 SDP Offer with SVC

Answer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE m0 m1	[I-D.ietf-mmusic-sdp-bundle-n
	egotiation]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
***** Audio m=line *****	*****
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]
109	
c=IN IP4 98.248.92.77	[RFC4566]
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]
a=mid:m0	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID
	(ma) and RTCMediaStreamTrack

	ID (ta)	
a=recvonly	[RFC3264]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=maxptime:120	[RFC4566]	
a=ice-frag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245]	
74af08a068		
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245]	
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B		
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A		
1:58:D0:A1:2C:19:08		
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:88888	[RFC5576]	
cname:Q/NWslao1HmN4Xa5		
a=candidate:0 1 UDP 2113667326	[RFC5245]	
192.168.1.7 51556 typ host		
a=candidate:1 1 UDP 1694302206	[RFC5245]	
98.248.92.77 49203 typ srflx		
raddr 192.168.1.5 rport 51556		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
***** Video m=line *****	*****	
m=video 49203 UDP/TLS/RTP/SAVPF	BUNDLE accepted Bundle	
96 100	address same as audio m=line.	
c=IN IP4 98.248.92.77	[RFC4566]	
a=rtcp:49203 IN IP4 98.248.92.77	[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=recvonly	[RFC3264] - Receive only	
	video stream	
a=rtpmap:96 H264/90000	[RFC3984]	
a=fmtp:96 profile-level-id=4d0028	[RFC3984] H.264 Layer 1	
;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=fingerprint:sha-256 6B:8B:F0:65	[RFC5245]	
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B		
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A		
1:58:D0:A1:2C:19:08		
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:* nack	[RFC5104]	
a=rtcp-fb:* nack pli	[RFC5104]	
a=rtcp-fb:* ccm fir	[RFC5104]	
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:99999	[RFC5576]	
cname:Q/Nws1ao1HmN4Xa5		
+-----+	+-----+	+-----+

Table 28: 5.3.2 SDP Answer with SVC

5.3.3. Successful Simulcast Video Session with Retransmission

This section shows an SDP Offer/Answer exchange for a simulcast scenario with 3 resolutions and has [[RFC4588](#)] style re-transmission flows.

[I-D.ietf-mmusic-rid] framework is used to specify all the (3) resolution constraints mapped to a single Payload Type (98).

[I-D.ietf-mmusic-sdp-simulcast] framework identifies the simulcast streams via their 'rid' identifiers.

Simulcast Streams with Retransmission

Alice	Bob
Alice offers single audio and simulcasted video streams	
Offer(Audio:Opus Video:VP8 with 3 resolutions)	
& RTX stream	
----->	
Answer (Bob accepts Alice's offer)	
<-----	
One-Way 1 Opus, 3 VP8 and RTX video streams,all muxed	
.....	

Offer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE m0 m1	[I-D.ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
***** Audio m=line *****	*****
m=audio 54609 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=rtcp:54609 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=sendonly	[RFC3264]
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]

a=maxptime:120	[RFC4566]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245]	
74af08a068		
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:11111	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 61665 typ host		
a=candidate:1 1 UDP 694302207	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 61665		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
***** Video m=line *****	*****	
m=video 0 UDP/TLS/RTP/SAVPF 98	bundle-only video line with	
103	port number set to zero	
c=IN IP4 24.23.204.141	[RFC4566]	
a=bundle-only	[I-D.ietf-mmusic-sdp-bundle-n	
	egotiation]	
a=mid:m1	[RFC5888]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb)	
a=sendonly	[RFC3264]	
a=rtpmap:98 VP8/90000	[I-D.ietf-payload-vp8]	
a=fmtp:98 max-fr=30	[RFC4566]	
a=rtpmap:103 rtx/90000	[RFC4588]	
a=fmtp:103 apt=98;rtx-time=200	[RFC4588]	
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:* nack	[RFC5104]	
a=rtcp-fb:* nack pli	[RFC5104]	
a=rtcp-fb:* ccm fir	[RFC5104]	
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:22222	[RFC5576] - Encoding-1 SSRC	

cname:EocUG1f0fcg/yvY7	
a=ssrc:33333	[RFC5576] - Encoding-1 RTX
cname:EocUG1f0fcg/yvY7	SSRC
a=ssrc-group:FID 22222 33333	[RFC5888]
a=ssrc:44444	[RFC5576] - Encoding-2 SSRC
cname:EocUG1f0fcg/yvY7	
a=ssrc:55555	[RFC5576] - Encoding-2 RTX
cname:EocUG1f0fcg/yvY7	SSRC
a=ssrc-group:FID 44444 55555	[RFC5888]
a=ssrc:66666	[RFC5576] - Encoding-3 SSRC
cname:EocUG1f0fcg/yvY7	
a=ssrc:77777	[RFC5576] - Encoding-3 RTX
cname:EocUG1f0fcg/yvY7	SSRC
a=ssrc-group:FID 66666 77777	[RFC5888]
a=rid:1 send pt=98;max-fs=921600	[I-D.ietf-mmusic-rid]
;max-fr=30;	
a=rid:2 send pt=98;max-fs=614400	[I-D.ietf-mmusic-rid]
;max-fr=15;	
a=rid:3 send pt=98;max-fs=230400	[I-D.ietf-mmusic-rid]
;max-fr=30;	
a=simulcast: send 1;2;3	[I-D.ietf-mmusic-sdp-simulcas
	t] Alice can send all the
	simulcast streams
+-----+	+-----+

Table 29: 5.3.3 SDP Offer w/Simulcast, RTX

Answer SDP Contents	RFC#/Notes
+-----+	+-----+
v=0	[RFC4566]
o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE m0 m1	[I-D.ietf-mmusic-sdp-bundle-n
	egotiation] Bob supports
	grouping of m=lines under
	BUNDLE semantics
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
***** Audio m=line *****	*****
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]
109	
c=IN IP4 98.248.92.77	[RFC4566]
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]
a=mid:m0	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID
	(ma) and RTCMediaStreamTrack

	ID (ta)	
a=recvonly	[RFC3264]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245]	
74af08a068		
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245]	
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B		
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A		
1:58:D0:A1:2C:19:08		
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:54321	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=candidate:0 1 UDP 2113667326	[RFC5245]	
192.168.1.7 51556 typ host		
a=candidate:1 1 UDP 1694302206	[RFC5245]	
98.248.92.77 49203 typ srflx		
raddr 192.168.1.7 rport 51556		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
***** Video m=line *****	*****	
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=rtcp:49203 IN IP4 98.248.92.77	[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=recvonly	[RFC3264]	
a=rtpmap:98 VP8/90000	[I-D.ietf-payload-vp8]	
a=fmtp:98 max-fr=30	[RFC4566]	
a=rtpmap:103 rtx/90000	[RFC4588]	
a=fmtp:103 apt=98;rtx-time=200	[RFC4588]	
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245]	
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B		
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A		
1:58:D0:A1:2C:19:08		
a=setup:active	[RFC4145]	

a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:* nack	[RFC5104]	
a=rtcp-fb:* nack pli	[RFC5104]	
a=rtcp-fb:* ccm fir	[RFC5104]	
a=extmap:2 urn:ietf:params:rtp-hdext:sdes:mid	[I-D.ietf-mmusic-sdp-bundle-negotiation]	
a=ssrc:98765	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=rid:1 recv pt=98;max-fs=921600;max-fr=30;	[I-D.ietf-mmusic-rid]	
a=rid:2 recv pt=98;max-fs=614400;max-fr=15;	[I-D.ietf-mmusic-rid]	
a=rid:3 recv pt=98;max-fs=230400;max-fr=30;	[I-D.ietf-mmusic-rid]	
a=simulcast: recv 1;2;3	[I-D.ietf-mmusic-sdp-simulcast]	
	t] Bob accepts the offered	
	simulcast streams	
+-----+		

Table 30: 5.3.3 SDP Answer w/Simulcast, RTX

5.3.4. Successful 1-way Simulcast Session 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 where 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                                           |
| .....|
|                                                         |
|                                                         |

```

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

	ID (ta)	
a=sendonly	[RFC3264]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245]	
74af08a068		
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:11111	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 61665 typ host		
a=candidate:1 1 UDP 694302207	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 61665		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
***** Video m=line *****	*****	
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=bundle-only	[I-D.ietf-mmusic-sdp-bundle-n	
	egotiation]	
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]	
a=mid:m1	[RFC5888]	
a=msid:ma tb	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (tb	
a=sendonly	[RFC3264]	
a=rtpmap:98 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:100 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:101 rtx/90000	[RFC4588]	
a=rtpmap:103 rtx/90000	[RFC4588]	
a=fmtp:98 max-fr=30;max-fs=8040	[RFC4566]	
a=fmtp:100 max-fr=15;max-fs=1200	[RFC4566]	
a=fmtp:101 apt=98;rtx-time=200	[RFC4588]	
a=fmtp:103 apt=100;rtx-time=200	[RFC4588]	
a=setup:actpass	[RFC4145]	

a=rtcp-mux	[RFC5761]	
a=rtcp-fb:* nack	[RFC5104]	
a=rtcp-fb:* nack pli	[RFC5104]	
a=rtcp-fb:* ccm fir	[RFC5104]	
a=rtcp-rsize	[RFC5506]	
a=extmap:2 urn:ietf:params:rtp-hdext:sdes:mid	[I-D.ietf-mmusic-sdp-bundle-negotiation]	
a=ssrc:22222	[RFC5576] - Encoding-1 SSRC	
cname:EocUG1f0fcg/yvY7		
a=ssrc:33333	[RFC5576] - Encoding-1 RTX	
cname:EocUG1f0fcg/yvY7	SSRC	
a=ssrc-group:FID 22222 33333	[RFC5888]	
a=ssrc:44444	[RFC5576] - Encoding-2 SSRC	
cname:EocUG1f0fcg/yvY7		
a=ssrc:55555	[RFC5576] - Encoding-2 RTX	
cname:EocUG1f0fcg/yvY7	SSRC	
a=ssrc-group:FID 44444 55555	[RFC5888]	
a=rid:1 send pt=98;	[I-D.ietf-mmusic-rid] 1:1	
	mapping between the PT and	
	the 'rid' identifier	
a=rid:2 send pt=100;	[I-D.ietf-mmusic-rid] 1:1	
	mapping between the PT and	
	the 'rid' identifier	
a=simulcast: send 1;2	[I-D.ietf-mmusic-sdp-simulcast]	
	t]	
+-----+-----+		

Table 31: 5.3.4 SDP Offer w/Simulcast, RTX

Answer SDP Contents	RFC#/Notes	
+-----+-----+		
v=0	[RFC4566]	
o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]	
s=-	[RFC4566]	
t=0 0	[RFC4566]	
a=group:BUNDLE m0 m1	[I-D.ietf-mmusic-sdp-bundle-negotiation]	
	Bob supports	
	grouping of m=lines under	
	BUNDLE semantics	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
***** Audio m=line *****	*****	
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
109		
c=IN IP4 98.248.92.77	[RFC4566]	
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]	
a=mid:m0	[RFC5888]	

a=msid:ma ta	Identifies RTCMediaStream ID
	(ma) and RTCMediaStreamTrack
	ID (ta)
a=recvonly	[RFC3264]
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=maxptime:120	[RFC4566]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245]
74af08a068	
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245]
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B	
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A	
1:58:D0:A1:2C:19:08	
a=setup:active	[RFC4145]
a=rtcp-mux	[RFC5761]
a=rtcp-rsize	[RFC5506]
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]
hdext:ssrc-audio-level	
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n
hdext:sdes:mid	egotiation]
a=ssrc:54321	[RFC5576]
cname:Q/NWs1ao1HmN4Xa5	
a=candidate:0 1 UDP 2113667326	[RFC5245]
192.168.1.7 51556 typ host	
a=candidate:1 1 UDP 1694302206	[RFC5245]
98.248.92.77 49203 typ srflx	
raddr 192.168.1.7 rport 51556	
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]
***** Video m=line *****	*****
m=video 49203 UDP/TLS/RTP/SAVPF	BUNDLE accepted with Bundle
98 101	address identical to audio
	m-line
c=IN IP4 98.248.92.77	[RFC4566]
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]
a=mid:m1	[RFC5888]
a=msid:ma tb	Identifies RTCMediaStream ID
	(ma) and RTCMediaStreamTrack
	ID (tb)
a=recvonly	[RFC3264]
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=200	[RFC4588]
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245]
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B	
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A	
1:58:D0:A1:2C:19:08	
a=setup:active	[RFC4145]

a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:98765	[RFC5576]	
cname:Q/Nws1ao1HmN4Xa5		
a=rid:1 recv pt=98;	[I-D.ietf-mmusic-rid]	
a=simulcast: recv 1	[I-D.ietf-mmusic-sdp-simulcas	
	t] Bob rejects the second	
	simulcast stream and the	
	associated rtx stream.	
+-----+-----+		

Table 32: 5.3.4 SDP Answer (one Simulcast Rejected)

5.3.5. Simulcast Video Session with Forward Error Correction

This section shows an SDP Offer/Answer exchange for 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

```

Alice                                                                    Bob
|                                                                           |
|                                                                           |
|                                                                           |
|Alice offers single audio and simulcasted video streams                 |
|with bundle-only                                                         |
|                                                                           |
|                                                                           |
|Offer(Audio:Opus Video:VP8 with 2 resolutions with FEC Streams)|----->|
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|Answer(Audio:Opus Video:VP8 with 2 resolutions w/FEC Streams)          |
|<-----|
|                                                                           |
|One-Way Audio,Video session with 4 video streams(Simulcast             |
| and FEC) all multiplexed                                               |
|.....|
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |

```

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

	ID (ta)	
a=sendonly	[RFC3264]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245]	
74af08a068		
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:11111	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 61665 typ host		
a=candidate:1 1 UDP 694302207	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 61665		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
***** Video m=line *****	*****	
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=bundle-only	[I-D.ietf-mmusic-sdp-bundle-n	
	egotiation]	
a=rtcp:54609 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=sendonly	[RFC3264]	
a=rtpmap:98 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:100 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:101 flexfec/90000	[I-D.ietf-payload-flexible-fe	
	c-scheme]	
a=rtpmap:103 flexfec/90000	[I-D.ietf-payload-flexible-fe	
	c-scheme]	
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; ToP=2;	[I-D.ietf-payload-flexible-fe
repair-window=200000	c-scheme]
a=fmtp:103 L=5; D=10; ToP=2;	[I-D.ietf-payload-flexible-fe
repair-window=200000	c-scheme]
a=setup:actpass	[RFC4145]
a=rtcp-mux	[RFC5761]
a=rtcp-rsize	[RFC5506]
a=rtcp-fb:* nack	[RFC5104]
a=rtcp-fb:* nack pli	[RFC5104]
a=rtcp-fb:* ccm fir	[RFC5104]
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n
hdext:sdes:mid	egotiation]
a=ssrc:22222	[RFC5576]
cname:EocUG1f0fcg/yvY7	
a=ssrc:33333	[RFC5576]
cname:EocUG1f0fcg/yvY7	
a=ssrc-group:FEC-FR 22222 33333	[RFC5956]
a=ssrc:44444	[RFC5576]
cname:EocUG1f0fcg/yvY7	
a=ssrc:55555	[RFC5576]
cname:EocUG1f0fcg/yvY7	
a=ssrc-group:FEC-FR 44444 55555	[RFC5956]
a=rid:1 send pt=98;	[I-D.ietf-mmusic-rid] 1:1
	mapping between the PT and
	the 'rid' identifier
a=rid:2 send pt=100;	[I-D.ietf-mmusic-rid] 1:1
	mapping between the PT and
	the 'rid' identifier
a=simulcast: send 1;2	[I-D.ietf-mmusic-sdp-simulcas
	t]
+-----+	+-----+

Table 33: 5.3.5 SDP Offer

Answer SDP Contents	RFC#/Notes
+-----+	+-----+
v=0	[RFC4566]
o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE m0 m1	[I-D.ietf-mmusic-sdp-bundle-n
	egotiation]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
***** Audio m=line *****	*****
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]
109	

c=IN IP4 98.248.92.77	[RFC4566]	
a=rtcp:49203 IN IP4 98.248.92.77	[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=recvonly	[RFC3264]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245]	
74af08a068		
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245]	
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B		
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A		
1:58:D0:A1:2C:19:08		
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:109 nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:54321	[RFC5576]	
cname:Q/Nws1ao1HmN4Xa5		
a=candidate:0 1 UDP 2113667326	[RFC5245]	
192.168.1.7 51556 typ host		
a=candidate:1 1 UDP 1694302206	[RFC5245]	
98.248.92.77 49203 typ srflx		
raddr 192.168.1.7 rport 51556		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
***** Video m=line *****	*****	
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=rtcp:49203 IN IP4 98.248.92.77	[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=recvonly	[RFC3264]	
a=rtpmap:98 VP8/90000	[I-D.ietf-payload-vp8]	
a=rtpmap:100 VP8/90000	[I-D.ietf-payload-vp8]	

a=rtpmap:101 flexfec/90000	[I-D.ietf-payload-flexible-fe	
	c-scheme]	
a=rtpmap:103 flexfec/90000	[I-D.ietf-payload-flexible-fe	
	c-scheme]	
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; ToP=2;	[I-D.ietf-payload-flexible-fe	
repair-window=200000	c-scheme]	
a=fmtp:103 L=5; D=10; ToP=2;	[I-D.ietf-payload-flexible-fe	
repair-window=200000	c-scheme]	
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245]	
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B		
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A		
1:58:D0:A1:2C:19:08		
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:* nack	[RFC5104]	
a=rtcp-fb:* nack pli	[RFC5104]	
a=rtcp-fb:* ccm fir	[RFC5104]	
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdrext:sdes:mid	egotiation]	
a=ssrc:98765	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=rid:1 recv pt=98;	[I-D.ietf-mmusic-rid]	
a=rid:2 recv pt=100;	[I-D.ietf-mmusic-rid]	
a=simulcast: recv 1;2	[I-D.ietf-mmusic-sdp-simulcas	
	t]	
+-----+-----+-----+		

Table 34: 5.3.5 SDP Answer

5.4. Others

The examples in the section provide SDP Offer/Answer exchange for a variety of scenarios related to RTP Header extension for conference usages, Legacy Interop scenarios and more.

5.4.1. Audio Session - Voice Activity Detection

This example shows Alice indicating the support of the RTP header extension to include the audio-level of the audio sample carried in the RTP packet.

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	

Offer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio	[I-D.ietf-mmusic-sdp-bundle-negotiation]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
***** Audio m=line *****	*****
m=audio 54609 UDP/TLS/RTP/SAVPF	[RFC4566]
109 0 8	
c=IN IP4 24.23.204.141	[RFC4566]
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=sendrecv	[RFC3264]

a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=rtpmap:0 PCMU/8000	[RFC3551]	
a=rtpmap:8 PCMA/8000	[RFC3551]	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245]	
74af08a068		
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:* nack	[RFC5104]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:12345	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 61665 typ host		
a=candidate:1 1 UDP 694302207	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 61665		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
+-----+-----+		

Table 35: 5.4.1 SDP Offer

Answer SDP Contents	RFC#/Notes	
+-----+-----+		
v=0	[RFC4566]	
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566]	
s=-	[RFC4566]	
t=0 0	[RFC4566]	
a=group:BUNDLE audio	[I-D.ietf-mmusic-sdp-bundle-n	
	egotiation]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
***** Audio m=line *****	*****	
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	
109 0 98		
c=IN IP4 98.248.92.77	[RFC4566]	
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]	
a=mid:audio	[RFC5888]	

a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=sendrecv	[RFC3264] - Bob can send and recv audio
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus] - Bob accepts only Opus Codec
a=rtpmap:0 PCMU/8000	[RFC3551] PCMU Audio Codec
a=rtpmap:0 PCMA/8000	[RFC3551] PCMA Audio Codec
a=maxptime:120	[RFC4566]
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245]
a=fingerprint:sha-256 6B:8B:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B:35:DC:B8:5F:64:1A:24:C2:43:F0:A1:58:D0:A1:2C:19:08	[RFC5245]
a=setup:active	[RFC4145]
a=rtcp-mux	[RFC5761] - Bob can perform RTP/RTCP Muxing on port 49203
a=rtcp-rsize	[RFC5506]
a=rtcp-fb:* nack	[RFC5104]
a=extmap:1 urn:ietf:params:rtp-hdext:ssrc-audio-level	[RFC6464]
a=extmap:2 urn:ietf:params:rtp-hdext:sdes:mid	[I-D.ietf-mmusic-sdp-bundle-negotiation]
a=ssrc:54321	[RFC5576]
cname:Q/Nws1ao1HmN4Xa5	
a=candidate:0 1 UDP 2113667327 192.168.1.7 51556 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 98.248.92.77 49203 typ srflx raddr 192.168.1.7 rport 51556	[RFC5245]
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]

Table 36: 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	

Offer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=-	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio	[I-D.ietf-mmusic-sdp-bundle-negotiation]
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]
***** Audio m=line *****	*****
m=audio 54609 UDP/TLS/RTP/SAVPF 109 0 8	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=rtcp:54609 IN IP4 24.23.204.141	[RFC3605]
a=mid:audio	[RFC5888]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=sendrecv	[RFC3264] - Alice can send and recv audio

a=rtpmap:109 opus/48000/2	[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=maxptime:120	[RFC4566]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee34	[RFC5245]	
74af08a068		
a=fingerprint:sha-256 19:E2:1C:3B	[RFC5245]	
:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:73		
:04 :BB:05:2F:70:9F:04:A9:0E:05:E		
9:26:33:E8:70:88:A2		
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:* nack	[RFC5104]	
a=extmap:1/recvonly	[RFC6465]	
urn:ietf:params:rtp-hdext:csrc-		
audio-level		
a=extmap:2 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:3 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:12345	[RFC5576]	
cname:EocUG1f0fcg/yvY7		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 61665 typ host		
a=candidate:1 1 UDP 694302207	[RFC5245]	
24.23.204.141 54609 typ srflx		
raddr 192.168.1.4 rport 61665		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
+-----+	+-----+	+-----+

Table 37: 5.4.2 SDP Offer

Answer SDP Contents	RFC#/Notes	
+-----+	+-----+	+-----+
v=0	[RFC4566]	
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin	
	Information	
s=-	[RFC4566]	
t=0 0	[RFC4566]	
a=group:BUNDLE audio	[I-D.ietf-mmusic-sdp-bundle-n	
	egotiation]	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ice]	
***** Audio m=line *****	*****	
m=audio 49203 UDP/TLS/RTP/SAVPF	[RFC4566]	

109 0 98		
c=IN IP4 98.248.92.77	[RFC4566]	
a=rtcp:49203 IN IP4 98.248.92.77	[RFC3605]	
a=mid:audio	[RFC5888]	
a=msid:ma ta	Identifies RTCMediaStream ID	
	(ma) and RTCMediaStreamTrack	
	ID (ta)	
a=sendrecv	[RFC3264]	
a=rtpmap:109 opus/48000/2	[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=maxptime:120	[RFC4566]	
a=ice-ufrag:c300d85b	[RFC5245]	
a=ice-pwd:de4e99bd291c325921d5d47	[RFC5245]	
efbabd9a2		
a=fingerprint:sha-256 6B:8B:F0:65	[RFC5245]	
:5F:78:E2:51:3B:AC:6F:F3:3F:46:1B		
:35 :DC:B8:5F:64:1A:24:C2:43:F0:A		
1:58:D0:A1:2C:19:08		
a=setup:active	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=rtcp-fb:* nack	[RFC5104]	
a=extmap:1/sendonly	[RFC6465]	
urn:ietf:params:rtp-hdext:csrc-		
audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle-n	
hdext:sdes:mid	egotiation]	
a=ssrc:54321	[RFC5576]	
cname:Q/NWs1ao1HmN4Xa5		
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.7 51556 typ host		
a=candidate:1 1 UDP 1694302207	[RFC5245]	
98.248.92.77 49203 typ srflx		
raddr 192.168.1.7 rport 51556		
a=end-of-candidates	[I-D.ietf-mmusic-trickle-ice]	
+-----+-----+-----+		

Table 38: 5.4.2 SDP Answer

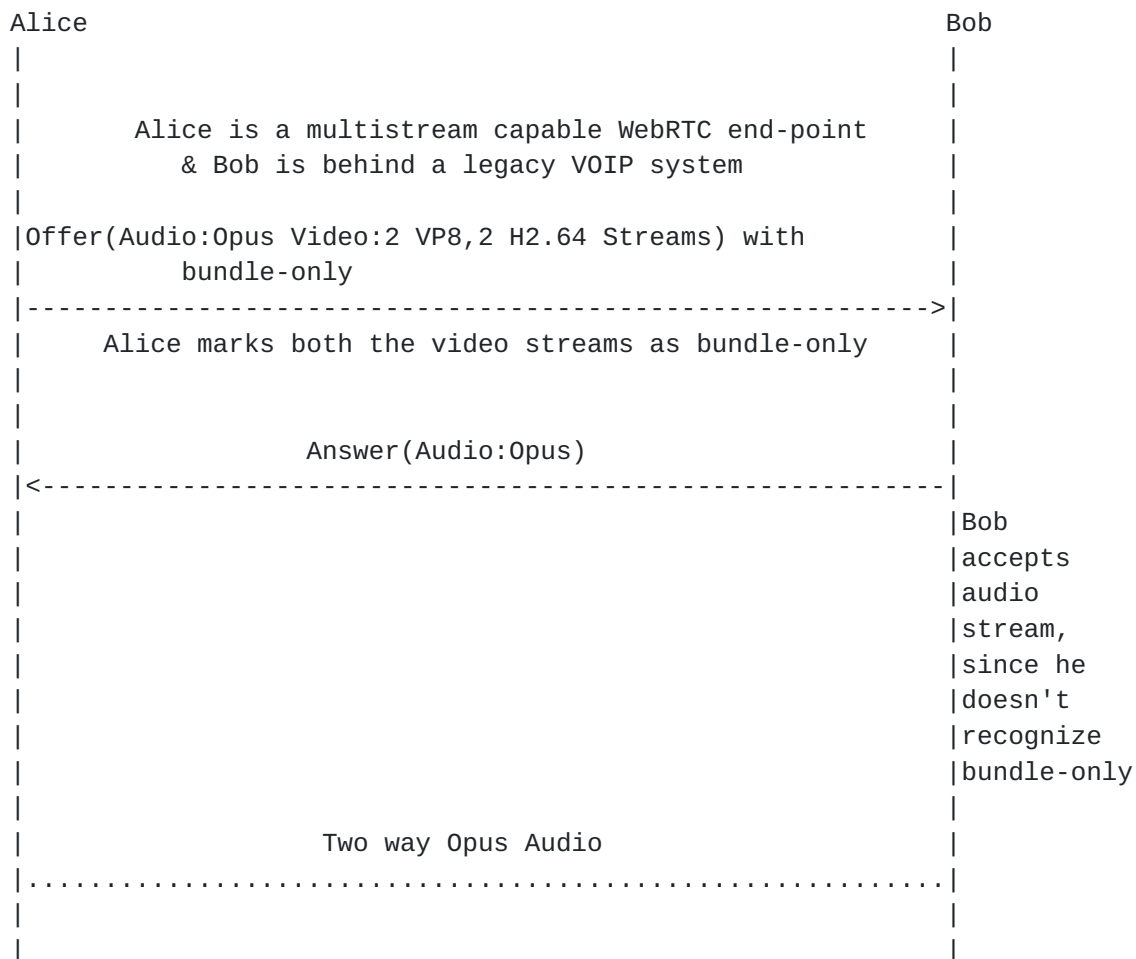
5.4.3. Successful legacy Interop Fallback with bundle-only

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.

NOTE: Since Alice is unaware of Bob's support for BUNDLE framework, Alice ensures to include separate RTP/RTCP ports and candidate information.

Successful 2-Way WebRTC <-> VOIP Interop



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

s=-	[RFC4566]	
t=0 0	[RFC4566]	
a=group:BUNDLE m0 m1 m2	[I-D.ietf-mmusic-sdp-bundle	
	-negotiation] Alice	
	supports grouping of	
	m=lines under BUNDLE	
	semantics	
a=ice-options:trickle	[I-D.ietf-mmusic-trickle-ic	
	e]	
***** Audio m=line *****	*****	
	**	
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=sendrecv	[RFC3264]	
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]	
a=rtcp-fb:109 nack	[RFC5104]	
a=maxptime:120	[RFC4566]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3474	[RFC5245]	
af08a068		
a=fingerprint:sha-256 19:E2:1C:3B:4	[RFC5245]	
B:9F:81:E6:B8:5C:F4:A5:A8:D8:73:04		
:BB:05:2F:70:9F:04:A9:0E:05:E9:26:3		
3:E8:70:88:A2		
a=setup:actpass	[RFC4145]	
a=rtcp-mux	[RFC5761]	
a=rtcp-rsize	[RFC5506]	
a=extmap:1 urn:ietf:params:rtp-	[RFC6464]	
hdext:ssrc-audio-level		
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle	
hdext:sdes:mid	-negotiation]	
a=ssrc:12345 cname:EocUG1f0fcg/yvY7	[RFC5576]E	
a=candidate:0 1 UDP 2113667327	[RFC5245]	
192.168.1.4 61665 typ host		
a=candidate:1 1 UDP 694302207	[RFC5245]	
24.23.204.141 54609 typ srflx raddr		
192.168.1.4 rport 61665		
a=candidate:0 1 UDP 2113667326	[RFC5245]	
192.168.1.4 61667 typ host		
a=candidate:1 1 UDP 1694302206	[RFC5245]	
24.23.204.141 64678 typ srflx raddr		

192.168.1.4 rport 61667	
***** Video-1 m=line *****	*****
	**
m=video 0 UDP/TLS/RTP/SAVPF 98 100	bundle-only video line with
	port number set to zero
c=IN IP4 24.23.204.141	[RFC4566]
a=bundle-only	[I-D.ietf-mmusic-sdp-bundle
	-negotiation]
a=mid:m1	[RFC5888] Video m=line part
	of BUNDLE group
a=msid:ma tb	Identifies RTCMediaStream
	ID (ma) and
	RTCMediaStreamTrack ID (tb)
a=sendrecv	[RFC3264]
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=setup:actpass	[RFC4145]
a=rtcp-mux	[RFC5761]
a=rtcp-rsize	[RFC5506]
a=rtcp-fb:* nack	[RFC5104]
a=rtcp-fb:* nack pli	[RFC5104]
a=rtcp-fb:* ccm fir	[RFC5104]
a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle
hdext:sdes:mid	-negotiation]
a=ssrc:56789 cname:EocUG1f0fcg/yvY7	[RFC5576]
***** Video-2 m=line *****	*****
	**
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=bundle-only	[I-D.ietf-mmusic-sdp-bundle
	-negotiation]
a=mid:m2	[RFC5888] Video m=line part
	of BUNDLE group
a=msid:ma tc	Identifies RTCMediaStream
	ID (ma) and
	RTCMediaStreamTrack ID (tc)
a=sendrecv	[RFC3264]
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=rtcp-mux	[RFC5761]
a=rtcp-rsize	[RFC5506]
a=rtcp-fb:* nack	[RFC5104]
a=rtcp-fb:* nack pli	[RFC5104]
a=rtcp-fb:* ccm fir	[RFC5104]

a=extmap:2 urn:ietf:params:rtp-	[I-D.ietf-mmusic-sdp-bundle
hdrext:sdes:mid	-negotiation]
a=ssrc:67890 cname:EocUG1f0fcg/yvY7	[RFC5576]

Table 39: 5.4.3 SDP Simulcast bundle-only

Answer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
***** Audio m=line *****	*****
m=audio 49203 UDP/TLS/RTP/SAVPF 109	[RFC4566]
c=IN IP4 24.23.204.141	[RFC4566]
a=rtcp:60065 IN IP4 24.23.204.141	[RFC3605]
a=sendrecv	[RFC3264]
a=rtpmap:109 opus/48000/2	[I-D.ietf-payload-rtp-opus]
a=maxptime:120	[RFC4566]
a=ice-ufraq:ufraq:c300d85b	[RFC5245]
a=ice-	[RFC5245]
pwd:de4e99bd291c325921d5d47efbabd9a2	
a=fingerprint:sha-256 6B:8B:F0:65:5F:7	[RFC5245]
8:E2:51:3B:AC:6F:F3:3F:46:1B:35 :DC:B8	
:5F:64:1A:24:C2:43:F0:A1:58:D0:A1:2C:1	
9:08	
a=setup:active	[RFC4145]
a=rtcp-rsize	[RFC5506]
a=rtcp-fb:109 nack	[RFC5104]
a=extmap:1 urn:ietf:params:rtp-hdrext	[RFC6464]
:ssrc-audio-level	
a=ssrc:54321 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
a=candidate:0 1 UDP 2113667327	[RFC5245]
192.168.1.7 51556 typ host	
a=candidate:1 1 UDP 694302207	[RFC5245]
98.248.92.77 49203 typ srflx raddr	
192.168.1.7 rport 51556	
a=candidate:0 2 UDP 2113667326	[RFC5245]
192.168.1.7 51558 typ host	
a=candidate:1 2 UDP 1694302206	[RFC5245]
98.248.92.77 60065 typ srflx raddr	
192.168.1.7 rport 51558	
***** Video m=line *****	*****

m=video 0 UDP/TLS/RTP/SAVPF 98 100	Bob doesn't recognize	
	bundle-only and hence	
	the m=line is rejected	
	implicitly due to port 0	
***** Video m=line *****	*****	

m=video 0 UDP/TLS/RTP/SAVPF 98 100	Bob doesn't recognize	
	bundle-only and hence	
	the m=line is rejected	
	implicitly due to port 0	
+-----+	+-----+	+-----+

Table 40: 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.

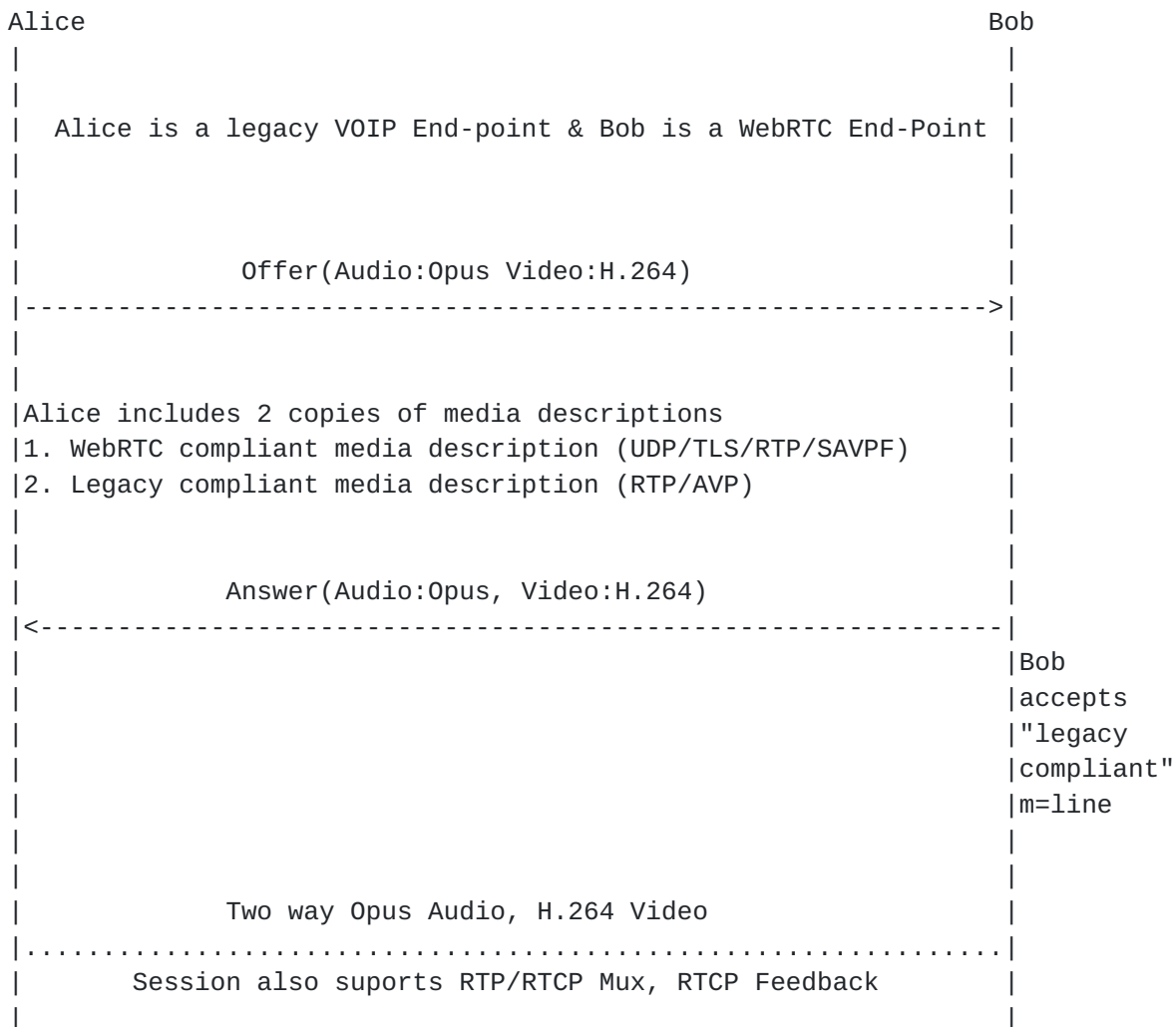
One set that corresponds to [WebRTC] compliant UDP/TLS/RTP/SAVPF based audio and video descriptions.

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



Offer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=ice-ufraq:074c6550	[RFC5245]
a=ice-	[RFC5245]
pwd:a28a397a4c3f31747d1ee3474af08a068	
a=fingerprint:sha-256 6B:8B:F0:65:5F:7	[RFC5245]
8:E2:51:3B:AC:6F:F3:3F:46:1B:35 :DC:B8	
:5F:64:1A:24:C2:43:F0:A1:58:D0:A1:2C:1	
9:08	
a=rtcp-rsize	[RFC5506]

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

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	[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]
***** Audio m=line *****	*****

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	[RFC5245]
192.168.1.4 62537 typ host	
a=candidate:1 1 UDP 1694302207	[RFC5245]
24.23.204.141 62537 typ srflx raddr	
192.168.1.4 rport 62537	
a=candidate:0 2 2113667326 192.168.1.4	[RFC5245]
54721 typ host	
a=candidate:1 2 UDP 1694302206	[RFC5245]
24.23.204.141 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
***** Audio m=line *****	*****

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-256 19:E2:1C:3B:4B:9	[RFC5245]

F:81:E6:B8:5C:F4:A5:A8:D8:73:04 :BB:05	
:2F:70:9F:04:A9:0E:05:E9:26:33:E8:70:8	
8:A2	
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	[RFC5245]
192.168.1.4 54732 typ host	
a=candidate:1 1 UDP 694302207	[RFC5245]
24.23.204.141 54732 typ srflx raddr	
192.168.1.4 rport 54732	
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] She adds her
	intent for NACK RTCP
	feedback support
***** Video m=line *****	*****

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-256 DC:B8:5F:64:1A:2	[RFC5245]
4:C2:43:F0:A1:58:D0:A1:2C:19:08 :6B:8B	
:F0:65:5F:78:E2:51:3B:AC:6F:F3:3F:46:1	
B:35	
a=rtpmap: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	[RFC5245]
192.168.1.4 62445 typ host	
a=candidate:1 1 UDP 1694302207	[RFC5245]
24.23.204.141 62537 typ srflx raddr	
192.168.1.4 rport 62445	
a=candidate:0 2 2113667326 192.168.1.4	[RFC5245]
54721 typ host	
a=candidate:1 2 UDP 1694302206	[RFC5245]
24.23.204.141 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 41: 5.4.5 SDP Offer

Answer SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=- 16833 0 IN IP4 0.0.0.0	[RFC4566]
s=-	[RFC4566]
t=0 0	[RFC4566]
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-	[RFC5245]
pwd:de4e99bd291c325921d5d47efbabd9a2	
a=fingerprint:sha-256 BB:05:2F:70:9F:0	[RFC5245]
4:A9:0E:05:E9:26:33:E8:70:88:A2 :19:E2	
:1C:3B:4B:9F:81:E6:B8:5C:F4:A5:A8:D8:7	
3:04	
***** Audio m=line *****	*****

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	[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=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	
***** Video m=line *****	*****

m=video 63130 RTP/SAVP 120	[RFC4566] Bob accepts
	RTP/AVP based video
	stream
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	[RFC5245]	
192.168.1.7 63130 typ host		
a=candidate:1 1 UDP 1694302207	[RFC5245]	
98.248.92.77 63130 typ srflx raddr		
192.168.1.7 rport 63130		
a=candidate:0 2 UDP 2113667326	[RFC5245]	
192.168.1.7 56607 typ host		
a=candidate:1 2 UDP 1694302206	[RFC5245]	
98.248.92.77 56607 typ srflx raddr		
192.168.1.7 rport 56607		
+-----+-----+-----+		

Table 42: 5.4.5 SDP Answer

6. IANA Considerations

This document requires no actions from IANA.

7. Acknowledgments

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

8. Change Log

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

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

- o Complete face-lift
- o Added visual markers around m=lines to indicate their type, added spacing between tables for aiding readers
- o Updated table names to indicate offer vs answer
- o Attempted to align to latest versions of SCTP, BUNDLE, MSID drafts
- o Added mid header extensions to all the lines
- o Harmonized BUNDLE semantics and conventions updated.

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

- o Updated Simulcast/FEC/RTX examples to use RID framework

- o Fixed BUNDLE references for a=bundle-only

Changes from [draft-nandakumar-rtcweb-sdp-08](#)

- o Fixed typos
- o Moved to a WG version

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 Examples
- 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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