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SDP for the WebRTC
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Abstract

The Web Real-Time Communication (WebRTC) [WEBRTC] working group is charged to provide protocol support for direct interactive rich communication using audio, video and data between two peers' web browsers. With in 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 the RFC 3264 [RFC3264].

This documents provides an informational reference in describing the role of SDP and Offer/Answer exchange 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

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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1. Introduction

Javascript Session Exchange Protocol(JSEP) [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: Section 3 and 4 provides an overview of SDP and the Offer/Answer exchange mechanism. Section 5 and 6 provide 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.

[WEBRTC] proposes JavaScript application to fully specify and control the signaling plane of a multimedia session as described in the JSEP

specification [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:
Provide grammatical structure syntactically.
Semantically convey partipant'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 [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:

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

5.1. Syntax Conventions

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

- In all the examples, Alice and Bob are assumed to be the WebRTC peers.
- 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.
- The SDP examples deviate from actual on-the-wire SDP notation in several ways. This is done to facilitate readability and to conform to the restrictions imposed by the RFC formatting rules.
- Any SDP line that is indented (compared to the initial line in the SDP block) is a continuation of the preceding line. The line break and indent are to be interpreted as a single space character.
- Empty lines in any SDP example are inserted to make functional divisions in the SDP clearer, and are not actually part of the SDP syntax.
- Excepting the above two conventions, line endings are to be interpreted as <CR><LF> pairs (that is, an ASCII 13 followed by an ASCII 10).
- Against each SDP line, pointers to the appropriate RFCs are provide for further information reference. Also an attempt has been made to provide explanatory notes to enable better understanding of the SDP usage, wherever appropriate.
- 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, server-reflexive and relayed ICE candidates (a=candidate)
    * SRTP Setup framework parameters (a=setup)
- 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.
- Payload type 109 is usually used for OPUS, 99 for H.264 and 120 for VP8 in most of the examples to maintain uniformity.
  OPEN ISSUE:SDP Examples for Data Channel, Simulcast, SVC are still being discussed and thus not represent the final solution.

5.2. Basic Examples

5.2.1. Two-Way 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 audio codecs offered.

```
title 2-Way Audio Only Session

participant Alice as Alice
participant Bob as Bob

Alice->Bob: Offer(Audio:Opus,PCMU,PCMA)
Bob->Alice: Answer(Audio:Opus,PCMU,PCMA)
Alice<->Bob: Two-way Opus Audio (preferred codec)
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20518 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=	[RFC4566]
t=0 0	[RFC4566]
m=audio 54609 RTP/SAVPF 109 0 8	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus] - Opus Codec 48khz, 2 channels
a=ptime:20	[draft-ietf-payload-rtp-opus] - Opus packetization of 20ms
a=rtpmap:0 PCMU/8000	[RFC3551] PCMU Audio Codec
a=rtpmap:8 PCMA/8000	[RFC3551] PCMA Audio Codec
a=sendrecv	[RFC3264] - Alice can send and recv audio
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761] - Alice can perform RTP/RTCP Muxing on port 54609
b=AS:64	[RFC4566] - Audio Session B/W of 64kbps
b=RS:800	[RFC3556] - RTCP b/w allocated to active data senders
b=RR:2400	[RFC3556] - RTCP b/w allocated to receivers
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70 :9d:1f:66:79:a8:07	[RFC5245] - DTLS Fingerprint for SRTP
a=ice-ufrag:074c6550	[RFC5245] - ICE user fragment

a=ice-pwd:a28a397a4c3f31747d1ee3474af08a0 68	[RFC5245] - ICE password
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245] - Host ICE Candidate
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245] - Server Reflexive ICE Candidate for the above host candidate
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245] - Second Host Candidate
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245] - Server Reflexive Candidate for the Second Host Candidate
a=rtcp-fb:109 nack	[RFC5104] - Indicates NACK RTCP feedback support
a=ssrc:12345 cname:EocUG1f0fcg/yvY7	[RFC5576]

Table 1: 5.2.1 SDP Offer

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=bob 16833 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=	[RFC4566]
t=0 0	[RFC4566]
m=audio 49203 RTP/SAVPF 109 0 8	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 98.248.92.77	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus] Opus Codec
a=ptime:20	[draft-ietf-payload-rtp-opus] Packetizationof 20ms
a=rtpmap:0 PCMU/8000	[RFC3551] PCMU Audio Codec
a=rtpmap:8 PCMA/8000	[RFC3551] PCMA Audio Codec
a=sendrecv	[RFC3264] - Bob can send and recv audio
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761] - Bob can perform RTP/RTCP Muxing on port 49203
b=AS:64	[RFC4566] - Audio Session b/w of 64kbps
b=RS:800	[RFC3556] - RTCP b/w allocated to active data senders
b=RR:2400	[RFC3556] - RTCP b/w allocated to receivers
a=fingerprint:sha-1 c9:c7:70:9d:1f:66:79:a8:07:99:41:49:83:4a:97:0e:1f:ef:6d:f7	[RFC5245] - DTLS Fingerprint for SRTP
a=ice-ufrag:05067423	[RFC5245] - ICE user fragment
a=ice-pwd:1747d1ee3474a28a397a4c3f3af08a068	[RFC5245] - ICE password parameter

a=candidate:0 1 UDP 2113667327 192.168.1.7 49203 typ host	[RFC5245] - Host ICE Candidate for Opus Stream
a=candidate:1 1 UDP 1694302207 98.248.92.77 49203 typ srflx raddr 192.168.1.7 rport 49203	[RFC5245] - Server Reflexive ICE Candidate for the above host candidate
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245] - Second Host Candidate
a=candidate:1 2 UDP 1694302206 98.248.92.77 60065 typ srflx raddr 192.168.1.7 rport 60065	[RFC5245] - Server Reflexive Candidate for the Second Host Candidate
a=rtcp-fb:109 nack	[RFC5104] - Indicates NACK RTCP feedback support
a=ssrc:54321 cname:NWs1ao1HmN4Xa5/yvY7	[RFC5576]

Table 2: 5.2.1 SDP Answer

5.2.2. Two-Way Audio/Video Session

Alice and Bob establish an audio and video session with Opus as the audio codec and H.264 as the video codec. This example also illustrates the negotiation of NACK based RTCP feedback mechanisms - PLI and FIR for the video session [RFC5104].

```
title 2-Way Audio,Video with RTCP Feedback

Alice->Bob: Offer(Audio:Opus,PCMU,PCMA Video:H.264,VP8)
Bob->Alice: Answer(Audio:Opus, Video:H.264)
Alice->Bob: Two-way Opus Audio, H.264 Video
note right of Alice
  Session also suports RTCP feedback for audio and video streams
end note
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20518 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=	[RFC4566]
t=0 0	[RFC4566]
m=audio 54609 RTP/SAVPF 109 0 8	[RFC4566]

a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus] - Opus Codec 48khz, 2 channels
a=ptime:20	[draft-ietf-payload-rtp-opus] - Opus packetization of 20ms
a=rtpmap:0 PCMU/8000	[RFC3551] PCMU Audio Codec
a=rtpmap:8 PCMA/8000	[RFC3551] PCMA Audio Codec
a=sendrecv	[RFC3264] - Alice can send and recv audio
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761] - Alice can perform RTP/RTCP Muxing on port 54609
a=ice-ufrag:074c6550	[RFC5245] - ICE user fragment
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245] - ICE password parameter
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] - DTLS Fingerprint for SRTP
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245] - Host ICE Candidate
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245] - Server Reflexive ICE Candidate for the above host candidate
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245] - Second Host Candidate
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245] - Server Reflexive Candidate for the Second Host Candidate
a=rtcp-fb:109 nack	[RFC5104] - Indicates NACK RTCP feedback support
a=ssrc:12345 cname:EocUG1f0fcg/yvY7	[RFC5576]

m=video 62537 RTP/SAVPF 99 120	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:99 H264/90000	[RFC3984] - H.264 Video Codec
a=fmtp:99 profile-level-id=4d0028;packetization-mode=1	[RFC3984]
a=rtpmap:120 VP8/90000	[draft-ietf-payload-vp8] - VP8 video codec
a=sendrecv	[RFC3264] - Alice can send and recv video
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761] - Alice can perform RTP/RTCP Muxing on port 62537
b=AS:256	[RFC4566] - Audio Session B/W of 256kbps
b=RS:800	[RFC3556] - RTCP b/w allocated to active data senders
b=RR:2400	[RFC3556] - RTCP b/w allocated to receivers
a=ice-ufrag:6550074c	[RFC5245] - ICE user fragment
a=ice-pwd:f31747d1ee3a28a397a4c3474af08a068	[RFC5245] - ICE password parameter
a=fingerprint:sha-1 4a:97:0e:1f:ef:99:41:49:83:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] - DTLS Fingerprint for SRTP
a=candidate:0 1 UDP 2113667327 192.168.1.4 62537 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 24.23.204.141 62537 typ srflx raddr 192.168.1.4 rport 62537	[RFC5245]
a=candidate:0 2 2113667326 192.168.1.4 54721 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 54721 typ srflx raddr 192.168.1.4 rport 54721	[RFC5245]

a=rtcp-fb:99 nack	[RFC5104] - Indicates NACK RTCP feedback support
a=rtcp-fb:99 nack pli	[RFC5104] - Indicates support for Picture loss Indication and NACK
a=rtcp-fb:99 ccm fir	[RFC5104] - Full Intra Frame Request-Codec Control Message support
a=rtcp-fb:120 nack	[RFC5104] - Indicates NACK RTCP feedback support
a=rtcp-fb:120 nack pli	[RFC5104] - Indicates support for Picture loss Indication and NACK
a=rtcp-fb:120 ccm fir	[RFC5104] - Full Intra Frame Request-Codec Control Message support
a=ssrc:1366781083 cname:EocUG1f0fcg/yvY7	[RFC5576]

Table 3: 5.2.2 SDP Offer

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=bob 16833 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=	[RFC4566]
t=0 0	[RFC4566]
m=audio 49203 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 98.248.92.77	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus] - Bob accept sonly Opus Codec
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=sendrecv	[RFC3264] - Bob can send and recv audio
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761] - Bob can perform RTP/RTCP Muxing on port 49203
a=ice-ufrag:c300d85b	[RFC5245] - ICE username frag
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245] - ICE password
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] - DTLS Fingerprint for SRTP
a=candidate:0 1 UDP 2113667327 192.168.1.7 49203 typ host	[RFC5245] - Host ICE Candidate for Opus Stream
a=candidate:1 1 UDP 1694302207 98.248.92.77 49203 typ srflx raddr 192.168.1.7 rport 49203	[RFC5245] - Server Reflexive ICE Candidate for the above host candidate
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245] - Second Host Candidate
a=candidate:1 2 UDP 1694302206 98.248.92.77 60065 typ srflx raddr 192.168.1.7 rport 60065	[RFC5245] - Server Reflexive Candidate for the Second Host Candidate

a=ssrc:1366788312 cname:1f0fcgEocUG/yvY7	[RFC5576]
m=video 63130 RTP/SAVPF 99	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 98.248.92.771	[RFC4566]
a=rtpmap:99 H264/90000	[RFC3984] - Bob accepts H.264 Video Codec.
a=fmtp:99 profile-level-id=4d0028;packetization-mode=1	[RFC3984]
a=sendrecv	[RFC3264] - Bob can send and recv video
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761] - Bob can perform RTP/RTCP Muxing on port 63130
a=ice-ufrag:0d85c30b	[RFC5245] - ICE username frag
a=ice-pwd:291c325921d5de4e99bdd47efbabd9a2	[RFC5245] - ICE password
a=fingerprint:sha-1 0e:1f:ef:6d:f7:99:41:49:83:4a:97:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] -DTLS Fingerprint for SRTP
a=candidate:0 1 UDP 2113667327 192.168.1.7 63130 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 98.248.92.77 63130 typ srflx raddr 192.168.1.7 rport 63130	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 56607 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 98.248.92.77 56607 typ srflx raddr 192.168.1.7 rport 56607	[RFC5245]
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=ssrc:3229706345 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]

Table 4: 5.2.2 SDP Answer

5.2.3. Secure Two-Way 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.

```
title WebRTC Session - 2-Way Secure Audio,Video with RTCP Feedback
Alice->Bob: Offer(DataChannel)
Bob->Alice: Answer(Data-Channel)
Alice->Bob: Two-way SCTP based Data-Channel
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20518 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=	[RFC4566]
t=0 0	[RFC4566]
a=ice-ufrag:074c6550	[RFC5245] - Session Level ICE parameter
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245] - Session Level ICE parameter
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] - Session DTLS Fingerprint for SRTP
m=application 56966 DTLS/SCTP 5000	[draft-ietf-rtcweb-data-channel]
c= IN IP4 24.23.204.141	[RFC4566]
a=sctpmap:5000 webrtc-Datachannel 1	[draft-ietf-mmusic-sctp-sdp] - One data stream of type chat
a=webrtc-Datachannel:5000 stream=1;label="channel 1";subprotocol="chat";	[draft-ietf-mmusic-sctp-sdp]
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives

a=sendrecv	[RFC3264] - Alice can send and recv non-media data
a=candidate:0 1 UDP 2113667327 192.168.1.7 56966 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 24.23.204.141 56966 typ srflx raddr 192.168.1.7 rport 56966	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 51641 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 51641 typ srflx raddr 192.168.1.7 rport 51641	[RFC5245]

Table 5: 5.2.3 SDP Offer

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=bob 16833 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=	[RFC4566]
t=0 0	[RFC4566]
m=application 55700 DTLS/SCTP 5000	[draft-ietf-mmusic-sctp-sdp]
c= IN IP4 98.248.92.771	[RFC4566]
a=sctpmap:5000 webrtc-Datachannel 1	[draft-ietf-mmusic-sctp-sdp]
a=webrtc-Datachannel:5000 stream=1;label="channel 1";subprotocol="chat";	[draft-ietf-mmusic-sctp-sdp]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=sendrecv	[RFC3264] - Bob can send and recv non-media data
a=ice-ufrag:c300d85b	[RFC5245] - Session Level ICE username frag
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245] - Session Level ICE password
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] - Session DTLS Fingerprint for SRTP

a=candidate:0 1 UDP 2113667327 192.168.1.7 55700 typ host	[RFC5245] - Refer 4.1 SDP Offer
a=candidate:1 1 UDP 1694302207 98.248.92.77 55700 typ srflx raddr 192.168.1.7 rport 55700	[RFC5245] Refer 4.1 SDP Offer
a=candidate:0 2 UDP 2113667326 192.168.1.7 58137 typ host	[RFC5245] Refer 4.1 SDP Offer
a=candidate:1 2 UDP 1694302206 98.248.92.77 58137 typ srflx raddr 192.168.1.7 rport 581371	[RFC5245] Refer 4.1 SDP Offer

Table 6: 5.2.3 SDP Answer

5.2.4. Audio Call On Hold

Alice calls Bob, but when Bob answers he places Alice on hold by setting the SDP direction attribute to a=sendonly in the Answer.

```
title Secure 2-Way Audio Only Session
participant Alice as Alice
participant Bob as Bob
Alice->Bob: Offer(Audio:Opus)
Bob->Alice: Answer(Audio:Opus,a=sendonly)
Alice->Bob: One-way Opus Audio (preferred codec)
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20518 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=	[RFC4566]
t=0 0	[RFC4566]
m=audio 54609 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus] - Opus Codec 48khz, 2 channels
a=ptime:20	[draft-ietf-payload-rtp-opus] - Opus packetization of 20ms
a=sendrecv	[RFC3264] - Alice can send and recv audio
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761] - Alice can perform RTP/RTCP Muxing on port 54609
a=ice-ufrag:074c6550	[RFC5245] - ICE user fragment
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245] - ICE password
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] - DTLS Fingerprint for SRTP
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245] - Host ICE Candidate
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245] - Server Reflexive ICE Candidate for the above host candidate
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245] - Second Host Candidate

a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245] - Server Reflexive Candidate for the Second Host Candidate
a=rtcp-fb:109 nack	[RFC5104] - Indicates NACK RTCP feedback support
a=ssrc:3229706345 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]

Table 7: 5.2.4 SDP Offer

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=bob 16833 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=	[RFC4566]
t=0 0	[RFC4566]
m=audio 49203 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 98.248.92.77	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus] - Bob accept sonly Opus Codec
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=sendonly	[RFC3264] - Bob puts call On Hold
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761] - Bob can perform RTP/RTCP Muxing on port 49203
a=ice-ufrag:c300d85b	[RFC5245] - ICE username frag
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245] - ICE password
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] - DTLS Fingerprint for SRTP

a=candidate:0 1 UDP 2113667327 192.168.1.7 49203 typ host	[RFC5245] - Host ICE Candidate for Opus Stream
a=candidate:1 1 UDP 1694302207 98.248.92.77 49203 typ srflx raddr 192.168.1.7 rport 49203	[RFC5245] - Server Reflexive ICE Candidate for the above host candidate
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245] - Second Host Candidate
a=candidate:1 2 UDP 1694302206 98.248.92.77 60065 typ srflx raddr 192.168.1.7 rport 60065	[RFC5245] - Server Reflexive Candidate for the Second Host Candidate
a=ssrc:1366781083 cname:EocUG1f0fcg/yvY7	[RFC5576]

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 the telephone-event for the other stream.

```
title Audio Session with DTMF
participant Alice as Alice
participant Bob as Bob
Alice->Bob: Offer(Audio:Opus,PCMU,PCMA Audio:telephone-event)
Bob->Alice: Answer(Audio:Opus, Audio:telephone-event)
Alice->Bob: Opus audio stream and telephone-event stream
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20518 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=	[RFC4566]
t=0 0	[RFC4566]
m=audio 54609 RTP/SAVPF 109 0 8	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus] - Opus Codec 48khz, 2 channels
a=ptime:20	[draft-ietf-payload-rtp-opus] - Opus packetization of 20ms
a=rtpmap:0 PCMU/8000	[RFC3551] PCMU Audio Codec
a=rtpmap:8 PCMA/8000	[RFC3551] PCMA Audio Codec
a=sendrecv	[RFC3264] - Alice can send and recv audio
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761] - Alice can perform RTP/RTCP Muxing on port 54609
a=ice-ufrag:074c6550	[RFC5245] - ICE user fragment
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245] - ICE password parameter
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] - DTLS Fingerprint for SRTP
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245] - Host ICE Candidate
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245] - Server Reflexive ICE Candidate for the above host candidate

a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245] - Second Host Candidate
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245] - Server Reflexive Candidate for the Second Host Candidate
a=rtcp-fb:109 nack	[RFC5104] - Indicates NACK RTCP feedback support
a=ssrc:3229706345 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
m=audio 54690 RTP/SAVPF 126	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:126 telephone-event/8000	[RFC2833]
a=sendonly	[RFC3264] - Alice can send DTMF Events
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=ice-ufrag:6550074c	[RFC5245] - ICE user fragment
a=ice-pwd:31747d1eea28a397a4af08a068	[RFC5245] - ICE password parameter
a=fingerprint:sha-1 0e:1f:ef:6d:f7:99:41:49:83:4a:97:c9:c7:70 :9d:1f:66:79:a8:07	[RFC5245] - DTLS Fingerprint for SRTP
a=candidate:0 1 UDP 2113667327 192.168.1.4 54690 typ host	[RFC5245] - Host ICE Candidate
a=candidate:1 1 UDP 694302207 24.23.204.141 54690 typ srflx raddr 192.168.1.4 rport 54690	[RFC5245] - Server Reflexive ICE Candidate for the above host candidate
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245] - Second Host Candidate
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245] - Server Reflexive Candidate for the Second Host Candidate
a=rtcp-fb:109 nack	[RFC5104] - Indicates NACK RTCP feedback support
a=ssrc:9032206345 cname:L/N9lk1ao1HmN4Xa5	[RFC5576]

Table 9: 5.2.5 SDP Offer

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=bob 16833 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=	[RFC4566]
t=0 0	[RFC4566]
m=audio 49203 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 98.248.92.77	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus] - Bob accept sOpus Codec
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=sendrecv	[RFC3264] - Bob can send and receive Opus audio
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761] - Bob can perform RTP/RTCP Muxing on port 49203
a=ice-ufrag:c300d85b	[RFC5245] - ICE username frag
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245] - ICE password
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] - Fingerprint for SRTP
a=candidate:0 1 UDP 2113667327 192.168.1.7 49203 typ host	[RFC5245] - Host ICE Candidate for Opus Stream
a=candidate:1 1 UDP 1694302207 98.248.92.77 49203 typ srflx raddr 192.168.1.7 rport 49203	[RFC5245] - Server Reflexive ICE Candidate for the above host candidate
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245] - Second Host Candidate

a=candidate:1 2 UDP 1694302206 98.248.92.77 60065 typ srflx raddr 192.168.1.7 rport 60065	[RFC5245] - Server Reflexive Candidate for the Second Host Candidate
a=ssrc:0634322975 cname:Q/o1HmN4XNWs1aa5	[RFC5576]
m=audio 54690 RTP/SAVPF 126	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:126 telephone-event/8000	[RFC2833]
a=recvonly	[RFC3264] - Alice can receive DTMF events
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761] - Alice can perform RTP/RTCP Muxing on port 54690
a=ice-ufrag:c3d85b00	[RFC5245] - ICE username frag
a=ice-pwd:bd291c32de4e995921d5d47efbabd9a2	[RFC5245] - Session Level ICE password
a=fingerprint:sha-1 83:4a:97:0e:1f99:41:49:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] - DTLS Fingerprint for SRTP
a=candidate:0 1 UDP 2113667327 192.168.1.7 49203 typ host	[RFC5245] - Host ICE Candidate for Opus Stream
a=candidate:1 1 UDP 1694302207 98.248.92.77 49203 typ srflx raddr 192.168.1.7 rport 49203	[RFC5245] - Server Reflexive ICE Candidate for the above host candidate
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245] - Second Host Candidate
a=candidate:1 2 UDP 1694302206 98.248.92.77 60065 typ srflx raddr 192.168.1.7 rport 60065	[RFC5245] - Server Reflexive Candidate for the Second Host Candidate
a=ssrc:6345903220 cname:L/k1aN9lo1HmN4Xa5	[RFC5576]

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 1 way audio and video session with Bob receiving Alice's audio and her presentation slides as video stream.

```
title 1 Way Audio & Video Session - Document Camera

note right of Alice
Alice Offers sendonly audio and video streams.
The video stream corresponds to her presentation
slides via a=content SDP attribute)
end note
Alice->Bob: Offer(Audio:Opus, Video: VP8)
note left of Bob
Bob accepts Alice's offer
end note
Bob->Alice: Answer(Audio:Opus, Video: VP8)
Alice->Bob: One-way Opus Audio, VP8 Video
note right of Alice
Bob can hear Alice and see her presentation slides.
end note
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
m=audio 54609 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=sendonly	[RFC3264] - Send only audio stream
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5104]
a=rtcp-fb:109 nack	[RFC5104]
a=ssrc:6345903220 cname:L/k1aN9lo1HmN4Xa5	[RFC5576]
m=video 62537 RTP/SAVPF 120	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:120 VP8/90000	[draft-ietf-payload-vp8]
a=content:slides	[RFC4796] -Alice's presentation video stream

a=sendonly	[RFC3264] - Send only video stream
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=ice-ufrag:6550074c	[RFC5245]
a=ice-pwd:1747d1ee3474af08a068a28a397a4c3f3	[RFC5245]
a=fingerprint:sha-1 1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07:99:41:49:83:4a:97:0e	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 62537 typ host	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 54721 typ host	[RFC5245]
a=rtcp-fb:120 nack	[RFC5104]
a=rtcp-fb:120 nack pli	[RFC5104]
a=rtcp-fb:120 ccm fir	[RFC5104]
a=ssrc:3429951804 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]

Table 11: 5.2.6 SDP Offer

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=bob 16833 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
m=audio 49203 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 98.248.92.77	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=recvonly	[RFC3264] - Receive only audio stream
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761]
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.7 49203 typ host	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245]
a=ssrc:9513429804 cname:Q/o1HmNWs1aN4Xa5	[RFC5576]
m=video 63130 RTP/SAVPF 120	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 98.248.92.771	[RFC4566]
a=rtpmap:120 VP8/90000	[draft-ietf-payload-vp8]
a=content:slides	[RFC4796]
a=recvonly	[RFC3264] - Receive Only Alice's presentation stream

a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761]
a=ice-ufrag:85bc300d	[RFC5245]
a=ice-pwd:325921d5d47efbabd9ade4e99bd291c2	[RFC5245]
a=fingerprint:sha-1 ef:6d:f7:c9:c7:70:9d:1h:99:41:49:83:4a:97: 0e:1f:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.7 63130 typ host	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 56607 typ host	[RFC5245]
a=ssrc:1366781083 cname:EocUG1f0fcg/yvY7	[RFC5576]

Table 12: 5.2.6 SDP Answer

5.3. Stream Mutiplexing Examples

The examples in this section show-cases using [draft-ietf-mmusic-sdp-bundle-negotiation] BUNDLE negotiation framework for the usage of a single 5-tuple for media associated with multiple SDP media descriptions ("m=" lines).

5.3.1. Audio, Video Session with BUNDLE Support Unknown

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

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

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

```
title 2-Way Secure Audio,Video with BUNDLE support unknown

Alice->Bob: Offer(Audio:Opus Video:VP8)
note right of Alice
Alice offers BUNDLE support with unique address for the audio and video m-line
end note

Bob->Alice: Answer(Audio:Opus Video:VP8) indicating its support for BUNDLE
note left of Bob
Bob uses identical addresses across the m=lines
end note

Alice->Bob: Updated Offer(Audio:Opus Video:VP8) for Bundle Address
Synchronzation.

Alice <-> Bob: 2Way Call with Audio and Video Multiplexed
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio video	[draft-ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
m=audio 54609 RTP/SAVPF 109	[RFC4566]
a=mid:audio	[RFC5888] Audio m=line part of BUNDLE group with a unique port number
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=sendrecv	[RFC3264]
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=ssrc:11111 cname:EocUG1f0fcg/yvY7	[RFC5576]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
a=rtcp-fb:109 nack	[RFC5104]

m=video 62537 RTP/SAVPF 120	[RFC4566]
a=mid:video	[RFC5888] Video m=line part of the Bundle group with a unique port number
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:120 VP8/90000	[draft-ietf-payload-vp8]
a=sendrecv	[RFC3264]
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=ssrc:22222 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
a=ice-ufrag:6550074c	[RFC5245]
a=ice-pwd:74af08a068a28a397a4c3f3174 7d1ee34	[RFC5245]
a=fingerprint:sha-1 1f:ef:6d:f7:c9:c7:70:9d:1f:66:99:41: 49:83:4a:97:0e79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 62537 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 24.23.204.141 62537 typ srflx raddr 192.168.1.4 rport 62537	[RFC5245]
a=candidate:0 2 2113667326 192.168.1.4 54721 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 54721 typ srflx raddr 192.168.1.4 rport 54721	[RFC5245]
a=rtcp-fb:120 nack	[RFC5104]
a=rtcp-fb:120 nack pli	[RFC5104]
a=rtcp-fb:120 ccm fir	[RFC5104]

Table 13: 5.3.1 SDP Offer w/BUNDLE

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=bob 16833 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]

a=group:BUNDLE audio video	[draft-ietf-mmusic-sdp-bundle-negotiation] Bob supports BUNDLE semantics.
m=audio 49203 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=mid:audio	[RFC5888] Audio m=line part of the BUNDLE group
c= IN IP4 98.248.92.77	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=sendrecv	[RFC3264]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-fb:109 nack	[RFC5104]
a=rtcp-mux	[RFC5761]
a=ssrc:33333 cname:Q/1HmN4Xa5NWs1ao	[RFC5576]
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.7 49203 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 98.248.92.77 49203 typ srflx raddr 192.168.1.7 rport 49203	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 98.248.92.77 60065 typ srflx raddr 192.168.1.7 rport 60065	[RFC5245]
m=video 49203 RTP/SAVPF 120	[RFC4566]
a=mid:video	[RFC5888] Video m=line part of the BUNDLE group with the port from audio line repeated
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)

b=AS:1756	[RFC4566]
c= IN IP4 98.248.92.77	[RFC4566]
a=rtpmap:120 VP8/90000	[draft-ietf-payload-vp8]
a=sendrecv	[RFC3264]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761]
a=ssrc:44444 cname:Q/2AqlmN4Xa5NWs	[RFC5576]
a=ice-ufrag:85bc300d	[RFC5245]
a=ice-pwd:bd2de4e9991c325921d5d47efb abd9a2	[RFC5245]
a=fingerprint:sha-1 41:49:83:4a:99:97:0e:1f:ef:6d:f7:c9: c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.7 49203 typ host	[RFC5245] - Candidate lines identical with the audio m-line.
a=candidate:1 1 UDP 1694302207 98.248.92.77 49203 typ srflx raddr 192.168.1.7 rport 49203	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 98.248.92.77 60065 typ srflx raddr 192.168.1.7 rport 60065	[RFC5245]
a=rtcp-fb:120 nack	[RFC5104]
a=rtcp-fb:120 nack pli	[RFC5104]
a=rtcp-fb:120 ccm fir	[RFC5104]

Table 14: 5.3.1 SDP Answer w/BUNDLE

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio video	[draft-ietf-mmusic-sdp-bundle-negotiation]
m=audio 54609 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=mid:audio	[RFC5888] - Port number finalized as Bundle Address.
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=sendrecv	[RFC3264]
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=ssrc:11111 cname:EocUG1f0fcg/yvY7	[RFC5576]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
a=rtcp-fb:109 nack	[RFC5104]
m=video 54609 RTP/SAVPF 120	[RFC4566]

a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
a=mid:video	[RFC5888] - Same Bundle address from the audio m=line
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:120 VP8/90000	[draft-ietf-payload-vp8]
a=sendrecv	[RFC3264]
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=ssrc:22222 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
a=rtcp-fb:120 nack	[RFC5104]
a=rtcp-fb:120 nack pli	[RFC5104]
a=rtcp-fb:120 ccm fir	[RFC5104]

Table 15: 5.3.1 SDP Offer for BAS

5.3.2. Audio, Video w/BUNDLE Support Known

This use-case is a successful audio and video stream multiplexing scenario, with Alice and Bob aware of each others support for SDP BUNDLE framework [draft-ietf-mmusic-sdp-bundle-negotiation].

```
title 2-Way Secure Audio, Video with BUNDLE support Known

Alice->Bob: Offer(Audio:Opus Video:VP8)
note right of Alice
Alice offers BUNDLE support with identical address across m-lines.
end note

Bob->Alice: Answer(Audio:Opus Video:VP8) indicating its support for BUNDLE
note left of Bob
Bob uses identical addresses across the m=lines
end note

Alice <-> Bob: 2Way Call with Audio and Video Multiplexed
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio video	[draft-ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics.
m=audio 10000 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=mid:audio	[RFC5888] - Audio m=line part of BUNDLE group
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=sendrecv	[RFC3264]
a=rtcp-mux	[RFC5761]
a=ssrc:11111 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 10000 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 10000 typ srflx raddr 192.168.1.4 rport 10000	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
a=rtcp-fb:109 nack	[RFC5104]
m=video 10000 RTP/SAVPF 120	[RFC4566]

a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
a=mid:video	[RFC5888] - Video m=line with Bundle address same as the audio m=line
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:120 VP8/90000	[draft-ietf-payload-vp8]
a=sendrecv	[RFC3264]
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=ssrc:22222 cname:Q/1HmN4Xa5NWs1ao	[RFC5576]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 10000 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 10000 typ srflx raddr 192.168.1.4 rport 10000	[RFC5245]
a=candidate:0 2 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
a=rtcp-fb:120 nack	[RFC5104]
a=rtcp-fb:120 nack pli	[RFC5104]
a=rtcp-fb:120 ccm fir	[RFC5104]

Table 16: 5.3.2 SDP Offer w/BUNDLE

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=bob 16833 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio video	[draft-ietf-mmusic-sdp-bundle-negotiation] - Bob supports BUNDLE semantics.
m=audio 20000 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=mid:audio	[RFC5888] - Audio m=line part of the BUNDLE group
c= IN IP4 98.248.92.77	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=sendrecv	[RFC3264]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761]
a=ssrc:33333 cname:EocUG1f0fcg/yvY7	[RFC5576]
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.7 20000 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 98.248.92.77 20000 typ srflx raddr 192.168.1.7 rport 20000	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 98.248.92.77 60065 typ srflx raddr 192.168.1.7 rport 60065	[RFC5245]
a=rtcp-fb:109 nack	[RFC5104]
m=video 20000 RTP/SAVPF 120	[RFC4566]

a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
a=mid:video	[RFC5888] - Video m=line with Bundle address same as the audio m=line
c= IN IP4 98.248.92.77	[RFC4566]
a=rtpmap:120 VP8/90000	[draft-ietf-payload-vp8]
a=sendrecv	[RFC3264]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761]
a=ssrc:44444 cname:1f0fcgEocUG/yvY7	[RFC5576]
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efb abd9a2	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9: c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.7 20000 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 98.248.92.77 20000 typ srflx raddr 192.168.1.7 rport 20000	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 98.248.92.77 60065 typ srflx raddr 192.168.1.7 rport 60065	[RFC5245]
a=rtcp-fb:120 nack	[RFC5104]
a=rtcp-fb:120 nack pli	[RFC5104]
a=rtcp-fb:120 ccm fir	[RFC5104]

Table 17: 5.3.2 SDP Answer w/BUNDLE

5.3.3. Audio, Video and Data BUNDLE

This example show-cases SDP for negotiating a session with Audio, Video and data streams between Alice and Bob with [draft-ietf-mmusic-sdp-bundle-negotiation] support known

```
title Audio, Video, Data with BUNDLE support known

Alice->Bob: Offer(Audio:Opus, Video:VP8, Data)
note right of Alice
Alice indicates BUNDLE support with identical address across all the m=lines.
end note

Bob->Alice: Answer(Audio:Opus Video:VP8, Data)
note left of Bob
Bob does the same
end note
Alice<->Bob: Two way Audio, Video and Data multiplexed
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio video data	[draft-ietf-mmusic-sdp-bundle-negotiation]
m=audio 54609 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:audio	[RFC5888]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=sendrecv	[RFC3264]
a=setup:actpass	[RFC4145]
a=rtcp-mux	[RFC5761]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]

a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
a=rtcp-fb:109 nack	[RFC5104]
a=ssrc:11111 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
m=video 54609 RTP/SAVPF 120	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:video	[RFC5888]
a=rtpmap:120 VP8/90000	[draft-ietf-payload-vp8]
a=sendrecv	[RFC3264]
a=setup:actpass	[RFC4145]
a=rtcp-mux	[RFC5761]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
a=rtcp-fb:120 nack	[RFC5104]
a=rtcp-fb:120 nack pli	[RFC5104]
a=rtcp-fb:120 ccm fir	[RFC5104]
a=ssrc:22222 cname:Q/aoNWs11HmN4Xa5	[RFC5576]
m=application 54609 DTLS/SCTP 5000	[draft-ietf-rtcweb-data-channel]
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:data	[RFC5888]
a=sctpmap:5000 webrtc-Datachannel 1	[draft-ietf-mmusic-sctp-sdp]
a=webrtc-Datachannel:5000 stream=1;label="channel 1";subprotocol="chat";	[draft-ietf-mmusic-sctp-sdp]
a=sendrecv	[RFC3264]

a=setup:actpass	[RFC4145]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474a f08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9: c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]

Table 18: 5.3.3 SDP Offer

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=bob 16833 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio video data	[draft-ietf-mmusic-sdp-bundle-negotiation]
m=audio 49203 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 98.248.92.77	[RFC4566]
a=mid:audio	[RFC5888]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=sendrecv	[RFC3264]
a=setup:active	[RFC4145]
a=rtcp-mux	[RFC5761]
a=rtcp-fb:109 nack	[RFC5104]
a=ice-ufrag:c300d85b	[RFC5245]

a=ice-pwd:de4e99bd291c325921d5d47efb abd9a2	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9: c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.7 49203 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 98.248.92.77 49203 typ srflx raddr 192.168.1.7 rport 49203	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 98.248.92.77 60065 typ srflx raddr 192.168.1.7 rport 60065	[RFC5245]
a=ssrc:33333 cname:L/aoNWs11HmN4Xa5	[RFC5576]
m=video 49203 RTP/SAVPF 120	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 98.248.92.771	[RFC4566]
a=mid:video	[RFC5888]
a=rtpmap:120 VP8/90000	[draft-ietf-payload-vp8]
a=sendrecv	[RFC3264]
a=setup:active	[RFC4145]
a=rtcp-mux	[RFC5761]
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efb abd9a2	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9: c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.7 49203 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 98.248.92.77 49203 typ srflx raddr 192.168.1.7 rport 49203	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 98.248.92.77 60065 typ srflx raddr 192.168.1.7 rport 60065	[RFC5245]
a=rtcp-fb:120 nack	[RFC5104]
a=rtcp-fb:120 nack pli	[RFC5104]
a=rtcp-fb:120 ccm fir	[RFC5104]
a=ssrc:44444 cname:EocUG1f0fcg/yvY7	[RFC5576]

m=application 49203 DTLS/SCTP 5000	[draft-ietf-mmusic-sctp-sdp]
c= IN IP4 98.248.92.771	[RFC4566]
a=mid:data	[RFC5888]
a=sctpmap:5000 webrtc-Datachannel 1	[draft-ietf-mmusic-sctp-sdp]
a=webrtc-Datachannel:5000 stream=1;label="channel 1";subprotocol="chat";	[draft-ietf-mmusic-sctp-sdp]
a=setup:active	[RFC4145]
a=sendrecv	[RFC3264]
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efb abd9a2	[RFC5245] - Session Level ICE password
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9: c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.7 49203 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 98.248.92.77 49203 typ srflx raddr 192.168.1.7 rport 49203	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 98.248.92.77 60065 typ srflx raddr 192.168.1.7 rport 60065	[RFC5245]

Table 19: 5.3.3 SDP Answer

5.3.4. Secure Two-Way Audio,Video w/BUNDLE Unsupported

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

On successful Offer/Answer exchange, Alice and Bob each end up using separate RTP streams for audio and video media streams respectively.

```
title 2-Way Secure Audio,Video with BUNDLE Unsupported

Alice->Bob: Offer(Audio:Opus Video:VP8)
note right of Alice
Alice offers BUNDLE support with unique address for the audio and video m-line
end note

Bob->Alice: Answer(Audio:Opus Video:VP8)
note left of Bob
Bob uses unique addresses as well since he doesn't understand BUNDLE
end note

Alice <-> Bob: 2Way Call with Audio and Video on different addresses.
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio video	[draft-ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
m=audio 55232 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=mid:audio	[RFC5888] Audio m=line part of BUNDLE group with a unique port number
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=sendrecv	[RFC3264]
a=rtcp-mux	[RFC5761]
a=rtcp-fb:109 nack	[RFC5104]
a=ssrc:11111 cname:EocUG1f0fcg/yvY7	[RFC5576]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 55232 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 55232 typ srflx raddr 192.168.1.4 rport 55232	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]

m=video 54332 RTP/SAVPF 120	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
a=mid:video	[RFC5888] Video m=line part of the BUNDLE group with a unique port number
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:120 VP8/90000	[draft-ietf-payload-vp8]
a=sendrecv	[RFC3264]
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=ssrc:22222 cname:yvY7/EocUG1f0fcg	[RFC5576]
a=ice-ufrag:7872093	[RFC5245]
a=ice-pwd:ee3474af08a068a28a397a4c3f31747d1	[RFC5245]
a=fingerprint:sha-1 6d:f7:c9:c7:70:9d:1f:66:79:a8:07:99:41:49:83:4a:97:0e:1f:ef	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54332 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 24.23.204.141 54332 typ srflx raddr 192.168.1.4 rport 54332	[RFC5245]
a=candidate:0 2 2113667326 192.168.1.4 54721 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 54721 typ srflx raddr 192.168.1.4 rport 54721	[RFC5245]
a=rtcp-fb:120 nack	[RFC5104]
a=rtcp-fb:120 nack pli	[RFC5104]
a=rtcp-fb:120 ccm fir	[RFC5104]

Table 20: 5.3.4 SDP Offer w/BUNDLE

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=bob 16833 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
m=audio 53214 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 98.248.92.77	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=sendrecv	[RFC3264]
a=rtcp-fb:109 nack	[RFC5104]
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.7 53214 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 98.248.92.77 53214 typ srflx raddr 192.168.1.7 rport 53214	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 98.248.92.77 60065 typ srflx raddr 192.168.1.7 rport 60065	[RFC5245]
m=video 58679 RTP/SAVPF 120	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 98.248.92.77	[RFC4566]
a=rtpmap:120 VP8/90000	[draft-ietf-payload-vp8]

a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=sendrecv	[RFC3264]
a=ice-ufrag:85bC300	[RFC5245]
a=ice-pwd:325921d5d47efbabd9a2de4e99bd291c	[RFC5245]
a=fingerprint:sha-1 9d:1f:66:79:a8:07:99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.7 58679 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 98.248.92.77 58679 typ srflx raddr 192.168.1.7 rport 58679	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 56607 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 98.248.92.77 56607 typ srflx raddr 192.168.1.7 rport 56607	[RFC5245]
a=rtcp-fb:120 nack	[RFC5104]
a=rtcp-fb:120 nack pli	[RFC5104]
a=rtcp-fb:120 ccm fir	[RFC5104]

Table 21: 5.3.4 SDP Answer without BUNDLE

5.4. MultiResolution, RTX, FEC Examples

This section deals with scenarios dealing with multiresolution negotiation such as layered coding, simulcast, along with techniques that deal with providing robustness against transmission errors such as FEC and RTX.

5.4.1. Sendonly Simulcast w/2 cameras and 2 encodings per camera

This SDP below shows Offer/Answer exchange with an audio and two video streams each of which can be sent at two different resolutions.

One video stream supports VP8, while the other supports H.264.

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

```
title 1 Way Successful Simulcast w/BUNDLE

note right of Alice
Alice offers 2 sendonly video streams with 2 simulcast encodings per stream
end note
Alice->Bob: Offer(Audio:Opus,Video1:VP8,Video2:H.264) with bundle-only for
video
note left of Bob
Bob accepts Alice's offer and 2 encodings per stream
end note
Alice->Bob: One-Way 1 Opus, 2 H.264 and 2 VP8 video streams, all mulitplexed
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE m0 m1 m2	[draft-ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
m=audio 54609 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:m0	[RFC5888] Audio m=line part of BUNDLE group with a unique port number
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=sendonly	[RFC3264]
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=rtcp-fb:109 nack	[RFC5104]
a=ssrc:11111 EocUG1f0fcg	[RFC5576]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]

a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9: c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
m=video 0 RTP/SAVPF 98 100	bundle-only video line with port number set to zero
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:m1	[RFC5888] Video m=line part of BUNDLE group
a=rtpmap:98 VP8/90000	[draft-ietf-payload-vp8]
a=rtpmap:100 VP8/90000	[draft-ietf-payload-vp8]
a=imageattr:98 [x=1280,y=720]	[RFC6236]Camera-1,Encoding -1 Resolution
a=fmtp:98 max-fr=30	[RFC4566]
a=imageattr:100 [x=640,y=480]	[RFC6236] Camera-1,Encoding-2 Resolution
a=fmtp:100 max-fr=15	[RFC4566]
a=ssrc-group:SIMULCAST 12345 45678	[RFC5576]
a=ssrc:12345 cname:axzo1278npDlAzM73	[RFC5576] [draft-rescorla-avtcore-62 22bis] Camera-1,Encoding-1 SSRC with Session CNAME
a=ssrc:45678 cname:axzo1278npDlAzM73	[RFC5576] [draft-rescorla-avtcore-62 22bis] Camera-1,Encoding-2 SSRC with Session CNAME
a=sendonly	[RFC3264] - Send only video stream
a=rtcp-mux	[RFC5761]
a=bundle-only	[draft-roach-mmusic-unified-plan]
a=rtcp-fb:98 nack	[RFC5104]
a=rtcp-fb:98 nack pli	[RFC5104]

a=rtcp-fb:98 ccm fir	[RFC5104]
a=rtcp-fb:100 nack	[RFC5104]
a=rtcp-fb:100 nack pli	[RFC5104]
a=rtcp-fb:100 ccm fir	[RFC5104]
m=video 0 RTP/SAVPF 101 102	bundle-only video line with port number set to zero
a=msid:ma tc	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tc)
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:m2	[RFC5888] Video m=line part of BUNDLE group
a=rtpmap:101 H264/90000	[RFC3984]
a=rtpmap:102 H264/90000	[RFC3984]
a=fmtp:101 profile-level-id=4d0028;packetizatio n-mode=1;max-fr=30	[RFC3984]Camera-2,Encoding -1 Resolution
a=fmtp:102 profile-level-id=4d0028;packetizatio n-mode=1;max-fr=15	[RFC3984]Camera-1,Encoding -2 Resolution
a=ssrc-group:SIMULCAST 67890 56789	[RFC5576]
a=ssrc:67890 cname:axzo1278npDlAzM73	[RFC5576] [draft-rescorla-avtcore-62 22bis] Camera-1,Encoding-1 SSRC with Session CNAME
a=ssrc:56789 cname:axzo1278npDlAzM73	[RFC5576] [draft-rescorla-avtcore-62 22bis] Camera-1,Encoding-2 SSRC with Session CNAME
a=sendonly	[RFC3264] - Send only video stream
a=rtcp-mux	[RFC5761]
a=bundle-only	[draft-roach-mmusic-unifie d-plan]
a=rtcp-fb:101 nack	[RFC5104]
a=rtcp-fb:101 nack pli	[RFC5104]
a=rtcp-fb:101 ccm fir	[RFC5104]
a=rtcp-fb:102 nack	[RFC5104]
a=rtcp-fb:102 nack pli	[RFC5104]
a=rtcp-fb:102 ccm fir	[RFC5104]

Table 22: 5.4.1 SDP Offer

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE m0 m1 m2	[draft-ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
m=audio 54609 RTP/SAVPF 109	[RFC4566]
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:m0	[RFC5888] Audio m=line part of BUNDLE group with a unique port number
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=rtcp-fb:109 nack	[RFC5104]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=sendonly	[RFC3264]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761]
a=ssrc:22222	[RFC5576]
cname:y8/C90alEocUG1f0fcg	
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efb	[RFC5245]
abd9a2	
a=fingerprint:sha-1	[RFC5245]
99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:	
c7:70:9d:1f:66:79:a8:07	
a=candidate:0 1 UDP 2113667327	[RFC5245]
192.168.1.4 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 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
m=video 54609 RTP/SAVPF 98 100	BUNDLE accepted with port repeated from the audio port
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:m1	[RFC5888] Video m=line part of BUNDLE group
a=rtpmap:98 VP8/90000	[draft-ietf-payload-vp8]
a=rtpmap:100 VP8/90000	[draft-ietf-payload-vp8]
a=imageattr:98 [x=1280,y=720]	[RFC6236]Camera-1,Encoding -1 Resolution
a=fmtp:98 max-fr=30	[RFC4566]
a=imageattr:100 [x=640,y=480]	[RFC6236] Camera-1,Encoding-2 Resolution
a=fmtp:100 max-fr=15	[RFC4566]
a=recvonly	[RFC3264] - receive only video stream
a=ssrc:54321 cname:axzo1278npDlAzM73	[RFC5576]
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efb abd9a2	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9: c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5576]
a=bundle-only	[draft-roach-mmusic-unified-plan]

m=video 54609 RTP/SAVPF 101 102	BUNDLE accepted with port repeated from the audio port
c= IN IP4 24.23.204.141	[RFC4566]
a=msid:ma tc	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tc)
a=mid:m2	[RFC5888] Video m=line part of BUNDLE group
a=rtpmap:101 H264/90000	[RFC3984]
a=rtpmap:102 H264/90000	[RFC3984]
a=recvonly	[RFC3264] - Send only video stream
a=fmtp:101 profile-level-id=4d0028;packetizatio n-mode=1;max-fr=30	[RFC3984]Camera-2,Encoding -1 Resolution
a=fmtp:102 profile-level-id=4d0028;packetizatio n-mode=1;max-fr=15	[RFC3984]Camera-1,Encoding -2 Resolution
a=ssrc:90876 cname:axzo1278npDlAzM73	[RFC5576]
a=ice-ufrag:ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efb abd9a2	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9: c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5576]
a=bundle-only	[draft-roach-mmusic-unified-plan]

Table 23: 5.4.1 SDP Anwer

5.4.2. Successful SVC Video Stream

This section shows an SDP Offer/Answer for a session with an audio and a single video stream. The video stream is 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.

```
title SVC Session - 3 Layers w/BUNDLE
note right of Alice
Alice offers 3 sendonly video stream with 3 layers of SVC
end note
Alice->Bob: Offer(Audio:Opus Video: H.264 SVC) bundle-only
note left of Bob
Bob accepts Alice's Offered Codec operation points
end note
Bob->Alice: Answer(Video: H.264) bundle-only
Alice->Bob: One-Way H.264 Video with codec points as indicated by Bob.
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE m0 m1	[draft-ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
m=audio 54609 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:m0	[RFC5888] Audio m=line part of BUNDLE group with a unique port number
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=sendonly	[RFC3264]
a=rtcp-fb:109 nack	[RFC5104]

a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
a=ssrc:67890 cname:axzo1278npDlAzM73	[RFC5576]
m=video 0 RTP/SAVPF 96 97 100	bundle-only video line with port number set to zero
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tc)
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:m1	[RFC5888] Audio m=line part of BUNDLE group
a=msid:ma tb	
a=rtpmap:96 H264/90000	[RFC3984]
a=fmtp:96 profile-level-id=4d0028;packetization-mode=1;max-fr=30;max-fs=8040	[RFC3984]H.264 Layer 1
a=rtpmap:97 H264/90000	[RFC3984]
a=fmtp:97 profile-level-id=4d0028;packetization-mode=1;max-fr=15;max-fs=1200	[RFC3984] H.264 Layer 2
a=rtpmap:100 H264-SVC/90000	[RFC3984]
a=fmtp:100 profile-level-id=4d0028;packetization-mode=1;max-fr=30;max-fs=8040	[RFC3984]
a=depend:100 lay m1:96,97;	[RFC5583]Layer 3 dependent on layers 1 and 2

a=sendonly	[RFC3264] - Send only video stream
a=rtcp-mux	[RFC5761]
a=bundle-only	[draft-roach-mmusic-unified-plan]
a=ssrc:1732846380 cname:axzo1278npDlAzM73	[RFC5576]
a=ssrc:1732846381 cname:axzo1278npDlAzM73	[RFC5576]
a=ssrc:1732846382 cname:axzo1278npDlAzM73	[RFC5576]
a=rtcp-fb:* nack	[RFC5104]
a=rtcp-fb:* nack pli	[RFC5104]
a=rtcp-fb:* ccm fir	[RFC5104]

Table 24: 5.4.2 SDP Offer with SVC

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE m0 m1	[draft-ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
m=audio 54609 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 24.23.204.142	[RFC4566]
a=mid:m0	[RFC5888] Audio m=line part of BUNDLE group with a unique port number
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=rtcp-fb:109 nack	[RFC5104]
a=recvonly	[RFC3264]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel

a=rtcp-mux	[RFC5761]	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]	
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]	
a=candidate:0 1 UDP 2113667327 192.168.1.5 54609 typ host	[RFC5245]	
a=candidate:1 1 UDP 694302207 24.23.204.142 54609 typ srflx raddr 192.168.1.5 rport 54609	[RFC5245]	
a=candidate:0 2 UDP 2113667326 192.168.1.5 64678 typ host	[RFC5245]	
a=candidate:1 2 UDP 1694302206 24.23.204.142 64678 typ srflx raddr 192.168.1.5 rport 64678	[RFC5245]	
m=video 54609 RTP/SAVPF 96 100	BUNDLE accepted Bundle address same as audio m=line.	
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)	
c= IN IP4 24.23.204.142	[RFC4566]	
a=mid:m1	[RFC5888] Video m=line part of BUNDLE group	
a=rtpmap:96 H264/90000	[RFC3984]	
a=fmtp:96 profile-level-id=4d0028;packetization-mode=1;max-fr=30;max-fs=8040	[RFC3984]H.264 Layer 1	
a=rtpmap:100 H264-SVC/90000	[RFC3984]	
a=fmtp:100 profile-level-id=4d0028;packetization-mode=1;max-fr=30;max-fs=8040	[RFC3984]	
a=depend:100 lay m1:96;	[RFC5583] Bob chooses 2 Codec Operation points	
a=ice-ufrag:074c6550	[RFC5245]	
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]	
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]	
a=candidate:0 1 UDP 2113667327 192.168.1.5 54609 typ host	[RFC5245]	
a=candidate:1 1 UDP 694302207 24.23.204.142 54609 typ srflx raddr 192.168.1.5 rport 54609	[RFC5245]	

a=candidate:0 2 UDP 2113667326 192.168.1.5 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.142 64678 typ srflx raddr 192.168.1.5 rport 64678	[RFC5245]
a=recvonly	[RFC3264] - Receive only video stream
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761]
a=bundle-only	[draft-roach-mmusic-unified-plan]
a=ssrc:4638117328 cname:axzo1278npDlAzM73	[RFC5576]

Table 25: 5.4.2 SDP Answer with SVC

5.4.3. Successful Simulcast Video Streams with Retransmisson

This section shows an SDP Offer/Answer exchange for a simulcast scenario with 2 two resolutions and has [RFC4588] style re-transmission flows.

```
title Simulcast Streams with Retransmission

note right of Alice
Alice offers single audio and simulcasted video stream
end note
Alice->Bob: Offer(Audio:Opus Video:VP8 with 2 resolutions and RTX Stream)
bundle-only
note left of Bob
Bob accepts all the streams offered by Alice
end note

Bob->Alice: Answer(Audio:Opus Video:VP8 with 2 resolutions and RTX Stream)
bundle-only

Alice<->Bob: 2 Way Audio and Simulcast Video with RTX Streams
```

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

a=group:BUNDLE m0 m1	[draft-ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
m=audio 54609 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:m0	[RFC5888] Audio m=line part of BUNDLE group with a unique port number
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=rtcp-fb:109 nack	[RFC5104]
a=sendrecv	[RFC3264]
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=ssrc:11111 cname:EocUG1f0fcg/yvY7	[RFC5576]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
m=video 0 RTP/SAVPF 98 100 101 103	bundle-only video line with port number set to zero
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)

c= IN IP4 24.23.204.141	[RFC4566]
a=mid:m1	[RFC5888] Audio m=line part of BUNDLE group
b=AS:1756	[RFC4566]
a=rtpmap:98 VP8/90000	[draft-ietf-payload-vp8]
a=rtpmap:100 VP8/90000	[draft-ietf-payload-vp8]
a=rtpmap:101 VP8/90000	[draft-ietf-payload-vp8]
a=rtpmap:103 VP8/90000	[draft-ietf-payload-vp8]
a=fmtp:98 max-fr=30;max-fs=8040	[RFC4566]
a=fmtp:100 max-fr=15;max-fs=1200	[RFC4566]
a=fmtp:101 apt=98;rtx-time=3000	[RFC4588]
a=fmtp:103 apt=100;rtx-time=3000	[RFC4588]
a=ssrc-group:SIMULCAST 12345 78990	Simulcast group
a=ssrc-group:FID 12345 34567	[RFC5888]
a=ssrc-group:FID 78990 90887	[RFC5888]
a=ssrc:12345 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
a=ssrc:78990 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
a=ssrc:34567 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
a=ssrc:90887 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
a=sendrecv	[RFC3264]
a=rtcp-mux	[RFC5761]
a=bundle-only	[draft-roach-mmusic-unified-plan]
a=rtcp-fb:* nack	[RFC5104]
a=rtcp-fb:* nack pli	[RFC5104]
a=rtcp-fb:* ccm fir	[RFC5104]

Table 26: 5.4.3 SDP Offer w/Simulcast, RTX

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE m0 m1	[draft-ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
m=audio 54609 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 24.23.204.142	[RFC4566]

a=mid:m0	[RFC5888] Audio m=line part of BUNDLE group with a unique port number
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=rtcp-fb:109 nack	[RFC5104]
a=sendrecv	[RFC3264]
a=setup:active	[RFC4145]
a=rtcp-mux	[RFC5761]
a=ssrc:33333 cname:L/HmN4Xa5NWs1ao1	[RFC5576]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.5 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.142 54609 typ srflx raddr 192.168.1.5 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.5 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.142 64678 typ srflx raddr 192.168.1.5 rport 64678	[RFC5245]
m=video 54609 RTP/SAVPF 98 100 101 103	BUNDLE accepted with Bundle address identical to audio m-line
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 24.23.204.142	[RFC4566]
a=mid:m1	[RFC5888] Video m=line part of BUNDLE group
a=rtpmap:98 VP8/90000	[draft-ietf-payload-vp8]
a=rtpmap:100 VP8/90000	[draft-ietf-payload-vp8]
a=rtpmap:101 VP8/90000	[draft-ietf-payload-vp8]
a=rtpmap:103 VP8/90000	[draft-ietf-payload-vp8]
a=fmtp:98 max-fr=30;max-fs=8040	[RFC4566]
a=fmtp:100 max-fr=15;max-fs=1200	[RFC4566]
a=fmtp:101 apt=98;rtx-time=3000	[RFC4588]
a=fmtp:103 apt=100;rtx-time=3000	[RFC4588]
a=ice-ufrag:074c6550	[RFC5245]

a=ice-pwd:a28a397a4c3f31747d1ee3474a f08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9: c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.5 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.142 54609 typ srflx raddr 192.168.1.5 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.5 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.142 64678 typ srflx raddr 192.168.1.5 rport 64678	[RFC5245]
a=ssrc-group:SIMULCAST 54321 77656	Simulcast group
a=ssrc-group:FID 54321 88776	[RFC5888]
a=ssrc-group:FID 77656 12908	[RFC5888]
a=ssrc:54321 cname:LP/NWs1ao1HmN4Xa5	[RFC5576]
a=ssrc:77656 cname:LP/NWs1ao1HmN4Xa5	[RFC5576]
a=ssrc:88776 cname:LP/NWs1ao1HmN4Xa5	[RFC5576]
a=ssrc:12908 cname:LP/NWs1ao1HmN4Xa5	[RFC5576]
a=sendrecv	[RFC3264]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761]
a=bundle-only	[draft-roach-mmusic-unified-plan]
a=rtcp-fb:* nack	[RFC5104]
a=rtcp-fb:* nack pli	[RFC5104]
a=rtcp-fb:* ccm fir	[RFC5104]

Table 27: 5.4.3 SDP Answer w/Simulcast, RTX

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

This section shows an SDP Offer/Answer exchange for a simulcast scenario with 2 two resolutions and has [RFC4588] style re-transmission flows.

It also showcases when Bob rejects one of the Simulcast Video Stream which results in the rejection of the associated repair stream implicitly

```
title Simulcast Streams with Retransmission Rejected

note right of Alice
Alice offers sendonly single audio and simulcasted video stream.
end note
Alice->Bob: Offer(Audio:Opus Video:VP8 with 2 resolutions and RTX Streams)
bundle-only

note left of Bob
Bob accepts one simulcast,rtx and rejects the other
end note
Bob->Alice: Answer(Audio:Opus Video:VP8 with 1 resolution and the RTX Stream)
bundle-only

Alice->Bob: 1 Way Audio, Video Session
note right of Alice
Only 1 Video stream and its associated RTX stream
is sent to Bob
end note
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE m0 m1	[draft-ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
m=audio 54609 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:m0	[RFC5888] Audio m=line part of BUNDLE group with a unique port number
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=rtcp-fb:109 nack	[RFC5104]
a=sendonly	[RFC3264]

a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=ssrc:11111 cname:LP/NWs1ao1HmN4Xa5	[RFC5576]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
m=video 0 RTP/SAVPF 98 100 101 103	bundle-only video line with port number set to zero
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:m1	[RFC5888] Audio m=line part of BUNDLE group
a=rtpmap:98 VP8/90000	[draft-ietf-payload-vp8]
a=rtpmap:100 VP8/90000	[draft-ietf-payload-vp8]
a=rtpmap:101 VP8/90000	[draft-ietf-payload-vp8]
a=rtpmap:103 VP8/90000	[draft-ietf-payload-vp8]
a=fmtp:98 max-fr=30;max-fs=8040	[RFC4566]
a=fmtp:100 max-fr=15;max-fs=1200	[RFC4566]
a=fmtp:101 apt=98;rtx-time=3000	[RFC4588]
a=fmtp:103 apt=100;rtx-time=3000	[RFC4588]
a=ssrc-group:SIMULCAST 12345 78990	Simulcast group
a=ssrc-group:FID 12345 34567	[RFC5888]
a=ssrc-group:FID 78990 90887	[RFC5888]
a=ssrc:12345 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
a=ssrc:78990 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
a=ssrc:34567 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
a=ssrc:90887 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
a=sendonly	[RFC3264]
a=rtcp-mux	[RFC5761]

a=bundle-only	[draft-roach-mmusic-unified-plan]
a=rtcp-fb:* nack	[RFC5104]
a=rtcp-fb:* nack pli	[RFC5104]
a=rtcp-fb:* ccm fir	[RFC5104]

Table 28: 5.4.4 SDP Offer w/Simulcast, RTX

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE m0 m1	[draft-ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
m=audio 54609 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 24.23.204.142	[RFC4566]
a=mid:m0	[RFC5888] Audio m=line part of BUNDLE group with a unique port number
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=recvonly	[RFC3264]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.5 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.142 54609 typ srflx raddr 192.168.1.5 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.5 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.142 64678 typ srflx raddr 192.168.1.5 rport 64678	[RFC5245]

m=video 54609 RTP/SAVPF 98 101	BUNDLE accepted with Bundle address identical to audio m-line
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 24.23.204.142	[RFC4566]
a=mid:m1	[RFC5888] Video m=line part of BUNDLE group
a=rtpmap:98 VP8/90000	[draft-ietf-payload-vp8]
a=rtpmap:101 VP8/90000	[draft-ietf-payload-vp8]
a=fmtp:98 max-fr=30;max-fs=8040	[RFC4566]
a=fmtp:101 apt=98;rtx-time=3000	[RFC4588]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.5 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.142 54609 typ srflx raddr 192.168.1.5 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.5 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.142 64678 typ srflx raddr 192.168.1.5 rport 64678	[RFC5245]
a=ssrc:54321 cname:NWs1ao1HmN4Xa5	[RFC5576]
a=recvonly	[RFC3264]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761]
a=bundle-only	[draft-roach-mmusic-unified-plan]

Table 29: 5.4.4 SDP Answer no Simulcast

5.4.5. Simulcast Video Stream with Forward Error Correction

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

On completion of Offer/Answer exchange, one audio stream, 2 simulcast

video streams and 2 associated FEC streams are sent over a single
5-Tuple as part of bundle-only and BUNDLE framework.

```
title Simulcast Streams with Forward Error Correction

note right of Alice
Alice offers sendonly single audio and simulcasted video stream
end note
Alice->Bob: Offer(Audio:Opus Video:VP8 with 2 resolutions with FEC Streams)
bundle-only

note left of Bob
Bob accepts simulcast stream as well as FEC streams
end note
Bob->Alice: Answer(Audio:Opus Video:VP8 with 2 resolutions with FEC Streams)
bundle-only

Alice->Bob: 1 Way Audio, Video Session
note right of Alice
Successful Session with 4 video streams (Simulcast + FEC) and 1 Audio Stream
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE m0 m1	[draft-ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
m=audio 54609 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:m0	[RFC5888] Audio m=line part of BUNDLE group with a unique port number
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=rtcp-fb:109 nack	[RFC5104]
a=sendrecv	[RFC3264]

a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=ssrc:11111 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
m=video 0 RTP/SAVPF 98 100 101 103	bundle-only video line with port number set to zero
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:m1	[RFC5888] Video m=line part of BUNDLE group
a=rtpmap:98 VP8/90000	[draft-ietf-payload-vp8]
a=rtpmap:100 VP8/90000	[draft-ietf-payload-vp8]
a=rtpmap:101 1d-interleaved-parityfec/90000	[RFC5956]
a=rtpmap:103 1d-interleaved-parityfec/90000	[RFC5956]
a=fmtp:98 max-fr=30;max-fs=8040	[RFC4566]
a=fmtp:100 max-fr=15;max-fs=1200	[RFC4566]
a=fmtp:101 L=5; D=10; repair-window=200000	[RFC5956]
a=fmtp:103 L=5; D=10; repair-window=200000	[RFC5956]
a=ssrc-group:SIMULCAST 12345 78990	Simulcast group
a=ssrc-group:FEC-FR 12345 34567	[RFC5888]
a=ssrc-group:FEC-FR 78990 90887	[RFC5888]
a=ssrc:12345 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
a=ssrc:78990 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]

a=ssrc:34567 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
a=ssrc:90887 cname:Q/NWs1ao1HmN4Xa5	[RFC5576]
a=sendrecv	[RFC3264]
a=rtcp-mux	[RFC5761]
a=bundle-only	[draft-roach-mmusic-unified-plan]
a=rtcp-fb:* nack	[RFC5104]
a=rtcp-fb:* nack pli	[RFC5104]
a=rtcp-fb:* ccm fir	[RFC5104]

Table 30: 5.4.5 SDP Offer

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE m0 m1	[draft-ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
m=audio 54609 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:m0	[RFC5888] Audio m=line part of BUNDLE group with a unique port number
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=rtcp-fb:109 nack	[RFC5104]
a=sendrecv	[RFC3264]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761]
a=ssrc:33333 cname:Y9/cZke09JAtpl98	[RFC5576]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]

a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9: c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
m=video 54609 RTP/SAVPF 98 100 101 103	BUNDLE accepted with Bundle Address identical to audio m=line.
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:m1	[RFC5888] Video m=line part of BUNDLE group
a=rtpmap:98 VP8/90000	[draft-ietf-payload-vp8]
a=rtpmap:100 VP8/90000	[draft-ietf-payload-vp8]
a=rtpmap:101 1d-interleaved-parityfec/90000	[RFC5956]
a=rtpmap:103 1d-interleaved-parityfec/90000	[RFC5956]
a=fmtp:98 max-fr=30;max-fs=8040	[RFC4566]
a=fmtp:100 max-fr=15;max-fs=1200	[RFC4566]
a=fmtp:101 L=5; D=10; repair-window=200000	[RFC5956]
a=fmtp:103 L=5; D=10; repair-window=200000	[RFC5956]
a=ssrc-group:SIMULCAST 54321 77656	Simulcast group
a=ssrc-group:FEC-FR 54321 88776	[RFC5888]
a=ssrc-group:FEC-FR 77656 12908	[RFC5888]
a=ssrc:54321 cname:Q/1HmN4Xa5CClapa	[RFC5576]
a=ssrc:77656 cname:Q/1HmN4Xa5CClapa	[RFC5576]
a=ssrc:88776 cname:Q/1HmN4Xa5CClapa	[RFC5576]
a=ssrc:12908 cname:Q/1HmN4Xa5CClapa	[RFC5576]
a=sendrecv	[RFC3264]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761]

a=bundle-only	[draft-roach-mmusic-unified-plan]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
a=rtcp-fb:* nack	[RFC5104]
a=rtcp-fb:* nack pli	[RFC5104]
a=rtcp-fb:* ccm fir	[RFC5104]

Table 31: 5.4.5 SDP Answer

5.5. Others

The examples in the section provide SDP for a variety of scenarios related to RTCP configuration, RTP Header extension, Legacy Interop scenarios and more.

5.5.1. Video Session with Reduced-Size RTCP Support

Alice wants to setup a secure RTCP feedback based video session with Bob, but also wants to negotiate support for Reduced Size RTCP as defined in RFC5506. Since Bob is capable of this feature, the includes a=rtcp-rsize in the Answer.

```
title Video Session with Reduced Size RTCP Support
Alice->Bob: Offer(Video:H.264,VP8)
note right of Alice
Alice prefers reduced size RTCP Packets
end note
Bob->Alice: Answer(Video:H.264)
note left of Bob
Bob supports reduced-size RTCP packets and he prefers the same from Alice.
end note
Alice<->Bob: Two-way H.264 Video
note right of Alice
  RTCP packets are generated per RFC5506
end note
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20518 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=	[RFC4566]
t=0 0	[RFC4566]
m=video 62537 RTP/SAVPF 99 120	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:99 H264/90000	[RFC3984] - H.264 Video Codec
a=fmtp:99 profile-level-id=4d0028;packetization-mode=1	[RFC3984]
a=rtpmap:120 VP8/90000	[draft-ietf-payload-vp8] - VP8 video codec
a=rtcp-rsize	[RFC5506] - Alice intends to use reduced size RTCP for this session
a=sendrecv	[RFC3264]
a=setup:actpass	[RFC4145]
a=rtcp-mux	[RFC5761]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]

a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9 d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 62537 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 24.23.204.141 62537 typ srflx raddr 192.168.1.4 rport 62537	[RFC5245]
a=candidate:0 2 2113667326 192.168.1.4 54721 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 54721 typ srflx raddr 192.168.1.4 rport 54721	[RFC5245]
a=rtcp-fb:99 nack	[RFC5245]
a=rtcp-fb:99 nack pli	[RFC5104]
a=rtcp-fb:99 ccm fir	[RFC5104]
a=rtcp-fb:120 nack	[RFC5104]
a=rtcp-fb:120 nack pli	[RFC5104]
a=rtcp-fb:120 ccm fir	[RFC5104]
a=ssrc:12908 cname:Q/1HmN4Xa5CClapa	[RFC5576]

Table 32: 5.5.1 SDP Offer

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=bob 16833 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
m=video 63130 RTP/SAVPF 99	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
c= IN IP4 98.248.92.771	[RFC4566]
a=rtpmap:99 H264/90000	[RFC3984]
a=fmtp:99 profile-level-id=4d0028;packetization-mode=1	[RFC3984]
a=rtcp-rsize	[RFC5506] - Bob supports reduced size RTCP
a=sendrecv	[RFC3264]
a=setup:active	[RFC4145]
a=rtcp-mux	[RFC5761]
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.7 63130 typ host	[RFC5245]
a=candidate:1 1 UDP 1694302207 98.248.92.77 63130 typ srflx raddr 192.168.1.7 rport 63130	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 56607 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 98.248.92.77 56607 typ srflx raddr 192.168.1.7 rport 56607	[RFC5245]
a=rtcp-fb:99 nack pli	[RFC5104]
a=rtcp-fb:99 ccm fir	[RFC5104]
a=ssrc:11111 cname:QCL/1HmN4Xa5CClapa	[RFC5576]

Table 33: 5.5.1 SDP Answer

5.5.2. 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.

```
   title 2-Way Audio with VAD

   Alice->Bob: Offer(Audio:Opus,PCMU,PCMA)
   note right of Alice
   Alice indicates support for including audio-level
   end note
   Bob->Alice: Answer(Audio:Opus,PCMU,PCMA)
   note left of Bob
   Bob accepts and indicates his support as well
   end note
   Alice<->Bob: Two-way Opus Audio
   note right of Alice
    Per packet audio-level is included
   end note
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
m=audio 54609 RTP/SAVPF 109 0 8	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 24.23.204.141	[RFC4566]
a=extmap:1 urn:ietf:params:rtp-hdrext:ssrc-audio-level	[RFC6464]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=rtpmap:0 PCMU/8000	[RFC3551]
a=rtpmap:0 PCMA/8000	[RFC3551]
a=sendrecv	[RFC3264]
a=setup:actpass	[RFC4145]
a=rtcp-mux	[RFC5761]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]

a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
a=rtcp-fb:* nack	[RFC5104]
a=ssrc:11111 cname:QCL/1HmN4Xa5CClapa	[RFC5576]

Table 34: 5.5.2 SDP Offer

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=bob 16833 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=	[RFC4566]
t=0 0	[RFC4566]
m=audio 49203 RTP/SAVPF 109 0 98	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 98.248.92.77	[RFC4566]
a=extmap:1 urn:ietf:params:rtp-hdrext:ssrc-audio-level	[RFC6464]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus] - Bob accept sonly Opus Codec
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=rtpmap:0 PCMU/8000	[RFC3551] PCMU Audio Codec
a=rtpmap:0 PCMA/8000	[RFC3551] PCMA Audio Codec
a=rtcp-fb:* nack	[RFC5104]
a=sendrecv	[RFC3264] - Bob can send and recv audio

a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761] - Bob can perform RTP/RTCP Muxing on port 49203
a=ice-ufrag:c300d85b	[RFC5245] - Session Level ICE username frag
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245] - Session Level ICE password
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] - Session DTLS Fingerprint for SRTP
a=candidate:0 1 UDP 2113667327 192.168.1.7 49203 typ host	[RFC5245] - Host ICE Candidate for Opus Stream
a=candidate:1 1 UDP 1694302207 98.248.92.77 49203 typ srflx raddr 192.168.1.7 rport 49203	[RFC5245] - Server Reflexive ICE Candidate for the above host candidate
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245] - Second Host Candidate
a=candidate:1 2 UDP 1694302206 98.248.92.77 60065 typ srflx raddr 192.168.1.7 rport 60065	[RFC5245] - Server Reflexive Candidate for the Second Host Candidate
a=ssrc:1732846380 cname:EocUG1f0fcg/yvY7	[RFC5576]

Table 35: 5.5.2 SDP Answer

5.5.3. 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.

```
   title 2-Way Audio with VAD

   Alice->Bob: Offer(Audio:Opus,PCMU,PCMA)
   note right of Alice
   Alice indicates support for including audio-level
   end note
   Bob->Alice: Answer(Audio:Opus,PCMU,PCMA)
   note left of Bob
   Bob accepts and indicates his support as well
   end note
   Alice<->Bob: Two-way Opus Audio
   note right of Alice
    Per packet audio-level is included
   end note
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20518 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=	[RFC4566]
t=0 0	[RFC4566]
a=rtcp-rsize	[RFC5506] - Alice intends to use reduced size RTCP for this session
m=audio 54609 RTP/SAVPF 109 0 8	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 24.23.204.141	[RFC4566]
a=extmap:1/recvonly urn:ietf:params:rtp-hdrext:csrc-audio-level	[RFC6465]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus] - Opus Codec 48khz, 2 channels
a=ptime:20	[draft-ietf-payload-rtp-opus] - Opus packetization of 20ms
a=rtpmap:0 PCMU/8000	[RFC3551] PCMU Audio Codec
a=rtpmap:0 PCMA/8000	[RFC3551] PCMA Audio Codec

a=rtcp-fb:* nack	[RFC5104]
a=sendrecv	[RFC3264] - Alice can send and recv audio
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761] - Alice can perform RTP/RTCP Muxing on port 54609
a=ice-ufrag:074c6550	[RFC5245] - Session Level ICE parameter
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245] - Session Level ICE parameter
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] - Session DTLS Fingerprint for SRTP
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245] - Host ICE Candidate
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245] - Server Reflexive ICE Candidate for the above host candidate
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245] - Second Host Candidate
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245] - Server Reflexive Candidate for the Second Host Candidate
a=ssrc:11111 cname:QCL/1HmN4Xa5CClapa	[RFC5576]

Table 36: 5.5.3 SDP Offer

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=bob 16833 0 IN IP4 0.0.0.0	[RFC4566] - Session Origin Information
s=	[RFC4566]
t=0 0	[RFC4566]
m=audio 49203 RTP/SAVPF 109 0 98	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
c= IN IP4 98.248.92.77	[RFC4566]
a=extmap:1/sendonly urn:ietf:params:rtp-hdrext:csrc-audio-level	[RFC6465]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus] - Bob accept sonly Opus Codec
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=rtpmap:0 PCMU/8000	[RFC3551] PCMU Audio Codec
a=rtpmap:0 PCMA/8000	[RFC3551] PCMA Audio Codec
a=rtcp-fb:* nack	[RFC5104]
a=sendrecv	[RFC3264] - Bob can send and recv audio
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761] - Bob can perform RTP/RTCP Muxing on port 49203
a=ice-ufrag:c300d85b	[RFC5245] - Session Level ICE username frag
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245] - Session Level ICE password
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245] - Session DTLS Fingerprint for SRTP
a=candidate:0 1 UDP 2113667327 192.168.1.7 49203 typ host	[RFC5245] - Host ICE Candidate for Opus Stream

a=candidate:1 1 UDP 1694302207 98.248.92.77 49203 typ srflx raddr 192.168.1.7 rport 49203	[RFC5245] - Server Reflexive ICE Candidate for the above host candidate
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245] - Second Host Candidate
a=candidate:1 2 UDP 1694302206 98.248.92.77 60065 typ srflx raddr 192.168.1.7 rport 60065	[RFC5245] - Server Reflexive Candidate for the Second Host Candidate
a=ssrc:2222 cname:HmN4Xa5CC/lapa	[RFC5576]

Table 37: 5.5.3 SDP Answer

5.5.4. Successful legacy Interop Fallaback 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,

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

```
title Successful 2-Way WebRTC <-> VOIP Interop

note right of Alice
Alice is a multistream capable WebRTC end-point & Bob is behind a legacy VOIP
system
end note
Alice->Bob: Offer(Audio:Opus Video: 2 VP8, 2 H2.64 Streams) with bundle-only
offer
note right of Alice
Alice marks both the video streams as bundle-only
end note
Bob->Alice: Answer(Audio:Opus)
note left of Bob
 Bob accepts only Audio stream since he doesn't recognize
 bundle-only streams
end note
Alice<->Bob: Two-way Opus Audio
```

SDP Contents	RFC#/Notes

| v=0 | [RFC4566] |
| o=alice 20519 0 IN IP4 0.0.0.0 | [RFC4566] |

s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE m0 m1 m2	[draft-ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics
m=audio 54609 RTP/SAVPF 109	[RFC4566]
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:m0	[RFC5888] Audio m=line part of BUNDLE group with a unique port number
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=rtcp-fb:109 nack	[RFC5104]
a=sendonly	[RFC3264]
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
a=ssrc:11111 cname:axzo1278npDlAzM73	[RFC5576]E
m=video 0 RTP/SAVPF 98 100	bundle-only video line with port number set to zero
c= IN IP4 24.23.204.141	[RFC4566]

a=mid:m1	[RFC5888] Video m=line part of BUNDLE group
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)
a=rtpmap:98 VP8/90000	[draft-ietf-payload-vp8]
a=rtpmap:100 VP8/90000	[draft-ietf-payload-vp8]
a=imageattr:98 [x=1280,y=720]	[RFC6236]Camera-1,Encoding -1 Resolution
a=fmtp:98 max-fr=30	[RFC4566]
a=imageattr:100 [x=640,y=480]	[RFC6236] Camera-1,Encoding-2 Resolution
a=fmtp:100 max-fr=15	[RFC4566]
a=ssrc-group:SIMULCAST 12345 45678	[RFC5576]
a=ssrc:12345 cname:axzo1278npDlAzM73	[RFC5576]E
a=ssrc:45678 cname:axzo1278npDlAzM73	[RFC5576]
a=bundle-only	[draft-roach-mmusic-unified-plan]
m=video 0 RTP/SAVPF 101 103	bundle-only video line with port number set to zero
c= IN IP4 24.23.204.141	[RFC4566]
a=mid:m2	[RFC5888] Video m=line part of BUNDLE group
a=msid:ma tc	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tc)
a=rtpmap:101 H264/90000	[RFC3984]
a=rtpmap:103 H264/90000	[RFC3984]
a=fmtp:101 profile-level-id=4d0028;packetization-mode=1;max-fr=30	[RFC3984]Camera-2,Encoding -1 Resolution
a=fmtp:100 profile-level-id=4d0028;packetization-mode=1;max-fr=15	[RFC3984]Camera-1,Encoding -2 Resolution
a=ssrc-group:SIMULCAST 67890 56789	[RFC5576]
a=ssrc:67890 cname:axzo1278npDlAzM73	[RFC5576]
a=ssrc:56789 cname:axzo1278npDlAzM73	[RFC5576]
a=bundle-only	[draft-roach-mmusic-unified-plan]

Table 38: 5.5.4 SDP Simulcast bundle-only

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20519 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
m=audio 54609 RTP/SAVPF 109	[RFC4566]
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=rtcp-fb:109 nack	[RFC5104]
a=sendonly	[RFC3264]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=ice-ufrag:ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 54609 typ host	[RFC5245]
a=candidate:1 1 UDP 694302207 24.23.204.141 54609 typ srflx raddr 192.168.1.4 rport 54609	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=candidate:1 2 UDP 1694302206 24.23.204.141 64678 typ srflx raddr 192.168.1.4 rport 64678	[RFC5245]
m=video 0 RTP/SAVPF 98 100	Bob doesn't recognize bundle-only and hence rejects the video stream
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:98 VP8/90000	[draft-ietf-payload-vp8]
a=rtpmap:100 VP8/90000	[draft-ietf-payload-vp8]
a=imageattr:98 [x=1280,y=720]	[RFC6236]Camera-1,Encoding-1 Resolution
a=fmtp:98 max-fr=30	[RFC4566]

a=imageattr:100 [x=640,y=480]	[RFC6236] Camera-1,Encoding-2 Resolution
a=fmtp:100 max-fr=15	[RFC4566]
m=video 0 RTP/SAVPF 98 100	Bob doesn't recognize bundle-only and hence rejects the video stream
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:101 H264/90000	[RFC3984]
a=rtpmap:103 H264/90000	[RFC3984]
a=fmtp:101 profile-level-id=4d0028;packetization-mode=1;max-fr=30	[RFC3984]Camera-2,Encoding-1 Resolution
a=fmtp:100 profile-level-id=4d0028;packetization-mode=1;max-fr=15	[RFC3984]Camera-1,Encoding-2 Resolution

Table 39: 5.5.4 SDP Anwer

5.5.5. Session with Trickle ICE support

In this example Alice and Bob negotiate using Tricke ICE to perform ICE candiate generation and connectivity checks. This example also multiplexes audio and video stream via SDP BUNDLE framework.

```
title Audio/Video Session with ICE Trickle

note right of Alice
Alice and Bob know that they both support BUNDLE.
end note
Alice->Bob: Offer(Audio:Opus Video:VP8)
note right of Alice
Alice indicates support for ICE Trickle and BUNDLE
end note

Bob->Alice: Answer(Audio:Opus Video:VP8) indicating its support for BUNDLE
note left of Bob
Bob also indicates ICE Trickle support.
end note
Alice <-> Bob: 2Way Call with Audio and Video Multiplexed
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio video	[draft-ietf-mmusic-sdp-bundle-negotiation] Alice supports grouping of m=lines under BUNDLE semantics.
m=audio 10000 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=mid:foo	[RFC5888] - Audio m=line part of BUNDLE group
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=rtcp-fb:109 nack	[RFC5104]
a=sendrecv	[RFC3264]
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=ssrc:11111 cname=Q/NWs1ao1HmN4Xa5	[RFC5576]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=ice-options:trickle	[draft-ivov-mmusic-trickle-ice]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 10000 typ host	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
m=video 10000 RTP/SAVPF 120	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)

a=mid:bar	[RFC5888] - Video m=line with Bundle address same as the audio m=line
c= IN IP4 24.23.204.141	[RFC4566]
b=AS:1000	[RFC4566]
a=rtpmap:120 VP8/90000	[draft-ietf-payload-vp8]
a=sendrecv	[RFC3264]
a=setup:actpass	[RFC4145] - Alice can perform DTLS before Answer arrives
a=rtcp-mux	[RFC5761]
a=ssrc:22222 Q/NWs1ao1HmN4Xa5	[RFC5576]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=ice-options:trickle	[draft-ivov-mmusic-trickle-ice]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.4 10000 typ host	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.4 64678 typ host	[RFC5245]
a=rtcp-fb:120 nack	[RFC5104]
a=rtcp-fb:120 nack pli	[RFC5104]
a=rtcp-fb:120 ccm fir	[RFC5104]

Table 40: 5.4 SDP Offer w/BUNDLE

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=bob 16833 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
a=group:BUNDLE audio video	[draft-ietf-mmusic-sdp-bundle-negotiation] - Bob supports BUNDLE semantics.
m=audio 20000 RTP/SAVPF 109	[RFC4566]
a=msid:ma ta	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (ta)
a=mid:foo	[RFC5888] - Audio m=line part of the BUNDLE group
c= IN IP4 98.248.92.77	[RFC4566]
a=rtpmap:109 opus/48000/2	[draft-ietf-payload-rtp-opus]
a=ptime:20	[draft-ietf-payload-rtp-opus]
a=sendrecv	[RFC3264]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-fb:109 nack	[RFC5104]
a=rtcp-mux	[RFC5761]
a=ssrc:33333 cname:EocUG1f0fcg/yvY7	[RFC5576]
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efbabd9a2	[RFC5245]
a=ice-options:trickle	[draft-ivov-mmusic-trickle-ice]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.7 20000 typ host	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245]
m=video 20000 RTP/SAVPF 120	[RFC4566]
a=msid:ma tb	Identifies RTCMediaStream ID (ma) and RTCMediaStreamTrack ID (tb)

a=mid:bar	[RFC5888] - Video m=line with Bundle address same as the audio m=line
c= IN IP4 98.248.92.77	[RFC4566]
a=rtpmap:120 VP8/90000	[draft-ietf-payload-vp8]
a=sendrecv	[RFC3264]
a=setup:active	[RFC4145] - Bob carries out DTLS Handshake in parallel
a=rtcp-mux	[RFC5761]
a=ssrc:44444 cname:EocUG1f0fcg/yvY7	[RFC5576]
a=ice-ufrag:c300d85b	[RFC5245]
a=ice-pwd:de4e99bd291c325921d5d47efb abd9a2	[RFC5245]
a=ice-options:trickle	[draft-ivov-mmusic-trickle -ice]
a=fingerprint:sha-1 99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9: c7:70:9d:1f:66:79:a8:07	[RFC5245]
a=candidate:0 1 UDP 2113667327 192.168.1.7 20000 typ host	[RFC5245]
a=candidate:0 2 UDP 2113667326 192.168.1.7 60065 typ host	[RFC5245]
a=rtcp-fb:120 nack	[RFC5104]
a=rtcp-fb:120 nack pli	[RFC5104]
a=rtcp-fb:120 ccm fir	[RFC5104]

Table 41: 5.4 SDP Answer w/BUNDLE

5.5.6. 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 enchance seamless inter-operability between the aforementioned communication systems.

In the scenario desribed below, Alice sends [RFC3264] Offer with two sets of media descriptions per media type.

- One set that correponds to [WEBRTC] Compliant 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 Legacy VOIP end-point, recognizes only the media descriptions with RTP/AVP as the application protocol. The security and fedback requirements for the session are either handled by a intermediate gateway or with some combination of Bob's capabilities and the intermediate gateway.

```
title Successful 2-Way WebRTC <-> VOIP Interop
note right of Alice
Alice is on a WebRTC end-point & Bob is behind a legacy VOIP system
end note
Alice->Bob: Offer(Audio:Opus Video:VP8)
note right of Alice
 Alice includes 2 copies of media descriptions
 1. WebRTC compliant media description (RTP/SAVPF)
 2. Legacy compliant media description (RTP/AVP)
end note
Bob->Alice: Answer(Audio:Opus Video:VP8)
note right of Bob
 Bob recognizes"legacy compliant" media description from Alice.
 and accepts the same.
end note
Alice->Bob: Two-way Opus Audio, VP8 Video
note right of Alice
  Session also suports RTP/RTCP Mux, RTCP feedback (nack,pli)
end note
```

SDP Contents	RFC#/Notes
v=0	[RFC4566]
o=alice 20518 0 IN IP4 0.0.0.0	[RFC4566]
s=	[RFC4566]
t=0 0	[RFC4566]
a=ice-ufrag:074c6550	[RFC5245]
a=ice-pwd:a28a397a4c3f31747d1ee3474af08a068	[RFC5245]
a=fingerprint:sha-1	[RFC5245]
99:41:49:83:4a:97:0e:1f:ef:6d:f7:c9:c7:70:9	
d:1f:66:79:a8:07	
a=rtcp-rsize	[RFC5506]
m=audio 54609 RTP/SAVPF 109	[RFC4566]
c= IN IP4 24.23.204.141	[RFC4566]
a=rtpmap:109 opus/48000	
a=ptime:20	
a=sendrecv	[RFC3264]
a=rtcp-mux	[RFC5761]
a=candidate:0 1 UDP 2113667327 192.168.1.4	[RFC5245]
54609 typ host	

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

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

Table 42: 6.1 SDP Offer

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

Table 43: 6.1 SDP Answer

6. IANA Considerations

This document requires no actions from IANA.

7. Change Log

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

Changes from draft-nandakumar-rtcweb-sdp-02
- Major refactoring was done to group the examples in to categories
- SDP was updated through out to reflect JSEP-04 style of defining attributes per m=line than at the session level.
- Added 8 new examples.
- Updated references for Trickle, Unified Plan
- Add section to explain the syntax conventions followed in the examples.

Changes from draft-nandakumar-rtcweb-sdp-01
- Updated references to OPUS RTP Payload Specification.
- Updated BUNDLE examples based on the latest draft-ietf-mmusic-sdp-bundle-negotiation.
- Added examples for multiple audio and video flows based on Unified Plan.
- Added new examples for RTX and FEC streams
- Updated Simulcast and SVC examples

Changes from draft-nandakumar-rtcweb-sdp-00
- Fixed editorial comments on the mailing list.
- Updated Data-channel SDP information based on draft-ietf-mmusic-sctp-sdp.
- Updated BUNDLE examples based on draft-ietf-mmusic-sdp-bundle-negotiation.
- Added examples for few more BUNDLE variants
- Added new examples for Simulcast and SVC

8. References

8.1. Normative References

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8.2. Informative References

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