Still a long way to go…

- Stay with SDP =
  - Completely specify the SDP generated and accepted at each point SDP is used in the API
  - Completely specify how incorrect SDP will be handled
- Provide an easily-specified API
  - (That is to say an API the behavior of which is fully described by the specification as opposed to by reference to a raft of SDP RFCs)
  - Rejected, so out of scope

SDP Example #1

Can we pass this to setLocalDescription and expect it to work?

```
v=0
o=unhelpful 23103 0 IN IP4 192.168.15.2
s=-
t=0 0
m=audio 10001 RTP/AVP 121
c=IN IP4 192.168.15.2
a=rtpmap:121 opus/48000
a=ptime:20
a=sendrecv
a=content:sl
```

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m=audio 10001 RTP/AVP 121
c=IN IP4 192.168.15.2
a=rtpmap:121 opus/48000
a=ptime:20
a=sendrecv
a=content:sl
```

ice-ufrag and ice-pwd?

candidates?

SDP Example #2

How about this one?

v=0

o=callmemaybe 20000 0 IN IP4 0.0.0.0

s=-

t=3560402800 3560410900

r=7d 1h 0 25h

p=+1 408 555-1212

c=IN IP4 0.0.0.0

SDP Example #3

Think those were crazy?

```
v=0
o=- 2899314018 2 IN IP4 127.0.0.1
s=-
t=0 0
a=group:BUNDLE audio video
m=audio 1 RTP/SAVPF 103 104 0 8 106 105 13 126
c=IN IP4 0.0.0.0
a=rtcp:1 IN IP4 0.0.0.0
a=ice-ufrag:E4AQja2fPM2VXXmQ
a=ice-pwd:gzQJmOORJxIt18UQv727KnRC
a=ice-options:google-ice
a=sendrecv
a=mid:audio
a=rtcp-mux
a=crypto:1 AES_CM_128_HMAC_SHA1_80 inline:ulvng7ifYakoWnQ939JXPeXQGlsxnWFbENbbExFb
a=rtpmap:103 ISAC/16000
a=rtpmap:104 ISAC/32000
a=rtpmap:0 PCMU/8000
a=rtpmap:8 PCMA/8000
a=rtpmap:106 CN/32000
a=rtpmap:105 CN/16000
a=rtpmap:13 CN/8000
a=rtpmap:126 telephone-event/8000
a=ssrc:1158854965 cname:Rv2JOE3+A2VNGv3I
a=ssrc:1158854965 mslabel:jH0xJC3JQ4DAlwqBPZVBEzpfA4jPfunL6MsX
a=ssrc:1158854965 label:jH0xJC3JQ4DAlwqBPZVBEzpfA4jPfunL6MsX00
m=video 1 RTP/SAVPF 100 101 102
c=IN IP4 0.0.0.0
a=rtcp:1 IN IP4 0.0.0.0
a=ice-ufrag:E4AQja2fPM2VXXmQ
a=ice-pwd:gzQJmOORJxIt18UQv727KnRC
a=ice-options:google-ice
a=sendrecv
a=mid:video
a=rtcp-mux
a=crypto:1 AES_CM_128_HMAC_SHA1_80 inline:ulvng7ifYakoWnQ939JXPeXQGlsxnWFbENbbExFb
a=rtpmap:100 VP8/90000
a=rtpmap:101 red/90000
a=rtpmap:102 ulpfec/90000
```

SDP Example #3

Zooming in a little…

v=0
o=- 2899314018 2 IN IP4 127.0.0.1
s=-
t=0 0
a=group:BUNDLE audio video
…

SDP Example #3

…
m=audio 1 RTP/SAVPF 103 104 0 8 106 105 13 126
c=IN IP4 0.0.0.0
a=rtcp:1 IN IP4 0.0.0.0
a=ice-ufrag:E4AQja2fPM2VXXmQ
a=ice-pwd:gzQJmOORJxIt18UQv727KnRC
a=ice-options:google-ice
a=sendrecv
a=mid:audio
a=rtcp-mux
a=crypto:1 AES_CM_128_HMAC_SHA1_80 inline:ulvng7ifYakoWnQ939JXPeXQGlsxnWFbENbbExFb
a=rtpmap:103 ISAC/16000
a=rtpmap:104 ISAC/32000
a=rtpmap:0 PCMU/8000
a=rtpmap:8 PCMA/8000
a=rtpmap:106 CN/32000
a=rtpmap:105 CN/16000
a=rtpmap:13 CN/8000
a=rtpmap:126 telephone-event/8000
a=ssrc:1158854965 cname:Rv2JOE3+A2VNGv3I
a=ssrc:1158854965 mslabel:jH0xJC3JQ4DAlwqBPZVBEzpfA4jPfunL6MsX
a=ssrc:1158854965 label:jH0xJC3JQ4DAlwqBPZVBEzpfA4jPfunL6MsX00
…

SDP Example #3

…
m=video 1 RTP/SAVPF 100 101 102
c=IN IP4 0.0.0.0
a=rtcp:1 IN IP4 0.0.0.0
a=ice-ufrag:E4AQja2fPM2VXXmQ
a=ice-pwd:gzQJmOORJxIt18UQv727KnRC
a=ice-options:google-ice
a=sendrecv
a=mid:video
a=rtcp-mux
a=crypto:1 AES_CM_128_HMAC_SHA1_80
inline:ulvng7ifYakoWnQ939JXPeXQGlsxnWFbENbbExFb
a=rtpmap:100 VP8/90000
a=rtpmap:101 red/90000
a=rtpmap:102 ulpfec/90000

SDP Example #4

How about these guys?

```
v=0
o=Mozilla-SIPUA 3063 0 IN IP4 0.0.0.0
s=SIP Call
t=0 0
a=ice-ufrag:30ce27a6
a=ice-pwd:cb15a35c9ddb3dbd1eb25f6c8bba718a
a=fingerprint:sha-256 F5:06:73:64:4F:ED:2C:FC:55:67:39:60:F8:45:AA:1B:AB:63:55:08:82:F4:60:AE:E5:93:9D:33:DD:EF:FD:E4
m=audio 29157 RTP/SAVPF 109 0 8 101
c=IN IP4 50.0.2.26
a=rtpmap:109 opus/48000
a=ptime:20
a=rtpmap:0 PCMU/8000
a=rtpmap:8 PCMA/8000
a=rtpmap:101 telephone-event/8000
a=fmtp:101 0-15
a=sendrecv
a=candidate:0 1 UDP 2111832319 10.92.38.139 60231 typ host
a=candidate:1 1 UDP 1692467199 50.0.2.26 29157 typ srflx raddr 10.92.38.139 rport 60231
a=candidate:0 2 UDP 2111832318 10.92.38.139 60232 typ host
a=candidate:1 2 UDP 1692467198 50.0.2.26 29158 typ srflx raddr 10.92.38.139 rport 60232
m=video 29159 RTP/SAVPF 120
c=IN IP4 50.0.2.26
a=rtpmap:120 VP8/90000
a=sendrecv
a=candidate:0 1 UDP 2111832319 10.92.38.139 60233 typ host
a=candidate:1 1 UDP 1692467199 50.0.2.26 29159 typ srflx raddr 10.92.38.139 rport 60233
a=candidate:0 2 UDP 2111832318 10.92.38.139 60234 typ host
a=candidate:1 2 UDP 1692467198 50.0.2.26 29160 typ srflx raddr 10.92.38.139 rport 60234
m=application 29161 SCTP/DTLS 5000
c=IN IP4 50.0.2.26
a=fmtp:5000 protocol=webrtc-datachannel;streams=16
a=sendrecv
a=candidate:0 1 UDP 2111832319 10.92.38.139 60235 typ host
a=candidate:1 1 UDP 1692467199 50.0.2.26 29161 typ srflx raddr 10.92.38.139 rport 60235
a=candidate:0 2 UDP 2111832318 10.92.38.139 60236 typ host
a=candidate:1 2 UDP 1692467198 50.0.2.26 29162 typ srflx raddr 10.92.38.139 rport 60236
```

SDP Example #4

```
v=0
o=Mozilla-SIPUA 3063 0 IN IP4 0.0.0.0
s=SIP Call
t=0 0
a=ice-ufrag:30ce27a6
a=ice-pwd:cb15a35c9ddb3dbd1eb25f6c8bba718a
a=fingerprint:sha-256 F5:06:73:64:4F:ED:2C:FC:55:67:39:60:F8:45:AA:1B:AB:63:55:08:82:F4:60:AE:E5:93:9D:33:DD:EF:FD:E4
…
```

SDP Example #4

…

m=audio 29157 RTP/SAVPF 109 0 8 101

c=IN IP4 50.0.2.26

a=rtpmap:109 opus/48000

a=ptime:20

a=rtpmap:0 PCMU/8000

a=rtpmap:8 PCMA/8000

a=rtpmap:101 telephone-event/8000

a=fmtp:101 0-15

a=sendrecv

a=candidate:0 1 UDP 2111832319 10.92.38.139 60231 typ host

a=candidate:1 1 UDP 1692467199 50.0.2.26 29157 typ srflx raddr 10.92.38.139 rport 60231

a=candidate:0 2 UDP 2111832318 10.92.38.139 60232 typ host

a=candidate:1 2 UDP 1692467198 50.0.2.26 29158 typ srflx raddr 10.92.38.139 rport 60232

…

SDP Example #4

…

m=video 29159 RTP/SAVPF 120

c=IN IP4 50.0.2.26

a=rtpmap:120 VP8/90000

a=sendrecv

a=candidate:0 1 UDP 2111832319 10.92.38.139 60233 typ host

a=candidate:1 1 UDP 1692467199 50.0.2.26 29159 typ srflx raddr 10.92.38.139 rport 60233

a=candidate:0 2 UDP 2111832318 10.92.38.139 60234 typ host

a=candidate:1 2 UDP 1692467198 50.0.2.26 29160 typ srflx raddr 10.92.38.139 rport 60234

…

SDP Example #4

```
…
m=application 29161 SCTP/DTLS 5000
c=IN IP4 50.0.2.26
a=fmtp:5000 protocol=webrtc-datachannel;streams=16
a=sendrecv
a=candidate:0 1 UDP 2111832319 10.92.38.139 60235 typ host
a=candidate:1 1 UDP 1692467199 50.0.2.26 29161 typ srflx raddr 10.92.38.139 rport 60235
a=candidate:0 2 UDP 2111832318 10.92.38.139 60236 typ host
a=candidate:1 2 UDP 1692467198 50.0.2.26 29162 typ srflx raddr 10.92.38.139 rport 60236
```

Specifying SDP (and O/A)

- Generally
  - BUNDLE: Optional? Required? Forbidden?
  - ICE candidates in createOffer or not?
  - Addresses: correct, 0.0.0.0, or 127.0.0.1?
  - SAVP *and* SAVPF?
  - a=rtcp-mux: Required or just allowed?
  - SDES keys?
  - SCTP? Really?
  - Offering for A/V when no media attached? Data channel?
  - Offer to send A or V when no user consent yet or just recvonly?
  - DTMF?
- Is the API enforcing the O/A state machine or not?
  - createOffer fails or succeeds if it was called before?
  - setLocalDescription fails or succeeds if setLocalDescription(“offer”) is called twice?
  - setLocalDescription(“offer”) fails or succeeds if setRemoteDescription(“offer”) has been called?
  - setRemoteDescription after a final answer does what exactly?
  - “Rollback” when the far end sends “reject”?

Specifying SDP (2)

- For each and every line from createOffer or createAnswer
  - Can I delete it?
  - Duplicate it?
  - Change it?
  - If not, how are violations handled?
  - What if conditions change before I call setLocalDescription or setRemoteDescription?
- What happens when I provide valid SDP lines to setLocalDescription or setRemoteDescription that weren't in the createOffer or createAnswer?

SDP?

- History of SDP in SIP suggests that complete answers to the previous questions may be impossible, incomplete but interoperable answers may take years
  - So how is this the faster route to the API for RTC in browsers?
  - And why does anyone think we're nearly finished?
- But finished we must eventually be…

Way Forward

- IF we are **using SDP as the API surface**, the SDP needs to be fully specified
- OR IF we are **using constraints as the API surface** and the SDP is an "opaque blob", the constraints need to be fully functional **and** the SDP needs to be fully specified

- If I am a JavaScript developer
  - I need to be able to know **exactly what is and is not allowed to be changed** in the SDP before I pass it to setLocalDescription, setRemoteDescription, or send it to a far browser,
  - **or** I need to be able to control **every reasonable thing** about what SDP is made by createOffer and createAnswer (SDES, sendonly/recvonly/sendrecv, ssrc choices, BUNDLE, rtcp-mux, etc., etc., etc.)
- If I am a browser implementer
  - I need to know what changes to the SDP might be made by a developer **or** change the contract to "no changes are allowed" and provide the above "every reasonable thing" constraints APIs
  - But I **still** must have a specification as to what SDP must be permitted to arrive from a far browser (or other SDP O/A device) and then passed to setRemoteDescription, so that all browsers behave similarly (as far as the other end(s) and gateways are concerned) including common error reporting for problems with this SDP

- Conclusion: There is now no escape from **complete specification** of the SDP permitted in and out of the WEBRTC browser APIs