**3GPP TSG- Meeting #**

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| *CR-Form-v12.2* | | | | | | | | |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network | **X** |

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| ***Source to WG:*** | , , Samsung Electronics Co., Ltd. | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
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| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | The description of IMS Data Channels in TS 26.114 is terse, possibly to keep initial description simple. There is also some implied expectations, e.g., single application support, which may not be obvious, limiting, and lead to misunderstanding. This CR proposes clarifications to more clearly define the expected deployment conditions. Further work is needed on additional clarifications. | | | | | | | | |
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| ***Summary of change:*** | | Multiple clarifications to sections 6.2.10 and Annex A.17. | | | | | | | | |
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| ***Consequences if not approved:*** | | Terse description and implied specification will compromise interoperability. The TS 26.114 is referenced by other standards organizations and a more expansive functionality support is considered. | | | | | | | | |
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| ***Clauses affected:*** | | 3.1, 6.2.10.1, A.17 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Revision 2 of S4-221350 | | | | | | | | |

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| **1st Change** |

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply:

NOTE: A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

**example:** text used to clarify abstract rules by applying them literally.

**360-degree video:** A real-world visual scene captured by a set of cameras or a camera device with multiple lenses and sensors covering the sphere in all directions around the centre point of the camera set or camera device. The term 360-degree video may be used to include also limited 360-degree video.

**Limited 360-degree video:** A 360-degree video in which the visual scene does not cover the entire sphere around the center point of the camera set or camera device but only a part of it. A limited 360-degree video may be limited i) in the horizontal field to less than 360 degrees, or ii) in the vertical field to less than 180 degrees or iii) in both the vertical and horizontal fields.

**AMR, AMR-NB:** Both names refer to the AMR codec (TS 26.071 [11]) and are used interchangeably in this specification.

**Bitstream:** A bitstream that conforms to a video or audio encoding format.

**bitstream**: A sequence of bits that forms the representation of one or more coded video or audio sequences.

**CHEM:** The Coverage and Handoff Enhancements using Multimedia error robustness feature.

**Codec mode:** Used for the AMR and AMR-WB codecs to identify one specific bitrate. For example AMR includes 8 codec modes (excluding SID), each of different bitrate.

**Constrained terminal:** UE that is (i) operating in radio access capability category series "M" capable of supporting conversational services, and/or (ii) a wearable device which is constrained in size, weight or power consumption (e.g. connected watches), excluding smartphones and feature phones.

**DCMTSI client:** A data channel capable MTSI client supporting data channel media as defined in clause 6.2.10.

**DCMTSI client in terminal:** A DCMTSI client that is implemented in a terminal or UE. The term "DCMTSI client in terminal" is used in this document when entities such as MRFP, MRFC or media gateways are excluded.

**Dual-mono:** A variant of 2-channel stereo encoding where two instances of a mono codec are used to encode a 2-channel stereo signal.

**Evolved UTRAN:** Evolved UTRAN is an evolution of the 3G UMTS radio-access network towards a high-data-rate, low-latency and packet-optimized radio-access network.

**EVS codec:** The EVS codec includes two operational modes: EVS Primary operational mode (‘EVS Primary mode’) and EVS AMR-WB Inter-Operable (‘EVS AMR-WB IO mode’). When using EVS AMR-WB IO mode the speech frames are bitstream interoperable with the AMR-WB codec [18]. Frames generated by an EVS AMR-WB IO mode encoder can be decoded by an AMR-WB decoder, without the need for transcoding. Likewise, frames generated by an AMR-WB encoder can be decoded by an EVS AMR-WB IO mode decoder, without the need for transcoding.

**EVS Primary mode:** Includes 11 bit-rates for fixed-rate or multi-rate operation; 1 average bit-rate for variable bit-rate operation; and 1 bit-rate for SID (TS 26.441 [121]). The EVS Primary can encode narrowband, wideband, super-wideband and fullband signals. None of these bit-rates are interoperable with the AMR-WB codec.

**EVS AMR-WB IO mode:** Includes 9 codec modes and SID. All are bitstream interoperable with the AMR-WB codec (TS 26.171 ‎‎[17]).

**Field of View**: The extent of visible area expressed with vertical and horizontal angles, in degrees in the 3GPP 3DOF reference system as defined in TS 26.118 [180].

**Fisheye Video**: Video captured by a wide-angle camera lens that usually captures an approximately hemispherical field of view and projects it as a circular image.

**Frame Loss Rate (FLR):** The percentage of speech frames not delivered to the decoder. FLR includes speech frames that are not received in time to be used for decoding.

**ITT4RT client:** MTSI client supporting the Immersive Teleconferencing and Telepresence for Remote Terminals (ITT4RT) feature, as defined in Annex Y.

**ITT4RT-Tx client:** ITT4RT client only capable of sending immersive video.

**ITT4RT-Rx client:** ITT4RT client only capable of receiving immersive video

**ITT4RT MRF:** An ITT4RT client implemented by functionality included in the MRFC and the MRFP.

**ITT4RT client in terminal:** An ITT4RT client that is implemented in a terminal or UE. The term "ITT4RT client in terminal" is used in this document when entities such as ITT4RT MRF is excluded.

**Mode-set:** Used for the AMR and AMR-WB codecs to identify the codec modes that can be used in a session. A mode-set can include one or more codec modes.

**MSMTSI client:** A multi-stream capable MTSI client supporting multiple streams as defined in Annex S. An MTSI client may support multiple streams, even of the same media type, without being an MSMTSI client. Such an MTSI client may, for example, add a second video to an ongoing video telephony session as shown in Annex A.11. In that case, the MTSI client is an MSMTSI client only if it is fully compliant with Annex S.

**MSMTSI MRF:** An MSMTSI client implemented by functionality included in the MRFC and the MRFP.

**MSMTSI client in terminal:** An MSMTSI client that is implemented in a terminal or UE. The term "MSMTSI client in terminal" is used in this document when entities such as MRFP, MRFC or media gateways are excluded.

**MTSI client:** A function in a terminal or in a network entity (e.g. a MRFP) that supports MTSI.

**MTSI client in terminal:** An MTSI client that is implemented in a terminal or UE. The term "MTSI client in terminal" is used in this document when entities such as MRFP, MRFC or media gateways are excluded.

**MTSI media gateway (or MTSI MGW):** A media gateway that provides interworking between an MTSI client and a non MTSI client, e.g. a CS UE. The term MTSI media gateway is used in a broad sense, as it is outside the scope of the current specification to make the distinction whether certain functionality should be implemented in the MGW or in the MGCF.

**Omnidirectional media:** Media such as image or video and its associated audio that enable rendering according to the user's viewing orientation, if consumed with a head-mounted device, or according to user's desired viewport, otherwise, as if the user was in the spot where and when the media was captured.

**Operational mode:** Used for the EVS codec to distinguish between EVS Primary mode and EVS AMR-WB IO mode.

**Overlay:** A piece of visual media, rendered over omnidirectional video or image, or a viewport.

**Pose:** Position and rotation information associated to a viewport.

**Projected picture:** Picture that has a representation format specified by an omnidirectional video projection format.

**Projection:** Inverse of the process by which the samples of a projected picture are mapped to a set of positions identified by a set of azimuth and elevation coordinates on a unit sphere.

**Root data channel application:** The data channel application downloaded from the Data Channel Server over a bootstrap data channel from the HTTP root ("/") URL, e.g., a starter Web page, that may present all the data channel applications that the subscriber could select for retrieval via the respective bootstrap data channel. The starter page is unders the Data Channel Server and may expose different functionality to the local and the remote UE.

**Simulcast:** Simultaneously sending different encoded representations (simulcast formats) of a single media source (e.g. originating from a single microphone or camera) in different simulcast streams.

**Simulcast format:** The encoded format used by a single simulcast stream, typically represented by an SDP format and all SDP attributes that apply to that particular SDP format, indicated in RTP by the RTP header payload type field.

**Simulcast stream:** The RTP stream carrying a single simulcast format in a simulcast.

**Viewport**: Region of omnidirectional image or video suitable for display and viewing by the user.

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| **2nd Change** |

### 6.2.10 Data channel

#### 6.2.10.1 General

Support of data channel media is optional for an MTSI client and an MTSI client in terminal. For brevity, an MTSI client supporting data channel is henceforth denoted as a DCMTSI client or DCMTSI client in terminal, respectively.

To indicate support for the procedures in this clause, a DCMTSI client shall when including media feature tags as specified in TS 24.229 [7] include a +sip.app-subtype media feature tag, as specified by RFC 5688 [177], with a value of "webrtc-datachannel" (the application media format used by [172]), regardless of data channel media being part of the SDP or not.

One or more data channel SDP media descriptions formatted according to [172] may be added to the SDP, alongside other SDP media descriptions such as e.g. speech, video, and text. A data channel SDP media description must not be placed before the first SDP speech media description. SDP examples are provided in Annex A.17.

If data channels are used in a session, the session setup shall determine the applicable bandwidth limit(s) as defined in clause 6.2.5.

Multiple data channels may be mapped to a single data channel SDP media description, each with a corresponding "a=dcmap" SDP attribute and stream IDs that are unique within that media description. There is no limit to the number of data channels in an SDP media description, but the aggregate of all defined data channels must keep within the set bandwidth limit and care should be taken to avoid excessive SDP size. If the session is re-negotiated to include a changed number of data channels in an SDP media description, the bandwidth limit may either be kept constant, changing the share of bandwidth available to each individual data channel, or the bandwidth limit may be changed to accommodate the changed number of data channels, keeping individual data channel bandwidth shares. Regardless of what approach is used when changing number of used data channels in a media description, the aggregate of all defined data channels must keep within the re-negotiated bandwidth limit.

If there is a need to use data channels with either different transport IP addresses, different UDP ports, or different SCTP ports, separate data channel SDP media descriptions must be used, as IP address, UDP port and SCTP port are all constant (though different on SDP offers and answers) per SDP media description. Multiple SCTP associations for a single channel, commonly denoted as "multi-homing", defined in IETF RFC 4960 [173] for reasons of redundancy and basically using one destination transport address at a time, is not described for use with WebRTC data channel and must therefore not be used in this specification.

NOTE 1: The main reasons to not specify multi-homing are because it cannot use the needed separation of signalling paths for redundancy purposes in the applicable usage scenarios, and it is also not considered feasible when using SCTP on top of DTLS.

NOTE x: While multi-homing is not supported on the UE, different data channels for an application that communicates with a different endpoint, e.g., a remote UE vs. a network server, would necessarily be described via separate media lines as the remote IP addresses would be different. This is also the case for bootstrap data channels that are terminated either on a local or a remote operator Data Channel Server, see section A.17 for examples.

To ease data channel media implementation and ease interworking with WebRTC data channels, DCMTSI clients must support ICE Lite and may support full ICE [184], for data channel media. DCMTSI clients supporting full ICE must only use host candidate addresses. SDP “a=candidate” line host address information must match corresponding SDP “c=” and “m=” line information.

NOTE 2: In typical IMS deployments, it is expected that DCMTSI clients have no need to use STUN or TURN servers with ICE. This is in line with what constitutes an ICE Lite agent.

Data channel stream IDs below 1000 must be reserved for using the HTTP [73] protocol, henceforth denoted as "bootstrap data channels", to retrieve an HTML web page including JavaScript(s), and optionally image(s) and style sheet(s), henceforth denoted as a "root data channel application", e.g., a starter Web page. The root data channel application accessible at the HTTP root ("/") URL through a bootstrap data channel describes the graphical user interface and the logic needed to handle any further data channel usage beyond the bootstrap data channel itself. That logic is under the Data Channel Server control, which defines what functions are exposed via the root data channel application.

NOTE y: For instance, the Data Channel Server local to a UE could provide that UE with a menu of applications for its user to choose from, while providing nothing to the remote UE. Alternatively, that server could provide the same menu to the remote UE but not allow its user to make application selections. And the logic could be reversed considering the Data Channel Server local to the remote UE.

The meaning of the "authority" (host) part of the URL and consequently the "Host" HTTP header are not defined, shall be ignored on reception, and shall be set to the empty value by a DCMTSI client in terminal.

The data channel application is created prior to the DCMTSI call where it is intended to be used, by means left out of scope for this specification. The data channel application workflow is depicted by Figure 6.2.10.1-1 below.



Figure 6.2.10.1-1: Data Channel Workflow

The data channel application is, referring to the numbered arrows in Figure 6.2.10.1-1:

1. Uploaded to the network, by the UE user or some other authorized party.

2. Stored in a data channel application repository in the network.

3. During the DCMTSI call where it should be used, retrieved from the repository.

4. Sent through a bootstrap data channel to the local UE A in response to an HTTP request from UE A.

5. Sent through a bootstrap data channel to the remote UE B in response to an HTTP request from UE B.

When correlated applications are to be used on both UEs A and B in a call, different realizations are possible. In one example, the Data Channel Server coordinates the app retrieval on both UEs by HTTP means via a respective bootstrap stream ID before any new data channels for the retrieved application are added to the call. Alternatively, UE B could get information on the application used in UE A as a result of a call upgrade from UE A that adds data channels for that application to the call. Identification of the correlated application used by UE A is sent to UE B in the SDP offer/answer in the call upgrade transaction resulting from using the application creating new data channels. The application identification will also allow both UEs to correlate the data channel media descriptions that are establishing the data channels for a particular application.

In both alternatives, applications are retrieved over the bootstrap stream IDs established during call set up. The difference being on the time of the application retrieval, which is dictated by the network implementation and the approach supported to deliver the retrieved applications on both UEs. For the UE initiating the application selection, the selected application will be retrieved as a result of that selection. For the remote UE, the network can provide the application as part of the initiating UE selection. Alternatively, when the network does not provide the application this way, the remote UE will learn of the application that was retrieved by the initiating UE as part of the SDP in the call upgrade request to add data channels for the application and initiate the application retrieval.

6. Some additional data channels created and used by the data channel application itself may be established (logically) between UE A and UE B, and some data channels created and used by the data channel application may be established (logically) between a UE and a server (not depicted in Figure 6.2.10.1-1). Data transmission on data channels shall not start until there is confirmation that both peers have instantiated the data channel, using the same procedures as described for WebRTC in section 6.5 of [172]. The traffic may effectively go through the Data Channel Server, e.g., when the bootstrap and end-to-end data channels have the same anchoring point. This traffic may pass across an inter-operator border if UE A and UE B belong to different operators’ networks.

The bootstrap data channel is not intended for use directly between DCMTSI clients in terminal. DCMTSI clients in terminal that receive HTTP requests on a bootstrap data channel shall ignore such request and shall update the session by removing the SDP "a=dcmap" line with the stream ID where such HTTP request was received, and closing that stream ID.

The data channel application sent in a bootstrap data channel may be updated at any time, automatically or interactively, using normal HTTP procedures.

A bootstrap data channel must be configured as ordered, reliable, with normal SCTP multiplexing priority. The bootstrap data channel shall use a well-defined sub-protocol. The sub-protocol should be HTTP (not encapsulating HTTP in TCP), represented by the following, example SDP "a=dcmap" line, which therefore must be present in each data channel media description in an SDP offer from a DCMTSI client in terminal:

a=dcmap:0 subprotocol="http"

When the HTTP subprotocol is used to retrieve a root or a new application via a bootstrap data channel, any other data channels used by the data channel application JavaScript(s) must be represented in an updated SDP as additional media descriptions with "a=dcmap" lines signalling the stream ID values starting from 1000, as requested by the application JavaScript(s), which triggers a call upgrade.

There are multiple, possible providers of data channel applications. In Figure 6.2.10.1-1, assume that UE A is local to the operator hosting the data channel server. Further assume that UE B belongs to a different operator (remote). The user of UE A can create and use data channel applications (steps 1-4), which can also be sent to UE B (step 5). Similarly, some other authorized part associated with UE A’s operator can create data channel applications for use by UE A (steps 1-4), which can also be sent to UE B (step 5). For simplicity, there’s no data channel server and data channel application repository depicted for UE B in Figure 6.2.10.1-1, but those could be present in a more general case. Seen from the perspective of a single UE, there are then at least four possible data channel application providers:

1. The local UE user.

2. Other authorized parties associated with the local network (e.g. the local operator).

3. The remote UE user.

4. Other authorized parties associated with the remote network (e.g. the remote operator).

The HTML web content making up a data channel application including a root data channel application retrieved via each bootstrap data channel represents a different context of user interaction and should open in a separate tab, or some corresponding user interface construct, but the details are out of scope for this specification and left open for individual implementations. It must be possible to use and navigate between different data channel applications from different bootstrap data channels with different stream IDs that are open simultaneously. While the logic needed to handle additional application retrieval over a bootstrap data channel is under the associated Data Channel Server control, with possibly different realizations as discussed above, all new application selections and retrieval shall occur over the same bootstrap data channel.

Table 6.2.10.1-2 describes a mandatory mapping between stream ID and bootstrap channel data channel application content sources, as seen from a single (local) DCMTSI client in terminal, each of which shall be listed as separate "a=dcmap" lines with "http" subprotocol in SDP when the DCMTSI client in terminal supports receiving data channel application content from that source.

Table 6.2.10.1-2: Bootstrap Data Channel Content Sources

|  |  |
| --- | --- |
| **Stream ID** | **Content Source** |
| 0 | Local network provider |
| 10 | Local user |
| 100 | Remote network provider |
| 110 | Remote user |

Figure 6.2.10.1-3, referring to Figure 6.2.10.1-1 and Table 6.2.10.1-2, is depicting the stream IDs used for distribution of a data channel application owned by UE A from its local UE user data channel repository to both UE A (stream ID 10) and its remote UE B (stream ID 110). Another scenario when the local operator is the provider of data channels applications would be to have UE A use stream ID 0 and UE B use stream ID 100 in Figure 6.2.10.1-3.



Figure 6.2.10.1-3: Distribution of local data channel application to both UE

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| **3rd Change** |

# A.17 SDP offers and answers with data channel capability signalling

The ellipsis ("...") in the examples in this clause is not part of the SDP but indicates possible presence of other media descriptions in addition to the ones shown in the examples.

Table A.17.1 demonstrates an example SDP offer from a UE A with data channel capability signalling for the "bootstrap" data channel defined in clause 6.2.10. The offering part is an ICE Lite agent, indicated by "a=ice-lite" on SDP session level (i.e., before first m= line), and thus only offers host candidates, in this example a single host candidate aligned with address information on the corresponding m= and c= lines.

Table A.17.1: Example SDP offer with data channel capability signalling

|  |
| --- |
| **SDP offer** |
| a=ice-options:ice2  a=ice-lite ...  m=application 52718 UDP/DTLS/SCTP webrtc-datachannel  c=IN IP4 192.0.2.156  b=AS:500  a=candidate:1 1 UDP 2130706431 192.0.2.156 52718 typ host a=ice-ufrag:8hhY  a=ice-pwd:asd88fgpdd777uzjYhagZg  a=max-message-size:1024  a=sctp-port:5000  a=setup:actpass  a=fingerprint:SHA-1 4A:AD:B9:B1:3F:82:18:3B:54:02:12:DF:3E:5D:49:6B:19:E5:7C:AB  a=tls-id: abc3de65cddef001be82  a=dcmap:0 subprotocol="http" |

An example SDP answer received by UE A is shown in Table A.17.2, where the data channel capability signalling from Table A.17.1 is also supported and accepted by the answerer, as indicated by the non-zero port on the m= line. The answering part is an ICE Lite agent, indicated by "a=ice-lite" on SDP session level, and only supports ICE according to the predecessor ICE specification to [184] as indicated by no "a=ice-options:ice2" being included on SDP session level. The bootstrap data channel being terminated on the local Data Channel Server implies that c= line would signal that server IP address (or a next hop towards that server).

Table A.17.2: Example SDP answer with data channel capability

|  |
| --- |
| **SDP answer** |
| a=ice-lite  ...  m=application 15327 UDP/DTLS/SCTP webrtc-datachannel  c=IN IP4 192.0.2.1  b=AS:500  a=candidate:1 1 UDP 2130706431 192.0.2.1 52718 typ host a=ice-ufrag:9uB6  a=ice-pwd:YH75Fviy6338Vbrhrlp8Yh  a=max-message-size:1024  a=sctp-port:6000  a=setup:passive  a=fingerprint:SHA-1 5B:AD:67:B1:3E:82:AC:3B:90:02:B1:DF:12:5D:CA:6B:3F:E5:54:FA  a=tls-id: dcb3ae65cddef0532d42  a=dcmap:0 subprotocol="http" |

Table A.17.3 demonstrates an example SDP offer from a UE A with multiple possible data channel application sources for the "bootstrap" data channel defined in Table 6.2.10.1-2, the different media lines exemplify the expectation that different Data Channel Servers would terminate the local and remote bootstrap data channels. In this example, the offering part supports full ICE, indicated by no "a=ice-lite" on SDP session level.

Table A.17.3: Example SDP offer with multiple data channel application sources

|  |
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| **SDP offer** |
| a=ice-options:ice2 ...  m=application 52718 UDP/DTLS/SCTP webrtc-datachannel  c=IN IP6 fe80::6676:baff:fe9c:ee4a  b=AS:500  a=candidate:1 1 UDP 2130706431 fe80::6676:baff:fe9c:ee4a 52718 typ host  a=ice-ufrag:8hhY  a=ice-pwd:asd88fgpdd777uzjYhagZg a=max-message-size:1024  a=sctp-port:5000  a=setup:actpass  a=fingerprint:SHA-1 4A:AD:B9:B1:3F:82:18:3B:54:02:12:DF:3E:5D:49:6B:19:E5:7C:AB  a=tls-id: abc3de65cddef001be82  a=dcmap:0 subprotocol="http"  a=dcmap:10 subprotocol="http"  m=application 52726 UDP/DTLS/SCTP webrtc-datachannel  c=IN IP6 fe80::6676:baff:fe9c:ee4a  b=AS:500  a=candidate:1 1 UDP 2130706431 fe80::6676:baff:fe9c:ee4a 52726 typ host  a=ice-ufrag:d452  a=ice-pwd:asd88fgpdd777uzjYhRtcq a=max-message-size:1024a=max-message-size:1024  a=sctp-port:5002  a=setup:actpass  a=fingerprint:SHA-1 4A:AD:B9:B1:3F:82:18:3B:54:02:12:DF:3E:5D:49:6B:19:E5:7C:AB  a=tls-id: abc3de65cddef001bf72  a=dcmap:100 subprotocol="http"  a=dcmap:110 subprotocol="http" |

Since the media description describing stream IDs 0 and 10 are to be terminated on the local Data Channel Server to provide applications to UE A, and that server should make itself available to the remote UE B, the SDP forwarded between the two operator networks should be as exemplified in Table A.17.3a. The network serving UE B considers the media description that includes a c= line that has the same address as the c=line at the session level in Table A.17.3a as the offer from (remote) UE A, the first media line in Table A.17.3a; it considers the media description that includes a c= line that has a different address than the c=line at the session level as the offer to UE B, the second media line in Table A.17.3a, from the Data Channel Server (c= line carries the IP address for that server) in the network serving UE A. This offer drops data channels from the Data Channel Server serving UE A towards UE A.

**Table A.17.3a: Example SDP offer with multiple bootstrap data channels, forwarded from the network for UE A to the remote network**

|  |
| --- |
| **SDP offer** |
| m=application 52726 UDP/DTLS/SCTP webrtc-datachannel  c=IN IP6 fe80::6676:baff:fe9c:ee4a  b=AS:500  a=candidate:1 1 UDP 2130706431 fe80::6676:baff:fe9c:ee4a 52726 typ host  a=ice-ufrag:8hhY  a=ice-pwd:asd88fgpdd777uzjYhagZg a=max-message-size:1024  a=sctp-port:5002  a=setup:actpass  a=fingerprint:SHA-1 4A:AD:B9:B1:3F:82:18:3B:54:02:12:DF:3E:5D:49:6B:19:E5:7C:AB  a=tls-id: abc3de65cddef001bf72  a=dcmap:100 subprotocol="http"  a=dcmap:110 subprotocol="http"  m=application 61423 UDP/DTLS/SCTP webrtc-datachannel  c=IN IP6 fe80::6676:baff:ffad:adb2  b=AS:500  a=candidate:1 1 UDP 2130706431 fe80::6676:baff:fe9c:adb2 61423 typ host  a=ice-ufrag:ac9G  a=ice-pwd:asd88fgpdd777uzjYhhCC2 a=max-message-size:1024  a=sctp-port:7002  a=setup:actpass  a=fingerprint:SHA-1 4A:AD:B9:B1:3F:82:18:3B:54:02:12:DF:3E:5D:49:6B:2A:7b:AA:9C  a=tls-id: abc3de65cddef001acdc  a=dcmap:100 subprotocol="http"  a=dcmap:110 subprotocol="http" |

Table A.17.3b demonstrates an example SDP offer propagated to UE B from its network. UE B considers the media line containing stream IDs 100 and 110 in Table A.17.3b as the offer from the remote Data Channel Server (c= line carrying the IP address for that server, these stream IDs indicate remote server), and considers the media line containing stream IDs 0 and 10 as the offer from the local Data Channel Server (c= line carrying the IP address for that server, these stream IDs indicate local server). This offer contains no data channels from the Data Channel Server serving UE A towards UE A, only offers towards UE B should be included.

**Table A.17.3b: Example SDP offer with multiple bootstrap data channels, forwarded to UE B**

|  |
| --- |
| **SDP offer** |
| m=application 61423 UDP/DTLS/SCTP webrtc-datachannel  c=IN IP6 fe80::6676:baff:ffad:adb2  b=AS:500  a=candidate:1 1 UDP 2130706431 fe80::6676:baff:fe9c:adb2 61423 typ host  a=ice-ufrag:ac9G  a=ice-pwd:asd88fgpdd777uzjYhhCC2 a=max-message-size:1024  a=sctp-port:7002  a=setup:actpass  a=fingerprint:SHA-1 4A:AD:B9:B1:3F:82:18:3B:54:02:12:DF:3E:5D:49:6B:2A:7b:AA:9C  a=tls-id: abc3de65cddef001acdc  a=dcmap:100 subprotocol="http"  a=dcmap:110 subprotocol="http"  m=application 54257 UDP/DTLS/SCTP webrtc-datachannel  c=IN IP6 fe80::6676:cdee:ffad:ee4a  b=AS:500  a=candidate:1 1 UDP 2130706431 fe80::6676:baff:fe9c:ee4a 54257 typ host  a=ice-ufrag:32Tq  a=ice-pwd:asd88fgpdd777uzjYhrtD3 a=max-message-size:1024  a=sctp-port:5502  a=setup:actpass  a=fingerprint:SHA-1 4A:AD:B9:B1:3F:82:18:3B:54:02:12:DF:3E:5D:49:6B:90:A3:45:BB  a=tls-id: abc3de65cddef0017654  a=dcmap:0 subprotocol="http"  a=dcmap:10 subprotocol="http" |

Table A.17.3c demonstrates an example SDP answer towards UE A generated from the network serving UE B, if UE B had agreed to use the Data Channel Server in the network serving UE A. Similarly, the network serving UE A considers the media description in Table A.17.3c that includes a c= line that has a different address than the c=line at the session level as the answer from the remote Data Channel Server (c= line carrying the IP address for that server) towards UE A, the first media line in Table A.17.3c; it considers the media description that includes a c= line that has the same address as the c=line at the session level as the answer from UE B towards its Data Channel Server, the second media line in Table A.17.3c. The response from UE B to its network is not shown, but this answer in Table A.17.3c drops data channels between UE B and the Data Channel Server serving UE B.

**Table A.17.3c: Example SDP answer with multiple bootstrap data channels, forwarded from the network for UE B to the remote network**

|  |
| --- |
| **SDP answer** |
| m=application 55956 UDP/DTLS/SCTP webrtc-datachannel  c=IN IP6 fe80::6676:cdee:ffad:ee4a  b=AS:500  a=candidate:1 1 UDP 2130706431 fe80::6676:baff:fe9c:ee4a 55956 typ host  a=ice-ufrag:efES  a=ice-pwd:asd88fgpdd777uzjYhRKs3 a=max-message-size:1024  a=sctp-port:5541  a=setup:passive  a=fingerprint:SHA-1 4A:AD:B9:B1:3F:82:18:3B:54:02:12:DF:3E:5D:49:6B:A3:99:27:1E  a=tls-id: abc3de65cddef001aacd  a=dcmap:100 subprotocol="http"  a=dcmap:110 subprotocol="http"  m=application 63972 UDP/DTLS/SCTP webrtc-datachannel  c=IN IP6 fe80::6676:cdee:ffad:24ef  b=AS:500  a=candidate:1 1 UDP 2130706431 fe80::6676:baff:fe9c:24ef 63972 typ host  a=ice-ufrag:aD3b  a=ice-pwd:asd88fgpdd777uzjYh83de a=max-message-size:1024  a=sctp-port:5731  a=setup:active  a=fingerprint:SHA-1 4A:AD:B9:B1:3F:82:18:3B:54:02:12:DF:3E:5D:49:6B:11:AC:17:93  a=tls-id: abc3de65cddef0012145  a=dcmap:100 subprotocol="http"  a=dcmap:110 subprotocol="http" |

Another example SDP answer from UE B is shown in Table A.17.4, where only one of the bootstrap data channels from the Data Channel Server in the remote network in the offer in Table A.17.3 is accepted by the answerer, UE B, removing the other a=dcmap line associated with stream ID 100. The data channels of stream IDs 0 and 10 terminated on the Data Channel Server local network are rejected by returning a zero port on the m= line that requested these streams to be opened. The SDP answer from UE B does not carry c= lines at the media level as its IP address is captured at the session level.

Figure 6.2.10.1-3 in clause 6.2.10.1 may be used as illustration to this example, in which case UE A in that Figure would send the offer in Table A.17.3, and UE B would send the answer in Table A.17.4.

In this SDP answer, the answerer (UE B) only accepts stream ID 110 to receive the data channel application from the offerer (UE A), but UE B has rejected to use any other data channel application provider.

Table A.17.4: Example UE SDP answer choosing a single data channel application source

|  |
| --- |
| **SDP answer** |
| a=ice-options:ice2 a=ice-lite  ...  m=application 57349 UDP/DTLS/SCTP webrtc-datachannel  c=IN IP4 192.0.2.1  b=AS:500  a=candidate:1 1 UDP 2130706431 192.0.2.1 52718 typ host a=ice-ufrag:9uB6  a=ice-pwd:YH75Fviy6338Vbrhrlp8Yh a=max-message-size:1024  a=sctp-port: 6000  a=setup:passive  a=fingerprint:SHA-1 5B:AD:67:B1:3E:82:AC:3B:90:02:B1:DF:12:5D:CA:6B:3F:E5:54:FA  a=tls-id: dcb3ae65cddef0532d42  a=dcmap:110 subprotocol="http"  m=application 0 UDP/DTLS/SCTP webrtc-datachannel  c=IN IP4 192.0.2.126  b=AS:500  a=candidate:1 1 UDP 2130706431 192.0.2.126 0 typ host a=ice-ufrag:2dE5  a=ice-pwd:YH75Fviy6338Vbrhrlas34 a=max-message-size:1024  a=sctp-port:5502  a=setup:passive  a=fingerprint:SHA-1 4A:AD:B9:B1:3F:82:18:3B:54:02:12:DF:3E:5D:49:6B:44:50:AE:11  a=tls-id: abc3de65cddef0012734  a=dcmap:0 subprotocol="http"  a=dcmap:10 subprotocol="http" |

Figure 6.2.10.1-3 in clause 6.2.10.1 may be used as illustration also to the example in Table A.17.5, in which case UE A in Figure 6.2.10.1-3 would send the offer in Table A.17.3, and the SDP answer sent back to UE A from the network would be the one in Table A.17.5, with intermediary offers and answers on the way to and from UE B as in Tables A.17.3a-A17.4.

In the SDP answer in Table A.17.5 sent from UE A’s (local) network, it is only accepting stream ID 10 and rejecting stream ID 0 by removing the a=dcmap line associated with it. The remote network also rejects stream IDs 100 and 110 by returning a zero port on the m= line requesting them. The SDP answer to UE A carries the IP addresses of both local and remote Data Channel Servers. That SDP answer may be a result from the answerer (UE B) only accepting stream ID 110 to receive the data channel application from the offerer (UE A) and rejecting to use any other data channel application provider as illustrated by its answer in Table A.17.4. The stream ID 10 would be used by UE A to receive its own, root data channel application, corresponding to the root data channel application sent to UE B in stream ID 110 based on the SDP answer in Table A.17.4 such that both UEs can use the same application. That application is however received through different stream IDs for UE A and UE B, as shown in Figure 6.2.10.1-3.

Table A.17.5: Example network SDP answer choosing a single data channel application source

|  |
| --- |
| **SDP answer** |
| a=ice-options:ice2 a=ice-lite  ...  m=application 52718 UDP/DTLS/SCTP webrtc-datachannel  c=IN IP4 192.0.2.24  b=AS:500  a=candidate:1 1 UDP 2130706431 192.0.2.1 52718 typ host a=ice-ufrag:9uB6  a=ice-pwd:YH75Fviy6338Vbrhrlp8Yh a=max-message-size:1024  a=sctp-port:5010  a=setup:passiv  a=fingerprint:SHA-1 BC:8A:99:A0:E3:28:CA:B3:09:20:1B:FD:21:D5:AC:B6:F3:5E:45:AF  a=tls-id: cd3bea56dced0f35d224  a=dcmap:10 subprotocol="http"  m=application 0 UDP/DTLS/SCTP webrtc-datachannel  c=IN IP4 198.51.100.78  b=AS:500  a=max-message-size:1024  a=sctp-port:6002  a=setup:passive  a=fingerprint:SHA-1 5B:AD:67:B1:3E:82:AC:3B:90:02:B1:DF:12:5D:CA:6B:3F:E5:54:FA  a=tls-id: cd3bea56dced0f355533  a=dcmap:100 subprotocol="http"  a=dcmap:110 subprotocol="http" |

Table A.17.6 demonstrates an example SDP (re-)offer that adds two non-bootstrap data channel streams used by the data channel application in the bootstrap data channel in Table A.17.5. The data channel application streams (two in this example) desire specific loss and latency characteristics indicated by the "a=3gpp-qos-hint" line (see also Annex A.16). and are offered as a separate m= line due to having different QoS requirements and different destination (e.g. a peer UE) than the bootstrap data channel The stream with ID 38754 has a strict latency requirement and data older than 150 ms will not be transmitted or re-transmitted. The stream with ID 7216 requires lower loss but can accept somewhat higher latency than stream ID 38754 and therefore allows at most 5 SCTP-level retransmissions.

Table A.17.6: Example SDP offer with data channel application streams

|  |
| --- |
| **SDP offer** |
| c=IN IP4 192.0.2.156 a=ice-options:ice2  a=ice-lite  ...  m=application 52718 UDP/DTLS/SCTP webrtc-datachannel  b=AS:500  a=candidate:1 1 UDP 2130706431 192.0.2.156 52718 typ host a=ice-ufrag:8hhY  a=ice-pwd:asd88fgpdd777uzjYhagZg a=max-message-size:1024  a=sctp-port:5000  a=setup:actpass  a=fingerprint:SHA-1 4A:AD:B9:B1:3F:82:18:3B:54:02:12:DF:3E:5D:49:6B:19:E5:7C:AB  a=tls-id: abc3de65cddef001be82  a=dcmap:10 subprotocol="http"  m=application 52720 UDP/DTLS/SCTP webrtc-datachannel  b=AS:1000  a=candidate:1 1 UDP 2130706431 192.0.2.156 52720 typ host a=ice-ufrag:9uB6  a=ice-pwd: YH75Fviy6338Vbrhrlp8Yh a=max-message-size:1024  a=sctp-port:5010  a=setup:actpass  a=fingerprint:SHA-1 BC:8A:99:A0:E3:28:CA:B3:09:20:1B:FD:21:D5:AC:B6:F3:5E:45:AF  a=tls-id: cd3bea56dced0f35d224  a=dcmap:38754 max-time=150;label="low latency"  a=dcmap:7216 max-retr=5;label="low loss"  a=3gpp-qos-hint:loss=0.01;latency=100 |