## **Source: Samsung Electronics Co., Ltd.**

## **Title: Offline discussions on IMS data channel applications**

## **Document for: Discussion and Agreement**

## **Agenda Item: 10.3**

1. **Introduction**

During SA4#121, there are offline discussions on IMS data channel applications. There was a consensus on the problems to be solved such as lack of binding information between a data channel application and its application data channel and the use of undefined host header in HTTP request for a data channel application and we agreed that further clarifications on the usage of data channel applications are required.

The purpose of this contribution is to capture the discussion results during SA4#121 which can be used as a basis for further work.

1. **Binding information between a DC application and its application DC(s)**

The clause provides the text which is the same as S4-221349\_RTC\_AppID for IMS Data Channel\_CR\_r2 in /Inbox/Draft/RTC folder for SA4#121.

**3GPP TSG- Meeting #**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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| *For* ***[HE](http://www.3gpp.org/3G_Specs/CRs.htm" \l "_blank)******[LP](http://www.3gpp.org/3G_Specs/CRs.htm" \l "_blank)*** *on using this form: comprehensive instructions can be found at  <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 TSG:*** | S4 | | | | | | | | | |
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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The IMS data channel application retrieval to be used across UEs in an DCMTSI call is under-specified in TS 26.114. The UEs need the ability to identify the application that is requesting which data channels are established. The inclusion of an App ID in the SDP offer and answer would resolve ambiguities and address other requirements discussed in S2-2209617. This CR captures the changes to TS 26.114 as discussed on discussion paper S4-221300. Some of the changes in S4-221350 are also included here for context on the AppID changes. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add an AppID attribute to the SDP offer/answer exchanges to enable UEs to correlate data channels established for IMS data channel applications. The AppID may also enable a remote UE to identify the application to retrieve, to match the application used by the local UE. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Retrieval and use of the same applications on the two UEs on a call that includes IMS data channels will remain under-specified. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.2.10.1, 6.2.10.2, A.17, adds 6.2.12 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 ... | | |
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| ***Other comments:*** | |  | | | | | | | | |
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| ***This CR's revision history:*** | |  | | | | | | | | |

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| **First 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 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.

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". 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 application. For instance, the server could provide to one UE a menu of applications for its user to choose from, while providing nothing to the other user. Alternatively, the server could provide the same menu to the other UE but not allow the other user to make application selections. And the logic could be reversed depending on the bootstrap data channel being used by the two UEs.

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.

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**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 the same application is to be used on both UEs A and B in a call, multiple realizations are possible, such as via the Data Channel Server coordinating the app retrieval on both UEs by HTTP means before any data channel media is added to the call. Alternatively, UE B could get the application used in UE A as a result of a call upgrade from UE A that adds IMS data channels to the call. Identification of the application used by UE A shall be sent to UE B in the SDP offer/answer in the call upgrade transaction resulting from using the new application. The application identification will also allow both UEs to correlate the IMS data channel media lines that are established for a particular application.

Editor’s NOTE: In order to fully describe possible realizations of distributing applications across different devices and other less obvious aspects, a separate appendix or technical report could collect guideline material.

6. Any additional data channels created and used by the data channel application itself are established (logically) between UE A and UE B. 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]. Some of the application traffic may effectively go through the Data Channel Server or other server and some traffic may be exchanged directly between the UEs in a call. 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, any other data channels used by the data channel application JavaScript(s) sent in the bootstrap data channel must be represented in an updated SDP as additional "a=dcmap" lines with stream ID values starting from 1000, using stream ID numbers from the JavaScript(s).

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 root data channel application in 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 any further data channel usage beyond the bootstrap data channel itself is under the 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 |

NOTE 2: When the local user has defined and stored multiple, different data channel applications in the local data channel application repository, the local network provider may provide functionality in the stream ID 0 data channel application that enables a dynamic choice of which user-defined data channel application to use with stream ID 10 in the DCMTSI call.

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 data channel repository to both UE A (stream ID 10) and its remote UE B (stream ID 110).

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

When the user in UE A in a call with UE B selects application(s) for retrieval and use, and after running the new application(s), UE A causes a call upgrade to add new data channel(s) for the new application(s). The SDP offer the UE A generates shall signal the application ID via a “a=dcapp-id” line as part of the media description ~~line~~ creating data channels for the application. The “a=dcapp-id” attribute may also include an endPoint tag to allow the UEs to identify the end points for the application data channels used for communication to a network server or to the remote UE. The combination of a=dcapp-id value and endpoint tag allows the communicating UEs to correlate the SDP offers and answers for each data channel being negotiated.

On receiving the call upgrade to add data channels for a new application, UE B should alert the user of the application(s) requested the new data channels and, if the user in UE B consents to the call upgrade, UE B shall composes the SDP answers for each corresponding media lines for each of the new application(s) from the SDP offer.

Editor’s NOTE x: In a realization where HTTP means are used to coordinate the launching of the same app on both UEs, additional coordination rules are needed to ensure that only one UE does the call upgrade for a new App.

Editor’s NOTE x: In a realization where HTTP means are not used to coordinate the launching of the same app on both UEs, UE B uses the application ID on the a=dcapp-id attribute to trigger the retrieve new applications as part of the call upgrade.

In a realization where HTTP means are not used to coordinate the launching of the same app on both UEs, UE B uses the application ID on the a=dcapp-id attribute value to get the application as part of the call upgrade, after the user in UE B consents to the call upgrade for the new application. UE B shall select a root application/stream ID to get the application details and retrieve the application for launch in UE B. Once the new application(s) are also running on UE B, UE B composes the SDP answers for each corresponding media lines for the new application(s) from the SDP offer.

6.2.10.2 Generating SDP offer

A DCMTSI client in terminal may include a data channel media description for the "bootstrap" data channels in the initial SDP offer, as described above and according to [172]. A DCMTSI client in terminal may add or disable (by setting port 0, as for RTP media) additional data channel media descriptions as needed in subsequent SDP offers.

A DCMTSI client in terminal that desires to use data channels with stream IDs from a data channel application retrieved from its local "bootstrap" data channel stream ID 0 or 10, shall initiate a subsequent SDP offer after the initial SDP offer, opening those data channels by adding corresponding "a=dcmap," (optionally) "a=dcsa," and “a=dcapp-id" lines. A DCMTSI client in terminal that retrieves a data channel application from a stream ID different than 0 or 10 (e.g. a data channel application from the peer), shall not initiate any subsequent offer to open data channels used by that data channel application.

A data channel media description with specific loss or latency requirements should use "a=3gpp-qos-hint" in the SDP offer, as detailed in section 6.2.7.4. If subsequent SDP offers or answers adds data channels with more strict loss or latency requirements that cannot be met by keeping current "a=3gpp-qos-hint" and providing suitable SCTP "a=dcmap" parameters, the existing "a=3gpp-qos-hint" should be modified accordingly. Similarly, if subsequent SDP offers or answers closes (removes) data channels that are known to be the limiting factor for choosing the existing "a=3gpp-qos-hint", a more relaxed "a=3gpp-qos-hint" should be chosen to better fit the remaining data channels.

#### 6.2.10.3 Generating SDP answer

An answering DCMTSI client in terminal may accept an SDP offer with data channel as described by [172].

An answering DCMTSI client in terminal that desires to reject the entire SCTP association for all offered data channels shall set the port to 0 (zero) on the corresponding "m=application" line in SDP, as described in [172]. An SCTP association that initially, or as a result of session modification, has no open data channels ("a=dcmap" lines) should be rejected or closed by modifying the session, setting port number to 0 (zero).

An answering DCMTSI client in terminal that desires to accept some offered data channels and reject others shall indicate this by removing the non-desired data channel "a=dcmap" and "a=dcsa" lines from the SDP answer, as described in [172], and including an “a=dcapp-id" line. The DCMTSI client in terminal accepting a data channel must also accept the corresponding, supported "bootstrap" data channels with stream ID <1000 (e.g. a=dcmap:0 …).

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| **2nd Change** |

### 6.2.12 Application ID (appID) Signalling

A DCMTSI client shall support signalling an application ID as an attribute to the media lines describing IMS data channels for an application as discussed in section 6.2.10.1.

A DCMTSI client shall identify an application requesting IMS data channel(s) to be established, by adding an "a=dcapp-id" media-level SDP attribute. The "a=dcapp-id" shall signal a value set by the application used on a local UE and retreived from a root application via a bootstrap data channel. The “a=dcapp-id” attribute also includes an endPoint tag to allow the UEs to identify the end points for the application data channels used for communication to a network server or to the remote UE. The combination of a=dcapp-id and endpoint tag allows the communicating UEs to correlate the offers and answers for each data channel being negotiated for the identified application. The remote UE also uses the "a=dcapp-id" to retrieve that same applition via a root application, as discussed in section 6.2.10.1.

#### 6.2.12.1 dcapp-id ABNF syntax and semantics

dcapp-id-value = app-id SP endpoint-value \*(";" dcapp-id-opt)

app-id = quoted-string

endpoint-value = “endPoint=” endpoint-name

endpoint-name = endpoint-type \*endpoint-id

endpoint-type = “UE” / “Server”

endpoint-id = 1\*5DIGIT

dcapp-id-opt = token

quoted-string = DQUOTE \*(quoted-char / escaped-char) DQUOTE

quoted-char = SP / quoted-visible

quoted-visible = %x21 / %x23-24 / %x26-7E ; VCHAR without " or %

escaped-char = "%" HEXDIG HEXDIG

DQUOTE = <from RFC 5234>

token = <from RFC 4566>

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| **3rd Change** |

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

Table A.17.1 demonstrates an example SDP offer with data channel capability signalling for the "bootstrap" data channel defined in clause 6.2.10.

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

|  |
| --- |
| **SDP offer** |
| m=application 52718 UDP/DTLS/SCTP webrtc-datachannel  b=AS:500  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 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.

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

|  |
| --- |
| **SDP answer** |
| m=application 52718 UDP/DTLS/SCTP webrtc-datachannel  b=AS:500  a=max-message-size:1024  a=sctp-port:5002  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 with multiple possible data channel application sources for the "bootstrap" data channel defined in Table 6.2.10.1-2.

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

|  |
| --- |
| **SDP offer** |
| m=application 52718 UDP/DTLS/SCTP webrtc-datachannel  b=AS:500  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"  a=dcmap:100 subprotocol="http"  a=dcmap:110 subprotocol="http" |

An example SDP answer is shown in Table A.17.4, where only one of the the data channel application sources from the offer in Table A.17.3 is accepted by the answerer, removing the other a=dcmap lines.

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** |
| m=application 52718 UDP/DTLS/SCTP webrtc-datachannel  b=AS:500  a=max-message-size:1024  a=sctp-port:5002  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" |

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.

In the SDP answer in Table A.17.5 sent from UE A’s (local) network, it is accepting stream ID 10 that would be used by UE A to receive its own, chosen data channel application, corresponding to the 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** |
| m=application 52718 UDP/DTLS/SCTP webrtc-datachannel  b=AS:500  a=max-message-size:1024  a=sctp-port:5010  a=setup:active  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" |

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). 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** |
| m=application 52718 UDP/DTLS/SCTP webrtc-datachannel  b=AS:500  a=max-message-size:1024  a=sctp-port:5000  a=setup:passive  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"  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 |

Table A.17.7 demonstrates an example SDP (re-)offer that adds two non-bootstrap data channel streams used by a new peer-to-peer data channel application retrieved via the bootstrap data channel in Table A.17.5. These data channel application streams desire the same QoS requirements as the example in Table A.17.6. The application is identified by the “a=dcapp-id” line which allows the remote UE to (re-)answer and accept the two new streams for the application as Table A.17.8 demonstrates

**Table A.17.7: Example SDP offer with data channel application streams**

|  |
| --- |
| **SDP offer** |
| m=application 52753 UDP/DTLS/SCTP webrtc-datachannel  b=AS:500  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:38754 max-time=150;label="low latency"  a=dcmap:7216 max-retr=5;label="low loss"  a=dcapp-id:”application1” endPoint=Server  a=3gpp-qos-hint:loss=0.01;latency=100 |

**Table A.17.8: Example SDP answer with data channel application streams**

|  |
| --- |
| **SDP answer** |
| m=application 62347 UDP/DTLS/SCTP webrtc-datachannel  b=AS:500  a=max-message-size:1024  a=sctp-port:5000  a=setup:passive  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: cd3bea56dced0f35d32f  a=dcmap:38754 max-time=150;label="low latency"  a=dcmap:7216 max-retr=5;label="low loss"  a=dcapp-id:”application1” endPoint=Server  a=3gpp-qos-hint:loss=0.01;latency=100 |

1. **Further clarification on data channel application**

The clause provides the text which is the same as S4-221350\_RTC\_DataCannel\_Clarifications\_CR\_r3 in /Inbox/Draft/RTC folder for SA4#121.

**3GPP TSG- Meeting #**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
|  | | | | | | | | |
| *For* ***[HELP](http://www.3gpp.org/3G_Specs/CRs.htm" \l "_blank)*** *on using this form: comprehensive instructions can be found at  <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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| ***Title:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Qualcomm Europe Inc. Sweden | | | | | | | | | |
| ***Source to TSG:*** | SA4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***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)* | |
|  |  | | | | | | | | | |
| ***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. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Multiple clarifications to sections 6.2.10 and Annex A.17. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Terse description and implied specification will compromise interoperability. The TS 26.114 is referenced by other standards organization and a more expansive functionality support is considered. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 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:*** | |  | | | | | | | | |

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| **First 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 multihoming is not supported on the UE, different data channels for an application that communicated with a different endpoint, e.g., a remote UE vs. a NW 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 the local or the remote operator Data Channel Server, see section A.17 for examples.

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., as 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 application. For instance, the server could provide to one UE a menu of applications for its user to choose from, while providing nothing to the other user. Alternatively, the server could provide the same menu to the other UE but not allow the other user to make application selections. And the logic could be reversed depending on the bootstrap data channel being used by the two UEs.

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 the same application is to be used on both UEs A and B in a call, multiple realizations are possible, such as via the Data Channel Server coordinating the app retrieval on both UEs by HTTP means via a respective bootstrap stream ID before any application data channel is 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 IMS data channels to the call. Identification of the application used by UE A shall be sent to UE B in the SDP offer/answer in the call upgrade transaction resulting from using the new application. The application identification will also allow both UEs to correlate the IMS data channel media lines that are established for a particular application.

Editor’s NOTE: In order to fully describe possible realizations of distributing applications across different devices and other less obvious aspects, a separate appendix or technical report could collect guideline material.6. Some of additional data channels created and used by the data channel application itself are 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. 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 [172This 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 new application via a bootstrap data channel, any other data channels used by the new data channel application must be represented in an updated SDP as additional media lines with "a=dcmap" lines signalling the stream ID values starting from 1000, requested by the new application that causes 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 root data channel application in 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 any further data channel usage beyond the bootstrap data channel itself is under the 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.

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

|  |
| --- |
| **2nd Change** |

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

Table A.17.1 demonstrates an example SDP offer with data channel capability signalling for the "bootstrap" data channel defined in clause 6.2.10.

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

|  |
| --- |
| **SDP offer** |
| m=application 52718 UDP/DTLS/SCTP webrtc-datachannel  b=AS:500  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 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 bootstrap data channel being terminated on the local Data Channel Server implies that c= line would signal that server IP address.

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

|  |
| --- |
| **SDP answer** |
| m=application 15327 UDP/DTLS/SCTP webrtc-datachannel  c=IN IP4 aaa.bbb.ccc.ddd  b=AS:500  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 with multiple possible data channel application sources for the "bootstrap" data channels 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.

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

|  |
| --- |
| **SDP offer** |
| m=application 52718 UDP/DTLS/SCTP webrtc-datachannel  b=AS:500  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  b=AS:500  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" |

An example SDP answer from UE B is shown in Table A.17.4, where only one of the data channel application sources from the offer in Table A.17.3 is accepted by the answerer, removing the a=dcmap line associated with stream ID 100. The data channels of stream IDs 0 and 10 are rejected by returning a zero port on the m= line requesting these to be opened. The SDP answer from UE B does not carry c= lines at the media level as its IP addresses 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** |
| m=application 0 UDP/DTLS/SCTP webrtc-datachannel  b=AS:500  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"  a=dcmap:10 subprotocol="http"  m=application 15347 UDP/DTLS/SCTP webrtc-datachannel  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: dcb3ae65cddef05334ab  a=dcmap:110 subprotocol="http" |

An example SDP answer to UE A from UE B is shown in Table A.17.4, where only one of the data channel application sources from the offer in Table A.17.3 is accepted by the answerer, removing the a=dcmap line associated with stream ID 100, rejected by the remote Data Channel Server. The local Data Channel Server returns a zero port on the m= line requesting to open stream IDs 0 and 10. ~~The SDP answer also carries the IP addresses of both Data Channel Servers.~~ That SDP answer may result from the answerer (UE B) only accepting 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.

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, and the SDP answer sent back to UE A from the network would be the one in Table A.17.5.

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** |
| m=application 62948 UDP/DTLS/SCTP webrtc-datachannel  c=IN IP4 aaa.bbb.ccc.ddd  b=AS:500  a=max-message-size:1024  a=sctp-port:5010  a=setup:passive  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 eee.fff.ggg.hhh  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). 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** |
| m=application 53913 UDP/DTLS/SCTP webrtc-datachannel  b=AS:500  a=max-message-size:1024  a=sctp-port:5000  a=setup:passive  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: abc3de65cddef001ae73  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 |

1. **Proposal**

We propose to work on data channel applications including

* to provide binding information between a data channel application and its application data channel
* to resolve issue on use of undefined host header in HTTP request for a data channel application and
* to provide clarification texts on the usage of data channel applications are required.

We also propose to agree on the contents of sections 2, 3 of this contribution as a basis for further work.