CLUE Protocol Data Channel
draft-ietf-clue-datachannel-05

Abstract

   This document defines how to use the WebRTC Data Channel mechanism in
   order to realize a data channel, referred to as a CLUE data channel,
   for transporting CLUE protocol messages between two CLUE entities.

   The document defines how to describe the SCTPoDTLS association used
   to realize the CLUE data channel using SDP, and defines usage of two
   mechanisms for establishing a CLUE data channel: the Data Channel
   Establishment Protocol (DCEP) and the SDP-based "SCTP over DTLS" data
   channel negotiation mechanism.

   Details and procedures associated with the CLUE protocol, and the SDP
   Offer/Answer procedures for negotiating usage of a CLUE data channel,
   are outside the scope of this document.

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[1](#). Introduction

This document defines how to use the WebRTC Data Channel mechanism
[[I-D.ietf-rtcweb-data-channel](#)] in order to realize a data channel,
referred to as a CLUE data channel, for transporting CLUE protocol
messages between two CLUE entities.

The document defines how to describe the SCTPoDTLS association
[I-D.ietf-tsvwg-sctp-dtls-encaps] used to realize the CLUE data
channel using SDP, and defines usage of two mechanisms for
establishing a CLUE data channel: the Data Channel Establishment
Protocol (DCEP) [I-D.ietf-rtcweb-data-protocol] and the SDP-based
"SCTP over DTLS" data channel negotiation mechanism
[I-D.ejzak-mmusic-data-channel-sdpneg]. This includes SCTP
considerations specific to a CLUE data channel, the SDP Media
Description (m- line) values, usage of SDP attributes and DCEP
considerations (when DCEP is used) specific to a CLUE data channel.

Details and procedures associated with the CLUE protocol, and the SDP
Offer/Answer [RFC3264] procedures for negotiating usage of a CLUE
data channel, are outside the scope of this document.

Simultaneous usage of DCEP and the SDP-based "SCTP over DTLS" data
channel negotiation mechanism for opening a CLUE data channel is
outside the scope of this specification.

2. Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
"SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this
document are to be interpreted as described in BCP 14, RFC 2119
[RFC2119].

WebRTC Data Channel refers to a SCTPoDTLS association
[I-D.ietf-tsvwg-sctp-dtls-encaps] that is used to transport non-media
data between two entities, according to the procedures in
[I-D.ietf-rtcweb-data-channel].

CLUE data channel refers to a WebRTC Data Channel
[I-D.ietf-rtcweb-data-channel] realization, with a specific set of
SCTP characteristics, with the purpose of transporting CLUE protocol
[I-D.ietf-clue-protocol] messages between two CLUE entities.

CLUE entity refers to a SIP User Agent (UA) [RFC3261] that supports
the CLUE data channel and the CLUE protocol.

CLUE session refers to a SIP session [RFC3261] between to SIP UAs,
where a CLUE data channel, associated with the SIP session, has been
established between the SIP UAs.

[RFC4960] defines an SCTP stream as a unidirectional logical channel
established from one to another associated SCTP endpoint, within
which all user messages are delivered in sequence except for those
submitted to the unordered delivery service.

[RFC4960] defines an SCTP identifier as a unsigned integer, which
identifies a SCTP stream.

3. CLUE Data Channel

3.1. General

This section describes the realization of a CLUE Data Channel. This
includes a set of SCTP characteristics specific to a CLUE Data
Channel, the values of the m- line describing the SCTPoDTLS
association associated with the WEBRTC Data Channel, and the usage of
either DCEP or SDP-based "SCTP over DTLS" data channel negotiation
mechanism for creating the CLUE Data Channel.

As described in [I-D.ietf-rtcweb-data-channel], the SCTP streams
realizing a WebRTC Data Channel must be associated with the same SCTP
association. In addition, both SCTP streams realizing the WebRTC
Data Channel must use the same SCTP stream identifier value. These
rules also apply to a CLUE Data Channel.

Within a given CLUE session, a CLUE entity MUST use a single CLUE
Data Channel for transport of all CLUE messages towards its peer.

3.2. SDP Considerations

3.2.1. General

This section defines how to construct the SDP Media Description (m-
line) for describing the SCTPoDTLS association used to realize a
WebRTC Data Channel. The section also defines how to construct the
SDP dcmap attribute, when the SDP-based "SCTP over DTLS" data channel
negotiation mechanism is used for establishing a CLUE Data Channel on
the SCTPoDTLS association.

NOTE: Other protocols than SDP for negotiating usage of a SCTPoDTLS
association for realizing a WebRTC Data Channel are outside the scope
of this specification.

[I-D.ietf-clue-signaling] describes the SDP Offer/Answer procedures
for negotiating a CLUE session, including the CLUE controlled media
streams and the CLUE Data Channel.

3.2.1.1. SDP Media Description Fields

As defined in [I-D.ietf-mmusic-sctp-sdp], the field values of an m-
line describing an SCTPoDTLS association are set as following:

```
+---------------+---------------+------------+------------------+
|     media     |     port      |   proto    |       fmt        |
+---------------+---------------+------------+------------------+
| "application" | UDP port value | "DTLS/SCTP" | application usage |
+---------------+---------------+------------+------------------+
```

Table 1: SDP "proto" field values

As defined in [I-D.ietf-mmusic-sctp-sdp], when the SCTPoDTLS
association is used to realize a WebRTC data channel, the value of
the application usage part is 'webrtc-datachannel'.

3.2.1.2. SDP sctp-port Attribute

As defined in [I-D.ietf-mmusic-sctp-sdp], the SDP sctp-port attribute
value is set to the SCTP port of the SCTPoDTLS association.

NOTE: Usage of the SDP sctp-port attribute is optional. As defined
in [I-D.ietf-mmusic-sctp-sdp], if the attribute is not present then
the default value is 5000.

3.2.2. SDP dcpmap Attribute

If the the SDP-based "SCTP over DTLS" data channel negotiation
mechanism is used to establish a CLUE data channel, the values of the
SDP dcmap attribute [I-D.ejzak-mmusic-data-channel-sdpneg],
associated with the m- line describing the SCTPoDTLS association used
to realize the WebRTC Data Channel, are set as following:

stream-id	subprotocol	label	ordered	max-retr	max-time
Value of the SCTP stream used to realize the CLUE data channel	"CLUE"	Application specific	N/A	N/A	N/A

Table 2: SDP dcmap attribute values

3.2.3. SDP dcsa Attribute

   The SDP dcsa attribute [I-D.ejzak-mmusic-data-channel-sdpneg] is not
   used when establishing a CLUE data channel.

3.2.4. Example

```
         m=application 54111 DTLS/SCTP webrtc-datachannel
         a=dcmap:2 subprotocol="CLUE"
```


         Figure 1: SDP Media Description for a CLUE Data Channel

3.3. DCEP Considerations

3.3.1. General

   This section describes how to realize a CLUE data channel using DCEP.

3.3.2. Open CLUE Data Channel

   Once the SCTPoDTLS association, used to realize a WebRTC Data Channel
   has been established, the offerer [RFC3264] is responsible for
   establishing the CLUE data channel. The offerer MUST send a DCEP
   DATA_CHANNEL_OPEN message [I-D.ietf-rtcweb-data-protocol]. The value
   of the 'protocol' field MUST be "CLUE". The value of the 'channel
   type' MUST be 'DATA_CHANNEL_RELIABLE'.

   Once the offerer has received the associated DCEP DATA_CHANNEL_ACK
   message [I-D.ietf-rtcweb-data-protocol], the CLUE data channel has
   been established.

   If the offerer receives a DCEP DATA_CHANNEL_OPEN message, for the
   purpose of establishing a CLUE data channel, the offerer MUST reset
   the SCTP stream, in order to prevent two CLUE data channels from
   being established within the same CLUE session. The offerer MUST NOT
   send a DCEP DATA_CHANNEL_ACK message.

   NOTE: If another mechanism than SDP Offer/Answer is used to negotiate
   the SCTPoDTLS association used to realize the WebRTC Data Channel,
   that mechanism needs to describ which endpoint is responsible for
   sending the DCEP_CHANNEL_OPEN message, etc.

3.3.3. Close CLUE Data Channel

   DCEP [I-D.ietf-rtcweb-data-protocol] does not define a message for
   closing individual data channels. As described in
   [I-D.ietf-rtcweb-data-protocol], in order to close a data channel, a
   SCTP reset message is sent, in order to close the SCTP stream
   associated with the data channel. The SCTPoDTLS association, and
   other data channels established on the same association, are not
   affected by the SCTP reset message.

3.4. SCTP Considerations

3.4.1. SCTP Payload Protocol Identifier (PPID)

   As described in [I-D.ietf-rtcweb-data-protocol], the PPID value 50 is
   used when sending a DCEP message on a SCTPoDTLS association used to
   realize a WebRTC Data Channel.

   A CLUE entity MUST use the PPID value 51 when sending a CLUE message
   on a CLUE data channel.

   NOTE: As described in [I-D.ietf-rtcweb-data-channel], the PPID value
   51 indicates that the SCTP message contains data encoded in a UTF-8
   format. The PPID value 51 does not indicate what application
   protocol the SCTP message is associated with, only the format in
   which the data is encoded.

```
                  +----------+------------+
                  | Protocol | PPID Value |
                  +----------+------------+
                  |   DCEP   |     50     |
                  |   CLUE   |     51     |
                  +----------+------------+
```

                  Table 3: CLUE Data Channel PPID Values

3.4.2. Reliability

   The usage of SCTP for the CLUE Data Channel ensures reliable
   transport of CLUE protocol [I-D.ietf-clue-protocol] messages.

   A CLUE entity MUST NOT use the partial reliability and limited
   retransmission extensions defined in [RFC3758].

   NOTE: [I-D.ietf-rtcweb-data-channel] requires the support of the
   partial reliability extension defined in [RFC3758]. This is not
   needed for a CLUE Data Channel, as messages are required to always be
   sent reliably. [I-D.ietf-rtcweb-data-channel] also mandates support

of the limited retransmission policy defined in
[I-D.ietf-tsvwg-sctp-prpolicies].

3.4.3. Order

A CLUE entity MUST use the ordered delivery SCTP service, as
described in section 6.6 of [RFC4960].

3.4.4. Stream Reset

A CLUE entity MUST support the stream reset extension defined in
[RFC6525].

The dynamic address reconfiguration extension defined in [RFC5061]
MUST be used to signal the support of the stream reset extension
defined in [RFC6525]. Other features of [RFC5061] MUST NOT be used.

3.4.5. SCTP Multihoming

SCTP multi-homing is not supported for SCTPoDTLS associations, and
can therefor not be used for a CLUE data channel.

4. Security Considerations

This specification does not introduce new security considerations, in
addition to those defined in [I-D.ietf-rtcweb-data-channel] and
[I-D.ietf-rtcweb-data-protocol]. Security considerations associated
with the CLUE protocol are defined in [I-D.ietf-clue-protocol].

5. IANA Considerations

5.1. New WebRTC Data Channel Protocol Value

[RFC EDITOR NOTE: Please replace RFC-XXXX with the RFC number of this
document.]

This document adds the 'CLUE' value to the "WebSocket Subprotocol
Name Registry" as follows:

```
    Subprotocl Identifier:      CLUE
    Subprotocol Common Name:    CLUE
    Subprotocol Definition:     RFC-XXXX
```

5.2. New SDP dcmap attribute subprotocol value

[RFC EDITOR NOTE: Please replace RFC-XXXX with the RFC number of this document.]

OPEN ISSUE: [I-D.ejzak-mmusic-data-channel-sdpneg] has not yet created a registry for new subprotocol values.

6. Acknowledgments

Thanks to Paul Kyzivat and Christian Groves for comments on the document.

7. Change Log

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

Changes from draft-ietf-clue-datachannel-04

o Defines DCEP and external SDP negotiation as two separate mechanisms for negotiating a CLUE data channel.
o Updates based on technical changes in referenced specifications.
o Reference to draft-ietf-mmusic-sctp-sdp added.

Changes from draft-ietf-clue-datachannel-03

o IANA considerations added.
o Editorial changes based on comments from Christian Groves.

Changes from draft-ietf-clue-datachannel-02

o SDP m- line example fixed.
o OPEN ISSUE #1 closed.
o - It was agreed (IETF#91) to use draft-ejzak-mmusic-data-channel-sdpneg, as it was adopted as a WG item in MMUSIC.
o - Details for draft-ejzak-mmusic-data-channel-sdpneg usage added.
o SDP Offer/Answer procedures removed, as they will be defined in the CLUE protocol draft.
o References updated.

Changes from draft-ietf-clue-datachannel-01

o Support of interleaving "MUST"->"SHOULD".
o Example updated.
o Reference update.

Changes from draft-ietf-clue-datachannel-00

o SDP Offer/Answer procedures structures according to RFC 3264.
o Reference update.

Changes from draft-holmberg-clue-datachannel-04

o Draft submitted as draft-ietf-clue-data-channel-00.
o Editorial nits fixed.
o Changes based on comments from Paul Kyzivat (http://www.ietf.org/
   mail-archive/web/clue/current/msg03559.html).
o - Proto value fixed.
o - Explicit text that the partial reliability and limited
   retransmission policies MUST NOT be used.
o - Added open issue on whether the DCEP 'protocol' field value for
   CLUE should contain a version number.
o - Removed paragraph saying that an offerer must not insert more
   than one m- line describing an SCTPoDTLS association to be used to
   realize a CLUE Data Channel, as the draft already states that only
   one CLUE Data Channel per CLUE session shall be opened.
o - Added reference to draft-ietf-rtcweb-data-protocol regarding
   details on reseting SCTP streams.
o - Added text saying that the value of the DCEP 'channel type' MUST
   be DATA_CHANNEL_RELIABLE.
o - Clarified that DCEP must be supported, and used in the absence
   of another mechanism for opening a CLUE Data Channel.

Changes from draft-holmberg-clue-datachannel-03

o Procedures updated, based on WG agreement (IETF#89) to use DCEP
   for the CLUE data channel.
o Procedures updated, based on WG agreement (IETF#89) that offerer
   is responsible for sending DCEP DATA_CHANNEL_OPEN.
o Editorial changes, and alignments caused by changes in referenced
   specifications.

Changes from draft-holmberg-clue-datachannel-02

o PPID value for CLUE messages added
o References updated

Changes from draft-holmberg-clue-datachannel-01

o More text added

Changes from draft-holmberg-clue-datachannel-00

o Editorial corrections based on comments from Paul K

8. References

8.1. Normative References

[RFC2119]   Bradner, S., "Key words for use in RFCs to Indicate
            Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC3261]   Rosenberg, J., Schulzrinne, H., Camarillo, G., Johnston,
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            Schooler, "SIP: Session Initiation Protocol", RFC 3261,
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[RFC3264]   Rosenberg, J. and H. Schulzrinne, "An Offer/Answer Model
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            2002.

[RFC4960]   Stewart, R., "Stream Control Transmission Protocol", RFC
            4960, September 2007.

[RFC5061]   Stewart, R., Xie, Q., Tuexen, M., Maruyama, S., and M.
            Kozuka, "Stream Control Transmission Protocol (SCTP)
            Dynamic Address Reconfiguration", RFC 5061, September
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            Transmission Protocol (SCTP) Stream Reconfiguration", RFC
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[I-D.ietf-clue-protocol]
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[I-D.ietf-clue-signaling]
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            progress), October 2014.

[I-D.ietf-tsvwg-sctp-dtls-encaps]
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   [I-D.ietf-rtcweb-data-channel]
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              Channels", draft-ietf-rtcweb-data-channel-12.txt (work in
              progress), September 2014.

   [I-D.ietf-rtcweb-data-protocol]
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              Establishment Protocol", draft-ietf-rtcweb-data-protocol-
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              Tuexen, M., Seggelmann, R., Stewart, R., and S. Loreto,
              "Additional Policies for the Partial Reliability Extension
              of the Stream Control Transmission Protocol", draft-ietf-
              tsvwg-sctp-prpolicies-05.txt (work in progress), November
              2014.

   [I-D.ejzak-mmusic-data-channel-sdpneg]
              Drage, K., Makaraju, R., Ejzak, R., and J. Marcon, "SDP-
              based WebRTC data channel negotiation", draft-ejzak-
              mmusic-data-channel-sdpneg-02.txt (work in progress),
              October 2014.

8.2. Informative References

   [RFC3758] Stewart, R., Ramalho, M., Xie, Q., Tuexen, M., and P.
              Conrad, "Stream Control Transmission Protocol (SCTP)
              Partial Reliability Extension", RFC 3758, May 2004.

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