CLUE Protocol Data Channel
draft-ietf-clue-datachannel-03

Abstract

   This document defines how to use the WebRTC Data Channel mechanism,
   together with the Data Channel Establishment Protocol (DCEP) and the
   SDP-based "SCTP over DTLS" data channel negotiation mechanism, in
   order to establish a data channel, referred to as CLUE Data Channel,
   for transporting CLUE protocol messages between two CLUE entities.

   The document defines the SCTP considerations specific to a CLUE Data
   Channel, the SDP Media Description- and SDP dcmap attribute values,
   and the DCEP procedures for opening, a CLUE Data Channel.

   Details and procedures associated with the CLUE protocol, and the SDP
   Offer/Answer procedures for negotiating 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], together with the Data Channel
Establishment Protocol (DCEP) [I-D.ietf-rtcweb-data-protocol] and the

SDP-based "SCTP over DTLS" data channel negotiation mechanism [add-ref], in order to establish a data channel, referred to as CLUE Data Channel, for transporting CLUE protocol [I-D.ietf-clue-protocol] messages between CLUE entities.

The document defines the SCTP considerations specific to a CLUE Data Channel, the SDP Media Description- and SDP dcmap attribute values, and the DCEP procedures for opening, a CLUE Data Channel.

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

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], with a specific set of SCTP characteristics, and usage of the Data Channel Establishment Protocol (DCEP) [I-D.ietf-rtcweb-data-protocol] in order to open a WebRTC Data Channel for 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 usage of the SDP-based "SCTP over DTLS" data channel
negotiation mechanism to describe a CLUE data channel in SDP, and the
usage of the Data Channel Establishment Protocol (DCEP)
[I-D.ietf-rtcweb-data-protocol] in order to open a WebRTC Data
Channel for the purpose of transporting CLUE protocol
[I-D.ietf-clue-protocol] messages between two CLUE entities.

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), and the associated SDP dcmap attribute, used to describe a
CLUE data channel in SDP.

[I-D.ietf-clue-protocol] describes the SDP Offer/Answer procedures
for negotiating a CLUE session, including the CLUE controlled media
channels and the CLUE data channel.

3.2.2. SDP Media Description Fields

The field values of the "m=" line for the SCTPoDTLS association are
set as following:

media	port	proto	fmt
"application"	DTLS port value	"DTLS/SCTP"	SCTP port value

Table 1: SDP "proto" field values

3.2.3. SDP sctpmap Attribute

The field values of the SDP sctpmap attribute, associated with the
"m=" line describing the SCTPoDTLS association, are set as following:

```
+----------------------------+----------------------+
|         sctpmap-number     |          app         |
+----------------------------+----------------------+
| fmt value of the "m=" line | "webrtc-datachannel" |
+----------------------------+----------------------+
```

Table 2: SDP sctpmap attribute values

3.2.4. SDP dcpmap Attribute

The SDP dcmap attribute [I-D.ejzak-mmusic-data-channel-sdpneg] values
for the CLUE data channel, associated with the "m=" line describing
the SCTPoDTLS, are set as following:

dcmap- stream-id	subprotocol-opt	label-opt	ordering-opt	maxretr-opt	maxtime-opt
Value of the SCTP stream used to realize the CLUE data channel	"CLUE"	"CLUE Data Channel"	Not applicable	Not applicable	Not applicable

Table 3: SDP dcmap attribute values

3.2.5. SDP dcsa Attribute

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

3.2.6. Example

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

Figure 1: SDP Media Description for a CLUE Data Channel

3.3. Data Channel Establishment Protocol (DCEP) Considerations

3.3.1. General

A CLUE entity MUST support the Data Channel Establishment Protocol
(DCEP) [I-D.ietf-rtcweb-data-channel], which can be used in order to
open a WebRTC Data Channel.

This section describes how to open and close a CLUE data channel
using DCEP.

NOTE: This document does not define any other mechanism for opening a
CLUE Data Channel, but such might be defined in future
specifications.

3.3.2. Open CLUE Data Channel

Once the SCTP association, to be used to realized the CLUE Data
Channel, has been established, the offerer [RFC3264] is responsible
for opening the CLUE Data Channel. If DCEP is used, 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'.

NOTE: A new 'protocol' value for CLUE needs to be registered with
IANA in the 'Protocol Registry' defined by
[I-D.ietf-rtcweb-data-protocol].

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

If the offerer receives a DCEP DATA_CHANNEL_OPEN message, for the
purpose of opening 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.

3.3.3. Close CLUE Data Channel

DCEP [I-D.ietf-rtcweb-data-protocol] does not define a message for
closing a WebRTC Data Channel. As described in
[I-D.ietf-rtcweb-data-protocol], in order to close a CLUE Data
Channel, a SCTP reset message is sent, in order to close the SCTP
stream associated with the CLUE Data Channel. The SCTP association,
and WebRTC Data Channels associated with other SCTP streams, are not
affected by the SCTP reset message.

3.3.4. SCTP Association Failure

In case of SCTP association failure, the offerer is responsible for
trying to re-establish the SCTP association (including sending a new
SDP offer, if needed). Once the SCTP association has been
successfully re-established, the offerer is responsible for sending a
DCEP DATA_CHANNEL_OPEN 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 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 is transported in a WebRTC Data Channel, only the format in
which the data is encoded.

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

Table 4: 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 multihoming cannot be used for a CLUE Data Channel.

NOTE: SCTPoDTLS does not support SCTP multihoming.

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

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

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-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

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[RFC3261] Rosenberg, J., Schulzrinne, H., Camarillo, G., Johnston,
           A., Peterson, J., Sparks, R., Handley, M., and E.
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[RFC3264] Rosenberg, J. and H. Schulzrinne, "An Offer/Answer Model
           with Session Description Protocol (SDP)", RFC 3264, June
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[RFC5061] Stewart, R., Xie, Q., Tuexen, M., Maruyama, S., and M.
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           Dynamic Address Reconfiguration", RFC 5061, September
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[RFC6525] Stewart, R., Tuexen, M., and P. Lei, "Stream Control
           Transmission Protocol (SCTP) Stream Reconfiguration", RFC
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[I-D.ietf-clue-protocol]
           Presta, R. and S. Romano, "CLUE protocol", draft-ietf-
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[I-D.ietf-tsvwg-sctp-dtls-encaps]
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           Encapsulation of SCTP Packets", draft-ietf-tsvwg-sctp-
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   [I-D.ietf-tsvwg-sctp-prpolicies]
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              "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.

Author's Address

   Christer Holmberg
   Ericsson
   Hirsalantie 11
   Jorvas 02420
   Finland

   Email: christer.holmberg@ericsson.com