Abstract

This document specifies how the Message Session Relay Protocol (MSRP) can be instantiated as a data channel sub-protocol, using the SDP offer/answer exchange-based generic data channel negotiation framework. Two network configurations are documented: a WebRTC end-to-end configuration (connecting two MSRP over data channel endpoints), and a gateway configuration (connecting an MSRP over data channel endpoint with an MSRP over TCP or TLS endpoint).

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1. Introduction

The Message Session Relay Protocol (MSRP) ([RFC4975]) is a protocol for transmitting a series of related instant messages in the context of a session. In addition to instant messaging, MSRP can also be used for image sharing or file transfer. MSRP is currently defined to work over TCP and TLS connections, and over a WebSocket subprotocol specified by ([RFC7977]).

This document defines the negotiation and transport of this MSRP protocol over data channels, where a data channel is a bi-directional communication channel running on top of SCTP/DTLS (as per [I-D.ietf-rtcweb-data-channel]) and where MSRP is instantiated as a sub-protocol of this data channel. The MSRP protocol negotiation defined in this document is based on the generic SDP offer/answer exchange based data channel negotiation as specified in [I-D.ietf-mmusic-data-channel-sdpneg].

Defining MSRP as a data channel sub-protocol has many benefits:

- provides to applications a proven protocol enabling instant messaging, file transfer, image sharing
- integrates those features with other RTCWeb voice, video and data features
- leverages the SDP-based negotiation already defined for MSRP
allows the interworking with MSRP endpoints running on a TCP or TLS connection.

Compared to WebSockets, that provide a message passing protocol to applications with no direct access to TCP or TLS sockets, data channels provide a low latency transport, leverage NAT-aware connectivity and security features of WebRTC, and are increasingly available not only in modern browsers but in other applications that use WebRTC for media or other purposes (IoT or telemetry in general, non-media data exchange, etc).

Considering an MSRP endpoint being an MSRP application that uses data channel from WebRTC specifications [I-D.ietf-rtcweb-data-channel], this document describes two configurations where the other endpoint is respectively either another MSRP over data channel endpoint (e.g., a WebRTC application) or an MSRP endpoint using either TCP or TLS transport.

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 [RFC2119].

3. Terminology

This document uses the following terms:

Data channel: A WebRTC data channel as specified in [I-D.ietf-rtcweb-data-channel].

MSRP data channel: A data channel specifically used to transport the messages of one MSRP session.

External negotiation: Data channel negotiation based on out-of-band or in-band mechanisms other than the Data Channel Establishment Protocol specified in [I-D.ietf-rtcweb-data-protocol].

In-band: Transmission through the peer-to-peer SCTP association.

Out-of-band: Transmission through the call control signaling path, e.g., using JSEP [I-D.ietf-rtcweb-jsep] and the SDP Offer/Answer model [RFC3264].

Peer: From the perspective of one of the agents in a session, its peer is the other agent. Specifically, from the perspective of
the SDP offerer, the peer is the SDP answerer. From the perspective of the SDP answerer, the peer is the SDP offerer.

4. Principles

4.1. MSRP Data Channel

In this document, an MSRP data channel is a data channel for which the instantiated sub-protocol is "MSRP", and where the MSRP-related negotiation is done as part of the SDP-based external negotiation method defined in [I-D.ietf-mmusic-data-channel-sdpneg].

4.2. Session Mapping

In this design, the MSRP session maps to the SCTP association and the "SCTP stream pair" assigned to the data channel, and each MSRP session maps to one data channel exactly.

4.3. MSRP URI

This document extends the MSRP URI syntax [RFC4975] by defining the new transport parameter value "dc":

transport  /= "dc" / 1*ALPHANUM
; Add "dc" to existing transports per [RFC4975]

MSRP design provides for new transport bindings, see Section 6 of [RFC4975], MSRP implementations are expected to allow unrecognized transports for which there is no need to establish a connection to the resource described by the URI, as it’s the case of data channels (Section 5.1.2).

4.4. msrp-scheme

The msrp-scheme portion of the MSRP-URI that represents an MSRP data channel endpoint (used in the SDP path attribute and in the MSRP message headers) is always "msrps", which indicates that the MSRP data channel is always secured using DTLS as described in [I-D.ietf-rtcweb-data-channel].

5. End-to-End Configuration

This section describes the network configuration where each MSRP endpoint is running MSRP over a data channel.
5.1. Basic MSRP Support

5.1.1. SDP Considerations

The generic SDP considerations, including the SDP Offer/Answer procedures, for negotiating a WebRTC data channel are defined in [I-D.ietf-mmusic-data-channel-sdpneg]. This section defines the SDP considerations that are specific to an MSRP data channel.

5.1.1.1. Use of the dcmap Attribute

An offerer and answerer MUST, in each offer and answer, include a dcmap attribute line ([I-D.ietf-mmusic-data-channel-sdpneg]) within the media description of the SCTP association for each MSRP data channel session to be negotiated.

The attribute includes the following data channel parameters:

- "label=" labelstring
- "subprotocol= " "MSRP"

The labelstring is set by the MSRP application according to [I-D.ietf-mmusic-data-channel-sdpneg].

The offerer and answerer MUST NOT include the max-retr and the max-time attribute parameters in the dcmap attribute.

The offerer and answerer MAY include the ordered attribute parameter in the dcmap attribute. If included, the attribute parameter value MUST be set to "true".

Below is an example of the dcmap attribute for an MSRP session to be negotiated with stream-id=2 and label="chat":

```
a=dcmap:2 label="chat";subprotocol="MSRP"
```

5.1.1.2. Use of the dcsa Attribute

An offerer and answerer MUST, in each offer and answer, include a dcsa attribute line ([I-D.ietf-mmusic-data-channel-sdpneg]) within the media description for the SCTP association for each MSRP-specific SDP attribute to be negotiated for each MSRP data channel being negotiated.

An offerer and answerer MUST include a dcsa attribute for the following MSRP-specific SDP attributes:
- defined in [RFC4975]: "path".
- defined in [RFC6714]: "msrp-cema".
- defined in [RFC6135]: "setup". See Section 5.1.1.3

It is considered a protocol error if one or more of the dcsa embedded attributes listed above are not included in an offer or answer.

An offerer and answerer MAY include a dcsa attribute for the following MSRP-specific SDP attributes, following the procedures defined for each attributes:

- defined in [RFC4975]: "accept-types", "accept-wrapped-types" and "max-size"
- defined in [RFC4566]: "sendonly", "recvonly", "inactive" and "sendrecv"
- defined in [RFC5547]: all the parameters related to MSRP file transfer. See Section 5.2.

A subsequent offer or answer MAY update the previously negotiated MSRP subprotocol attributes while keeping the same subprotocol a=dcsa description. The semantics for newly negotiated MSRP subprotocol attributes are per [RFC4975].

5.1.1.3. Use of the dcsa embedded setup Attribute

As described in Section 5.1.1.2, the usage of a dsca embedded setup attribute is mandated for MSRP sessions over data channels. It is used to negotiate which MSRP session endpoint assumes the active role as per Section 4.2.2 of [RFC6135] and Section 5.4 of [RFC4975]. It has no relationship with the DTLS connection establishment roles [I-D.ietf-mmusic-sctp-sdp].

The dsca embedded setup attribute is of the form "a=dcsa:x setup:<role>", with x being the data channel’s SCTP stream identifier, so that such attribute is explicitly associated with an MSRP session over a specific data channel.

5.1.1.4. Example SDP Negotiation

The following is an example of an "m" line for data channels in an SDP offer that includes the attributes needed to establish two MSRP sessions: one for chat and one for file transfer. The example is derived from a combination of examples in [RFC4975] and [RFC5547].
Session Opening

Section 5.1.1.3 describes how the active MSRP session endpoint role is negotiated. The active MSRP session endpoint uses the data channel established for this MSRP session by the generic data channel opening procedure defined in [I-D.ietf-mmusic-data-channel-sdpneg]. The path attribute SHALL NOT be used for transport negotiation.

As soon as this data channel is opened, the MSRP session is actually opened by the active MSRP session endpoint. In order to do this the active MSRP endpoint sends an MSRP SEND message (empty or not) to the other MSRP endpoint.

Data Framing

Each text-based MSRP message is sent on the corresponding SCTP stream using standard MSRP framing and chunking procedures, as defined in [RFC4975], with each MSRP chunk delivered in a single SCTP user message. Therefore all sent MSRP chunks including the MSRP chunk...
header MUST have lengths of less than or equal to the value of the peer’s "a=max-message-size" attribute, which is associated with the data channel’s SCTP association.

5.1.4. Data Sending and Reporting

Data sending and reporting procedures SHALL conform to RFC 4975.

5.1.5. Session Closing

The closure of an MSRP session MUST be signaled via an SDP offer/answer exchange which removes the "a=dcmap:" and "a=dcsa:" attribute lines associated with the MSRP session from the associated DTLS/SCTP based media description. This results in the associated data channel being closed as well as per [I-D.ietf-mmusic-data-channel-sdpneg], where the actual data channel closure procedure is typically initiated by the SDP answerer right after having accepted the SDP offer.

The port value for the "m" line SHOULD NOT be changed (e.g. to zero) when closing an MSRP session (unless all data channels are being closed and the SCTP association is no longer needed), since this would close the SCTP association and impact all of the data channels. In all cases in [RFC4975] where the procedure calls for setting the port to zero for the MSRP "m" line in an SDP offer for TCP transport, the SDP offerer of an MSRP session with data channel transport SHALL remove the corresponding dcmmap and dcsa attributes.

The SDP answerer must ensure that no dcmmap or dcsa attributes are present in the SDP answer if no corresponding attributes are present in the received SDP offer.

5.2. Support for MSRP File Transfer Function

[RFC5547] defines an end-to-end file transfer method based on MSRP and the SDP offer/answer mechanism. This file transfer method is also usable by MSRP endpoints using data channels, with the following considerations:

- As an MSRP session maps to one data channel, a file transfer session maps also to one data channel.

- SDP attributes specified in [RFC5547] for a file transfer "m" line are embedded as subprotocol-specific attributes using the syntax defined in [I-D.ietf-mmusic-data-channel-sdpneg].

- Once the file transfer is complete, the same data channel MAY be reused for another file transfer.
6. Gateway Configuration

This section describes the network configuration where one MSRP endpoint uses data channels as MSRP transport, the other MSRP endpoint uses TLS/TCP connections as MSRP transport, and the two MSRP endpoints interwork via an MSRP gateway.

Specifically, a gateway can be configured to interwork an MSRP session over a data channel with a peer that does not support data channel transport in one of two ways.

In one model, the gateway performs as a MSRP B2BUA to interwork all the procedures as necessary between the endpoints. No further specification is needed for this model.

Alternately, the gateway can provide transport level interworking between MSRP endpoints using different transport protocols. In accordance with Section 5.1.2, path attributes SHALL NOT be used for transport level interworking.

When the gateway performs transport level interworking between MSRP endpoints, all of the procedures in Section 5 apply to each peer, with the following additions:

- The gateway MUST use CEMA towards the non-data channel endpoint.
- If the non-data channel endpoint does not support CEMA, transport level interworking mode is not possible, the gateway needs to act as an MSRP B2BUA.
- The gateway MUST NOT modify the path attribute received from data channel or from non-data channel endpoints.
- The gateway MUST NOT modify the setup value received from data channel or from non-data channel endpoints.
- The endpoint establishing an MSRP session using data channel transport SHALL NOT request inclusion of any relays, although it MAY interoperate with a peer that signals the use of relays.

7. IANA Considerations

7.1. Subprotocol Identifier MSRP

NOTE to RFC Editor: Please replace "XXXX" with the number of this RFC.
This document adds the subprotocol identifier "MSRP" to the "WebSocket Subprotocol Name Registry" as follows:

+--------------------------+---------+
| Subprotocol Identifier:  | MSRP    |
| Subprotocol Common Name: | MSRP    |
| Subprotocol Definition:  | RFCXXXX |
| Reference:               | RFCXXXX |
+--------------------------+---------+

7.2. setup Attribute

NOTE to RFC Editor: Please replace "XXXX" with the number of this RFC.

This document modifies the usage of the SDP setup attribute, if this attribute is embedded in a dcsa attribute and associated with an MSRP session over a data channel. The modified usage is described in Section 5.1.1.3.

Usage level "dcsa(MSRP)" should be added to the IANA registration of the SDP setup attribute as follows:

+-----------------------+-------------------------------------------+
| Contact name:         | MMUSIC Chairs                             |
| Contact email:        | mmusic-chairs@ietf.org                    |
| Attribute name:       | setup                                     |
| Usage level:          | dcsa(MSRP)                                |
| Purpose:              | Negotiate the active role of an MSRP     |
|                       | session over a data channel as per        |
|                       | Section 5.1.1.3                           |
| Reference:            | RFCXXXX                                   |
+-----------------------+-------------------------------------------+

8. Security Considerations

MSRP traffic over data channels is secured, including confidentiality, integrity and source authentication, as specified by [I-D.ietf-rtcweb-data-channel]

Note that discussion in [RFC4975] on MSRP message attribution to remote identities applies to data channel transport.

9. Acknowledgments

The authors wish to acknowledge the borrowing of ideas from another internet draft by Peter Dunkley and Gavin Llewellyn, and to thank Flemming Andreasen, Christian Groves, Christer Holmberg, Paul
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10. CHANGE LOG

10.1. Changes against 'draft-ietf-mmusic-msrp-usage-data-channel-13'
  o Clarify gateway procedures in accordance to mandatory use of CEMA.

10.2. Changes against 'draft-ietf-mmusic-msrp-usage-data-channel-12'
  o Make CEMA mandatory, clarify SDP procedures.

10.3. Changes against 'draft-ietf-mmusic-msrp-usage-data-channel-11'
  o Additional clarifications on cema and path attribute after mail list feedback.

10.4. Changes against 'draft-ietf-mmusic-msrp-usage-data-channel-10'
  o Corrections and clarifications on cema and path attributes after mail list feedback.

10.5. Changes against 'draft-ietf-mmusic-msrp-usage-data-channel-09'
  o Corrected area to ART.

10.6. Changes against 'draft-ietf-mmusic-msrp-usage-data-channel-08'
  o Updated reference to 4566bis.
  o Expanded motivation paragraphs in introduction.

10.7. Changes against 'draft-ietf-mmusic-msrp-usage-data-channel-07'
  o Move security considerations after IANA considerations, following RFC7322 suggested order.
  o Update references to use xml.resource.org citation database.
  o Reformat of the section discussing setup parameter
  o Align examples with latest [I-D.ietf-mmusic-data-channel-sdpneg] draft.
  o Edit section 6 for clarity.
  o Security requirements.
o Clarify comment on unrecognized transports and session opening.

o Update year, add editor.

10.8. Changes against ‘draft-ietf-mmusic-msrp-usage-data-channel-06’

o Modification of Keith’s address information.

10.9. Changes against ‘draft-ietf-mmusic-msrp-usage-data-channel-05’

o Modification of Juergen’s address information.

10.10. Changes against ‘draft-ietf-mmusic-msrp-usage-data-channel-04’

o Addition of [I-D.ietf-mmusic-rfc4566bis] to list of normative references.

o Addition of Section 7.2 as per section 8.2.4 of [I-D.ietf-mmusic-rfc4566bis].

10.11. Changes against ‘draft-ietf-mmusic-msrp-usage-data-channel-03’

o Addition of IANA registration related Section 7.1.


o Addition of "a=setup:actpass", "a=connection:new", "a=fingerprint:...", and "a=dcsa:x setup=active" SDP attributes to the SDP example in Section 5.1.1.4.

o Addition of [RFC4145] and [I-D.ietf-mmusic-sctp-sdp] to list of normative references.

o Addition of new Section 5.1.1.3 describing how the active MSRP session endpoint role is negotiated.

o Extension of first paragraph of Section 5.1.2 with new first sentence "Section 5.1.1.3 describes how the active MSRP session endpoint role is negotiated.".

o First sentence of second paragraph in Section 5.1.2 was "As soon as this data channel is opened, the MSRP session is actually opened by the active MSRP endpoint which sends an MSRP SEND message (empty or not) to the other MSRP endpoint." Replacement of this sentence with "As soon as this data channel is opened, the MSRP session is actually opened by the active MSRP endpoint. In order to do this the active MSRP endpoint sends an MSRP SEND message (empty or not) to the other MSRP endpoint."
o Addition of setup attribute specific behavior descriptions of data channel to TCP or TLS interworking gateways in Section 6.

10.13. Changes against 'draft-ietf-mmusic-msrp-usage-data-channel-01'

o In the abstract replacement of the first sentence "This document specifies how the Message Session Relay Protocol (MSRP) can be instantiated as a data channel sub-protocol, using the SDP offer/answer exchange-based external negotiation defined in [I-D.ietf-mmusic-data-channel-sdpneg]" with "This document specifies how the Message Session Relay Protocol (MSRP) can be instantiated as a data channel sub-protocol, using the SDP offer/answer exchange-based generic data channel negotiation framework" in order to remove the reference from the abstract text.

o Addition of following sentence to the second paragraph in Section 1: "The MSRP protocol negotiation defined in this document is based on the generic SDP offer/answer exchange based data channel negotiation as specified in [I-D.ietf-mmusic-data-channel-sdpneg]."

o In Section 4.1 replacement of sub-protocol identifier "msrp" with "MSRP" in order to make this consistent with the formal specification in Section 5.1.1.1.

o Throughout the text replacement of "shall" with "SHALL" etc where appropriate as per [RFC2119].

o In Section 5.1.1.1 replacement of sentence ‘The max-retr, max-time and ordered parameters shall not be used.’ with ‘Ordered and reliable data channels MUST always be used, such that the "max-retr" and "max-time" parameters SHALL NOT be used. If the "ordered" parameter is used, then its value MUST be equal to "true".’.

o In Section 5.1.1.1 removal of "(on default SCTP port 5000)" from the sentence preceding the example "a=dcsa" attribute line.

o In Section 5.1.1.2 first paragraph was "The SDP offer shall also include a dcsa attribute line (defined in [I-D.ietf-mmusic-data-channel-sdpneg]) within the media description for the SCTP association for each MSRP-specific SDP attribute to be negotiated for each MSRP data channel being negotiated.". Replacement of this paragraph with "The SDP offer SHALL also include within the media description for the SCTP association a dcsa attribute line (defined in [I-D.ietf-mmusic-data-channel-sdpneg]) for each MSRP-specific SDP
attribute to be negotiated for each MSRP data channel being negotiated.

- Appended following sentence at the end of the first paragraph of Section 5.1.3: "Therefore all sent MSRP chunks MUST have lengths of less than or equal to the value of the peer’s "a=max-message-size" attribute, which is associated with the data channel’s SCTP association."

- Addition of the previously missing colon to the "a=sctp-port" attribute line in Section 5.1.1.4.

- In Section 5.1.5 replacement of the first paragraph "Closing of an MSRP session is done using the generic data channel closing procedure defined in [I-D.ietf-mmusic-data-channel-sdpneg]." with ‘The closure of an MSRP session MUST be signaled via an SDP offer/answer exchange which removes the "a=dcmap:" and "a=dcsa:" attribute lines associated with the MSRP session from the associated DTLS/SCTP based media description. This results in the associated data channel being closed as well as per [I-D.ietf-mmusic-data-channel-sdpneg], where the actual data channel closure procedure is typically initiated by the SDP answerer right after having accepted the SDP offer.’.


- Replacement of previous document title "MSRP over SCTP/DTLS data channels" with "MSRP over Data Channels" in order to align with the terminology used in [I-D.ietf-mmusic-data-channel-sdpneg].

- In Section 3 "WebRTC data channel" was defined as "A bidirectional channel consisting of paired SCTP outbound and inbound streams." Replacement of this definition with "Data channel: A WebRTC data channel as specified in [I-D.ietf-rtcweb-data-channel]", and consistent usage of either "data channel" or "MSRP data channel" in the remainder of the document.

- In the introduction replacement of references to [I-D.ietf-rtcweb-data-protocol] with a reference to [I-D.ietf-rtcweb-data-channel].

- Consistent usage of ’"m" line’ in whole document as per [RFC4566].

- In the gateway configuration section (Section 6) replacement of the first sentence "This section describes the network
configuration where one endpoint runs MSRP over a WebRTC SCTP/DTLS connection, the other MSRP endpoint runs MSRP over one or more TLS/TCP connections, and the two endpoints interwork via an MSRP gateway" with "This section describes the network configuration where one MSRP endpoint uses data channels as MSRP transport, the other MSRP endpoint uses TLS/TCP connections as MSRP transport, and the two MSRP endpoints interwork via an MSRP gateway".

10.15. Changes against ‘draft-ejzak-mmusic-msrp-usage-data-channel-01’

  o Removed empty spaces after ";" in the examples’ "a=dcmmap" attribute lines.

  o In all examples, the "m" line proto value "DTLS/SCTP" was replaced with "UDP/DTLS/SCTP" and the "a=fmtp" attribute lines were replaced with "a=max-message-size" attribute lines, as per draft-ietf-mmusic-sctp-sdp-12.

10.16. Changes against ‘-00’

  o Transport parameter change for MSRP to allow MSRP RFC transports.

  o Clarification on SDP offer/answer and removing duplicated procedures and refer them to draft-ejzak-mmusic-data-channel-sdpneg-02.

11. Normative References


Internet-Draft          MSRP over Data Channels        December 2019

          Establishment for Media Anchoring (CEMA) for the Message
          Session Relay Protocol (MSRP)", RFC 6714,
          DOI 10.17487/RFC6714, August 2012,

[RFC7977]  Dunkley, P., Llewellyn, G., Pascual, V., Salgueiro, G.,
          and R. Ravindranath, "The WebSocket Protocol as a
          Transport for the Message Session Relay Protocol (MSRP)",
          RFC 7977, DOI 10.17487/RFC7977, September 2016,

Authors' Addresses

  Keith Drage (editor)
  Unaffiliated
  Email: drageke@ntlworld.com

  Maridi R. Makaraju (Raju)
  Unaffiliated
  Email: mmraju@gmail.com

  Juergen Stoetzer-Bradler
  Unaffiliated
  Email: Juergen.S-B.ietf@email.de

  Richard Ejzak
  Unaffiliated
  Email: richard.ejzak@gmail.com

  Jose M. Recio (editor)
  Email: jose@ch3m4.com