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RFC 8873
Message Session Relay Protocol (MSRP) over Data Channels

Abstract

This document specifies how a Web Real-Time Communication (WebRTC) data channel can be used as a transport mechanism for the Message Session Relay Protocol (MSRP) and how the Session Description Protocol (SDP) offer/answer mechanism can be used to negotiate such a data channel, referred to as an MSRP data channel. Two network configurations are supported: the connection of two MSRP data channel endpoints; and a gateway configuration, which connects an MSRP data channel endpoint with an MSRP endpoint that uses either TCP or TLS. This document updates RFC 4975.

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 7841.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at https://www.rfc-editor.org/info/rfc8873.

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Table of Contents

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 was initially defined in [RFC4975] to work over TCP and TLS connections, and over a WebSocket subprotocol specified by [RFC7977].

This document specifies how a Web Real-Time Communication (WebRTC) data channel [RFC8831] can be used as a transport mechanism for MSRP without the TCP and TLS layers, and how the Session Description Protocol (SDP) offer/answer mechanism for data channels [RFC8864] can be used to negotiate such a data channel.

In this document, an MSRP data channel refers to a WebRTC data channel for which the instantiated subprotocol is "msrp" and the data channel is negotiated using the SDP offer/answer mechanism [RFC8864].

Defining MSRP as a data channel subprotocol has many benefits:

- provides to applications a proven protocol enabling instant messaging, file transfer, image sharing
- integrates those features with other WebRTC 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 the WebSocket protocol, which provides a message-passing protocol to applications with no direct access to TCP or TLS sockets, data channels provide a low-latency transport and leverage NAT-aware connectivity and the security features of WebRTC.

This document defines an MSRP data channel endpoint as an MSRP application that uses a WebRTC data channel for MSRP transport. This document describes configurations for connecting such endpoint to another MSRP data channel endpoint, or to an MSRP endpoint that uses either TCP or TLS transport.

This document updates [RFC4975] as described in Section 7.

2. Conventions

The key words "**MUST**", "**MUST NOT**", "**REQUIRED**", "**SHALL**", "**SHALL NOT**", "**SHOULD**", "**SHOULD NOT**", "**RECOMMENDED**", "**NOT RECOMMENDED**", "**MAY**", and "**OPTIONAL**" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

3. WebRTC Data Channel Considerations

3.1. MSRP Data Channel

The following WebRTC data channel property values [RFC8831] apply to an MSRP data channel:

Property	Value
Subprotocol Identifier	msrp
Transmission reliability	reliable
Transmission order	in-order
Label	See Section 4.3

Table 1

4. SDP Considerations

The generic SDP considerations, including the SDP offer/answer procedures [RFC3264], for negotiating a WebRTC data channel are defined in [RFC8864]. This section and its subsections define the SDP considerations that are specific to an MSRP data channel, identified by the "subprotocol" attribute parameter, with an "msrp" parameter value in the 'dcmap' attribute.

4.1. MSRP URI

This document extends the MSRP URI syntax [RFC4975] by defining the new transport parameter value "dc" (an abbreviation of data channel):

```
transport  /= "dc"
; Add "dc" to existing transports per Section 9 of [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 is the case of data channels (Section 4.4).

4.2. MSRP URI 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 [RFC8831].

4.3. Use of the 'dcmap' Attribute

An offerer and answerer **SHALL**, in each offer and answer, include a 'dcmap' attribute [RFC8864] in the SDP media description ("m=" section) [RFC4566] describing the SCTP association [RFC4960] used to realize the MSRP data channel.

The attribute includes the following data channel parameters:

- "label=" labelstring
- "subprotocol=" "msrp"

The labelstring is set by the MSRP application according to [RFC8864].

The offerer and answerer **SHALL 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 **SHALL** be set to "true".

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

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

4.4. Use of the 'dcsa' Attribute

An offerer and answerer can, in each offer and answer, include one or more data channel subprotocol attributes ('dcsa' attributes) [RFC8864] in the "m=" section describing the SCTP association used to realize the MSRP data channel. An SDP attribute included in a 'dcsa' attribute is referred to as a DCSA-embedded attribute.

If an offerer or answerer receives a 'dcsa' attribute that contains an SDP attribute for which usage has not been defined for an MSRP data channel, the offerer or answerer should ignore the 'dcsa' attribute, following the rules in Section 6.7 of [RFC8864].

An offerer and answerer **SHALL** include a 'dcsa' attribute for each of the following MSRP-specific SDP attributes:

- defined in [RFC4975]: 'path'.
- defined in [RFC6714]: 'msrp-cema'.
- defined in [RFC6135]: 'setup'. See Section 4.5.

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 any of the following MSRP-specific SDP attributes, following the procedures defined for each attribute:

- 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 4.7.

A subsequent offer or answer **MAY** update the previously negotiated MSRP subprotocol attributes while keeping the 'dcmap' attribute associated with the MSRP data channel unchanged. The semantics for newly negotiated MSRP subprotocol attributes are per [RFC4975].

When MSRP messages are transported on a data channel, the 'path' attribute is not used for the routing of the messages. The MSRP data channel is established using the SDP offer/answer procedures defined in [RFC8864], and the MSRP messages are then transported on that data channel. This is different from legacy MSRP [RFC4975] but similar to MSRP Connection Establishment for Media Anchoring (MSRP CEMA) [RFC6714]. Because of this, a DCSA-embedded 'msrp-cema' attribute is mandated for MSRP sessions over data channels. However, when an endpoint receives an MSRP message over a data channel, it **MUST** still perform the MSRP URI comparison procedures defined in [RFC4975].

4.5. Use of the DCSA-Embedded 'setup' Attribute

As described in Section 4.4, the usage of a DCSA-embedded 'setup' attribute is mandated for MSRP sessions over data channels. It is used to negotiate which MSRP data channel 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 [RFC8841].

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

4.6. Session Closing

An MSRP session is closed by closing the associated data channel following the procedures in [RFC8864].

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 in 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 'dcmap' and 'dcsa' attributes.

4.7. Support for MSRP File Transfer Function

SDP attributes specified in [RFC5547] for a file transfer "m=" line are embedded as subprotocol-specific attributes using the syntax defined in [RFC8864].

4.8. Example

Below is an example of an offer and an answer that include 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].

Offer:

```
m=application 54111 UDP/DTLS/SCTP webrtc-datachannel
c=IN IP6 2001:db8::3
a=max-message-size:100000
a=sctp-port:5000
a=setup:actpass
a=fingerprint:SHA-256 12:DF:3E:5D:49:6B:19:E5:7C:AB:4A:AD:B9:B1:\
   3F:82:18:3B:54:02:12:DF:3E:5D:49:6B:19:E5:7C:AB:4A:AD
a=tls-id:4a756565cddef001be82
a=dcmap:0 label="chat";subprotocol="msrp"
a=dcsa:0 msrp-cema
a=dcsa:0 setup:active
a=dcsa:0 accept-types:message/cpim text/plain
a=dcsa:0 path:msrps://2001:db8::3:54111/si438dsaodes;dc
a=dcmap:2 label="file transfer";subprotocol="msrp"
a=dcsa:2 sendonly
a=dcsa:2 msrp-cema
a=dcsa:2 setup:active
a=dcsa:2 accept-types:message/cpim
a=dcsa:2 accept-wrapped-types:*
a=dcsa:2 path:msrps://2001:db8::3:54111/jshA7we;dc
a=dcsa:2 file-selector:name:"picture1.jpg" type:image/jpeg \
   size:1463440 hash:sha-256:7C:DF:3E:5D:49:6B:19:E5:12:AB:4A:AD:\
   4A:B1:3F:82:3E:3B:54:12:02:5D:18:DF:49:6B:19:E5:7C:AB:B9:AD
a=dcsa:2 file-transfer-id:rjEtHAcYVZ7xKwGYpGGwyn5gqsSaU7Ep
a=dcsa:2 file-disposition:attachment
a=dcsa:2 file-date:creation:"Tue, 11 Aug 2020 19:05:30 +0200"
a=dcsa:2 file-icon:cid:id2@bob.example.com
a=dcsa:2 file-range:1-1463440
```

Answer:

```
m=application 51444 UDP/DTLS/SCTP webrtc-datachannel
c=IN IP6 IP6 2001:db8::1
a=max-message-size:100000
a=sctp-port:6000
a=setup:passive
a=fingerprint:SHA-256 5D:02:3E:AD:49:6B:19:E5:7C:AB:4A:AD:B9:\
   B1:3F:82:18:3B:54:DF:12:6B:3E:5D:49:DF:19:E5:7C:AB:4A:5D
a=tls-id:65cd4a7565debe82f100
a=dcmap:0 label="chat";subprotocol="msrp"
a=dcsa:0 msrp-cema
a=dcsa:0 setup:passive
a=dcsa:0 accept-types:message/cpim text/plain
a=dcsa:0 path:msrps://2001:db8::1:51444/di551fsaodes;dc
a=dcmap:2 label="file transfer";subprotocol="msrp"
a=dcsa:2 recvonly
a=dcsa:2 msrp-cema
a=dcsa:2 setup:passive
a=dcsa:2 accept-types:message/cpim
a=dcsa:2 accept-wrapped-types:*
a=dcsa:2 path:msrps://2001:db8::1:51444/jksh7Bwc;dc
a=dcsa:2 file-selector:name:"picture1.jpg" type:image/jpeg \
   size:1463440
a=dcsa:2 file-transfer-id:rjEtHAcYVZ7xKwGYpGGwyn5gqsSaU7Ep
a=dcsa:2 file-range:1-1463440
```

Note that due to RFC formatting conventions, this document splits SDP content that exceeds 72 characters across lines, marking this line folding with a backslash character. This backslash and its trailing CRLF and whitespace would not appear in actual SDP content.

5. MSRP Considerations

The procedures specified in [RFC4975] apply except when this document specifies otherwise. This section describes the MSRP considerations specific to an MSRP data channel.

5.1. Session Mapping

In this document, each MSRP session maps to one data channel exactly.

5.2. Session Opening

Section 4.5 describes how the active MSRP data channel endpoint role is negotiated. The active MSRP data channel endpoint uses the data channel established for this MSRP session by the generic data channel opening procedure defined in [RFC8864].

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

5.3. Session Closing

The closure of an MSRP session **SHALL** be signaled via SDP following the requirements in Section 4.6.

If the data channel used to transport the MSRP session fails and is torn down, the MSRP data channel endpoints **SHALL** consider the MSRP session failed. An MSRP data channel endpoint **MAY**, based on local policy, try to negotiate a new MSRP data channel.

5.4. Data Framing

Each text-based MSRP message is sent on the corresponding data channel 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 **SHALL** have lengths of less than or equal to the value of the peer's 'max-message-size' attribute [RFC8841] associated with the SCTP association.

5.5. Data Sending, Receiving, and Reporting

Data sending, receiving, and reporting procedures **SHALL** conform to [RFC4975].

5.6. 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 data channel endpoints 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 are negotiated as specified in Section 4.7.
- Once the file transfer is complete, the same data channel **MAY** be reused for another file transfer.

6. Gateway Considerations

This section describes the network configuration where one MSRP endpoint uses an MSRP data channel as MSRP transport, the other MSRP endpoint uses TLS/TCP connections as MSRP transport, and the two MSRP endpoints interwork via a 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 an MSRP Back-to-Back User Agent (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 4.4, '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 4 and Section 5 apply to each peer, with the following additions:

- The gateway **SHALL** use the MSRP CEMA mechanism [RFC6714] towards the non-data channel endpoint.
- If the non-data channel endpoint does not support MSRP CEMA, transport-level interworking mode is not possible, and the gateway needs to act as an MSRP B2BUA.
- The gateway **SHALL NOT** modify the 'path' attribute received from data channel or from non-data channel endpoints.
- The gateway **SHALL 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. Updates to RFC 4975

This document updates [RFC4975] by allowing the usage of the "msrps" scheme when the underlying connection is protected with DTLS.

8. Security Considerations

MSRP traffic over data channels, including confidentiality, integrity, and source authentication, is secured as specified by [RFC8831]. However, [RFC4975] allows transport of MSRP traffic over nonsecured TCP connections and does not provide a mechanism to guarantee usage of TLS end to end. As described in [RFC4975], even if TLS is used between some hops, TCP might still be used between other hops. Operators need to establish proper policies in order to ensure that the MSRP traffic is protected between endpoints.

[RFC5547] specifies security considerations related to the usage of MSRP for file transfer.

[RFC7092] specifies security considerations related to B2BUAs.

Note that the discussion in Section 14.5 of [RFC4975] on MSRP message attribution to remote identities applies to data channel transport.

If the Session Initiation Protocol (SIP) [RFC3261] is used to implement the offer/answer transactions for establishing the MSRP data channel, the SIP security considerations specified in [RFC3261] apply.

9. IANA Considerations

9.1. "msrps" URI scheme

This document modifies the usage of the "msrps" URI scheme, registered by [RFC4975], by adding DTLS as a protected transport indicated by the URI scheme.

A reference to RFC 8873 has been added to the URI scheme "msrps" in the "Uniform Resource Identifier (URI) Schemes" registry.

9.2. Subprotocol Identifier "msrp"

A reference to RFC 8873 has been added to the subprotocol identifier "msrp" in the "WebSocket Subprotocol Name Registry".

9.3. SDP Attributes

This document modifies the usage of a set of SDP attributes if any of those attributes is included in an SDP 'dcsa' attribute associated with an MSRP data channel. The modified usage of the SDP 'setup' attribute is described in Section 4.5. The usage of the other SDP attributes is described in Section 4.4.

- 'accept-types'
- 'accept-wrapped-types'
- 'file-date'
- 'file-disposition'
- 'file-icon'
- 'file-range'
- 'file-selector'
- 'file-transfer-id'
- 'inactive'
- 'max-size'
- 'msrp-cema'
- 'path'
- 'recvonly'
- 'sendonly'
- 'sendrecv'

The usage level "dcsa (msrp)" has been added to the registration of the SDP 'accept-types' attribute in the Session Description Protocol (SDP) Parameters "att-field" subregistry as follows:

Contact name: IESG
Contact email: iesg@ietf.org

Attribute name:	accept-types
Usage level:	dcsa (msrp)
Purpose:	Contain the list of media types that the endpoint is willing to receive.
Reference:	RFC 8873

The usage level "dcsa (msrp)" has been added to the registration of the SDP 'accept-wrapped-types' attribute in the Session Description Protocol (SDP) Parameters "att-field" subregistry as follows:

Contact name:	IESG
Contact email:	iesg@ietf.org
Attribute name:	accept-wrapped-types
Usage level:	dcsa (msrp)
Purpose:	Contain the list of media types that the endpoint is willing to receive in an MSRP message with multipart content.
Reference:	RFC 8873

The usage level "dcsa (msrp)" has been added to the registration of the SDP 'file-date' attribute in the Session Description Protocol (SDP) Parameters "att-field" subregistry as follows:

Contact name:	IESG
Contact email:	iesg@ietf.org
Attribute name:	file-date
Usage level:	dcsa (msrp)
Purpose:	Indicate one or more dates related to the file in an MSRP file transfer negotiation.
Reference:	RFC 8873

The usage level "dcsa (msrp)" has been added to the registration of the SDP 'file-disposition' attribute in the Session Description Protocol (SDP) Parameters "att-field" subregistry as follows:

Contact name:	IESG
Contact email:	iesg@ietf.org
Attribute name:	file-disposition
Usage level:	dcsa (msrp)
Purpose:	Provide a suggestion to the other endpoint about the intended disposition of the file in an MSRP file transfer negotiation.
Reference:	RFC 8873

The usage level "dcsa (msrp)" has been added to the registration of the SDP 'file-icon' attribute in the Session Description Protocol (SDP) Parameters "att-field" subregistry as follows:

Contact name:	IESG
Contact email:	iesg@ietf.org
Attribute name:	file-icon

Usage level:	dcsa (msrp)
Purpose:	Contain a pointer to a small preview icon representing the contents of the file in an MSRP file transfer negotiation.
Reference:	RFC 8873

The usage level "dcsa (msrp)" has been added to the registration of the SDP 'file-range' attribute in the Session Description Protocol (SDP) Parameters "att-field" subregistry as follows:

Contact name:	IESG
Contact email:	iesg@ietf.org
Attribute name:	file-range
Usage level:	dcsa (msrp)
Purpose:	Contain the range of transferred octets of the file in an MSRP file transfer negotiation.
Reference:	RFC 8873

The usage level "dcsa (msrp)" has been added to the registration of the SDP 'file-selector' attribute in the Session Description Protocol (SDP) Parameters "att-field" subregistry as follows:

Contact name:	IESG
Contact email:	iesg@ietf.org
Attribute name:	file-selector
Usage level:	dcsa (msrp)
Purpose:	Indicate a file in an MSRP file transfer negotiation.
Reference:	RFC 8873

The usage level "dcsa (msrp)" has been added to the registration of the SDP 'file-transfer-id' attribute in the Session Description Protocol (SDP) Parameters "att-field" subregistry as follows:

Contact name:	IESG
Contact email:	iesg@ietf.org
Attribute name:	file-transfer-id
Usage level:	dcsa (msrp)
Purpose:	Indicate a unique identifier of the file transfer operation in an MSRP file transfer negotiation.
Reference:	RFC 8873

The usage level "dcsa (msrp)" has been added to the registration of the SDP 'inactive' attribute in the Session Description Protocol (SDP) Parameters "att-field" subregistry as follows:

Contact name:	IESG
Contact email:	iesg@ietf.org
Attribute name:	inactive
Usage level:	dcsa (msrp)
Purpose:	Negotiate the direction of the media flow on an MSRP data channel.

Reference: RFC 8873

The usage level "dcsa (msrp)" has been added to the registration of the SDP 'max-size' attribute in the Session Description Protocol (SDP) Parameters "att-field" subregistry as follows:

Contact name: IESG
Contact email: iesg@ietf.org
Attribute name: max-size
Usage level: dcsa (msrp)
Purpose: Indicate the largest message an MSRP endpoint wishes to accept.
Reference: RFC 8873

The usage level "dcsa (msrp)" has been added to the registration of the SDP 'msrp-cema' attribute in the Session Description Protocol (SDP) Parameters "att-field" subregistry as follows:

Contact name: IESG
Contact email: iesg@ietf.org
Attribute name: msrp-cema
Usage level: dcsa (msrp)
Purpose: Indicate that the routing of MSRP messages transported on a data channel is more similar to the MSRP CEMA mechanism than the legacy MSRP routing mechanism.
Reference: RFC 8873

The usage level "dcsa (msrp)" has been added to the registration of the SDP 'path' attribute in the Session Description Protocol (SDP) Parameters "att-field" subregistry as follows:

Contact name: IESG
Contact email: iesg@ietf.org
Attribute name: path
Usage level: dcsa (msrp)
Purpose: Indicate an endpoint, but not used for routing, as described in Section 4.4.
Reference: RFC 8873

The usage level "dcsa (msrp)" has been added to the registration of the SDP 'recvonly' attribute in the Session Description Protocol (SDP) Parameters "att-field" subregistry as follows:

Contact name: IESG
Contact email: iesg@ietf.org
Attribute name: recvonly
Usage level: dcsa (msrp)
Purpose: Negotiate the direction of the media flow on an MSRP data channel.
Reference: RFC 8873

The usage level "dcsa (msrp)" has been added to the registration of the SDP 'sendonly' attribute in the Session Description Protocol (SDP) Parameters "att-field" subregistry as follows:

Contact name:	IESG
Contact email:	iesg@ietf.org
Attribute name:	sendonly
Usage level:	dcsa (msrp)
Purpose:	Negotiate the direction of the media flow on an MSRP data channel.
Reference:	RFC 8873

The usage level "dcsa (msrp)" has been added to the registration of the SDP 'setup' attribute in the "att-field" subregistry as follows:

Contact name:	IESG
Contact email:	iesg@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 4.5.
Reference:	RFC 8873

The usage level "dcsa (msrp)" has been added to the registration of the SDP 'sendrecv' attribute in the Session Description Protocol (SDP) Parameters "att-field" subregistry as follows:

Contact name:	IESG
Contact email:	iesg@ietf.org
Attribute name:	sendrecv
Usage level:	dcsa (msrp)
Purpose:	Negotiate the direction of the media flow on an MSRP data channel.
Reference:	RFC 8873

10. References

10.1. Normative References

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