

MMUSIC Working Group
Internet-Draft
Intended status: Standards Track
Expires: August 22, 2013

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**Multiplexing Negotiation Using Session Description Protocol (SDP) Port
Numbers**
draft-ietf-mmusic-sdp-bundle-negotiation-03.txt

Abstract

This specification defines a new SDP Grouping Framework extension, "BUNDLE", that can be used with the Session Description Protocol (SDP) Offer/Answer mechanism to negotiate the usage of bundled media, which refers to the usage of a single 5-tuple for media associated with multiple SDP media descriptions ("m=" lines).

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1. Introduction

In the IETF RTCWEB WG, a need to use a single 5-tuple for sending and receiving media associated with multiple SDP media descriptions ("m=" lines) has been identified. This would e.g. allow the usage of a single set of Interactive Connectivity Establishment (ICE) [[RFC5245](#)] candidates for multiple media descriptions. Normally different media types (audio, video etc) will be described using different media descriptions.

This specification defines a new SDP Grouping Framework [[RFC5888](#)] extension, "BUNDLE", that can be used with the Session Description Protocol (SDP) Offer/Answer mechanism [[RFC3264](#)] to negotiate the usage of bundled media, which refers to the usage of a single 5-tuple for media associated with multiple SDP media descriptions ("m=" lines).

The SDP Offerer and SDP Answerer [[RFC3264](#)] use the "BUNDLE" grouping extension to indicate which media is associated with a single 5-tuple. For each media, the associated "m=" line is associated with a "BUNDLE" group.

For each "BUNDLE" group, the SDP Offerer and SDP Answerer use an identical port number value in each "m=" line associated with the "BUNDLE" group. However, until it is known that the SDP Answerer supports the "BUNDLE" grouping extension, when the SDP Offerer generates an SDP Offer, a different port number value is inserted for each "m=" line associated with the "BUNDLE" group. The port number value associated with the first "m=" line associated with the "BUNDLE" group represents the port value number offered to be used in the single 5-tuple.

NOTE: As defined in [RFC 4566](#) [[RFC4566](#)], the semantics of multiple "m=" lines using the same port number value are undefined, and there is no grouping defined by such means. Instead, an explicit grouping mechanism needs to be used to express the intended semantics. This specification provides such extension.

SDP Offers and SDP Answer can contain multiple "BUNDLE" groups. For each "BUNDLE" group, a different port number value MUST be used.

When media is transported using the Real-Time Protocol (RTP) [[RFC3550](#)], the default assumption of the mechanism is that all media associated with a "BUNDLE" group will form a single RTP Session [[RFC3550](#)]. However, future specifications can extend the mechanism, in order to negotiate RTP Session multiplexing, i.e. "BUNDLE" groups where media associated with a group form multiple RTP Sessions.

The mechanism is backward compatible. Endpoints that do not support the "BUNDLE" grouping extension are expected to generate SDP Offers and SDP Answers without inserting a "BUNDLE" group, and to insert different port number values in each "m=" line, in the SDP Offers and SDP Answers, as defined in [RFC 4566](#) and [RFC 3264](#).

2. Terminology

5-tuple: A collection of the following values: source address, source port, destination address, destination port and protocol.

Bundled media: Two or more RTP streams using a single 5-tuple. The RTCP streams associated with the RTP streams also use a single 5-tuple, which might be the same, but can also be different, as the one used by the RTP streams.

3. 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](#)].

4. Applicability Statement

The mechanism in this specification only applies to the Session Description Protocol (SDP) [[RFC4566](#)], when used together with the SDP Offer/Answer mechanism [[RFC3264](#)].

5. SDP Grouping Framework BUNDLE Extension Semantics

This section defines a new SDP Grouping Framework extension, "BUNDLE".

The "BUNDLE" extension can be indicated using an SDP session-level 'group' attribute. Each SDP media description ("m=" line) that is grouped together, using an SDP media-level 'mid' attribute, is part of a specific "BUNDLE" group.

6. SDP Offer/Answer Procedures

6.1. General

When an endpoint generates an SDP Offer or SDP Answer, which contains a "BUNDLE" group, it MUST insert an SDP session-level 'group' attribute, with a "BUNDLE" value, and assign SDP media-level 'mid' attribute values for each "m=" line associated the "BUNDLE" group.

Until it is known whether the SDP Answerer supports the "BUNDLE" grouping extension, the SDP Offerer MUST, for each "m=" line associated with a "BUNDLE" group:

- o 1. Insert different port number values.
- o 2. Insert identical connection data ("c=" line) value.
- o 3. Insert different SDP 'rtcp' attribute value, when used.
- o 4. Insert different ICE candidate values, when used.
- o 5. Insert an SDP 'rtcp-mux' attribute.
- o 6. Insert identical DTLS-SRTP fingerprint attribute, when used
- o 7. Insert different SDES crypto attribute, when used

Once it is known that both endpoints support the "BUNDLE" grouping extension, the SDP Offerer and SDP Answerer MUST, for each "m=" line associated with a "BUNDLE" group:

- o 1. Insert identical port number values.
- o 2. Insert identical connection data ("c=" line) value.
- o 3. Insert identical SDP 'rtcp' attribute value, when used.
- o 4. Insert identical ICE candidate values, when used.
- o 5. Insert an SDP 'rtcp-mux' attribute.
- o 6. Insert identical DTLS-SRTP fingerprint attribute, when used
- o 7. Insert different SDES crypto attribute, when used

Once both endpoints have indicated support of the "BUNDLE" grouping extension, they can start using the single port for the media associated with each "m=" line in the "BUNDLE group".

OPEN ISSUE #1: If the SDP Answerer supports "BUNDLE", do we mandate that "m=" lines must be grouped in the same way in the SDP Answer as they are grouped in the SDP Offer?

6.2. SDP Offerer Procedures

When the SDP Offerer generates an SDP Offer that contains a "BUNDLE" group, the SDP Offer MUST be generated according to the procedures in [Section 6.1](#).

If the associated SDP Answer contains a "BUNDLE" group, and the SDP Offer contained different port number values in each "m=" line associated with the "BUNDLE" group, the SDP Offerer MUST generate a

new SDP Offer, and insert an identical port number value for each "m=" line associated with the "BUNDLE" group. Unless ICE is used, the SDP Offerer MUST generate the new SDP Offer immediately when it has received the SDP Answer indicating that the SDP Answerer supports the "BUNDLE" grouping extension. If ICE is used, the SDP Offer can wait until the SDP Offer indicating that ICE is finished is sent, as defined in [RFC 5245](#).

NOTE: The reason for sending the new SDP Offer, which includes an identical port number value in each "m=" line associated with the "BUNDLE" group, is to ensure that intermediary entities that look at SDP information e.g. for different type of policing functions, have the correct information regarding which ports will be used for media.

If the SDP Offer contains different port number values for each "m=" lines associated with the "BUNDLE" group, and if the associated SDP Answer does not contain a "BUNDLE" group, the SDP Offerer MUST use the different port number values that were included in the SDP Offer.

Once it is known that both the SDP Offerer and SDP Answerer support the "BUNDLE" grouping extension, in each subsequent SDP Offer towards the SDP Answerer, the SDP Offerer MUST insert an identical port number value in each "m=" line associated with the "BUNDLE" group.

NOTE: If needed, the SDP Offerer is allowed to change the port number value in an subsequent SDP Offer, but it still inserts the same identical port number value in each "m=" line associated with the "BUNDLE" group.

When generating an SDP Offer, if the SDP Offerer wants to disable media associated with an "m=" line in a "BUNDLE" group, it will insert a zero port number value in the disabled "m=" line, as defined in [RFC 3264](#). However, if the "m=" lines associated with the "BUNDLE" group contain different port number values (i.e. the SDP Offer is generated until it is known whether the SDP Answerer supports the "BUNDLE" grouping extension) the SDP Offerer MUST NOT set the port number value of the first "m=" line associated with the "BUNDLE" group to zero.

The SDP Offerer MUST NOT insert an identical port number value in multiple "m=" lines, unless the "m=" lines are associated with a "BUNDLE" group.

OPEN ISSUE #2: If the session has been established without BUNDLE, do we allow BUNDLE to be enabled later during the session?

OPEN ISSUE #3: If the session has been established with BUNDLE, do we allow BUNDLE to be disabled later during the session, meaning that

different port number values will be used for media associated with each "m=" line?

6.3. SDP Answerer Procedures

When an SDP Answerer receives an SDP Offer which contains a "BUNDLE" group, and the SDP Answerer accepts the offered "BUNDLE" group, the SDP Answerer MUST generate an SDP Answer according to the procedures in [Section 6.1](#).

When generating the SDP Answer, if the SDP Answerer wants to reject media associated with an "m=" line in the "BUNDLE" group, it will insert a zero port number value in the disabled "m=" line, as defined in [RFC 3264](#).

The SDP Answerer MUST NOT insert a "BUNDLE" group in an SDP Answer, unless the associated SDP Offer contains a "BUNDLE" group.

The SDP Answerer MUST NOT insert an identical port number value in multiple "m=" lines, unless the "m=" lines are associated with a "BUNDLE" group.

Until the SDP Answerer receives the new SDP Offer, which contains an identical port number value for each "m=" line associated with a "BUNDLE" group, it MUST use the port, and related information (ICE candidates, SDES keys etc) associated with the first "m=" line in the "BUNDLE" group.

6.4. Bundled SDP Information

6.4.1. General

This section describes how SDP information, given for each media description, is calculated into a single value for a "BUNDLE" group.

6.4.2. Bandwidth (b=)

The total proposed bandwidth is the sum of the proposed bandwidth for each "m=" line associated with a negotiated BUNDLE group.

6.4.3. Attributes (a=)

There are also special rules for handling many different attributes as defined in [[I-D.nandakumar-mmusic-sdp-attributes](#)]. It might not be possible to use bundle with some attributes.

[7.](#) Single vs Multiple RTP Sessions

[7.1.](#) General

When entities negotiate the usage of bundled media, the default assumption is that all media associated with the bundled media will form a single RTP session.

The usage of multiple RTP Sessions within a "BUNDLE" group is outside the scope of this specification. Other specification needs to extend the mechanism in order to allow negotiation of such bundle groups.

It is possible to use multiple "BUNDLE" groups, in case the RTP media within each group will be part of different RTP Sessions.

[7.2.](#) Single RTP Session

When a single RTP Session is used, media associated with all "m=" lines part of a bundle group share a single SSRC [[RFC3550](#)] numbering space.

In addition, the following rules and restrictions apply for a single RTP Session:

- o - The dynamic payload type values used in the "m=" lines MUST NOT overlap.
- o - The "proto" value in each "m=" line MUST be identical (e.g. RTP/AVPF).
- o - A given SSRC SHOULD NOT transmit RTP packets using payload types that originates from different "m=" lines.

NOTE: The last bullet above is to avoid sending multiple media types from the same SSRC. If transmission of multiple media types are done with time overlap RTP and RTCP fails to function. Even if done in proper sequence this causes RTP Timestamp rate switching issues [ref to [draft-ietf-avtext-multiple-clock-rates](#)].

[8.](#) Usage With ICE

[8.1.](#) General

This section describes how to use the "BUNDLE" grouping extension together with the Interactive Connectivity Establishment (ICE) mechanism [[RFC5245](#)].

8.2. Candidates

When an ICE-enabled endpoint generates an SDP Offer, which contains a "BUNDLE" group, the SDP Offerer MUST include ICE candidates for each "m=" line associated with a "BUNDLE" group, except for any "m=" line with a zero port number value. If the "m=" lines associated with the "BUNDLE" group contain different port number values, the SDP Offerer MUST also insert different candidate values in each "m=" line associated with the "BUNDLE" group. If the "m=" lines associated with the "BUNDLE" group contain an identical port number value, the candidate values MUST also be identical.

When an ICE-enabled endpoint generates and SDP Answer, which contains a "BUNDLE" group, the SDP Answerer MUST include ICE candidates for each "m=" line associated with the "BUNDLE" group, except for any "m=" line where the port number value is set to zero. The SDP Answerer MUST insert identical candidate values in each "m=" line associated with the "BUNDLE" group.

8.3. Candidates

Once it is known that both endpoints support, and accept to use, the "BUNDLE" grouping extension, ICE connectivity checks and keep-alives only needs to be performed for the whole "BUNDLE" group, instead of for each individual "m=" line associated with the group.

9. Security Considerations

This specification does not significantly change the security considerations of SDP which can be found in Section X of TBD.

TODO: Think carefully about security analysis of reuse of same SDES key on multiple "m=" lines when the far end does not use BUNDLE and warn developers of any risks.

10. Example: SDP Offer with different port number values

The example below shows an SDP Offer, where bundled media is offered using different port number values in the "m=" lines associated with the "BUNDLE" group. The example also shows two SDP Answer alternatives: one where bundled media is accepted, and one where bundled media is rejected (or, not even supported) by the SDP Answerer.

SDP Offer (Bundled media offered)

```
v=0
o=alice 2890844526 2890844526 IN IP4 host.atlanta.com
s=
c=IN IP4 host.atlanta.com
t=0 0
a=group:BUNDLE foo bar
m=audio 10000 RTP/AVP 0 8 97
a=mid:foo
b=AS:200
a=rtpmap:0 PCMU/8000
a=rtpmap:8 PCMA/8000
a=rtpmap:97 iLBC/8000
m=video 10002 RTP/AVP 31 32
a=mid:bar
b=AS:1000
a=rtpmap:31 H261/90000
a=rtpmap:32 MPV/90000
```

SDP Answer (Bundled media accepted)

```
v=0
o=bob 2808844564 2808844564 IN IP4 host.biloxi.com
s=
c=IN IP4 host.biloxi.com
t=0 0
a=group:BUNDLE foo bar
m=audio 20000 RTP/AVP 0
a=mid:foo
b=AS:200
a=rtpmap:0 PCMU/8000
m=video 20000 RTP/AVP 32
a=mid:bar
b=AS:1000
a=rtpmap:32 MPV/90000
```


SDP Answer (Bundled media not accepted)

```
v=0
o=bob 2808844564 2808844564 IN IP4 host.biloxi.com
s=
c=IN IP4 host.biloxi.com
t=0 0
m=audio 20000 RTP/AVP 0
b=AS:200
a=rtpmap:0 PCMU/8000
m=video 30000 RTP/AVP 32
b=AS:1000
a=rtpmap:32 MPV/90000
```

SDP Offer with ICE (Bundled media offered)

```
v=0
o=alice 2890844526 2890844526 IN IP4 host.atlanta.com
s=
c=IN IP4 host.atlanta.com
t=0 0
a=group:BUNDLE foo bar
m=audio 10000 RTP/AVP 0 8 97
a=mid:foo
b=AS:200
a=rtpmap:0 PCMU/8000
a=rtpmap:8 PCMA/8000
a=rtpmap:97 iLBC/8000
a=candidate:1 1 UDP 1694498815 host.atlanta.com 10000 typ host
m=video 10002 RTP/AVP 31 32
a=mid:bar
b=AS:1000
a=rtpmap:31 H261/90000
a=rtpmap:32 MPV/90000
a=candidate:1 1 UDP 1694498815 host.atlanta.com 10002 typ host
```

11. Example: SDP Offer with identical port number values

The example below shows an SDP Offer, where bundled media is offered an identical port number value in the "m=" lines associated with the "BUNDLE" group. The example also shows two SDP Answer alternatives: one where bundled media is accepted, and one where bundled media is rejected (or, not even supported) by the SDP Answerer.

SDP Offer (Bundled media offered)

```
v=0
o=alice 2890844526 2890844526 IN IP4 host.atlanta.com
s=
c=IN IP4 host.atlanta.com
t=0 0
a=group:BUNDLE foo bar
m=audio 10000 RTP/AVP 0 8 97
a=mid:foo
b=AS:200
a=rtpmap:0 PCMU/8000
a=rtpmap:8 PCMA/8000
a=rtpmap:97 iLBC/8000
m=video 10000 RTP/AVP 31 32
a=mid:bar
b=AS:1000
a=rtpmap:31 H261/90000
a=rtpmap:32 MPV/90000
```

SDP Answer (Bundled media accepted)

```
v=0
o=bob 2808844564 2808844564 IN IP4 host.biloxi.com
s=
c=IN IP4 host.biloxi.com
t=0 0
a=group:BUNDLE foo bar
m=audio 20000 RTP/AVP 0
a=mid:foo
b=AS:200
a=rtpmap:0 PCMU/8000
m=video 20000 RTP/AVP 32
a=mid:bar
b=AS:1000
a=rtpmap:32 MPV/90000
```

SDP Answer (Bundled media not accepted)

```
v=0
o=bob 2808844564 2808844564 IN IP4 host.biloxi.com
s=
c=IN IP4 host.biloxi.com
t=0 0
m=audio 20000 RTP/AVP 0
b=AS:200
```



```
a=rtpmap:0 PCMU/8000
m=video 30000 RTP/AVP 32
b=AS:1000
a=rtpmap:32 MPV/90000
```

SDP Offer with ICE (Bundled media offered)

```
v=0
o=alice 2890844526 2890844526 IN IP4 host.atlanta.com
s=
c=IN IP4 host.atlanta.com
t=0 0
a=group:BUNDLE foo bar
m=audio 10000 RTP/AVP 0 8 97
a=mid:foo
b=AS:200
a=rtpmap:0 PCMU/8000
a=rtpmap:8 PCMA/8000
a=rtpmap:97 iLBC/8000
a=candidate:1 1 UDP 1694498815 host.atlanta.com 10000 typ host
m=video 10000 RTP/AVP 31 32
a=mid:bar
b=AS:1000
a=rtpmap:31 H261/90000
a=rtpmap:32 MPV/90000
a=candidate:1 1 UDP 1694498815 host.atlanta.com 10000 typ host
```

12. IANA Considerations

This document requests IANA to register the new SDP Grouping semantic extension called BUNDLE.

13. Acknowledgements

The usage of the SDP grouping extension for negotiating bundled media is based on a similar alternative proposed by Harald Alvestrand. The SDP examples are also modified versions from the ones in the Alvestrand proposal.

14. Change Log

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

Changes from [draft-ietf-mmusic-sdp-bundle-negotiation-02](#)

- o Mechanism modified, to be based on usage of SDP Offers with both different and identical port number values, depending on whether it is known if the remote endpoint supports the extension.
- o Cullen Jennings added as co-author.

Changes from [draft-ietf-mmusic-sdp-bundle-negotiation-01](#)

- o No changes. New version due to expiration.

Changes from [draft-ietf-mmusic-sdp-bundle-negotiation-00](#)

- o No changes. New version due to expiration.

Changes from [draft-holmberg-mmusic-sdp-multiplex-negotiation-00](#)

- o Draft name changed.
- o Harald Alvestrand added as co-author.
- o "Multiplex" terminology changed to "bundle".
- o Added text about single versus multiple RTP Sessions.
- o Added reference to [RFC 3550](#).

[15.](#) References

[15.1.](#) Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC3264] Rosenberg, J. and H. Schulzrinne, "An Offer/Answer Model with Session Description Protocol (SDP)", [RFC 3264](#), June 2002.
- [RFC4566] Handley, M., Jacobson, V., and C. Perkins, "SDP: Session Description Protocol", [RFC 4566](#), July 2006.
- [RFC5888] Camarillo, G. and H. Schulzrinne, "The Session Description Protocol (SDP) Grouping Framework", [RFC 5888](#), June 2010.
- [I-D.nandakumar-mmusic-sdp-attributes] Nandakumar, S. and C. Jennings, "A Framework for SDP Attributes when Multiplexing", [draft-nandakumar-mmusic-sdp-attributes-00](#) (work in progress), February 2013.

[15.2.](#) Informative References

- [RFC3550] Schulzrinne, H., Casner, S., Frederick, R., and V. Jacobson, "RTP: A Transport Protocol for Real-Time Applications", STD 64, [RFC 3550](#), July 2003.

[RFC5245] Rosenberg, J., "Interactive Connectivity Establishment (ICE): A Protocol for Network Address Translator (NAT) Traversal for Offer/Answer Protocols", [RFC 5245](#), April 2010.

[Appendix A](#). Design Considerations

[A.1](#). General

One of the main issues regarding the "BUNDLE" grouping extensions has been whether, in SDP Offers and SDP Answers, the same port number value should be inserted in "m=" lines associated with a "BUNDLE" group, as the purpose of the extension is to negotiate the usage of a single 5-tuple for media associated with the "m=" lines. Issues with both approaches, discussed in the Appendix have been raised. The outcome was to specify a mechanism which uses SDP Offers with both different and identical port number values.

Below are the primary issues that have been considered when defining the "BUNDLE" grouping extension:

- o 1) Interoperability with existing UAs.
- o 2) Interoperability with intermediary B2BUA- and proxy entities.
- o 3) Time to gather, and the number of, ICE candidates.
- o 4) Different error scenarios, and when they occur.
- o 5) SDP Offer/Answer impacts, including usage of port number value zero.

NOTE: Before this document is published as an RFC, this Appendix might be removed.

[A.2](#). UA Interoperability

Consider the following SDP Offer/Answer exchange, where Alice sends an SDP Offer to Bob:

SDP Offer

```
v=0
o=alice 2890844526 2890844526 IN IP4 host.atlanta.com
s=
c=IN IP4 host.atlanta.com
t=0 0
m=audio 10000 RTP/AVP 97
a=rtpmap:97 iLBC/8000
m=video 10002 RTP/AVP 97
a=rtpmap:97 H261/90000
```


SDP Answer

```
v=0
o=bob 2808844564 2808844564 IN IP4 host.biloxi.com
s=
c=IN IP4 host.biloxi.com
t=0 0
m=audio 20000 RTP/AVP 97
a=rtpmap:97 iLBC/8000
m=video 20002 RTP/AVP 97
a=rtpmap:97 H261/90000
```

[RFC 4961](#) specifies a way of doing symmetric RTP but that is an a later invention to RTP and Bob can not assume that Alice supports [RFC 4961](#). This means that Alice may be sending RTP from a different port than 10000 or 10002 - some implementation simply send the RTP from an ephemeral port. When Bob's endpoint receives an RTP packet, the only way that Bob know if it should be passed to the video or audio codec is by looking at the port it was received on. This lead some SDP implementations to use the fact that each "m=" line had a different port number to use that port number as an index to find the correct m line in the SDP. As a result, some implementations that do support symmetric RTP and ICE still use a SDP data structure where SDP with "m=" lines with the same port such as:

SDP Offer

```
v=0
o=alice 2890844526 2890844526 IN IP4 host.atlanta.com
s=
c=IN IP4 host.atlanta.com
t=0 0
m=audio 10000 RTP/AVP 97
a=rtpmap:97 iLBC/8000
m=video 10000 RTP/AVP 98
a=rtpmap:98 H261/90000
```

will result in the second "m=" line being considered an SDP error because it has the same port as the first line.

[A.3. Usage of port number value zero](#)

In an SDP Offer or SDP Answer, the media associated with an "m=" line can be disabled/rejected by setting the port number value to zero.

This is different from e.g. using the SDP direction attributes, where RTCP traffic will continue even if the SDP "inactive" attribute is indicated for the associated "m=" line.

If each "m=" line associated with a "BUNDLE" group would contain different port number values, and one of those port would be used for the 5-tuple, problems would occur if an endpoint wants to disable/reject the "m=" line associated with that port, by setting the port number value to zero. After that, no "m=" line would contain the port number value which is used for the 5-tuple. In addition, it is unclear what would happen to the ICE candidates associated with the "m=" line, as they are also used for the 5-tuple.

A.4. B2BUA And Proxy Interoperability

Some back to back user agents may be configured in a mode where if the incoming call leg contains an SDP attribute the B2BUA does not understand, the B2BUS still generates that SDP attribute in the Offer for the outgoing call leg. Consider an B2BUA that did not understand the SDP "rtcp" attribute, defined in [RFC 3605](#), yet acted this way. Further assume that the B2BUA was configured to tear down any call where it did not see any RTCP for 5 minutes. In this cases, if the B2BUA received an Offer like:

SDP Offer

```
v=0
o=alice 2890844526 2890844526 IN IP4 host.atlanta.com
s=
c=IN IP4 host.atlanta.com
t=0 0
m=audio 49170 RTP/AVP 0
a=rtcp:53020
```

It would be looking for RTCP on port 49172 but would not see any because the RTCP would be on port 53020 and after five minutes, it would tear down the call. Similarly, an SBC that did not understand BUNDLE yet put BUNDLE in it's offer may be looking for media on the wrong port and tear down the call. It is worth noting that a B2BUA that generated an Offer with capabilities it does not understand is not compliant with the specifications.

A.4.1. Traffic Policing

Sometimes intermediaries do not act as B2BUA, in the sense that they don't modify SDP bodies, nor do they terminate SIP dialogs. Still, however, they may use SDP information (e.g. IP address and port) in order to control traffic gating functions, and to set traffic policing rules. There might be rules which will trigger a session to be terminated in case media is not sent or received on the ports retrieved from the SDP. This typically occurs once the session is already established and ongoing.

A.4.2. Bandwidth Allocation

Sometimes intermediaries do not act as B2BUA, in the sense that they don't modify SDP bodies, nor do they terminate SIP dialogs. Still, however, they may use SDP information (e.g. codecs and media types) in order to control bandwidth allocation functions. The bandwidth allocation is done per "m=" line, which means that it might not be enough if media associated with all "m=" lines try to use that bandwidth. That may either simply lead to bad user experience, or to termination of the call.

A.5. Candidate Gathering

When using ICE, an candidate needs to be gathered for each port. This takes approximately 20 ms extra for each extra "m=" line due to the NAT pacing requirements. All of this gather can be overlapped with other things while the page is loading to minimize the impact. If the client only wants to generate TURN or STUN ICE candidates for one of the "m=" lines and then use trickle ICE [TODO REF] to get the non host ICE candidates for the rest of the "m=" lines, it MAY do that and will not need any additional gathering time.

Some people have suggested a TURN extension to get a bunch of TURN allocation at once. This would only provide a single STUN result so in cases where the other end did not support BUNDLE, may cause more use of the TURN server but would be quick in the cases where both sides supported BUNDLE and would fall back to a successful call in the other cases.

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